Date Received:

Authorization for Remediation/Restoration Activity

www.oregon.gov/dsl

Land Management Division **WESTERN REGION** Department of State Lands 775 Summer Street NE, Suite 100 Salem, OR 97301-1279 503-986-5200 FAX: 503-378-4844	Mail completed application with the applicable non-refundable fee, made payable to: Oregon Department of State Lands. We accept Visa and Master Card, please call (503) 986-5253	**Land Management Division** **EASTERN REGION** Department of State Lands 951 SW Simpson Ave, Suite 104 Bend, OR 97702 541-388-6112 FAX: 541-388-6480

AGENCY WILL ASSIGN NUMBER

Oregon Department of State Lands No._____

Agency requiring action: **Order No:**	☒ **Easement** ☐ **Lease**	**$1,250.00** Application Fee	☐ **Access Agreement**	**$750.00** Application Fee
	☐ **Renewal of Lease or Access Agreement**	**$375 .00** Application Fee	**Application #:**	

1- APPLICANT INFORMATION

Applicant's Name: NW Natural	Home Phone:
Address: 250 SW Taylor Street	Business Phone: 503-610-7656
Portland, OR 97204	Fax: N/A
Attn: Robert Wyatt	Email:robert.wyatt@nwnatural.com
Authorized Agent's Name: Patricia Dost	Home Phone:
Address: Pearl Legal Group PC	Business Phone: 503-467-4675
529 SW 3rd Avenue, Suite 600	Fax:
Portland, OR 97204	Email: pdost@pearllegalgroup.com
Riparian Property Owner Name: City of Portland Bureau of Parks and Recreation (vested); if different than applicant	Home Phone:
Address: 1120 SW 5th Avenue, Suite 858	Business Phone: 503-823-7529
Portland, OR 97204	Fax:
	Email:

2 - PROJECT LOCATION

Street, Road or other descriptive location		Legal Description			
NW Everett Street and SR 99 West (Steel Bridge)		Township 1N	Range 01E	Section 34db	Quarter N/A
In or Near (City or Town) Portland	County Multnomah	Tax Map # 889		Tax Lot (s) # N/A	
Waterway Willamette River	River Mile 12.2	County Property Tax Account Number			

3 - PROJECT INFORMATION

Activity Type (Check all that apply):	Area requested (length x width)
☐ Restoration for Mitigation (R/F or NRDA)	
☒ Monitored Natural Recovery	25,566 ft^2 (SDUs B1, F2)
☐ Environmental Dredging	
☒ Site Monitoring	92,198 ft^2 (all SDUs)
☒ Enhanced Monitored Natural Recovery	15,568 ft^2 (SDUs B2, C3, F1)
☒ Sediment Cap	25,940 ft^2 (SDUs C1, E)
☒ Other (Explain Below) *In-situ Treatment with Granular Activated Carbon*	13,258 ft^2 (SDUs A, D)

Are you aware of any Endangered Species on the project site?	☒ Yes	☐ No
Are you aware of any Cultural Resources on the project site?	☐ Yes	☒ No
Is the project site near a State Scenic Waterway?	☐ Yes	☒ No

If yes to any of the above, please explain in the project description (Section 4).

How will activity impact area and proposed mitigation? *See Project Description.*

4 - PROJECT PURPOSE & DESCRIPTION*

☒ Existing Facility/Activity ☐ Proposed Project

Project Purpose and Need: The purpose of continuing the long-term monitoring and maintenance program is to verify the effectiveness of the remedy that was implemented in 2020 consistent with the Department on Environmental Quality's (DEQ's) July 2017 Record of Decision. This is needed to demonstrate that Remedial Action Objectives are being attained. Monitoring activities will be implemented consistent with the DEQ-approved Long Term Monitoring and Maintenance Plan. Placement of up to 1,970 cy of additional clean cover material, with or without activated carbon, may also occur as a contingency to cover any necessary cap or cover repairs that may be identified by the long-term monitoring activities.

Project Description: See attached Project Description.

Estimated Start Date: July 1, 2023	Estimated Completion Date: December 31, 2035

5 - ADDITIONAL INFORMATION

Please provide the names, addresses and phone numbers for all adjoining property owners

Name: City of Portland Bureau of Parks and Recreation
Address: 1120 SW Fifth Avenue, Suite 858, Portland, Oregon 97204-1912
Phone:

Name: Oregon Department of State Lands
Address: Attn: Pablo Martos, 775 Summer Street NE, Suite 100, Salem, Oregon 97301-1279
Phone:

Name: City of Portland Facilities Services
Address: 1120 SW Fifth Avenue #1204, Portland, Oregon 97204-1912
Phone:

Name: Unico Properties, LLC
Address: Attn: UCP 38 Davis LLC, 1215 4th Avenue #600, Seattle, Washington 98161
Phone:

Has the proposed activity or nay related activity received the attention of the Corps of Engineers of the State of Oregon in the past, e.g., wetland delineation, violation, permit, lease request, etc.? ☒ Yes ☐ No	
If yes, what identification number(s) were assigned by the respective agencies:	
U.S. Army Corps of Engineers: Corps # NWP-2009-20-4 Corps # NWP-2009-20-5	State of Oregon: DSL # 61591-PW DSL # 0061743-EA DSL # 60510-AA DSL # 60510-AA DSL #41802-TU

[1]

[1] * Please attach all associated DEQ/EPA documentation (Work Plan, O&M Plan, AOC & Consent Judgement, etc)

6 - CITY/COUNTY PLANNING DEPARTMENT AFFIDAVIT

(to be completed by local planning official)

❒ This project is not regulated by the local comprehensive plan and zoning ordinance.
❒ This project has been reviewed and is consistent with the local comprehensive plan and zoning ordinance.
❒ This project has been reviewed and is **not** consistent with the local comprehensive plan and zone ordinance.
❒ Consistency of this project with the local planning ordinance cannot be determined until the following local approval(s) are obtained:

❒ Conditional Use Approval ❒ Development Permit
❒ Plan Amendment ❒ Zone Change
❒ Other _____

An application ❒ has ❒ has not been made for local approvals checked above.

Signature of local planning official	Title	City / County	Date

Applicant is seeking an Access Agreement for the purpose of a remedial investigative action (sediment sampling, water quality monitoring, etc.) that does not affect land use or require a land use compatibility determination (LUCS) by the City/County Planning Department. No permanent structures to be placed on state-owned lands.

_____ _____
Print/Type Name Applicant's signature

7 - BUSINESS INFORMATION

LIMITED LIABILITY COMPANY: Complete the following

a) Do you have authority from the Oregon Secretary of State to do business in the State of Oregon? ☐ Yes ☐ No
b) Is the LLC presently in good standing with the Oregon Secretary of State? ☐ Yes ☐ No
c) In what state is the LLC primarily domiciled? _____
d) Is the LLC name and the Oregon business address the same as stated in this application? ☐ Yes ☐ No
If no, state the legal Name: _____

Address:

Street or Box Number	City	State	Zip Code

Additionally, a LIMITED LIABILITY COMPANY must submit the following with the application:

a) A certified copy of the company's Articles of Organization
b) A copy of the company's operating agreement

CORPORATION: Complete the following:

a) Do you have authority from the Oregon Secretary of State to do business in the State of Oregon? ☒ Yes ☐ No
b) Is the corporation presently in good standing with the Oregon Secretary of State? ☒ Yes ☐ No
c) In what state are you incorporated? Oregon
d) Is the legal corporation name and Oregon business address the same as stated in this application? ☐ Yes ☒ No
If no, state the legal Corporate Name: Northwest Natural Gas Company

Address:

Street or Box Number	City	State	Zip Code
_250 SW Taylor Street ____	_Portland__	___Oregon__	_97204_

PARTNERSHIP OR JOINT VENTURE: Complete the following

NAME	BUSINESS ADDRESS	%SHARE	DIVISION

TRUST: Complete the following for each beneficiary of the Trust:

NAME	BUSINESS ADDRESS

OR identify the Trust document by title, document number, and county where document is recorded:

TITLE	DOCUMENT NUMBER	COUNTY

A resolution that the individual designated to sign is authorized to act on behalf of the company in this matter.

8 - FOR A COMPLETE APPLICATION:
PLEASE SUBMIT ALL OF THE FOLLOWING:

A. A street or highway location map with road directions to the site from the nearest main highway or road.

B. Assessor map that contains the riparian uplands. Do not mark on this map.

C. A copy of the current year's property tax statement which identifies the present owner's name(s), land values, land size and tax account numbers of the riparian uplands.

D. A separate drawing to a scale of 1 inch = 100 feet of all existing and proposed structures and /or work. Label each separate activity type stated in Section 3 and show the dimensions of each area by length and width, as stated in Section 3.

E. A legal description of the requested authorization area(s) with an accurate delineation of the area relative to the tax lot boundaries of the upland parcel. (The department may require a survey for this purpose).

F. Project Inventory and Evaluation for purposes of Site Diminishment Impact Determination.

G. Any Consent Judgment, Order on Consent, and/or any related documentation by DEQ or EPA.

H. Any and All Work Plan or Operation & Maintenance plans that have been prepared for proposed activities.

I. Documentation of any Financial Assurance required by DEQ or EPA.

J. Enclose applicable non-refundable application fee, as determined during pre-application process. Made payable to: Oregon Department of State Lands.

APPLICANT SIGNATURE

I hereby request a state authorization for: 30 (number) years.

Application is hereby made for the activities described herein. I certify that I am familiar with the information contained in the application, and, to the best of my knowledge and belief, this information is true, complete, and accurate. I further certify that I possess the authority to undertake the proposed activities. I understand that the granting of other permits by local, county, state or federal agencies does not release me from the requirement of obtaining the authorization requested before commencing the project. I understand that payment of the required state application fee does not guarantee authorization.

Robert J. Wyatt	Director, Legacy Environmental Program
Print /Type Name	Title
	2/28/2023
Applicant Signature	Date

I appoint the person named below to act as my duly authorized agent.

Patricia Dost	Attorney
Print /Type Name	Title
	2.28.2023
Authorized Agent Signature	Date

Updated 11_16_2020

Applicant Name: _____
Application Type: _____
Waterway: _____
County: _____

Site Diminishment Impact Determination

For remediation and habitat restoration activities on state-owned submerged and submersible lands governed by Division 145

PROJECT INVENTORY & EVALUATION

Policy
Prior to making a decision on compensation required for a remediation or habitat restoration activity on state-owned submerged and submersible land the applicant shall prepare, or cause to be prepared, a project inventory and evaluation **sufficient to understand the short-term and long-term effects** of the proposed activity on public trust uses and the Department's ability to issue additional waterway authorizations. The Department will use this information when determining the site diminishment impact of the activity on the requested area of state-owned land.

Standards for Decision Making

- Impacts to public trust uses as defined in OAR 141-145-0005(28);
- Duration of impacts to public trust uses;
- Impacts on the Department's ability to issue leases, licenses and registrations for structures on and uses of state-owned submerged and submersible lands governed by OAR 141-082.

  Note: The Department may consult with pertinent local, state and federal agencies, federally recognized tribal governments, ports, and other stakeholders to assist in the review of the inventory and evaluation.

Inventory for the proposed action

The following factors may be considered for inclusion in the inventory for the proposed action as appropriate to the magnitude, likelihood of effects, and the significance of potentially affected uses:

1. Location (using maps, charts, descriptions, etc.)

   See Project Description Attachments A and D

2. Numbers and sizes of equipment, structures associated with the proposed use;

See Project Description and Attachment D

3. Duration of activities occurring with the proposed use;

See Project Description

4. Physical and chemical properties of materials to be used or produced, if any;

See Project Description

5. Navigation aids;

Not applicable

6. Proposed time schedule; and

See Project Description

7. Location and description of all affected areas on state-owned lands.

See Project Description and Attachments A, D and E.

8. Does the proposed use require any restrictions to navigation, recreation, commerce, or fishing (for example an agency ordered fishing restriction, or restriction to boating or anchoring)? If so, for what duration?

See Attachment F.

9. Does the proposed use require the exclusive use of the property (no other waterway structures can occupy the affected area such as a mooring dock or boat ramp)? If so, for what duration?

See Attachment F.

10. Agency Consultation (Which agencies were consulted in the development of this inventory?).

None

11. Public Participation (Which stakeholders from the public were consulted in the development of this inventory?).

None

Project Description
NW Natural PGM Site
Long-Term Monitoring and Contingency Material Placement

Overview

The proposed project is to continue to conduct post-remediation long-term monitoring at the former Portland Gas Manufacturing (PGM) site and to implement contingency material placement actions (i.e., cap and cover repair and/or augmentation) if the monitoring results indicate a need to do so. The project site is located on approximately 35,516 square feet (0.82 acre; SDUs C1, E, and A) of submerged land near river mile 12.2 along the left (west) bank of the Willamette River in downtown Portland. In 2020, NW Natural completed a successful remedial action in accordance with the selected remedy in the Record of Decision issued by the Department of Environmental Quality (DEQ) on July 3, 2017. The remedial action included dredging, in-situ treatment with granular activated carbon (GAC), armoring where needed, dredge residuals cover, monitored natural recovery, and enhanced monitored natural recovery (EMNR). The most recent Year 2 monitoring data showed surface sediments, transition zone water, porewater, and surface water (SW) were already meeting site cleanup levels over a large majority of the site, and the few remaining spots with low-level exceedances were on track to achieve cleanup levels soon.

The site is currently undergoing long-term monitoring to ensure the remedy is functioning as intended and remedial action objectives are being met. Long-term monitoring activities include bathymetry surveys, surface sediment grab samples, transition zone water samples, porewater samples, and SW samples as described in the DEQ-approved Long Term Monitoring and Maintenance Plan. Monitoring activities occurred in Year 0, immediately following construction (2020), and more recently in Year 2 (2022), and future monitoring events are scheduled to occur in Year 5 (2025) and Year 10 (2030) post-remediation.

The Willamette River is a dynamic environment. All capped areas have been stable; however, there has been some movement of placed cover materials (sand and sand amended with GAC) observed at the site. In addition, propwash associated with the docking and undocking of U.S. Navy vessels during Fleet Week has the potential to disturb the riverbed, as well as caps and covers placed on the riverbed. Therefore, DEQ is requiring additional bathymetric surveys prior to the scheduled Year 5 event, including Year 3 (2023), and if significant new areas of cover erosion are identified, targeted follow-up sampling and analysis work may be required to determine if any response actions are warranted.

Project Description

The proposed project includes the following elements: 1) perform DEQ-required long-term monitoring activities; and 2) place up to 1,970 cubic yards of clean imported material on the riverbed for contingency repairs and/or augmentations of remedial caps and covers if repairs or augmentations are determined to be needed based on the long-term monitoring record. Each element is described in more detail in the following subsections.

Monitoring Activities

Long-term monitoring activities include bathymetry surveys; surface sediment grab samples; diver-assisted surface sediment samples; and transition zone water, porewater, and SW samples as described in more detail in the long-term monitoring plan or as otherwise approved by DEQ. (Anchor QEA 2021).

Contingency Material Placement Activities

Contingency material placement activities include cap and cover repair and/or augmentation if the monitoring results indicate a need to do so. Clean cap and/or cover augmentation materials would be placed as needed as approved by DEQ.

Project Timing

Long-term monitoring activities are scheduled to occur in Year 5 (2025) and Year 10 (2030) post-remediation. Additional bathymetric surveys prior to the scheduled Year 5 event, including Year 3 (2023) and Year 4 (2024), will also be conducted, and if significant new areas of cover erosion are identified, targeted follow-up sampling and analysis work may be required prior to Year 5 to determine if any contingency response actions are warranted. Bathymetry surveys and sediment, TZW, PW, and SW sampling could occur at any time of year. Contingency material placement activities would occur during the approved, regulatory in-water work window for the Lower Willamette River and would be scheduled to avoid interference with other activities within the project area (e.g., fleet week).

Endangered Species Act (ESA)-Listed Species

The PGM project site is within the range of several salmonid species listed as threatened under the ESA: the Upper Willamette River (UWR) and Lower Columbia River (LCR) Evolutionary Significant Unit (ESU) of Chinook salmon (*Oncorhynchus tschawytscha*), LCR ESU of coho salmon (*O. kisutch*), and UWR and LCR Distinct Population Segment (DPS) of steelhead (*O. mykiss*). The site is also within the designated critical habitat for these species. Columbia River ESU of chum salmon (*O. keta*), eulachon (Columbia River smelt; *Thaleichthys pacificus*), Columbia River DPS of bull trout (*Salvelinus confluentus*), and Southern DPS of North American green sturgeon (*Acipenser medirostris*) are threatened species that are found in the Columbia River but are uncommon in the Willamette River and, therefore, unlikely to be affected by the proposed project.

Of the threatened salmonid species expected to be present within the Lower Willamette River, various salmonid life stages may be present in the vicinity of the PGM site. Adults would be expected to occur in the deeper water of the main river channel, but no spawning occurs in or near the project site. Juveniles would be expected to primarily use shallow-water, nearshore areas of the Willamette River, depending on species and life stage. The project area is characterized by a vertical seawall and lack of riparian habitat and shallow-water areas, which results in a lack of the habitats where juveniles are likely to be found. Further, due to the timing of outmigration, juvenile salmon are less likely to be in the project area during the approved in-water work window (July 1 to October 31), when contingency material placement work would be conducted, if necessary. Relatively fewer adults are in the project area at this time, as well.

Cultural Resources Survey

In-water historic debris at the site was characterized using divers and geophysical surveys prior to remediation. Some of the debris was removed and further evaluated during site remediation. In compliance with Section 106 of the National Historic Preservation Act, and as required by the U.S. Army Corps of Engineers, the debris was evaluated by an archaeological firm, Willamette Cultural Resources Associates, Ltd., and was determined not eligible for listing in the National Register of Historic Places. Archaeologists at the State Historic Preservation Office and the Department of State Lands concurred with this determination. Since the debris was removed during the remedial action, and the proposed project is not expected to involve any further excavation, no additional cultural resources evaluation is necessary.

SOURCE: ©DeLorme, Topo USA

NOTE: The site is located in the Willamette River near the Steel Bridge at river mile 12.1 to 12.2. The site is visible from the bike path/walkway of Tom McCall Waterfront Park but can only be accessed by boat. The closest street intersection to the site is NW Naito Parkway and NW Everett Street; the closest boat launch is at Willamette Park at river mile 15.5.

Latitude: N45° 31.5724'
Longitude: W122° 40.1662'
Section-Township-Range: S34-T1N-R1E

Publish Date: 2018/11/05 1:36 PM | User: jbigsby
Filepath: K:\Projects\0029-NW Natural Gas Co\Portland Gas Manufacturing Site\Permitting\0029-PM-023 (Vicinity Map-DSL Easement).dwg A

Date: February 2023

ANCHOR QEA

Attachment A
Vicinity Map

DSL Easement Application
Former Portland Gas Manufacturing Site
Portland, Oregon

THIS MAP WAS PREPARED FOR ASSESSMENT PURPOSE ONLY

N.W.1/4 S.E.1/4 SEC.34 T.1N. R.1E. W.M.
MULTNOMAH COUNTY
1" = 100'

1N 1E 34DB
PORTLAND

SEE MAP 1N 1E 34BD

N.W. NAITO (S.W. FRONT AVE.)

STEEL BRIDGE

SEE MAP 1N 1E 34AC

N.W. GLISAN ST.

APPROX. CEN. SEC.

APPROX. 1/16 COR.

PKWY.

RAIL

21

22

N.W. FLANDERS ST.

LIGHT

6

5

NOTE: RELINQUISHED TO CITY OF PORTLAND FOR USE AS PARK.

HARBOR LINE U.S. ARMY CORPS OF ENG. DR. WR-3-5/5

N.W. EVERETT (E) ST.

PARK

TRI-MET

7

4

WATERFRONT

SEE MAP 1N 1E 34CA

AVE.

COUCHS ADD.

BK. 1003 PG. 143

N.W. DAVIS (D) ST.

PKWY.

3

McCALL

CITY OF PO ORD. 74907 ADOPTS RESOLUTION NO.31850 ENG. REPORT

ORD. 75503 CITY OF PORTLAND POSSESSION FEB.28, 1941

1ST

NAITO

889

G.L.O. MEANDER LINE

WILLAMETTE RIVER

N.W. COUCH (C) ST.

708

N.W.

(S.W. FRONT AVE.)

SEE RELINQUISHMENT DEED 80-1452-1171

1300 TOM

2

NOTE: RELINQUISHED TO CITY OF PORTLAND FOR USE AS PARK BY 80-1452-1151 SEE ORD. 149606

WATERFRONT LINE PER CITY OF PORTLAND 1922 OPO MAPPING

JUDGEMENT 20372 3-8-1894

STREET R/W

NORTH LINE 110' WIDE

RES.14155

RESOLUTION NO. 14155

ORD.45951

W. (B) BURNSIDE ST.

BURNSIDE BRIDGE

EASEMENT 2017-028948

SOUTH LINE 110' WIDE

RES.14155

APPROX. 1/16 COR.

SEE MAP 1N 1E 34CD

SEE MAP 1N 1E 34DC

1N 1E 34DB
PORTLAND

3/28/2017

ATTACHMENT C

Current Year's Property Tax Statement
Permittee NW Natural
Portland Gas Manufacturing (PGM) Site

The riparian property adjacent to the sediment cap is the City of Portland Waterfront Park and is not a tax lot. NW Natural's understanding is that this property is jointly owned by the City of Portland and the State of Oregon. The nearest tax lot is TL100 (446 NW Naito Parkway). In 2020, DSL opted not to value the riparian property adjacent to the cap based on TL100 and instead selected TL1300 (10 Naito Parkway), which is upstream of the cap near the Burnside Bridge. We are providing information retrieved from PortlandMaps for both locations.

446 NW NAITO PKWY

PORTLAND, OR 97209

ASSESSOR

Address	446 NW NAITO PKWY
Address2	PORTLAND, OR 97209
Block	110
City	PORTLAND
Property ID	R140724
Tax Roll	COUCHS ADD, BLOCK 110 TL 1200, DEPT OF REVENUE
Use	CENTRALLY ASSESSED
County	Multnomah
State ID	1N1E34AC 1200
New State ID	1N1E34AC -01200
Alt Account Number	R180210190
Map Number	2929
Building Area	0 sq ft
Assessor Update Date	02/20/2023 4:22AM

For more information about data updates or discrepancies, please contact Multnomah County Assessment, Recording & Taxation at (503) 988-3326 or dartcs@multco.us.

Owner

Name	UNION PACIFIC RAILROAD COMPANY
Address	1400 DOUGLAS ST - MS 1640 OMAHA NE 68179-1640

Improvements

Assessment History

Year	Improvements	Land	Special Use	Real Market	Exemptions	Assessed
2022	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2021	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Year	Improvements	Land	Special Use	Real Market	Exemptions	Assessed
2020	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2019	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2018	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2017	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2016	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2015	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2014	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2013	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2012	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2011	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2010	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2009	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2008	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2007	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2006	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2005	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2004	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2003	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2002	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2001	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2000	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
1999	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Tax Districts

Code	Description
101	PORT OF PORTLAND
130	CITY OF PORTLAND
143	METRO
166	WEST MULT SOIL/WATER
170	MULTNOMAH COUNTY
171	URBAN RENEWAL PORTLAND
173	URB REN SPECIAL LEVY - PORTLAND
176	MULTNOMAH COUNTY LIBRARY
198	TRI-MET TRANSPORTATION
304	MULTNOMAH ESD

Code	Description
309	PORTLAND COMM COLLEGE
311	PORTLAND SCHOOL DIST #1
130L	CITY OF PORTLAND - LOC OPT
130N	CITY OF PORTLAND - NEW BONDS
143L	METRO - LOC OPT
143N	METRO - NEW BONDS
170H	MULT CO HIST SOCIETY LOC OPT
309N	PORTLAND COMM COLLEGE BONDS-NEW
311L	PORTLAND SCHOOL DIST LOC OPT
311N	PORTLAND SCHOOL DIST NEW BONDS

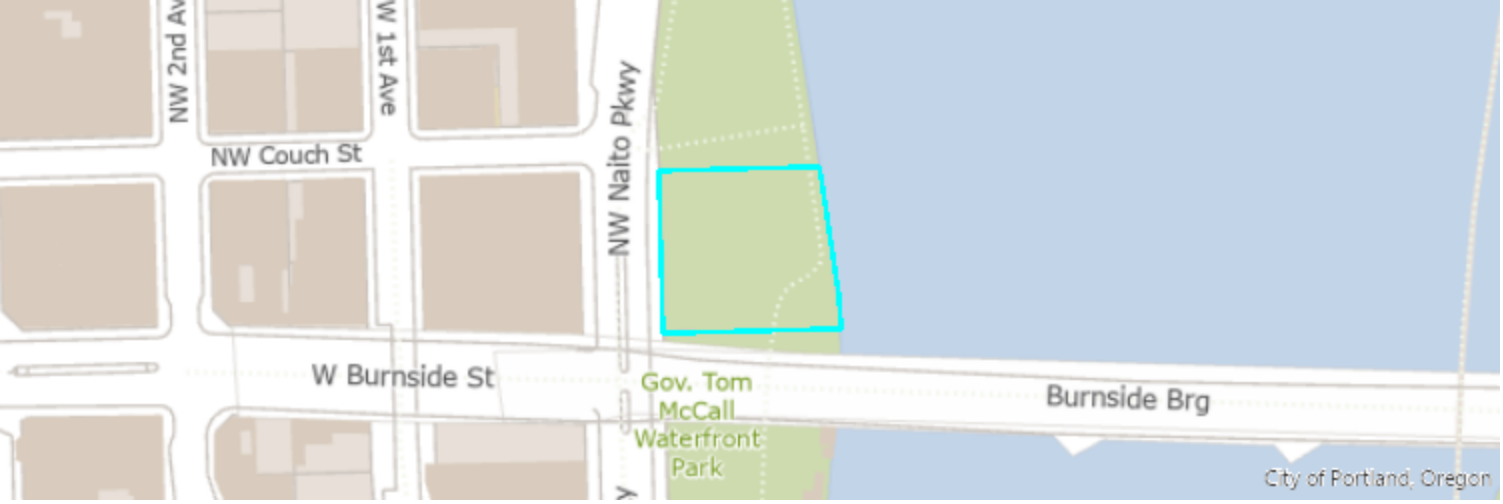
Tax History

Year	Property Tax	Total Tax
2022	$0.00	$0.00
2021	$0.00	$0.00
2020	$0.00	$0.00
2019	$0.00	$0.00
2018	$0.00	$0.00
2017	$0.00	$0.00
2016	$0.00	$0.00
2015	$0.00	$0.00
2014	$0.00	$0.00
2013	$0.00	$0.00
2012	$0.00	$0.00
2011	$0.00	$0.00
2010	$0.00	$0.00
2009	$0.00	$0.00
2008	$0.00	$0.00
2007	$0.00	$0.00
2006	$0.00	$0.00
2005	$0.00	$0.00
2004	$0.00	$0.00
2003	$0.00	$0.00
2002	$0.00	$0.00
2001	$0.00	$0.00

Year	Property Tax	Total Tax
2000	$0.00	$0.00
1999	$0.00	$0.00

Tax Maps

Quarter Section	Size
1n1e34ac (Current Property)	4,755.9 KB
1n1e34	215.4 KB
1n1e34aa	550.0 KB
1n1e34ab	5,509.1 KB
1n1e34ad	453.8 KB
1n1e34b	499.4 KB
1n1e34ba	330.1 KB
1n1e34bb	484.4 KB
1n1e34bc	387.4 KB
1n1e34bd	580.7 KB
1n1e34ca	485.2 KB
1n1e34cb	375.4 KB
1n1e34cc	597.5 KB
1n1e34cd	598.0 KB
1n1e34da	450.2 KB
1n1e34db	276.2 KB
1n1e34dc	12,406.1 KB
1n1e34dd	423.6 KB



10 NW NAITO PKWY

PORTLAND, OR 97209

ASSESSOR

Address	10 NW NAITO PKWY
Address2	PORTLAND, OR 97209
Block	1-3
City	PORTLAND
Property ID	R527708
Tax Roll	COUCHS ADD, BLOCK 1-3 TL 1300
Use	PARK
Lot	1300
County	Multnomah
State ID	1N1E34DB 1300
New State ID	1N1E34DB -01300
Alt Account Number	R180200020
Total Land Area	0.92 acres (40,238 sq ft)
Building Area	0 sq ft
Assessor Update Date	02/20/2023 4:22AM

For more information about data updates or discrepancies, please contact Multnomah County Assessment, Recording & Taxation at (503) 988-3326 or dartcs@multco.us.

Owner

Name	PORTLAND CITY OF
Address	1120 SW 5TH AVE #858 PORTLAND OR 97204-1912

Improvements

Assessment History

Year	Improvements	Land	Special Use	Real Market	Exemptions	Assessed
2022	$0.00	$1,609,520.00	$0.00	$0.00	$0.00	$0.00
2021	$0.00	$1,609,520.00	$0.00	$0.00	$0.00	$0.00

Year	Improvements	Land	Special Use	Real Market	Exemptions	Assessed
2020	$0.00	$1,609,520.00	$0.00	$0.00	$0.00	$0.00
2019	$0.00	$1,609,520.00	$0.00	$0.00	$0.00	$0.00
2018	$0.00	$1,609,520.00	$0.00	$1,609,520.00	$1,609,520.00	$0.00
2017	$0.00	$1,609,520.00	$0.00	$1,609,520.00	$1,609,520.00	$0.00
2016	$0.00	$1,609,520.00	$0.00	$1,609,520.00	$1,609,520.00	$0.00
2015	$0.00	$1,609,520.00	$0.00	$1,609,520.00	$1,609,520.00	$0.00
2014	$0.00	$1,609,520.00	$0.00	$1,609,520.00	$1,609,520.00	$0.00
2013	$0.00	$1,609,520.00	$0.00	$1,609,520.00	$1,609,520.00	$0.00
2012	$0.00	$1,609,520.00	$0.00	$1,609,520.00	$1,609,520.00	$0.00
2011	$0.00	$1,609,520.00	$0.00	$1,609,520.00	$1,609,520.00	$0.00
2010	$0.00	$1,609,520.00	$0.00	$1,609,520.00	$1,609,520.00	$0.00
2009	$0.00	$1,609,520.00	$0.00	$1,609,520.00	$1,609,520.00	$0.00
2008	$0.00	$1,609,520.00	$0.00	$1,609,520.00	$1,609,520.00	$0.00
2007	$0.00	$1,609,520.00	$0.00	$1,609,520.00	$1,609,520.00	$0.00
2006	$0.00	$1,609,520.00	$0.00	$1,609,520.00	$1,609,520.00	$0.00
2005	$0.00	$1,609,520.00	$0.00	$1,609,520.00	$1,609,520.00	$0.00
2004	$0.00	$1,207,000.00	$0.00	$1,207,000.00	$1,207,000.00	$0.00
2003	$0.00	$1,207,000.00	$0.00	$1,207,000.00	$1,207,000.00	$0.00
2002	$0.00	$1,207,000.00	$0.00	$1,207,000.00	$1,207,000.00	$0.00

Tax Districts

Code	Description
101	PORT OF PORTLAND
130	CITY OF PORTLAND
143	METRO
166	WEST MULT SOIL/WATER
170	MULTNOMAH COUNTY
171	URBAN RENEWAL PORTLAND
173	URB REN SPECIAL LEVY - PORTLAND
176	MULTNOMAH COUNTY LIBRARY
198	TRI-MET TRANSPORTATION
304	MULTNOMAH ESD
309	PORTLAND COMM COLLEGE
311	PORTLAND SCHOOL DIST #1
130L	CITY OF PORTLAND - LOC OPT

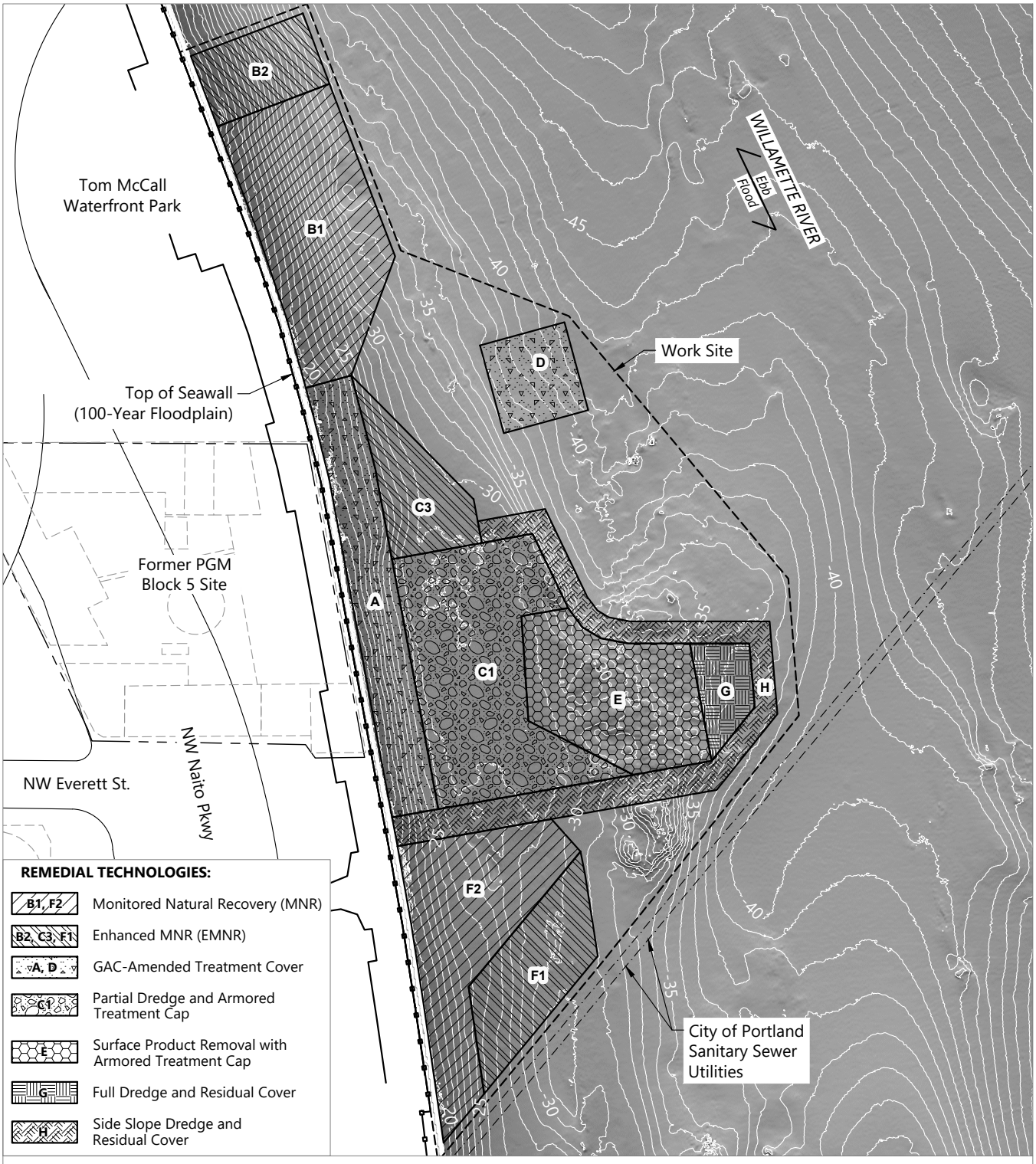
Code	Description
130N	CITY OF PORTLAND - NEW BONDS
143L	METRO - LOC OPT
143N	METRO - NEW BONDS
170H	MULT CO HIST SOCIETY LOC OPT
309N	PORTLAND COMM COLLEGE BONDS-NEW
311L	PORTLAND SCHOOL DIST LOC OPT
311N	PORTLAND SCHOOL DIST NEW BONDS

Tax History

Year	Property Tax	Total Tax
2022	$0.00	$0.00
2021	$0.00	$0.00
2020	$0.00	$0.00
2019	$0.00	$0.00
2018	$0.00	$0.00
2017	$0.00	$0.00
2016	$0.00	$0.00
2015	$0.00	$0.00
2014	$0.00	$0.00
2013	$0.00	$0.00
2012	$0.00	$0.00
2011	$0.00	$0.00
2010	$0.00	$0.00
2009	$0.00	$0.00
2008	$0.00	$0.00
2007	$0.00	$0.00
2006	$0.00	$0.00
2005	$0.00	$0.00
2004	$0.00	$0.00
2003	$0.00	$0.00
2002	$0.00	$0.00

Tax Maps

Quarter Section	Size
1n1e34db (Current Property)	276.2 KB
1n1e34	215.4 KB
1n1e34aa	550.0 KB
1n1e34ab	5,509.1 KB
1n1e34ac	4,755.9 KB
1n1e34ad	453.8 KB
1n1e34b	499.4 KB
1n1e34ba	330.1 KB
1n1e34bb	484.4 KB
1n1e34bc	387.4 KB
1n1e34bd	580.7 KB
1n1e34ca	485.2 KB
1n1e34cb	375.4 KB
1n1e34cc	597.5 KB
1n1e34cd	598.0 KB
1n1e34da	450.2 KB
1n1e34dc	12,406.1 KB
1n1e34dd	423.6 KB



HORIZONTAL DATUM: Oregon State Plane North, NAD83, Int. Feet
VERTICAL DATUM: City of Portland Datum

NOTE:
GAC: granular activated carbon

LEGEND:

Work Site

2022 Bathymetric Contours (1-Foot Intervals)

0 100
Feet

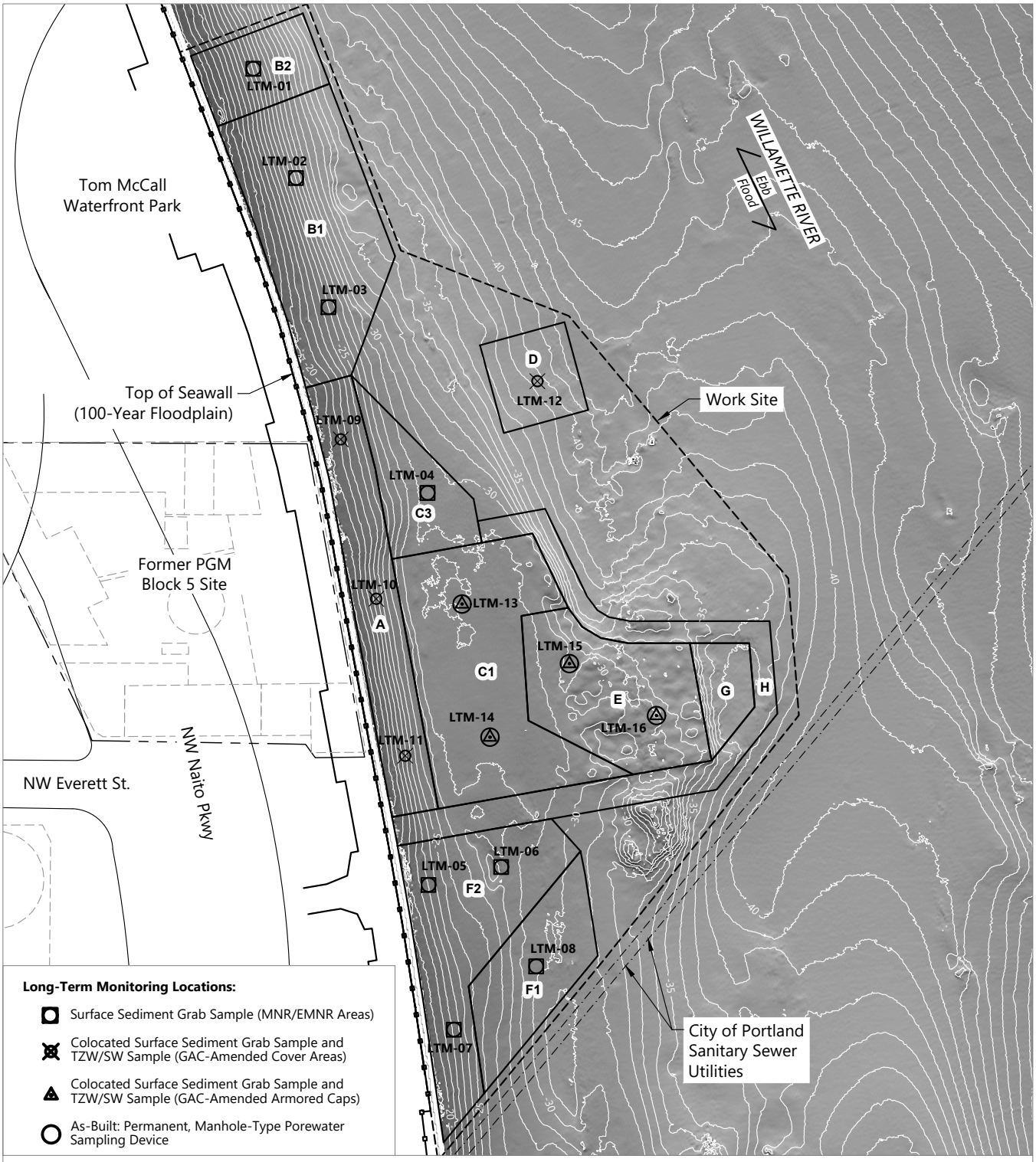
Publish Date: 2023/02/13 1:23 PM | User: jbigsby
Filepath: K:\Projects\0029-NW Natural Gas Co\Portland Gas Manufacturing Site\Permitting\0029-PM-056 (SDUs-JPA-2023).dwg Figure 2

Date: February 2023

ANCHOR QEA

Attachment D
Remedial Technology Application Areas

DSL Easement Application
Former Portland Gas Manufacturing Site
Portland, Oregon



Publish Date: 2023/02/13 1:23 PM | User: jbigsby
Filepath: K:\Projects\0029-NW Natural Gas Co\Portland Gas Manufacturing Site\Permitting\0029-PM-058 (LTM-JPA-2023).dwg Figure 3

Date: February 2023

ANCHOR QEA

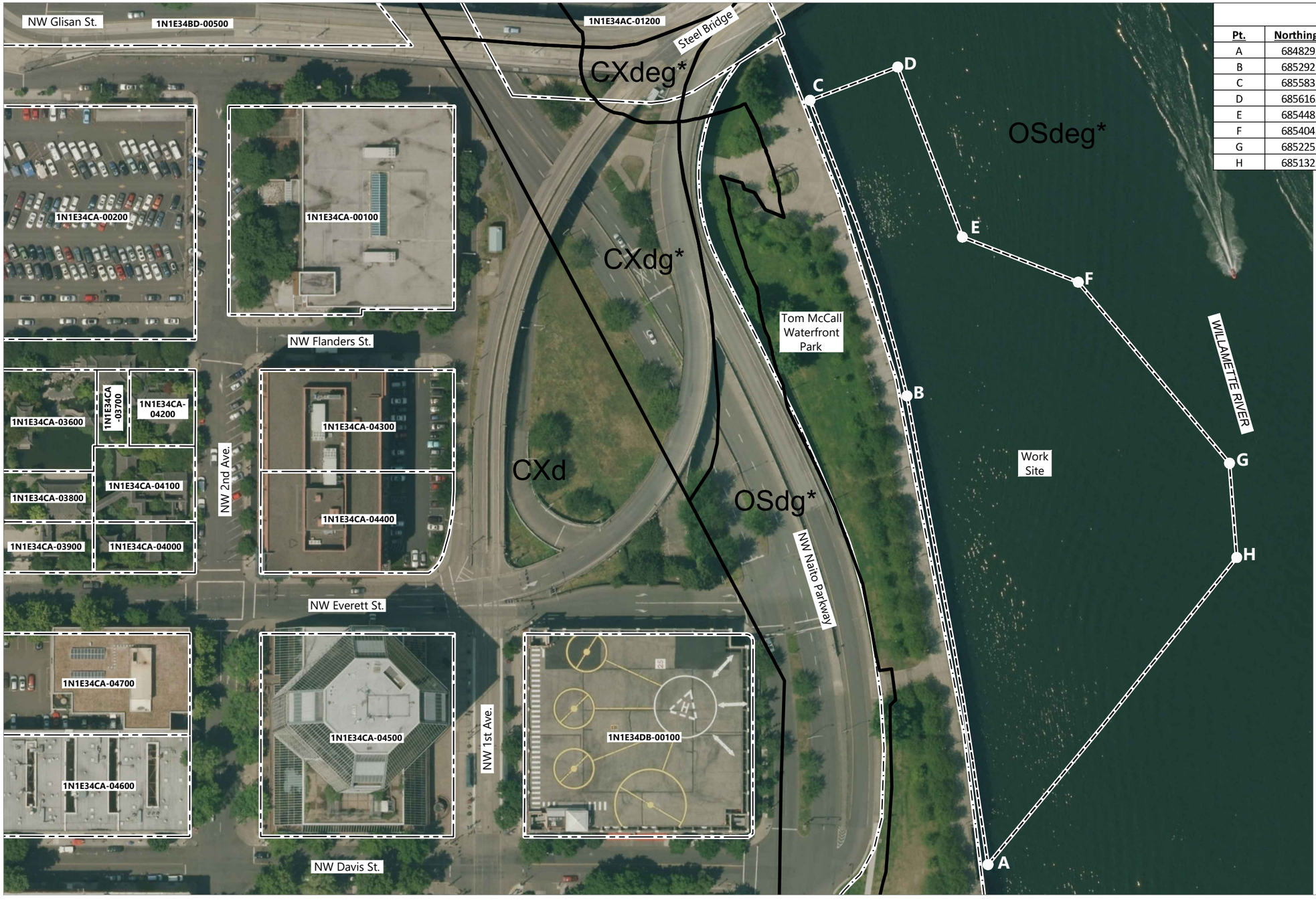
Attachment D
Long-Term Monitoring Locations

DSL Easement Application
Former Portland Gas Manufacturing Site
Portland, Oregon

ATTACHMENT E

LEGAL DESCRIPTION OF USE AREA FOR DSL EASEMENT FOR LONG-TERM MONITORING AND CONTINGENCY MATERIAL PLACEMENT WORK
Permittee NW Natural
Portland Gas Manufacturing (PGM) Site

For the long-term monitoring on state-owned submerged or submersible land lying within the Willamette River fronting the former Portland Gas Manufacturing Site (the Site) from River Mile (RM) 12.0 to RM 12.2, and more particularly state-owned submerged or submersible land lying within the Willamette River in Section 34, Township 1 North, Range 1 East, Willamette Meridian, Multnomah County, Oregon, and comprising an area of approximately 780 feet along the western portion of the Willamette River between the Steel Bridge and NW Davis Street and their intersections with the Willamette River in Portland, Oregon, all sediment collection sites and potential material placement sites generally within the area shown on the accompanying figure labeled Attachment E, hereinafter referred to as the "Property."



Work Site Control Points

Pt.	Northing (ft)	Easting (ft)	Latitude	Longitude
A	684829.86	7646148.42	45° 31.477'	122° 40.169'
B	685292.12	7646068.62	45° 31.553'	122° 40.190'
C	685583.62	7645972.96	45° 31.600'	122° 40.214'
D	685616.45	7646059.4	45° 31.606'	122° 40.194'
E	685448.69	7646123.2	45° 31.579'	122° 40.178'
F	685404.23	7646237.38	45° 31.572'	122° 40.151'
G	685225.68	7646386.48	45° 31.543'	122° 40.115'
H	685132.68	7646393.66	45° 31.528'	122° 40.113'

LEGEND:

- 1N1E34AC-01200 — Tax Lot Boundary and Number
- Park Boundary
- Work Site Boundary
- OSdg* — Zoning Boundary and Type (CX = Central Commercial, OS = Open Space)

0 100 Feet

SOURCE: Aerial photograph from Google Earth Pro

Publish Date: 2018/12/07 9:34 AM | User: jbigsby
Filepath: K:\Projects\0029-NW Natural Gas Co\Portland Gas Manufacturing Site\Permitting\0029-PM-025 (Legal Desc-DSL Easement).dwg E

Date: February 2023

ANCHOR QEA

Attachment E
Site Legal Description

DSL Easement Application
Former Portland Gas Manufacturing Site
Portland, Oregon

Site Diminishment Impact Determination
Project Inventory and Evaluation
NW Natural PGM Site Long-Term Monitoring and Contingency Material Placement

A detailed overview of the project is presented in the Project Description, which also serves as the "project inventory" for the purposes of this evaluation.

Potential Public Trust Uses

The Division 145 rules define "Public Trust Use(s)" as "those uses embodied in the Public Trust Doctrine under federal and state law including, but not limited to navigation, recreation, commerce and fisheries, and other uses that support, protect, and enhance those uses. Examples of public trust uses include, but are not limited to, short term moorage, camping, bank fishing, picnicking, and boating."[1]

The Oregon Department of Environmental Quality's (DEQ's) Record of Decision (ROD) for the former Portland Gas Manufacturing (PGM) site provides a "Beneficial Land and Water Use Determination" that summarizes the typical uses of this section of the Willamette River that is the subject of the long-term monitoring and contingency material placement activities. The ROD states the following:

> Current land uses in the upland area are open space (park with some roadway coverage) and commercial. Use is not expected to change. *The identified area of in-water contamination supports a variety of human and ecological uses, including recreation, subsistence fishing, and habitat for a variety of benthic and non-benthic fauna.* Threatened, endangered, and candidate species that may be present… include Chinook, chum, Coho and sockeye salmon.
>
> There is no use of groundwater for drinking of (human) uses within the upland locality as defined for either soil or groundwater. Groundwater is, however, acknowledged to provide a benefit, in terms of the contribution of water, to the adjacent Willamette River [emphasis added] (DEQ 2017).[2]

In addition, DEQ's Water Quality Standards identify the "Designated Beneficial Uses" pertaining to each basin of Oregon's waterways. The beneficial uses of the main stem of the Willamette River are identified in Table 340A of Oregon Administrative Rule (OAR) 340-041-0340. Pursuant to that table, this reach of the Willamette River currently supports, or could support, the following beneficial uses:

- Industrial water supply
- Irrigation
- Livestock watering
- Fish and aquatic life, as well as a migration corridor for salmon and steelhead

[1] OAR 141-145-0005(29). "Public trust uses" are "[u]ses embodied in the Public Trust Doctrine … including, but not limited to navigation, recreation, commerce and fisheries, and other uses that support, protect and enhance those uses." OAR 141-0005(29). NW Natural disagrees that some activities for which the Oregon Department of State Lands seeks compensation (such as those regulated by OAR Chapter 141 Division 82) are "public trust uses." Oregon law distinguishes between the rights of the public to access state lands, which must remain "forever free" to the public, and the proprietary right of the state to generate revenue from use of state lands for other activities. Revenue-generating activities are not "public trust uses." See *Brusco Towboat Co. v. State*, By and Through Straub, 30 Or. App. 509, 518, 567 P.2d 1037, 1043–44 (1977), affirmed in relevant part, 284 Or. 627, 589 P.2d 712 (1978).
[2] DEQ (Oregon Department of Environmental Quality), 2017. *Record of Decision, Selected Remedial Action for Former Portland Gas Manufacturing, Portland, Oregon ("PGM ROD")*. June 2017.

- Wildlife
- Fishing
- Boating
- Water contact recreation
- Aesthetic quality
- Hydropower
- Commercial navigation and transportation[3]

Although Table 340A also includes public and private domestic water supplies among the Designated Beneficial Uses of this stretch of the Willamette River, domestic water supply has not been identified as a current or reasonably likely future use of the surface water in the Lower Willamette River within the Portland Harbor, and the City of Portland (City) has reported it has no plans to use the Willamette River as a municipal water supply, stating, "Although the City has made claims to the Willamette River to protect past usage of this source, the Portland City Council determined in 1996 that the City will not use the Willamette River as a source of municipal water without further action by the Council" (City of Portland and Portland Water Bureau 2010).[4]

Potential Public Use Impact Evaluation

For the purposes of this evaluation, NW Natural will consider the potential impact of the PGM long-term monitoring and contingency material placement activities on each of the Designated Beneficial Uses identified in the PGM ROD or Table 340A. Related uses are grouped for efficiency.

1. Industrial Water Supply; Irrigation

The remediation that occurred in 2020 under DEQ oversight improved surface water quality in the area of the PGM site. The ROD explains that the selected remedy protects surface water quality as follows:

> The selected remedy achieves protection (as defined in OAR 340-122-0040) through a combination of contaminant removal and upland (landfill) disposal, physical isolation, contaminant sequestration, and contaminant burial (where natural recovery is already occurring). Cleanup levels are expected to be achieved shortly after implementation in most areas, with an estimated *maximum* time of less than 10 years to achieve protective levels where the remedy is EMNR (SDUs A1, B2, C3, and F) and MNR (SDU B1). The remedy is expected to address all Site-related contaminants in all exposure media including sediment, porewater, and surface water.

The PGM long-term monitoring and contingency material placement activities will not change the surface water quality at the PGM site. Any contingency material placement will occur for the purpose of cap or cover repair if such repairs are determined to be needed based on the long-term monitoring record, and any such actions will be designed to enhance the protectiveness of the remediated areas to achieve the remediation goals. Therefore, the monitoring and contingency material placement activities will not have a negative impact on surface water and porewater as sources of industrial water supply or

[3]City of Portland and Portland Water Bureau, 2010). *Water Management and Conservation Plan for the City of Portland, Oregon.* Final Report. July 2010.
[3] OAR 340-041-0340, Table 340A.

irrigation, but rather will maintain the improved water quality achieved during remediation for those purposes as needed.

2. Fish and Aquatic Life; Wildlife

Before the remedial action was performed, ecological receptors, including fish and wildlife, were potentially affected by site contaminants through direct contact, ingestion, or bioaccumulation from exposure to surface water and sediment. Per the PGM ROD, the PGM remedial action that occurred in 2020 was approved by DEQ to address these risk pathways and protect human health and the environment. It stated, "The remedy achieves acceptable levels of risk, as defined by OAR 340-122-0115, as demonstrated by discussion in [the] ROD and accompanying information presented in the [Feasiblity Study] previously approved by DEQ." Accordingly, existing conditions for fish, aquatic life, and wildlife in the project area have been improved as a result of the remediation. The long-term monitoring activities will be implemented to confirm the remediation is functioning as intended, and contingency material placement activities will occur if the monitoring activities identify a deficiency that needs to be addressed to achieve the remediation goals. Therefore, existing habitat conditions important to fish, aquatic life, and wildlife will be maintained and will not be negatively impacted by the project.

3. Fishing

The long-term monitoring and contingency material placement activities are not expected to impact the use of the PGM area for purposes of fishing. As stated, the remedial action that occurred at PGM in 2020 was approved by DEQ to address contaminant risk to human receptors from bioaccumulation through fish ingestion, and no post-remediation fish advisories were needed at the PGM site. Monitoring and contingency material placement activities will not result in the issuance of fish advisories. As such, the long-term monitoring and contingency material placement activities will not negatively impact the public trust use of fishing at the PGM site. Potential restrictions on anchoring, in reference to boating, are discussed in the next subsection for the remediated areas.

4. Boating; Water Contact Recreation; Commercial Navigation and Transportation

The primary navigation use in this portion of the river is for the berthing of U.S. Navy vessels for a 5-day period every June during the Rose Festival Fleet Week. The public use of the river for Fleet Week will not be impacted by the long-term monitoring and contingency material placement activities at the site for the following reasons:

- The authorized navigation depth in the Willamette River channel between the Broadway and Ross Island bridges is -30 feet Columbia River Datum (CRD). The long-term monitoring and material placement activities will not impact the authorized navigation depth. Sediment Decision Unit (SDU) G, the project area furthest from the seawall, underwent dredging to -35.0 to -37.0 City with no subsequent cap placement—only residual cover. This post-remediation depth is more than sufficient to meet the navigational needs of this area, and, because the contamination in this area was fully removed with no need for a cap, maintenance dredging will not be impacted.
- Outside the navigation channel, individual parties are responsible for maintaining their own berthing areas. The only known maintenance dredging event along this portion of the seawall was conducted in 1989 by the City in response to the U.S. Navy's concerns regarding the safe passage and berthing of its vessels during Fleet Week. In May 1989, 14,600 cubic yards of material was removed to a target depth of -30 feet CRD in a 60-foot-wide strip along the seawall between the Burnside and Steel bridges. The PGM remedial action maintained this depth, as well as additional buffer depth in armored cap areas, to allow for future unobstructed

maintenance dredging. The long-term monitoring and contingency material placement activities will not impact this depth, since monitoring will not alter water depths, and any material that would be placed would simply return an area to post-remediation elevations.

- The Fleet Week vessels utilize breasting barges to establish adequate distance from the seawall for safety and security. As a result, the vessels do not require increased depth for passage along the seawall and do not place anchors in these nearshore sediments.

Boating and other recreational uses of the water in the area of the PGM site will also be unaffected by the long-term monitoring and contingency material placement activities. Anchors can safely be placed in areas of monitored natural recovery; enhanced monitored natural recovery; residual cover; and uncapped areas, including SDUs B1, B2, C3, F1, F2, G, and H. The monitoring activities will not affect where anchors can be placed in any location. Contingency material placement activities will also not affect where anchors can be placed in monitored natural recovery, enhanced monitored natural recovery, or residual cover areas.

The only submerged areas subject to a post-remediation institutional control is a regulated navigation area requiring prior notice of dredging; spudding; and large vessel anchoring in SDUs A, C1, and E. Any such activities would require notification and consultation with DEQ and NW Natural. Monitoring and contingency material placement activities that occur in these SDUs will not affect the existing institutional controls currently in place at the site. Regardless, implementation of the existing institutional control does not impose use restrictions in the sense contemplated by the Site Diminishment Impact (SDI) calculation. As noted, the last maintenance dredging event that occurred along the seawall was in 1989. In the past 30 years, dredging outside the channel has not been a requested or necessary use. Further, the institutional control selected by DEQ requires only prior notice of these sediment-disturbing activities so DEQ and NW Natural can consult with proponents of the activities, provide advice, and, as necessary, inspect and stabilize or repair areas of disturbance. Since the remedial action, there have been no requests to conduct sediment-disturbing activities within the controlled portion of the site. Thus, commercial sediment-disturbing activities cannot be deemed a likely or anticipated restricted, constrained, or precluded use in this portion of the river.

Conclusion

The in-water cleanup at the former PGM site conveyed significant benefit to the area of the Willamette River at river mile 12.2 west. Long-term monitoring and contingency material placement activities will ensure that the remediation functions as intended and achieves remediation goals. Public trust uses, such as fishing and recreation, have been enhanced due to the environmental restoration and protectiveness provided by the remediation that occurred in 2020. The long-term monitoring and contingency material placement activities will not affect public trust uses, but will be used to verify and, if needed, to enhance the protectiveness of the remedy to ensure remediation goals are being achieved. The actual in-water work will be minimal (i.e., less than 14 consecutive days) for each year of monitoring and, if needed, contingency material placement. The work will result in no impacts to public use of the PGM site. The monitoring and contingency material placement activities do not require exclusive use of the property. Accordingly, a minimal SDI value should be applied to the entire PGM project site in the easement fee calculation.

IN THE CIRCUIT COURT OF THE STATE OF OREGON

FOR THE COUNTY OF MULTNOMAH

STATE OF OREGON, ex rel. RICHARD WHITMAN, DIRECTOR DEPARTMENT OF ENVIRONMENTAL QUALITY Plaintiff, v. NORTHWEST NATURAL GAS COMPANY, Defendant.	Case No. _____ CONSENT JUDGMENT *General Judgment* **ORS 20.140 - State fees deferred at filing**

Contents Page

Department of Justice
100 SW Market St.
Portland, OR 97201-5702
(971) 673-1880 / Fax: (971) 673-1886

Department of Justice
100 SW Market St.
Portland, OR 97201-5702
(971) 673-1880 / Fax: (971) 673-1886

1. Purpose

This Consent Judgment is filed simultaneously with and for the purpose of resolving the underlying complaint by the State of Oregon. Plaintiff State of Oregon *ex rel*. the Director of the Department of Environmental Quality ("DEQ") and Defendant Northwest Natural Gas Company ("NW Natural" or "Defendant") (collectively, the "Parties") desire to resolve this action without litigation and have agreed to entry of the Consent Judgment without admission or adjudication of any issue of fact or law. The mutual objective of the Parties is to protect public health, safety, and welfare and the environment by the design and implementation of remedial measures in accordance with ORS 465.200 through 465.410, regulations promulgated thereto, and the administrative Record of Decision dated July 3, 2017.

2. Stipulations and Findings

A. Defendant stipulates:

(1) To entry of this Consent Judgment;

(2) To perform and comply with all provisions of this Consent Judgment;

(3) To not litigate, in any proceeding brought by DEQ to enforce this Consent Judgment or to assess penalties for noncompliance with this Consent Judgment, any issue other than Defendant's compliance with this Consent Judgment; and

(4) To waive any right Defendant might have under ORS 465.260(7) to seek reimbursement from the Hazardous Substances Remedial Action Fund for costs incurred under this Consent Judgment.

B. DEQ and Defendant stipulate:

(1) For the purposes of this Consent Judgment, the "Facility," as defined in ORS 465.200(13), means: (a) the Portland Gas Manufacturing ("PGM") Site; and (b) the full extent of existing known or unknown contamination by hazardous substances of any media on, above, or below the PGM Site, or that has migrated, might have migrated, or hereafter migrates or could migrate to the Willamette River from the Site. DEQ and NW Natural intend this

Department of Justice
100 SW Market St.
Portland, OR 97201-5702
(971) 673-1880 / Fax: (971) 673-1886

Consent Judgment to address all sediment, surface water and transition zone water contamination as well as all current or potential future upland sources of contamination to the Willamette River associated with the PGM Site.

(2) For the purposes of this Consent Judgment, "Matters Addressed" means all investigation, removal, and remedial actions taken or to be taken and all remedial action costs incurred or to be incurred at or in connection with a release of hazardous substances at the Facility.

(3) On April 27, 2009, DEQ and NW Natural signed Order on Consent No. LQVC-NWR-09-02, in which NW Natural agreed to complete a remedial investigation ("RI") and source control evaluation ("SCE") at the PGM Site. The purpose of the RI and SCE was to investigate the nature and extent of hazardous substance contamination at the Site and determine the need for source control measures. On April 4, 2014, DEQ and NW Natural amended the order to include a Feasibility Study ("FS"). The purpose of the FS was to develop alternatives for remedial action. On August 10, 2017, DEQ and NW Natural amended the order a second time to expedite remedial design for the Site pending negotiation and entry of this Consent Judgment. This Consent Judgment supersedes and replaces Order on Consent No. LQVC-NWR-09-02, as amended.

C. DEQ finds, and Defendant neither admits nor denies:

(1) NW Natural is the corporate successor to entities, including the Portland Gas Light Co., that formerly owned or operated portions of the PGM Site.

(2) The PGM Site is generally located on the west bank of the Willamette River between approximately River Miles 12.1 and 12.3 and includes a five-block area historically occupied by manufactured gas plant operations. The Site extends into the Willamette River. These areas are collectively referred to in this Consent Judgment as the "Site." The general location of the Site is shown on Exhibit A to this Consent Judgment.

Department of Justice
100 SW Market St.
Portland, OR 97201-5702
(971) 673-1880 / Fax: (971) 673-1886

From approximately 1860 to 1913, predecessors of NW Natural manufactured gas from coal, carbureted water, and later, oil at the Site. In 1913, all manufacturing operations were moved downriver to the Gasco site. In 1928, a portion of the abandoned PGM plant collapsed into the Willamette River during construction of the seawall. The City of Portland acquired much of the Site in the 1940s, with uses including urban roadways. The upland portion of the site is currently largely covered by Waterfront Park and by roadways and bridge access ramps.

(4) Petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), semi-volatile organic compounds (SVOCs), benzene, toluene, ethylbenzene, and xylenes (BTEX), and metals have been detected in upland soil and groundwater. PAHs, BTEX, cyanide, petroleum hydrocarbons and metals have been detected in Willamette River sediments, and a surface layer of weathered and hardened tar-like material, associated with debris from seawall construction, is present on the river bottom in an area of the Site. Sediment contamination extends a significant depth below the river in some areas, including adjacent to the City of Portland seawall. In limited areas of the Site, PAHs, BTEX and cyanide have been detected at low concentrations in transition zone water (TZW), and PAHs and toluene have less frequently been detected at low concentrations in near-bottom surface water.

(5) In March 2014, NW Natural submitted a Final RI/SCE report to DEQ. In September 2016, NW Natural submitted the Final FS to DEQ. Pursuant to ORS 465.320, on November 1, 2016, DEQ published notice of a proposed remedial action and provided opportunity for public comment. Comments received on the proposed remedial action were considered by DEQ, as shown in the administrative record.

(6) DEQ's Northwest Region Administrator selected the remedial action set forth in a Record of Decision dated July 3, 2017 ("ROD"). The remedial action selected in the ROD requires the following:

- Excavation and upland disposal of a "hot spot" consisting of a surface layer of tar-like material and high-concentration shallow sediment in offshore Sediment Decision Unit (SDU) E, and installation of a minimum 1- foot thick treatment cap

Department of Justice
100 SW Market St.
Portland, OR 97201-5702
(971) 673-1880 / Fax: (971) 673-1886

(sand, amended with granular activated carbon (GAC)) following removal, and a minimum 1-foot thick rock armor layer.

- Excavation and upland disposal of contaminated shallow sediment in SDUs C1, C2, and D1, and installation of a minimum 1-foot GAC-amended treatment cap. SDUs C2 and D1 are to include a minimum 1-foot rock armor layer.
- Installation of a minimum 1-foot GAC-amended treatment cap, without dredging, in SDUs D2 and D3, to be covered with a minimum 1-foot rock armor layer.
- Installation of a minimum 1-foot GAC amended treatment cover in SDU A2.
- Enhanced monitored natural recovery (EMNR) in offshore SDUs A1, B2, C3, and F, including placement of minimum 1-foot (non-amended) sand cover to accelerate the natural recovery processes.
- Monitored natural recovery (MNR) in SDU B1.
- Institutional controls, and long-term inspection and maintenance in all SDUs.

(7) On March 31, 2019 DEQ published notice of this proposed Consent Judgment and provided opportunity for public comment in accordance with ORS 465.320(1) and 465.325(4)(d). The comment period was completed on April 30, 2019; no comment was received. Comments were received and considered by DEQ, as documented in the administrative record.

(8) Defendant NW Natural is a "person" within the meaning of ORS 465.200(21), and a potentially liable person under ORS 465.255.

(9) Contaminants described in check Paragraph 2.C.(4) are "hazardous substances" within the meaning of ORS 465.200(16). The presence of these hazardous substances in soil, groundwater, sediments, surface water and transition zone water at the Site constitutes a "release" or "threat of release" to the environment within the meaning of ORS 465.200(22).

(10) Based on the administrative record, the Director determines, in accordance with ORS 465.325(1) and (7), that this Consent Judgment and Defendant's commitments under the Consent Judgment will expedite removal or remedial action, minimize litigation, be consistent with rules adopted under ORS 465.400, and be in the public interest.

Department of Justice
100 SW Market St.
Portland, OR 97201-5702
(971) 673-1880 / Fax: (971) 673-1886

3. Work to be Performed

A. Remedial Design and Remedial Action

Defendant will perform the remedial design and remedial action for the Site in accordance with the terms and schedules set forth in the Scope of Work ("SOW") attached to and incorporated by reference into this Consent Judgment as Exhibit B, and the terms and schedules set forth in a DEQ-approved work plan.

B. Modification of SOW or Related Work Plans

(1) If DEQ determines that modification to the work specified in the SOW and/or in work plans developed pursuant to the SOW is necessary in order to implement or maintain the effectiveness of the remedy set forth in the ROD, DEQ may require that such modification be incorporated in the SOW and/or such work plans; provided, any such modification may be required pursuant to this paragraph only to the extent that the modification is consistent with the scope of the remedy selected in the ROD.

(2) Subject to dispute resolution under Subsection 4.M., Defendant will modify the SOW and/or work plans as required by DEQ and implement any work required by the modifications. Before invoking dispute resolution under Subsection 4.M., Defendant and DEQ will make a good-faith effort to resolve any dispute regarding DEQ-requested modifications by informal discussions for no more than 30 days following notice from DEQ of a requested modification.

C. Periodic Review

At least once every five years, DEQ will review the remedy to ensure that the Site remains protective of public health, safety, and welfare and the environment. Periodic reviews will include evaluation of monitoring data, progress reports, inspection and maintenance reports, land and water uses, compliance with institutional controls, and any other relevant information.

D. Additional Measures

Defendant may elect at any time during the term of this Consent Judgment to

Department of Justice
100 SW Market St.
Portland, OR 97201-5702
(971) 673-1880 / Fax: (971) 673-1886

undertake measures, beyond those required under this Consent Judgment and the SOW, necessary to address the release or threatened release of hazardous substances at the Site. Such additional measures are subject to prior approval by DEQ. DEQ's approval will be granted if DEQ determines that the additional measures are consistent with the remedial action objectives in the ROD and will not threaten human health or the environment.

E. Site Restrictions

(1) Within 60 days of entry of this Consent Judgment, Defendant will use its best efforts to obtain an appropriate Easement from the State of Oregon. Defendant will provide DEQ a copy of the Easement within five working days of receipt.

4. General Provisions

A. Project Managers

(1) To the extent possible, all reports, notices, and other communications required under or relating to this Consent Judgment must be directed to:

DEQ Project Manager:
Daniel Hafley, RG
Department of Environmental Quality
Northwest Region
700 NE Multnomah, Suite 600
Portland, OR 97232
Email: hafley.dan@deq.state.or.us

NW Natural Project Manager
Robert J. Wyatt
Director, Legacy Environmental Program NW Natural
220 NW Second Avenue
Portland, OR 97209
Phone: 503.226.4211 x 5425
Email: rjw@nwnatural.com

With a copy to:
Patricia Dost
Pearl Legal Group PC
529 SW Third Avenue, Suite 600
Portland, OR 97204
Phone: 503.467.4675
Email: pdost@pearllegalgroup.com

(2) The Project Managers or their respective designees must be available and have the authority to make day-to-day decisions necessary to complete the SOW.

Department of Justice
100 SW Market St.
Portland, OR 97201-5702
(971) 673-1880 / Fax: (971) 673-1886

B. Supervising Contractor

(1) All aspects of the work to be performed by Defendant pursuant to this Consent Judgment must be performed under the direction and supervision of a qualified employee or contractor having experience in hazardous substance remediation and knowledge of applicable state and federal laws, regulations, and guidance.

(2) Before initiation of remedial design work for the Site, Defendant will notify DEQ in writing of the name, title, and qualifications of any proposed supervising contractor. DEQ may for good cause disapprove the proposed contractor. In the event of such disapproval, DEQ will notify Defendant in writing of the reasons for its disapproval within 14 days of receipt of the initial notice from Defendant. Defendant, within 14 days of receiving DEQ's notice of disapproval, will notify DEQ of the name, title, and qualifications of an alternate supervising contractor, subject to DEQ's right to disapprove under the terms and schedule specified above. DEQ approves AnchorQEA and Sevenson Environmental Services as qualified contractors for Defendant for purposes of this Consent Judgment.

(3) If, during the course of work required under this Consent Judgment, Defendant proposes to change its supervising contractor, Defendant will notify DEQ in accordance with the provisions of the preceding paragraph. DEQ may disapprove such contractor, under the terms and schedule specified in the preceding paragraph.

C. DEQ Approvals

(1) Where DEQ review and approval is required for any plan or activity under this Consent Judgment, Defendant may not proceed to implement the plan or activity until DEQ approval is received. Any DEQ delay in granting or denying approval correspondingly extends the time for completion by Defendant. Prior approval is not required in emergencies; provided, Defendant will notify DEQ immediately after the emergency and evaluate the impact of its actions.

(2) After review of any plan, report, or other item required to be submitted for

Department of Justice
100 SW Market St.
Portland, OR 97201-5702
(971) 673-1880 / Fax: (971) 673-1886

DEQ approval under this Consent Judgment, DEQ will: (a) approve the submission in whole or in part; or (b) disapprove the submission in whole or in part, and notify Defendant of its deficiencies and/or request modifications to cure the deficiencies.

(3) DEQ approvals, rejections, or identification of deficiencies will be given in writing within the time specified in the SOW or as soon as practicable, and will state DEQ's reasons with reasonable specificity.

(4) In the event of DEQ disapproval or request for modification of a submission, Defendant will, within 30 days of receipt of the DEQ notice or such longer time as may be specified in the notice, correct the deficiencies and resubmit the revised report or other item for approval.

(5) In the event of two deficient submittals of the same deliverable that are deficient for the same reasons due to Defendant's failure in good faith to cure the original deficiency, DEQ may modify the submission to cure the deficiency.

(6) In the event of approval or modification of a submission by DEQ, Defendant will implement the action(s) required by the plan, report, or other item, as so approved or modified, or invoke dispute resolution under Subsection 4.M.

D. Access to Property

(1) The work required by this Consent Judgment is within the downtown reach of the Willamette River, a publicly accessible water of the State, and includes submerged and submersible lands owned by the Oregon Department of State Lands. Defendant will seek to obtain access as necessary to perform the work, including access to allow DEQ to oversee Defendant's performance under this Consent Judgment. Defendant will allow DEQ to inspect records relating to work under this Consent Judgment, conduct such tests and take such samples as DEQ deems necessary, verify data submitted to DEQ by Defendant, conduct periodic review using camera, sound recording, or other recording equipment and perform other appropriate oversight activities at all reasonable times. DEQ will make available to Defendant, upon

Department of Justice
100 SW Market St.
Portland, OR 97201-5702
(971) 673-1880 / Fax: (971) 673-1886

Defendant's request, any photographs or recorded or videotaped material taken.

(2) DEQ may use its statutory authority to obtain access to property on behalf of Defendant if DEQ determines that access is necessary and that Defendant has exhausted all good faith efforts to obtain access.

E. Records

(1) In addition to those reports and documents specifically required under this Consent Judgment, Defendant will provide to DEQ, within 10 days of DEQ's written request, copies of QA/QC memoranda and audits, raw data, final plans, task memoranda, field notes (not made by or at the direction of Defendant's attorney), and laboratory analytical reports relating to activities under this Consent Judgment.

(2) Defendant will preserve all records and documents in possession or control of Defendant or its employees, agents, or contractors that relate in any way to activities under this Consent Judgment for at least five years after certification of completion under Section 8. Upon DEQ's request, Defendant will provide to DEQ, or make available for copying by DEQ, copies of non-privileged records. For a period of 10 years after certification of completion, Defendant will provide DEQ 60 days notice before destruction or other disposal of such records or documents. Ten years after certification of completion, Defendant has no further obligation to preserve documents or records.

(3) Subject to Paragraph 4.E.(4), Defendant may assert a claim of confidentiality under the Oregon Public Records Law regarding any documents or records submitted to or copied by DEQ pursuant to this Consent Judgment. DEQ will treat documents and records for which a claim of confidentiality has been made in accordance with ORS 192.410 through 192.505. If Defendant does not make a claim of confidentiality at the time the documents or records are submitted to or copied by DEQ, the documents or records may be made available to the public without notice to Defendant.

(4) Defendant will identify to DEQ (by addressor-addressee, date, general subject

Department of Justice
100 SW Market St.
Portland, OR 97201-5702
(971) 673-1880 / Fax: (971) 673-1886

matter, and distribution) any document, record, or item withheld from DEQ on the basis of attorney-client or attorney work product privilege, except to the extent that such identifying information is itself subject to a privilege. Attorney-client or work product privilege may not be asserted with respect to any records required to be submitted under Paragraph 4.E.(1). DEQ reserves its rights under law to obtain documents DEQ asserts are improperly withheld by Defendant.

F. Notice and Samples

(1) Defendant will make every reasonable effort to notify DEQ of any excavation, drilling, sampling, or other fieldwork to be conducted under this Consent Judgment at least five working days before such activity, but in no event less than 24 hours before such activity. Upon DEQ's verbal request, Defendant will make every reasonable effort to provide a split or duplicate sample to DEQ or allow DEQ to take a split or duplicate of any sample taken by Defendant while performing work under this Consent Judgment. DEQ will provide Defendant with copies of all analytical data from such samples as soon as practicable.

(2) If DEQ conducts any sampling or analysis in connection with this Consent Judgment, DEQ will, except in an emergency, make every reasonable effort to notify Defendant of any excavation, drilling, sampling, or other fieldwork at least 72 hours before such activity. Upon Defendant's verbal request, DEQ will make every reasonable effort to provide a split or duplicate sample to Defendant or allow Defendant to take a split or duplicate of any sample taken by DEQ, and will provide Defendant with copies of all analytical data for such samples. Defendant will provide DEQ with copies of all analytical data from such samples as soon as practicable.

G. Quality Assurance

(1) Defendant will conduct all sampling, sample transport, and sample analysis in accordance with the Quality Assurance/ Quality Control (QA/QC) provisions approved by DEQ as part of the work plan. All plans prepared and work conducted as part of this Consent

Department of Justice
100 SW Market St.
Portland, OR 97201-5702
(971) 673-1880 / Fax: (971) 673-1886

Judgment must be consistent with DEQ's *Environmental Cleanup Quality Assurance Policy* (DEQ10-LQ-0063-QAG). Defendant will make every reasonable effort to ensure that each laboratory used by Defendant for analysis performs such analyses in accordance with such provisions.

(2) If DEQ conducts sampling or analysis in connection with this Consent Judgment, DEQ will conduct sampling, sample transport, and sample analysis in accordance with the QA/QC provisions of the approved work plan. Upon written request, DEQ will provide Defendant with copies of DEQ's records regarding such sampling, transport, and analysis.

H. Progress Reports

During each calendar quarter following entry of this Consent Judgment, Defendant will deliver to DEQ, on or before the tenth working day of each quarter, a progress report containing:

(1) Actions taken by Defendant under this Consent Judgment during the previous three months;

(2) Actions scheduled to be taken by Defendant in the next three months;

(3) A summary of sampling, test results, and any other data generated or received by Defendant during the previous three months; and

(4) A description of any problems experienced by Defendant during the previous three months and actions taken to resolve them.

DEQ may approve less frequent reporting by Defendant, if warranted. Progress reports may be submitted in electronic form. If submitted in hard-copy written form, two copies must be provided to DEQ.

I. Other Applicable Laws

(1) Subject to ORS 465.315(3), all activities under this Consent Judgment must be performed in accordance with all applicable federal, state, and local laws. RD and RA work will necessarily involve engaging with/approval from regulatory agencies including the

Department of Justice
100 SW Market St.
Portland, OR 97201-5702
(971) 673-1880 / Fax: (971) 673-1886

US Army Corps of Engineers, US EPA, and US Fish and Wildlife. Engagement with the Oregon Division of State Lands, landowner within the Site, will also be necessary. The City of Portland will also be engaged. To the extent appropriate, DEQ will support Defendant's efforts to obtain required approvals.

(2) All activities under this Consent Judgment must be performed in accordance with any applicable federal, state, and local laws related to archeological objects and sites and their protection. If archeological objects or human remains are discovered during any investigation, removal, or remedial activity at the Property, Defendant will, at a minimum: (a) stop work immediately in the vicinity of the find; (b) provide any notifications required by ORS 97.745 and ORS 358.920; (c) notify the DEQ Project Manager within 24 hours of the discovery; and (d) use best efforts to ensure that Defendant and its employees, contractors, counsel, and consultants keep the discovery confidential, including but not limited to refraining from contacting the media or any third party or otherwise sharing information regarding the discovery with any member of the public. Any project delay caused by the discovery of archeological object or human remains is a Force Majeure under Subsection 4.L.

J. Reimbursement of DEQ Costs

(1) DEQ will submit to Defendant a monthly invoice of costs incurred by DEQ on or after the date of entry of this Consent Judgment in connection with development and approval of this Consent Judgment and any activities related to the oversight and periodic review of Defendant's implementation of this Consent Judgment. Each invoice must include a summary of costs billed to date.

(2) DEQ oversight costs payable by Defendant include direct and indirect costs. Direct costs include site-specific expenses, DEQ contractor costs, and DEQ legal costs actually and reasonably incurred by DEQ under ORS 465.200 *et seq*. DEQ's direct cost summary must include a Land Quality Division ("LQD") direct labor summary showing the persons charging time, the number of hours, and the nature of work performed. Indirect costs include those

Department of Justice
100 SW Market St.
Portland, OR 97201-5702
(971) 673-1880 / Fax: (971) 673-1886

general management and support costs of DEQ and of the LQD allocable to DEQ oversight under this Consent Judgment and not charged as direct, site-specific costs. Indirect charges are based on actual costs and applied as a percentage of direct personal services costs. DEQ will maintain work logs, payroll records, receipts, and other documents to document work performed and expenses incurred under this Consent Judgment and, upon request, will provide copies of such records to Defendant.

(3) Within 30 days of receipt of DEQ's invoice, Defendant will pay the amount of costs billed by check payable to the "State of Oregon, Hazardous Substance Remedial Action Fund," or invoke dispute resolution under Subsection 4.M. After 30 days, any unpaid amounts that are not the subject of pending dispute resolution, or that have been determined owing after dispute resolution, become a liquidated debt collectible under ORS 293.250 or other applicable law.

(4) Defendant will pay simple interest of 9% per annum on the unpaid balance of any DEQ oversight costs, which interest will begin to accrue at the end of the 30-day payment period, unless dispute resolution has been invoked. Interest on any amount disputed under Subsection 4.M. will begin to accrue 30 days from final resolution of any such dispute.

K. Financial Assurance

DEQ has determined that Defendant has the ability to fund the work to be performed by Defendant pursuant to this Consent Judgment. In determining that the Defendant has the ability to fund Remedial Action work, DEQ understands that NW Natural's commitment to PGM remediation activities applies to implementation of all remedial action elements outlined in the Final Design Report and the Monitoring, Performance Evaluation and Contingency Plan.

L. Force Majeure

(1) If any event occurs that is beyond Defendant's reasonable control and that causes or might cause a delay or deviation in performance of the requirements of this Consent Judgment despite Defendant's reasonable efforts ("Force Majeure"), Defendant will promptly,

Department of Justice
100 SW Market St.
Portland, OR 97201-5702
(971) 673-1880 / Fax: (971) 673-1886

upon learning of the event, notify DEQ's Project Manager verbally of the cause of the delay or deviation, its anticipated duration, the measures that have been or will be taken to prevent or minimize the delay or deviation, and the timetable by which Defendant proposes to carry out such measures. Defendant will confirm in writing this information within five working days of the verbal notification. Failure to comply with these notice requirements precludes Defendant from asserting Force Majeure for the event and for any additional delay caused by the event.

(2) If Defendant demonstrates to DEQ's satisfaction that the delay or deviation has been or will be caused by Force Majeure, DEQ will extend times for performance of related activities under this Consent Judgment as appropriate. Circumstances or events constituting Force Majeure might include but not be limited to acts of God, unforeseen strikes or work stoppages, unanticipated site conditions, fire, explosion, riot, sabotage, war, and delays in receiving a governmental approval or permit. Normal inclement weather, increased cost of performance or changed business or economic circumstances may not be considered Force Majeure.

M. Dispute Resolution

(1) Except as provided in Paragraph 4.M.(4), if Defendant disagrees with DEQ regarding any matter relating to this Consent Judgment, Defendant will promptly notify DEQ in writing of its objection. DEQ and Defendant then will make a good-faith effort to resolve the disagreement within 14 days of Defendant's written objection. At the end of the 14-day period, DEQ will provide Defendant with a written statement of its position from DEQ's Northwest Region Cleanup Manager. If Defendant still disagrees with DEQ's position, then Defendant, within 14 days of receipt of DEQ's position from the Region Cleanup Manager, will provide Defendant's position and rationale in writing to DEQ's Northwest Region Administrator. The Region Administrator may discuss the disputed matter with Defendant and, in any event, will provide Defendant with DEQ's final position in writing as soon as practicable after receipt of Defendant's written position.

Department of Justice
100 SW Market St.
Portland, OR 97201-5702
(971) 673-1880 / Fax: (971) 673-1886

(2) If Defendant refuses or fails to follow DEQ's final position pursuant to Paragraph 4.M.(1), and DEQ seeks to enforce its final position, the Parties, subject to Subsection 2.A., are entitled to such rights, remedies, and defenses as are provided by applicable law.

(3) During the pendency of any dispute resolution under this subsection, the time for completion of work or obligations affected by such dispute is extended for a period of time not to exceed the actual time taken to resolve the dispute. Elements of work or obligations not affected by the dispute must be completed in accordance with the applicable schedule.

(4) Dispute resolution under this subsection does not apply to (a) DEQ approval or modification of the remedial design/remedial action work plan required under the SOW (which approval or modification is nonetheless subject to Subsection 4.C.); or (b) DEQ assessment of stipulated penalties under Subsection 4.N. (after dispute resolution has been exhausted, before assessment of a penalty, regarding the alleged violation).

N. Stipulated Penalties

(1) Subject to Subsections 4.C., 4.L., and 4.M., upon any violation by Defendant of any provision of this Consent Judgment, and upon Defendant's receipt from DEQ of written notice of violation and penalty assessment, Defendant will pay the stipulated penalties set forth in the following schedule:

(a) $5,000 for the first week of violation or delay and $2,500 per day of violation or delay thereafter, for:

(i) failure to allow DEQ access to the Site under Subsection 4.D.

(ii) failure to provide notice and samples under Subsection 4.F.

(iii) failure to provide records under Subsection 4.E.

(b) $2,500 for the first week of violation or delay and $1,000 per day of violation or delay thereafter, for:

(i) failure to submit a final work plan in accordance with the SOW's schedule and terms;

Department of Justice
100 SW Market St.
Portland, OR 97201-5702
(971) 673-1880 / Fax: (971) 673-1886

(ii) failure to complete work in accordance with an approved work plan schedule and terms;

(iii) failure to submit a final report in accordance with an approved work plan schedule and terms; or

(iv) failure to record or comply with an Easement and Equitable Servitude.

(c) $500 for the first week of violation or delay and $500 per day of violation or delay thereafter, for:

(i) failure to submit a draft work plan in accordance with the SOW's schedule and terms;

(ii) failure to submit reports in accordance with the SOW's schedule and terms; or

(iii) any other violation of the Consent Judgment, SOW, or an approved work plan.

(2) Violations arising out of the same facts or circumstances or based on the same deadline are treated as one violation per day.

(3) Stipulated penalties do not begin to accrue under this subsection until Defendant receives a notice of violation from DEQ describing the violation and what is necessary to correct it. If the violation was not intentional, and is capable of cure, and Defendant corrects the violation within 30 days of receipt of such notice of violation or such other period as may be specified in the notice, DEQ in its sole discretion may waive in writing the stipulated penalties. This opportunity to cure does not apply to violations subject to Subparagraph 4.N.(1)(a).

(4) Defendant will, within 30 days of receipt of the notice, pay the amount of such stipulated penalty not waived by DEQ as provided in Paragraph 4.N.(3), by check made payable to the "State of Oregon, Hazardous Substance Remedial Action Fund." Defendant will pay

Department of Justice
100 SW Market St.
Portland, OR 97201-5702
(971) 673-1880 / Fax: (971) 673-1886

simple interest of 9% per annum on the unpaid balance of any stipulated penalties, which interest begins to accrue at the end of the 30-day payment period. Any unpaid amounts are a liquidated debt collectible under ORS 293.250 and other applicable law.

(5) If DEQ assesses stipulated penalties pursuant to this section for any failure of Defendant to comply with this Consent Judgment, DEQ may not seek civil penalties from Defendant for the same violation under ORS 465.900 or other applicable law.

O. Effect of Consent Judgment

(1) In addition to assessment of stipulated penalties under Subsection 4.N.or civil penalties under ORS 465.900, DEQ may seek enforcement of this Consent Judgment by this Court. If DEQ seeks enforcement of this Consent Judgment by this Court, DEQ may seek monetary sanctions, such as civil penalties, only if DEQ has not assessed and collected any stipulated penalties under this Consent Judgment regarding the same violation.

(2) Subject to Section 2, Defendant does not admit any liability, violation of law, factual or legal findings, conclusions, or determinations asserted in or pursuant to this Consent Judgment.

(3) Nothing in this Consent Judgment is intended to create any cause of action in favor of any person not a party to this Consent Judgment.

(4) Subject to Paragraph 2.A.(4), nothing in this Consent Judgment prevents DEQ, the State of Oregon, or Defendant from exercising any rights each might have against any person not a party to this Consent Judgment.

(5) If for any reason the Court declines to approve this Consent Judgment in the form presented, this settlement is voidable at the sole discretion of any Party and the terms of the settlement may not be used in evidence in any litigation among or against the Parties.

(6) DEQ and Defendant intend for this Consent Judgment to be construed as a judicially-approved settlement, by which Defendant has resolved its liability to the State of Oregon, within the meaning of Section 113(f)(2) of the Comprehensive Environmental

Department of Justice
100 SW Market St.
Portland, OR 97201-5702
(971) 673-1880 / Fax: (971) 673-1886

Response, Compensation and Liability Act (CERCLA), 42 U.S.C. § 9613(f)(2), regarding Matters Addressed, and for Defendant not to be liable for claims for contribution regarding Matters Addressed to the extent provided by Section 113(f)(2) of CERCLA, 42 U.S.C. §§ 9613(f)(2).

(7) Unless specified otherwise, the use of the term "days" in this Consent Judgment means calendar days.

P. Indemnification and Insurance

(1) Defendant will indemnify and hold harmless the State of Oregon and its commissions, agencies, officers, employees, contractors, and agents from and against any and all claims arising from acts or omissions related to this Consent Judgment of Defendant or its officers, employees, contractors, agents, receivers, trustees, or assigns. DEQ may not be considered a party to any contracts made by Defendant or its agents in carrying out activities under this Consent Judgment.

(2) To the extent permitted by Article XI, Section 7, of the Oregon Constitution and by the Oregon Tort Claims Act, the State of Oregon will indemnify and hold harmless Defendant and its respective officers, employees, contractors, and agents, and indemnify the foregoing, from and against any and all claims arising from acts or omissions related to this Consent Judgment of the State of Oregon or its commissions, agencies, officers, employees, contractors, or agents (except for acts or omissions constituting approval or disapproval of any activity of Defendant under this Consent Judgment). Defendant may not be considered a party to any contract made by DEQ or its agents in carrying out activities under this Consent Judgment.

(3) Before commencing any onsite work under this Consent Judgment, Defendant must obtain and maintain for the duration of this Consent Judgment comprehensive general liability and automobile insurance with limits of $1 million, combined single limit per occurrence, naming as an additional insured the State of Oregon. Upon DEQ request, Defendant will provide DEQ a copy or other evidence of the insurance. If Defendant demonstrates by

Department of Justice
100 SW Market St.
Portland, OR 97201-5702
(971) 673-1880 / Fax: (971) 673-1886

evidence satisfactory to DEQ that its contractor(s) or subcontractor(s) maintain equivalent coverage, or coverage for the same risks but in a lesser amount or for a lesser term, then Defendant may provide only that portion of the insurance that is not maintained by its contractor(s) or subcontractor(s).

Q. Parties Bound

This Consent Judgment is binding on the Parties and their respective successors, agents, and assigns. The undersigned representative of each party certifies that he or she is fully authorized to execute and bind such party to this Consent Judgment. No change in ownership, corporate, or partnership status in any way alters Defendant's obligations under this Consent Judgment, unless otherwise approved in writing by DEQ.

R. Modification

DEQ and Defendant may modify this Consent Judgment by written agreement, subject to approval by this Court. DEQ and Defendant may modify the SOW or a work plan without having to obtain court approval, provided the modification is consistent with the ROD.

S. Service

Each Party designates in Exhibit D the name and address of an agent authorized to accept service of process by mail on behalf of the Party with respect to any matter relating to this Consent Judgment. Each Party agrees to accept service in such manner, and waives any other service requirements set forth in the Oregon Rules of Civil Procedure or local rules of this Court. The Parties agree that Defendant need not file an answer to the complaint in this action unless or until the Court expressly declines to approve this Consent Judgment.

5. Contribution Actions

A. Pursuant to ORS 465.325(6)(b), Defendant is not liable for claims for contribution regarding Matters Addressed.

B. Subject to Paragraph 2.A.(4), nothing in this Consent Judgment prevents Defendant from exercising any rights of contribution or indemnification Defendant might have against any

Department of Justice
100 SW Market St.
Portland, OR 97201-5702
(971) 673-1880 / Fax: (971) 673-1886

person regarding activities under this Consent Judgment. DEQ and Defendant intend for this Consent Judgment to be construed as a judicially-approved settlement, by which Defendant has resolved its liability to the State of Oregon, within the meaning of ORS 465.325

6. Covenant Not to Sue by State of Oregon

A. Subject to Subsection 6.B., the State of Oregon covenants not to sue or take any other judicial or administrative action against Defendant, its officers, directors, employees, shareholders, parents, subsidiaries, or affiliates concerning any liability to the State of Oregon under ORS 465.200 to 465.455 and 465.900 regarding Matters Addressed. This covenant not to sue is effective upon certification of completion under Section 8.

B. The State of Oregon reserves all rights against Defendant with respect to any matter not expressly included in the covenant not to sue set forth in Subsection 6.A., including but not limited to:

(1) Failure of remedial action;

(2) Information unknown to DEQ at the time of certification of completion showing that the remedial action is not protective of public health, safety, and welfare or the environment;

(3) Claims based on failure by Defendant to meet any applicable requirement of this Consent Judgment;

(4) Liability arising from disposal of hazardous substances removed from the Site by Defendant;

(5) Liability under federal or state law for natural resource damages;

(6) Claims based on criminal liability;

(7) Any matters as to which the State of Oregon is owed indemnification by the Defendant under Subsection 4.P.;

(8) Liability for violations of federal or state law by the Defendant occurring during implementation of the work required under this Consent Judgment; and

Department of Justice
100 SW Market St.
Portland, OR 97201-5702
(971) 673-1880 / Fax: (971) 673-1886

(9) Liability for oversight costs incurred by DEQ in connection with this Consent Judgment.

7. Liability Release by DEQ

A. Subject to Subsection 7.B., DEQ releases Defendant its officers, directors, employees, shareholders, parents, subsidiaries, or affiliates from liability to DEQ under any federal or state statute, regulation, or common law, including but not limited to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. § 9601 et seq., regarding the release or threatened release of hazardous substances at the Facility. This release from liability is effective upon certification of completion under Section 8.

B. DEQ reserves all rights against Defendant with respect to any matter not expressly included in the release from liability set forth in Subsection 7.A., including but not limited to:

(1) Failure of remedial action;

(2) Information unknown to DEQ at the time of certification of completion showing that the remedial action is not protective of public health, safety, and welfare or the environment;

(3) Claims based on failure by Defendant to meet any applicable requirement of this Consent Judgment;

(4) Liability arising from disposal of hazardous substances removed from the Site by Defendant;

(5) Liability under federal or state law for natural resource damages;

(6) Claims based on criminal liability;

(7) Any matters as to which the State of Oregon is owed indemnification by the Defendant under Subsection 4.P.;

(8) Liability for violations of federal or state law by the Defendant occurring during implementation of the work required under this Consent Judgment; and

(9) Liability for oversight costs incurred by DEQ in connection with this Consent

Department of Justice
100 SW Market St.
Portland, OR 97201-5702
(971) 673-1880 / Fax: (971) 673-1886

Judgment.

8. Certification of Completion

A. Upon Defendant's completion of work in accordance with the SOW, Defendant will submit a final closeout report to DEQ signed both by an Oregon-registered professional engineer and Defendant's Project Manager certifying that the remedial action for the Site has been completed in accordance with this Consent Judgment. The report must summarize the work performed and include all necessary supporting documentation.

B. DEQ will preliminarily determine whether the remedial action has been performed for the Site in accordance with this Consent Judgment. Upon a preliminary determination that the remedial action has been satisfactorily performed, DEQ will provide public notice and opportunity to comment on a proposed certification decision in accordance with ORS 465.320 and 465.325(10)(b). After consideration of public comment, and within 90 days after receiving Defendant's closeout report, the Director of DEQ will issue a final certification decision. The certification decision will subsequently be submitted by DEQ to this Court. A certification of completion of the remedial action does not affect Defendant's remaining obligations under this Consent Judgment or for implementation of measures necessary to long-term effectiveness of the remedial action.

C. This Court retains jurisdiction over the Parties and the subject matter of this Consent Judgment regarding obligations under this Consent Judgment.

Signed: 4/23/2020 03:02 PM

Circuit Court Judge Stephen K. Bushong

Department of Justice
100 SW Market St.
Portland, OR 97201-5702
(971) 673-1880 / Fax: (971) 673-1886

STATE OF OREGON, DEPARTMENT OF ENVIRONMENTAL QUALITY

By:_____ Date:_____
Nina DeConcini
Administrator, Northwest Region DEQ

/s/ Gary Vrooman
By:_____ Date: 4/15/2020
Gary Vrooman, OSB No. 075832
Assistant Attorney General
Oregon Department of Justice
100 SW Market Street
Portland, OR 97201
Attorney for DEQ

Northwest Natural Gas Company

By:_____ Date:_____
MardiLyn Saathoff
Senior Vice President and General Counsel
NW Natural Gas Company
220 NW Second Avenue
Portland, Oregon 97209

By:_____ Date:_____
Patricia Dost, OSB No. 902530
Pearl Legal Group PC
529 SW Third Avenue, Suite 600
Portland, Oregon 97204
Attorney for Northwest Natural Gas Company

Department of Justice
100 SW Market St.
Portland, OR 97201-5702
(971) 673-1880 / Fax: (971) 673-1886

STATE OF OREGON, DEPARTMENT OF ENVIRONMENTAL QUALITY

By: _____ Date: 4/11/2020
Nina DeConcini
Administrator, Northwest Region DEQ

By: _____ Date: _____
Gary Vrooman, OSB No. 075832
Assistant Attorney General
Oregon Department of Justice
100 SW Market Street
Portland, OR 97201
Attorney for DEQ

Northwest Natural Gas Company

By: _____ Date: April 13, 2020
MardiLyn Saathoff
Senior Vice President and General Counsel
NW Natural Gas Company
250 SW Taylor
Portland, OR 97204

By: _____ Date: 4.13.2020
Patricia Dost, OSB No. 902530
Pearl Legal Group PC
529 SW Third Avenue, Suite 600
Portland, Oregon 97204
Attorney for Northwest Natural Gas Company

Department of Justice
100 SW Market St.
Portland, OR 97201-5702
(971) 673-1880 / Fax: (971) 673-1886

CERTIFICATE OF COMPLIANCE with UTCR 5.100

The Parties to this to this action have stipulated to and approved of the Consent Judgment pursuant to ORS 465.325 and ORS 465.327.

This proposed order or judgment is ready for judicial signature because:

1. [X] Each opposing party affected by this order or judgment has stipulated to the order or judgment, as shown by each opposing party's signature on the document being submitted.

2. [X] Each opposing party affected by this order or judgment has approved the order or judgment, as shown by signature on the document being submitted or by written confirmation of approval sent to me.

3. [ ] I have served a copy of this order or judgment on all parties entitled to service and:

a. [ ] No objection has been served on me.

b. [ ] I received objections that I could not resolve with the opposing party despite reasonable efforts to do so. I have filed a copy of the objections I received and indicated which objections remain unresolved.

c. [ ] After conferring about objections, [role and name of opposing party] agreed to independently file any remaining objection.

4. [ ] The relief sought is against an opposing party who has been found in default.

5. [ ] An order of default is being requested with this proposed judgment.

6. [ ] Service is not required pursuant to subsection (3) of this rule, or by statute, rule, or otherwise.

///

///

///

///

Department of Justice
100 SW Market Street
Portland, OR 97201
(971) 673-1880/ Fax: (971) 673-1886

7. [ ] This is a proposed judgment that includes an award of punitive damages and notice has been served on the Director of the Crime Victims' Assistance Section as required by subsection (4) of this rule.

DATED this 15th day of April, 2020.

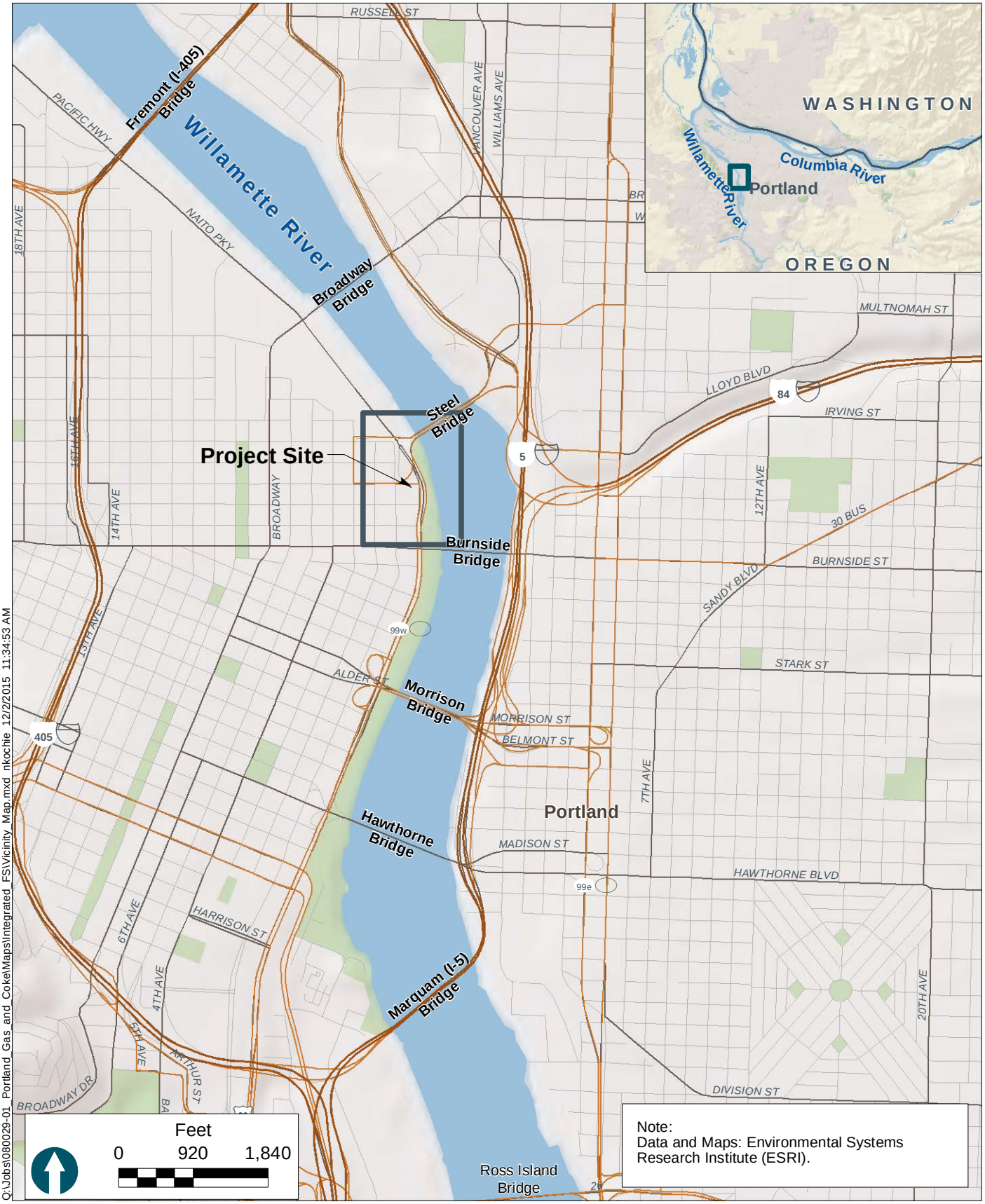
Attorney General
ELLEN F. ROSENBLUM

/s/ Gary Vrooman

Gary Vrooman, OSB #075832
Assistant Attorney General
Of Attorneys for Plaintiff
Department of Justice
100 SW Market Street
Portland, OR 97201
Phone: 971-673-1878
Fax: 971-673-1884
gary.l.vrooman@doj.state.or.us

Department of Justice
100 SW Market Street
Portland, OR 97201
(971) 673-1880/ Fax: (971) 673-1886

Exhibit A



Attachment 3

ANCHOR QEA

Figure 1-1
Site Vicinity Map
Integrated Feasibility Study
Former Portland Gas Manufacturing Site

EXHIBIT B
REMEDIAL DESIGN/REMEDIAL ACTION
SCOPE OF WORK

I. SCHEDULE AND OBJECTIVES

The objectives of the RD/RA are to attain the degree of cleanup of hazardous substances and control of further release of hazardous substances as established in the Record of Decision (ROD). The objectives are consistent with the requirements set forth in the Environmental Cleanup Rules, Oregon Administrative Rules (OAR) 340-122-0010 to 0110, and the Environmental Cleanup Laws, Oregon Revised Statutes (ORS), Chapter 465.

This RD/RA Scope of Work supersedes and replaces the Remedial Design Scope of Work that was Attachment C to DEQ Order on Consent No. LQV-NWR-09-02, as amended. Certain of the deliverables and other work requirements described in this Scope of Work are in progress as of the date of this Consent Judgment, and the parties do not intend the lodging and entry of this Consent Judgment to require duplication, modification or delay of work performed under the Order on Consent.

II. REMEDIAL DESIGN AND REMEDIAL ACTION DELIVERABLES

A. RD/RA WORK PLAN

The RD/RA Work Plan was developed in conformance with DEQ's ROD dated July 3, 2017; this Scope of Work; and as appropriate, EPA's "Superfund Remedial Design Remedial Action Guidance," OSWER Directive 9355.0-4A, 1986; "Guidance on Expediting Remedial Design and Remedial Action," OSWER Directive 9355.5-02; and any additional guidance documents as directed by DEQ.

The final RD/RA Work Plan was submitted to DEQ on May 1, 2018 and approved by DEQ on June 1, 2018. The RD/RA Work Plan includes the following items:

1. Description of proposed RD/RA tasks and activities to be performed.

2. Proposed schedule for submittal of RD/RA deliverables and implementation of all proposed RD/RA activities.

3. Identification and description of duties, responsibilities, authorities, and qualifications of the personnel involved in the remedial design and remedial action.

4. Project organization and identification of reporting relationships, lines of communication, and authorities.

5. Summary of the selected remedy and cleanup levels.

6. General description of remedial actions to be performed.

7. Identification and description of design objectives.

8. Identification and description of design criteria and performance standards that shall be applied to the remedial activities to be conducted by Respondent.

9. Identification and listing of federal, state, or local laws, regulations, or guidance applicable to or associated with the remedial action and an explanation of how they will be incorporated into the design and implementation of the remedial action.

10. Assessment of permitting requirements, including identification of any permitting or procedural requirements exempted pursuant to ORS 465.315(3) (as stated in the ROD or Consent Order, or as proposed to be exempted), and a plan for satisfying any applicable substantive or non-exempted permitting/procedural requirements. A description of permitting requirements shall be included in the specific design reports.

11. Identification of any off-site disposal facilities and requirements for disposal, if any.

12. Identification and description of any site access agreements required to implement RA activities.

13. Description of any proposed bench scale or pilot scale studies, treatability studies, or unit process evaluations. Include study objectives and a schedule for submittal of a more detailed work plan describing design parameters, data requirements, size and scale, mobilization procedures, and schedule for conducting the tests.

14. Identification and description of additional sampling, evaluations, or engineering studies required to supplement available technical information.

15. Identification and description of any property, utility, right-of-way, topographic, or other site surveys required.

16. Description of any special design/implementation problems anticipated and how they will be addressed. Include any special technical problems, anticipated community relations problems, access, easements, rights-of-way, transportation, utilities, and logistics problems.

17. Identification and description of institutional controls to be imposed during and/or after remedial action activities.

18. Description of construction methods and equipment to be used.

19. Procedures for documentation/validation of remedial action activities.

B. SAMPLING AND ANALYSIS PLAN (SAP)

A Sampling and Analysis Plan (SAP) dated August 31, 2017 has been approved by DEQ and will serve as the Sampling and Analysis Plan for this project. Additional remedial design sampling needs, if any, will be discussed with DEQ during remedial design. Sampling and analysis requirements associated with remedy implementation, including verification of the quality of capping and armoring material sources, will be specified in the Construction Quality Assurance and Control Plan (Section II.E. of this Scope of Work). This SAP does not address long-term

monitoring or sediments and other media, as appropriate, which is addressed in Item F, Monitoring, Performance Evaluation, and Contingency Plan.

In preparation of the SAP, the following guidance documents were used: DEQ Environmental Cleanup Program's Quality Assurance Policy #DEQ10-LQ-0063-QAG; and as appropriate, "Data Quality Objectives Process for Superfund," EPA 540-R-93-071, September, 1993; "Data Quality Objectives for Remedial Response Activities," EPA/540/G-87/004 (OSWER Directive 9355.0-7B), March 1987; "Test Methods for Evaluating Solid Waste," SW-846; and "A Compendium of Superfund Field Operations Methods," EPA/540/P-87/001 (OSWER Directive 9355.0-14), December 1987.

The SAP includes:

1. Proposed sampling locations, frequency, parameters, and rationale.

2. A description of sample collection techniques, sampling equipment, sample handling, and decontamination procedures.

3. A description of proposed analytical or test methods.

4. A description of quality assurance and quality control (QA/QC) procedures for both field and laboratory activities, including a data quality objectives plan. For each target compound, compare the method reporting limit and the remedial action standard established in the ROD, for each applicable environmental medium.

5. A description of documentation and data reporting, including a proposed schedule for data report submittals.

6. A description of data analysis and interpretation methods, including statistical methods, sensitivity methods, or mathematical models for:

    i. Evaluating attainment of remedial action cleanup levels.

    ii. Evaluating bench or pilot scale tests for full-scale application of the technology.

7. A description of residuals management procedures.

If field or lab studies are proposed during the remedial design phase, then the SAP shall be amended, addressing those activities to be conducted during the remedial design phase. A revised SAP shall then be submitted with the Pre-final (90%) Design Reports (Item D.2) to address all remedial action activities. If no additional field or lab studies are proposed during the remedial design phase, then the revised SAP shall be submitted with the Pre-final Design Report.

C. RD/RA SITE HEALTH AND SAFETY PLAN

A site-specific Health and Safety Plan (HASP) shall be prepared to address all field activities to be conducted during the remedial action and shall include construction hazards, chemical exposure hazards, on-site worker safety, and measurement of potential off-site impacts.

The HASP shall be developed in accordance with "Standard Operating Safety Guides," EPA Office of Emergency and Remedial Response, 1988; and applicable standards promulgated by the U.S. Occupational Safety and Health Administration including Hazardous Waste Operations and Emergency Response, 29 CFR 1910.120; General Industry Standards, 29 CFR 1910; and the Construction Industry Standards, 29 CFR 1926.

The HASP shall include at a minimum:

1. Scope and applicability of plan.
2. Identification and responsibilities of key health and safety personnel.
3. Task/operation safety and health risk analysis for each site task and operation, including a description of known hazards and risks and procedures for assessing risks.
4. Personnel training requirements.
5. Personal protective equipment to be used.
6. Medical surveillance requirements.
7. Air monitoring requirements, including types and frequency, and a description of air monitoring methods to be used.
8. Site control measures, including communication, site security, and work zone delineation.
9. Decontamination plan for personnel, equipment, and facilities.
10. Emergency response/contingency plan.
11. Confined space entry procedures, if applicable.
12. Spill containment program.
13. Identification of potential construction hazards and precautionary measures to minimize hazards.

A copy of the HASP shall be provided to the Oregon Occupational Safety and Health Division.

The HASP shall be submitted with Pre-final (90%) Design Reports (Item D.2) to address all remedial action activities.

D. DESIGN REPORTS AND IMPLEMENTATION (Plans and Specifications)

Construction plans and specifications and related design information, to accomplish the remedial action selected by DEQ, shall be submitted to DEQ for review and approval. Design reports shall be submitted in the following phases:

1. PRELIMINARY DESIGN MEETINGS

Upon completion of approximately 50% of the remedial design effort, and prior to submittal of the 90% Remedial Design Report (Item D.2), Respondent shall make an oral presentation to DEQ. The objective of this presentation is to identify and allow correction of any problem areas before extensive design has been completed.

The presentation shall include the following:

a. Design objectives, criteria, and standards.

b. Description of design elements.

c. Preliminary drawings and schematics.

d. Description of problems encountered or anticipated that may delay the project schedule.

e. Preliminary construction schedule.

2. PRE-FINAL DESIGN

The Pre-final Design Report shall contain a compilation of major design items reflecting an approximate 90% completion. This report shall serve as the draft design report and may constitute construction-ready drawings for a design/build process. The report shall contain the following, as applicable:

a. Design criteria/standards.

b. Final design/analyses calculations.

c. Drawing index and final drawings.

d. Final specifications.

e. Final construction schedule.

f. Detailed description of remedial action activities to be performed, including methods and equipment for:

   i. mobilization.

   ii. site preparation.

   iii. excavation.

   iv. demolition, clearing, and removal of buildings, structures, equipment, vehicles, existing pavement, foundations, and floors, as applicable.

v. site restoration, including backfilling and grading.

g. Estimates of soil volumes to be excavated, or volume of media to be treated.

h. Detailed site layout drawings, delineating the areas to be excavated or treated.

i. Excavation methods, including area delineation, slope stabilization, characterization and management of excavated materials, dewatering and water management, and incorporation of confirmation sampling.

j. Description of permitting requirements, if any, to include:

i. construction/operating permits required.

ii. permitting authorities and specific permit requirements.

iii. permit application processing procedures, schedule, and fees.

iv. monitoring and compliance testing requirements.

k. Identification and description of construction quality assurance/quality control (QA/QC) program requirements and procedures for construction QA/QC program implementation.

l. Equipment startup and operator training requirements to include:

i. contractor/vendor procedures for providing appropriate service visits by experienced personnel to supervise installation, adjustment, startup, and operation of treatment systems.

ii. identification of appropriate operational procedures training for personnel.

m. Description of proposed control measures to minimize releases of hazardous substances to all environmental media during construction or installation activities.

n. Description of proposed surface water runoff control measures during construction.

o. Identification and description of dust control and noise abatement measures to minimize and monitor environmental impacts of construction or installation activities.

p. Identification and description of any site security measures necessary to minimize exposure to hazardous situations during remedial action.

q. Identification and description of transportation requirements, including haul route selection, load limits, truck haul schedule, restricted routes, traffic control needs, accident prevention and response, and decontamination.

r. Summaries of treatability studies, bench scale or pilot scale studies, or other engineering studies conducted during the design phase, including results and conclusions.

s. Land disposal requirements to include:

i. identification and description of off-site land disposal facilities.

ii. specific treatment/disposal requirements.

3. FINAL DESIGN

The Final Design Report shall incorporate required revisions resulting from DEQ's review and comments on the Pre-final Design Report. The Final Design Report shall provide the basis for the remedial action activities to be undertaken at the facility. The Final Design Report shall include the elements described above, plus draft bid packages for construction contractors, as necessary.

4. IMPLEMENTATION

Upon DEQ's approval of the Final Design Report, the remedial measures shall be performed in accordance with the design plans and schedule.

E. CONSTRUCTION QUALITY ASSURANCE AND CONTROL PLAN

The Construction Quality Assurance and Control (CQA/QC) plan is a document that describes the site-specific components of the construction quality assurance program. The purpose of the CQA/QC Plan is to ensure, with a reasonable degree of certainty, that a completed project meets or exceeds all design criteria, plans, and specifications. The Plan shall be reviewed and approved by the person with the overall responsibility for the design and submitted with the Pre-final (90%) Design Report. The Plan shall address the following:

1. Construction quality assurance objectives, specific quality control requirements, and performance standards to be enforced during implementation of remedial actions.

2. Identification of responsibilities and authorities of all organizations and key personnel involved in the design and construction of the site remediation.

3. Description of the construction quality assurance personnel's qualifications.

4. Description of inspection activities, observation and tests to be conducted, schedules, and scope.

5. Procedures for scheduling and managing submittals, including those of subcontractors, off-site fabricators, suppliers, and purchasing agents.

6. Sampling strategies to include sampling types, locations, size, frequency of testing, acceptance and rejection criteria, and plans for implementing corrective measures.

7. Documentation of inspections and sampling events.

8. Proposed schedule for submittal of inspection and sampling reports to DEQ.

F. MONITORING, PERFORMANCE EVALUATION, AND CONTINGENCY PLAN

The objectives of the Monitoring, Performance Evaluation, and Contingency Plan include monitoring variations in sediment quality (and other media such as transition zone water and surface water, as appropriate) at or near target remediation areas, monitoring contaminant concentrations and migration, evaluating the effectiveness of source removals and other remedial actions, verifying results of fate and transport modeling, and evaluating effectiveness of site remedial actions in attaining the remedial action objectives, goals, requirements, and specified cleanup levels. The plan shall also propose response actions to occur in the event of statistically significant exceedance of the sediment, transition zone water or surface water remediation criteria during the long-term monitoring program.

A draft Monitoring, Performance Evaluation, and Contingency Plan shall be submitted for DEQ review and comment with the Pre-final (90%) Design Report. A final plan shall be submitted with the Final Design Report for DEQ approval addressing DEQ's comments on the draft plan. The draft and final Monitoring, Performance Evaluation, and Contingency Plans shall be submitted according to the schedule of deliverables in the approved RD/RA Work Plan and shall include, at a minimum:

1. Proposed frequency and duration of monitoring periods.

2. Proposed monitoring locations and parameters.

3. A description of sample collection techniques, sampling equipment, and sample handling procedures.

4. Descriptions of proposed analytical or test methods.

5. A description of quality assurance and quality control (QA/QC) procedures for both field and laboratory activities, including a data quality objectives plan. For each target compound, compare the method reporting limit and the remedial action standard established in the ROD.

6. Documentation and data reporting, including a proposed schedule for data report submittals.

7. A description of methods for data analysis, including modeling and statistical methodology, for evaluating changes and trends in sediment quality (and other media,

as appropriate), contaminant migration, and attainment of remedial action objectives and criteria as specified in the ROD, including the achievement of cleanup levels in MNR and EMNR areas within an acceptable period of time.

8. Proposed trigger mechanisms and assessment criteria that would warrant evaluation of contingency measures if cleanup levels are not being maintained, or are otherwise not expected to be achieved within an acceptable period of time.

9. A contingency plan to include identification of potential response actions and a description of the procedures and process for evaluating and implementing potential response actions.

10. A description of assessment criteria for modifications to the long-term sediment (and other media, as appropriate) monitoring program.

11. A description of periodic reviews of local land uses and beneficial water uses to be conducted, including procedures, reporting, and schedule.

12. A description of how investigation-derived waste will be managed.

G. MONITORING AND PERFORMANCE EVALUATION REPORTS

Sediment and other media, as appropriate, monitoring reports, performance evaluation reports, and periodic land and water use review reports shall be submitted in accordance with the terms and schedule set forth in the ROD and in the DEQ-approved Monitoring, Performance Evaluation, and Contingency Plan (Item F).

I. POST-CONSTRUCTION CAP INSPECTION AND MAINTENANCE PLAN

An Inspection and Maintenance Plan shall be submitted to describe the specific post-construction inspection and maintenance requirements for capped areas. This Inspection and Maintenance Plan shall focus on maintaining the physical integrity of the capped areas, including monitoring for erosion or other physical disturbances. A draft Inspection and Maintenance Plan shall be submitted with the draft Project Completion Report for DEQ review and comment. A final Inspection and Maintenance Plan shall be submitted with the final Project Completion Report for DEQ approval addressing DEQ's comments on the draft plan.

The Inspection and Maintenance Plan shall include, at a minimum:

1. Description of inspection requirements and schedule.

2. Description of maintenance requirements and schedule.

3. Description of documentation, reporting, and records management.

4. Description of institutional controls to be implemented in capped areas.

J. PROJECT COMPLETION (CONSTRUCTION COMPLETION) REPORT

At the completion of the remedial action construction phases, Respondent shall conduct a final inspection and prepare a draft Project Completion (Construction Completion) Report for DEQ review and comment. A final Project Completion Report shall be submitted for DEQ approval addressing DEQ's comments on the draft report. The Project Completion Report shall include, at a minimum:

1. Results of the final inspection, including a brief description of any problems discovered during the final inspection and the resolution of those problems, as necessary.

2. A detailed description of all work conducted in accordance with the approved final design plans and specifications, and certification by an Oregon-Registered Professional Engineer and Respondent's Project Coordinator that the work was performed in accordance with all approved plans and specifications.

3. Explanation of any modifications to the approved plans and specifications and why these modifications were necessary.

4. Final, as-built drawings, if different from final design drawings previously submitted under Item D.2 or D.3.

5. Copy of final permits, as applicable.

6. Results of verification sampling, including data validation, and certification that the remediation performs according to design specifications, as appropriate.

7. Explanation of any additional inspections, and maintenance activities (including monitoring) to be undertaken at the site.

Exhibit C – Service List

For Plaintiff:

Gary Vrooman, OSB No. 075832
Assistant Attorney General
Oregon Department of Justice
100 SW Market St.
Portland, OR 97201-5702

For Defendant:

Patricia Dost, OSB No. 902530
Pearl Legal Group PC
529 SW Third Avenue, Suite 600
Portland, Oregon 97204

CERTIFICATE OF SERVICE

I certify that on April 15, 2020, I served a true copy of the foregoing of COMPLAINT and CONSENT JUDGMENT in NORTHWEST NATURAL GAS COMPANY, upon the party hereto by the method indicated below, and addressed to the following:

Patricia Dost
Pearl Legal Group PC
529 SW Third Avenue, Suite 600
Portland, Oregon 97204

__ Hand Delivery
_x_ Mail Delivery
__ Overnight Mail
__ E-Mail

/s/ Gary Vrooman

Gary Vrooman, OSB #075832
Assistant Attorney General
Of Attorneys for Plaintiff
Department of Justice
100 SW Market Street
Portland, OR 97201
Phone: 971-673-1878
Fax: 971-673-1886
gary.l.vrooman@doj.state.or.us

Appendix H
Long-Term Monitoring and Maintenance Plan

ECSI No. 1138
March 2, 2020
Former Portland Gas Manufacturing Site

Long-Term Monitoring and Maintenance Plan

Prepared for
NW Natural
220 NW Second Avenue
Portland, Oregon 97209

Prepared by
Anchor QEA, LLC
6720 SW Macadam Avenue, Suite 125
Portland, Oregon 97219

Project Number: 080029-01.09
\\FUJI\Anchor\Projects\NW Natural\PGM\Design\07 Revised Final (100%) Design, V4\Working (all files)\Reports\App F_LTMMP\Appendix F_LTMMP_2020-02-25.docx

TABLE OF CONTENTS

TABLES

FIGURES

ABBREVIATIONS

bml	below mudline
BTEX	benzene, toluene, ethylbenzene, and xylene
CCV	continuing calibration verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cm	centimeter
COC	contaminant of concern
COP	City of Portland datum
CRD	Columbia River Datum
CUL	cleanup level
DEQ	Oregon Department of Environmental Quality
DGPS	differential global positioning system
DQO	data quality objective
EDD	electronic data deliverable
EMNR	enhanced monitored natural recovery
EPA	U.S. Environmental Protection Agency
GAC	granular activated carbon
IC	institutional control
IDW	investigation-derived waste
L/kg	liters per kilogram
LCS	laboratory control samples
LTMMP	*Long-Term Monitoring and Maintenance Plan*
MDL	method detection limit
MNR	monitored natural recovery
MRL	method reporting limit
MS/MSD	matrix spike/matrix spike duplicate
NAVD88	North American Vertical Datum of 1988
NSMP	National Strong Motion Project
PAH	polycyclic aromatic hydrocarbon
PGM	Portland Gas Manufacturing
PW	porewater
QA	quality assurance
QC	quality control
RAO	remedial action objective
RL	reporting limit
RNA	regulated navigation area
ROD	Record of Decision

RPD	relative percent difference
RTK	real-time kinematic
SDU	Sediment Decision Unit
SW	surface water
TOC	total organic carbon
TPH	total petroleum hydrocarbon
TSS	total suspended solids
TZW	transition zone water
UCL	upper confidence limit
USGS	U.S. Geological Survey

1 Introduction

On behalf of NW Natural, Anchor QEA, LLC, has prepared this *Long-Term Monitoring and Maintenance Plan* (LTMMP) for the former Portland Gas Manufacturing (PGM) site. The location of the site is shown in Figure F-1. This plan describes recommended long-term monitoring and maintenance tasks to confirm the site remedy is functioning as intended and remedial action objectives (RAOs) are being met, as identified in the Record of Decision (ROD) issued by the Oregon Department of Environmental Quality (DEQ; DEQ 2017). The LTMMP is being prepared and implemented in accordance with the requirements of the 2009 DEQ Order on Consent No. LQVC-NWR-09-02 between DEQ and NW Natural, as amended, and addresses the combined requirements of the *Monitoring, Performance Evaluation, and Contingency Plan* and the *Cap Inspection and Maintenance Plan*, as stated in the draft Statement of Work for the Consent Judgement for the PGM remedial action.

1.1 Project Summary

The site includes a river reach of approximately 800 feet along the western side of the Willamette River from approximately river mile 12.0 to 12.2, between the Burnside and Steel bridges in downtown Portland (Figure F-1). Sediments, transition zone water (TZW), porewater (PW), and surface water (SW) at the site have been impacted by polycyclic aromatic hydrocarbons (PAHs); total petroleum hydrocarbons (TPH); benzene, toluene, ethylbenzene, and xylene (BTEX); metals; and cyanide. These impacted media are being addressed by the selected remedy using a variety of remedial technologies including sediment dredging, isolation caps and covers with granular activated carbon (GAC) amendments, armoring where needed to protect against erosion and propwash, monitored natural recovery (MNR), and enhanced monitored natural recovery (EMNR). These remedial technologies are organized on the basis of sediment decision units (SDUs), which are shown in Figure F-2 (see also Section 3.2 of the *Revised Final Design Report, Version 4*).

This LTMMP specifies the field and laboratory analytical procedures and associated quality assurance/quality control (QA/QC) procedures that will be used during post-construction monitoring activities for the PGM cleanup project.

1.2 Objectives of the Long-Term Monitoring and Maintenance Plan

The objectives of this LTMMP are as follows:

- Perform periodic cap inspections to ensure that the physical integrity of the cap is maintained and not compromised by scour, erosion, or other physical disturbances.
- Monitor the overall effectiveness of the PGM remedy over time to ensure that cleanup levels (CULs) are being achieved and maintained in sediment, TZW or PW, and SW, and if they are not, evaluate whether the site is being recontaminated by off-site sources.

- Monitor the effectiveness of natural recovery in MNR and EMNR areas to ensure that recovery is progressing on pace and recovery times are generally less than 10 years.
- Track contaminant concentration trends in the monitored media relative to project CULs.
- Provide a plan for identifying and evaluating contingency response actions, including cap repairs, when there is an unacceptable loss of cap or cover material, or when CULs are exceeded in one or more locations and those exceedances are attributable to on-site sources; contingency response actions could include more frequent monitoring, additional monitoring locations or depths, or remedy augmentation through the placement of additional GAC-amended treatment layers, sand covers, or armor layers.
- Provide a process for evaluating and, if appropriate, modifying the monitoring program in response to ongoing data results and trends or terminating the monitoring program once CULs and RAOs have been achieved (EPA 2005).

1.3 Monitoring, Performance Evaluation, and Contingency Plan Organization

The remaining sections of this LTMMP are organized as follows:

- **Section 2 – Project Performance Criteria.** This section provides physical and chemical criteria for assessing long-term remedy performance and site analytical parameters and CULs for long-term chemical monitoring of surface sediments, TZW or PW, and SW.
- **Section 3 – Overview of Long-Term Monitoring Program.** This section describes the hydrographic survey requirements for cap inspections and the sample locations, depths, and schedules for the long-term monitoring program.
- **Section 4 – Field Procedures.** This section describes surveying, field sampling, processing, and handling procedures, location control, field QC requirements, field documentation, and management of investigation-derived waste (IDW).
- **Section 5 – Laboratory Procedures, Quality Assurance, and Quality Control.** This section describes the role of the contract analytical laboratory, data quality objectives (DQOs), analytical methods and reporting limits (RLs), laboratory QC requirements, data management, reporting, and validation.
- **Section 6 – Reporting.** This section describes the data analysis methods and contents of the long-term monitoring reports prepared in accordance with this LTMMP.
- **Section 7 – Contingency Plan.** This section describes the decision framework for evaluating and implementing contingency response actions if it is determined that the physical integrity of caps and covers is compromised or the PGM remedy is not achieving project CULs and RAOs.
- **Section 8** – **References.** This section provides details on cited materials.

2 Project Performance Criteria

Long-term monitoring objectives and assessment criteria are summarized in Table F-1. This table presents the PGM remediation goals, remedial technologies and design specifications, and estimated post-construction (i.e., baseline or Year 0) conditions in the various PGM SDUs. Post-construction conditions include the estimated depths and thicknesses of any residual contamination, if present, based on comparisons to project CULs and hot spot criteria (see Attachments 22a and 22b of the PGM ROD; DEQ 2017). Post-construction depth intervals take into account estimated removal depths and cap/cover design applications and thicknesses. These data will help inform long-term site management decisions if areas of elevation loss or erosion are observed. Estimated post-construction conditions do not currently include any overdredging or overplacement allowances and should be updated to "as-built" conditions after the remedy is constructed.

2.1 Bathymetric Criteria

Hydrographic surveys will be performed during each monitoring event to evaluate the physical integrity of caps and covers. Armored caps (SDUs C1 and E), GAC-amended covers (SDUs A and D), sand covers (SDUs F1, C3, and B2), and MNR areas (SDUs B1 and F2) will be surveyed. Bathymetric performance criteria are based on the depth and extent of any observed loss of riverbed elevation relative to the baseline post-construction survey, which may be caused by erosion or settlement.

If cap or cover areas do not meet their respective bathymetric performance criteria, further investigation of cap or cover conditions or implementation of cap or cover repairs may be required (see Section 7.2.1).

2.1.1 Armored Cap Areas (SDUs C1, E)

The physical integrity of armored caps will be confirmed if the following criterion is met:

- The cap surface elevation is stable or increasing (i.e., depositional) when compared to the baseline (post-construction) bathymetric elevation and has not incurred any significant areas of elevation loss that are attributable to a loss of cap material (as opposed to cap settlement). The depth and areal extent of elevation loss that is deemed significant will be determined by DEQ and NW Natural on a case-by-case basis during post-event review meetings in consideration of the risk posed by potentially exposing contaminated underlying materials.

2.1.2 GAC-Amended Cover Areas (SDUs A, D)

By design, GAC-amended sand covers are intended to be locally dispersed on the riverbed and to mix into the underlying sediment; therefore, bathymetric performance criteria are expected to be

more flexible in these areas. The physical integrity of GAC-amended sand covers will be confirmed if the following criterion is met:

- The surface elevation of GAC-amended cover areas is stable or increasing (i.e., depositional) when compared to the baseline (post-construction) bathymetric elevation and has not incurred any significant areas of elevation loss that are attributable to a loss of cover material (as opposed to settlement). The depth and areal extent of the elevation loss that is deemed significant will be determined by DEQ and NW Natural on a case-by-case basis during post-event review meetings in consideration of the potential risk posed by exposing contaminated underlying materials.

2.1.3 Sand Cover (EMNR) Areas (SDUs F1, C3, B2)

EMNR areas are, by definition, flexible technologies that are subject to sediment movement and mixing. As a result, the primary quantitative metric for evaluating remedy performance in EMNR areas is whether surface sediment concentrations are decreasing and are projected to achieve PGM cleanup levels within an acceptable period of time (see Section 2.2). Bathymetric data will be considered in a qualitative manner to confirm that significant interruptions in sedimentation or significant losses of sediment associated with flooding, large vessel grounding, or other significant sediment disturbance events have not occurred that could delay or reverse the natural recovery process or potentially expose buried contamination.

2.1.4 MNR Areas (SDUs B1, F2)

Similar to EMNR areas, MNR areas are, by definition, flexible technologies that are subject to sediment movement and mixing. As a result, the primary quantitative metric for evaluating remedy performance in MNR areas is whether surface sediment concentrations are decreasing and are projected to achieve PGM cleanup levels within an acceptable period of time (see Section 2.2). Bathymetric data will be considered in a qualitative manner to confirm that significant interruptions in sedimentation or significant losses of sediment associated with flooding, large vessel grounding, or other significant sediment disturbance events have not occurred that could delay or reverse the natural recovery process or potentially expose buried contamination.

2.2 Chemical Criteria

2.2.1 Chemical Analytical Parameters

Surface sediments, SW, and TZW or PW will be monitored for PGM contaminants of concern (COCs) to determine the effectiveness of the remedy at protecting these media in the Willamette River from residual contaminants in underlying sediments, upwelling groundwater, or upstream sources. Sampling ports will be installed in armored cap areas, and PW will be monitored until a sufficient

thickness of new sediment (12 inches) has accumulated above the armored cap to allow for TZW samples to be collected (see Section 3.2.3 for further discussion).

The PGM analytical parameters, by media, are as follows:

Sediment Parameters

- Target metals—lead, mercury, and zinc
- PAHs
- TPH-diesel and residual fractions
- Total organic carbon (TOC)
- Grain size analysis

Transition Zone Water/Porewater and Surface Water Parameters

- Target metals—lead, mercury, and zinc (total and dissolved)
- Free cyanide (total fraction, unfiltered)
- PAHs (total and dissolved)
- BTEX (total)
- Hardness
- Total suspended solids (TSS)

2.2.2 Chemical Performance Criteria

Surface sediment, TZW/PW, and SW are the media that will be sampled and analyzed in the long-term monitoring program. The CULs for these media are presented in the ROD (DEQ 2017, Attachment 22a) and compiled in Table F-2. The CULs will serve as the chemical performance criteria for long-term monitoring.

2.2.3 Points of Compliance

PGM CULs will be applied at the following points of compliance:

- Surface sediment: 0 to 4 inches (0 to 10 centimeters [cm]) below mudline (bml)
- TZW: 0 to 12 inches (0 to 30 cm) bml
- SW: 12 inches (30 cm) above mudline

Sample collection methods are designed to target these depths and exposure zones. However, point of compliance monitoring for TZW or sediment will not be feasible in armored cap areas until sufficient sediment has accumulated to allow sample collection in the newly established biological exposure zone. Until such time, PW samples collected from specially designed sampling ports installed during remedial construction (Section 3.2.3) will be used to verify cap performance in armored cap areas.

In addition, appropriate spatial scales of exposure will be applied. Specifically, aquatic life criteria in sediment and TZW/PW will be evaluated on a point-by-point basis. Bioaccumulation criteria in sediment and SW will be applied on the basis of site-wide, surface-weighted average concentrations (Tables F-1 and F-2).

3 Overview of Long-Term Monitoring Program

This section provides an overview of the post-construction long-term monitoring and maintenance program, including site inspections using bathymetry surveys; chemical monitoring locations, media, and depths, as summarized in Table F-3. Monitoring will occur on the schedule shown in Table F-4 unless otherwise approved by DEQ. Additional details regarding field and analytical procedures are provided in Sections 4 and 5, respectively.

3.1 Bathymetry Surveys

Multibeam hydrographic surveys will be performed during each monitoring event to evaluate the physical integrity of the PGM remedy. The multibeam surveys will cover the area between the Burnside and Steel Bridges on the western half of the river between the seawall and the center line of the river channel. The surveys will encompass the entire PGM site as well as a substantial part of the surrounding riverbed to better understand local sediment dynamics.

Areas of apparent scour and erosion will be identified based on bathymetric comparisons with the baseline (Year 0) survey from the completion of the remedial action. The potential effects of cap consolidation must be considered in these evaluations. Apparent erosional areas with significant depth or extent, as defined in Section 2.1 and in consideration of the location-specific conditions, may be targeted for a follow-up investigation of cap or cover conditions. If triggered, follow-up investigations could include diver surveys; probe surveys; additional chemical monitoring of sediment, TZW, or PW; or other methods as needed to verify cap integrity.

3.2 Chemical Monitoring

Following the PGM cleanup action, surface sediment, TZW (or PW), and SW will be monitored to assess the chemical effectiveness of the remedy.

3.2.1 Monitoring Locations

Sixteen locations were selected for long-term monitoring, and those locations will be reoccupied during each monitoring event to establish a time series of chemical concentrations over the course of the monitoring program (Figure F-3). The 16 locations were selected to provide representative spatial coverage of the different SDUs and different remedial technology applications at the site, as summarized in Tables F-3 and F-4. In particular, LTM-01 through LTM-08 provide coverage of MNR and EMNR areas, LTM-09 through LTM-12 provide coverage of in situ treatment areas with GAC-amended sand covers, and LTM-13 through LTM-16 provide coverage of armored, GAC-amended treatment caps. In addition, these samples provide representative coverage of the range of sediment types, residual contamination, and groundwater seepage rates found at the site.

3.2.2 Sampling Media

Surface sediment samples will be collected at all 16 long-term monitoring stations, provided that sufficient new sediment has accumulated over the armored cap areas (Tables F-3 and F-4). At eight locations where GAC-amended treatment covers and treatment caps are applied (LTM-09 through LTM-16), collocated TZW/PW and SW samples will also be collected. Sediment, TZW/PW, and SW samples will be tested for the analytical parameters listed in Tables F-5 and F-6.

The contributions of remediation layers (e.g., sand covers, GAC-amended sand covers, and armor layers) should be considered in the evaluation of all media, especially during early monitoring events (i.e., Year 0, Year 2, Year 5) when these layers may represent a portion of the sampling and compliance depth. In particular, visual evidence of GAC content will be carefully monitored during sample collection activities because organic contaminants (PAHs, TPH, BTEX) can become highly concentrated in GAC due to its high adsorption capacity (i.e., GAC is approximately 100 times more adsorptive than natural organic carbon; see Appendix C of the *Revised Final Design Report, Version 4*). Due to uncertainties regarding the potential impacts of GAC on bulk sediment concentrations, a weight-of-evidence approach that considers all long-term monitoring media (sediment, TZW/PW, and SW) will therefore be used in evaluating remedy performance.

3.2.3 Sampling Depths and Methods

Surface Sediment. The target sampling depth for surface sediment in MNR, EMNR, and GAC-amended cover areas (LTM-01 through LTM-12) is the top 4 inches (10 cm) of the sediment, which represents the bioturbation zone in freshwater sediments and the depth of exposure for benthic organisms (ITRC 2014). This is also the PGM point of compliance for surface sediment (Section 2.2.3). The target sampling depth for surface sediment in armored, GAC-amended cap areas (LTM-13 through LTM-16) is within the newly deposited sediments that have accumulated on the surface of the armor layer. Given typical site sedimentation rates of 0.4 to 2 inches (1 to 5 cm) per year, a 4-inch-thick layer of new sediment is expected to accumulate over the armor layer in 2 to 10 years. Sediment sampling may be attempted with new sediment accumulations of at least 2 inches.

Each surface sediment sampling location will be composited from three replicate samples spaced approximately 25 feet apart in a triangular pattern around the central location. The surface sediment grab samples will be collected using a grab sampler or a diver-assisted push core. Diver assistance may be especially useful in armored cap areas with marginal sediment accumulations. Efforts will be made to identify the contact between the remediation materials (e.g., sand covers, GAC-amended sand covers, or armor layers) and the overlying newly deposited sediment, to better interpret the stratigraphic context of the surface grab samples as well as the TZW/PW samples described in the next section. Such observations will be documented in the field notes.

Transition Zone Water. TZW samples will be collected using a push probe sampler with a pre-packed screen and a seal plate (to prevent short circuiting with SW) connected to a low-flow peristaltic pump, such as Coastal Monitoring Associates' Trident Probe, or similar device. The target sampling interval for TZW is 8 to 12 inches bml (i.e., below the bioturbation zone). In areas covered with GAC-amended sand, this will ensure that the screen is placed within the cover layer (minimum 12-inch-thick cover layer) and not in the underlying sediments, which may be contaminated.

In armored cap areas (LTM-13 through LTM-16), the TZW push probe sampler will not be able to penetrate the gravel/cobble armor layer, and therefore, TZW sampling will not be effective until a layer of newly deposited sediment has accumulated. A minimum thickness of 12 inches of new sediment is recommended for TZW sampling in armored cap areas to avoid short circuiting of the probe with overlying SW. TZW sampling of accumulations less than the 12-inch compliance depth may be feasible, as long as short-circuiting is minimal, but the screen interval of the probe would need to be adjusted.

Porewater. In armored cap areas (SDUs C1 and E), collection of TZW samples may not be feasible during the early monitoring rounds before a sufficient depth of new sediment has accumulated over the armor (Table F-3). In these instances, PW samples will be collected from specialized sampling ports installed in the armored cap areas during cap construction, as shown in Figures F-3 and F-4. The sampling ports will be constructed of a reinforced concrete manhole, approximately 2 feet tall and a few feet in diameter, placed directly over the GAC-amended treatment layer, and filled with inert sand. Then, the cap armor stone will be placed outside of the manhole. During long-term monitoring, the manhole will be located using a magnetometer and accessed for collection of PW samples, which will be collected using the same push probe method used to collect TZW samples, but the screen interval will be placed directly above the GAC-amended treatment layer (chemical isolation layer) at an estimated depth of 12 to 18 inches bml. Once sufficient new sediment has accumulated over the armor layer to allow TZW sampling to occur (i.e., 12 inches of new sediment, equivalent to the compliance depth), the use of PW sampling ports will be discontinued. Until site conditions allow for the collection of TZW samples, PW samples will be used to evaluate cap performance.

Surface Water. SW samples will be collocated with TZW samples at stations LTM-09 through LTM-16. SW samples will be collected from 12 inches above the mudline using a peristaltic pump and tubing. SW samples will be collected even if there is insufficient new sediment accumulation to allow TZW samples to be collected.

3.3 Inspection and Monitoring Schedule

Bathymetric inspection surveys and chemical monitoring events will initially be performed during Years 0, 2, 5, and 10 (Table F-4). An additional bathymetric inspection survey will be performed

during Year 1 to confirm the physical integrity of the remedy following the first year of winter/spring flooding and Fleet Week docking activities. Physical inspections (hydrographic surveys) and chemical monitoring of sediment, TZW/PW, and SW will be performed during each event, with the exception of the Year 1 event, which consists of bathymetry only. NW Natural and DEQ will review the first 10 years of monitoring data to determine an appropriate level of monitoring beyond Year 10 on a schedule to be approved by DEQ.

In general, monitoring activities will be conducted on the schedule shown in Table F-4 unless otherwise approved by DEQ. All events will be conducted during a similar time of year to control seasonal variability, mainly during summer months when river levels are low, encouraging positive groundwater discharge, and currents are comparatively weak, providing more stable sampling conditions. The baseline (Year 0) event in 2020 will be conducted as soon as practicable following remedial construction, likely in October and/or November, depending on construction progress. All subsequent events will be conducted in July and August. This 2-month window will allow for a phased monitoring approach, such that bathymetry data will be collected in July, shortly after any winter or spring flooding and Fleet Week docking events. The bathymetry data will then be processed and reviewed by DEQ and NW Natural prior to mobilizing the chemical monitoring crew, in case any additional concerns are identified by the bathymetry data that may warrant follow-up sampling activities beyond those currently scoped. Contingency inspection events may also be triggered by significant sediment disturbances, such as extreme floods, earthquakes, or large vessel groundings, as described in Section 3.3.4.

After each monitoring event, DEQ and NW Natural will hold a project review meeting to review the monitoring results collected to date and determine the path forward for the monitoring program. The purpose of the meetings will be to determine whether monitoring should be increased, reduced, or eliminated, or alternatively, to evaluate contingency response actions if CULs and RAOs are not being achieved due to on-site sources.

Remedy performance assessment criteria and contingency response actions are discussed further in Section 7.

3.3.1 Baseline (Year 0) Monitoring Event

Initial post-construction conditions will be established with the baseline (Year 0) monitoring event. The baseline event will be conducted as soon as practicable following completion of the remedial action. The baseline monitoring event will include surface sediment sampling at stations LTM-01 through LTM-12, TZW sampling at stations LTM-09 through LTM-12, PW sampling (via manhole access ports) at stations LTM-13 through LTM-16, and SW sampling at stations LTM-09 through LTM-16 (Table F-3). Surface sediment and TZW will not be sampled at stations LTM-13 through

LTM-16 during the baseline event because those stations will be composed of clean gravel/cobble armor stone with little or no newly deposited sediment.

3.3.2 Near-Term (Year 1, Year 2) Monitoring Events

Near-term post-construction conditions will be monitored during the Year 1 and Year 2 events. The Year 1 event will include a bathymetric inspection survey to confirm the physical integrity of the remedy following the first year of winter/spring floods and Fleet Week docking activities. The Year 1 event will not include chemical monitoring unless unacceptable areas of erosion are identified during the survey. The Year 2 event will include both bathymetry and chemical monitoring (Table F-4). By Year 2, sufficient sediment (2 to 4 inches) may have accumulated over the armored cap to allow sampling of surface sediments at LTM-13 through LTM-16. However, it is not expected that sufficient sediment (12 inches) will have accumulated over the armored cap to allow TZW sampling, so PW sampling of these stations (via manhole access ports) will likely continue during Year 2. Some long-term consolidation (up to 12 inches) of low-plasticity silt beneath armored cap areas may occur between Year 0 and Year 2 events and should be considered during data interpretation, but after Year 2, no further cap consolidation is expected (see *Revised Final Design Report, Version 4*, Section 3.3.1.3).

3.3.3 Five-Year (Year 5, Year 10) Monitoring Events

Long-term monitoring will continue with Year 5 and Year 10 events. These events will include both bathymetry and chemical monitoring (Table F-4). By Year 5, it is expected that sufficient sediment should be available for surface sediment sampling at LTM-13 through LTM-16. As soon as sufficient sediment has accumulated to allow TZW sampling in the newly deposited surface layer, PW sampling in the manhole access ports will be discontinued.

The schedule for ongoing monitoring beyond Year 10 and the nature and scope of any contingency response actions will be subject to DEQ approval.

3.3.4 Contingency Monitoring Events

Unscheduled cap inspections (hydrographic surveys) will be conducted following extreme events that could potentially compromise cap integrity. Extreme events that would trigger an emergency inspection survey include the following:

- **Design Flood.** This is a 100-year flood event, defined as a river discharge of 375,000 cubic feet per second, or a river stage of 29.9 feet City of Portland datum (COP; 32.0 feet North American Vertical Datum of 1988 [NAVD88]), as estimated at river mile 12.3 on the Lower Willamette River (FEMA 2010).
- **Design Seismic Event.** The occurrence of an earthquake with a 72-year or greater recurrence interval (50% chance of exceedance in 50 years) will trigger a post-earthquake cap monitoring

event. This determination will be based on real-time monitoring data recorded at the publicly available seismic acceleration monitoring station at Portland State University (National Strong Motion Project [NSMP] Station 2172, located at 45.513°N, 122.684°W, 1721 SW Broadway, in Portland State University Cramer Hall[1]). The seismic acceleration associated with a 72-year earthquake was determined using the U.S. Geological Survey (USGS) Unified Hazard Tool[2] Dynamic Conterminous U.S. 2014 update (v4.2.0). Because site-specific subsurface data were not readily available, both Site Class C (very dense soil/soft rock) and Site Class D (stiff soil) were conservatively evaluated, and the more stringent ground acceleration criterion (Site Class C) was selected. Based on this evaluation, if the peak ground acceleration recorded at NSMP Station 2172 meets or exceeds 0.044 g, a 72-year or larger earthquake will be assumed to have occurred, and contingency cap monitoring will be performed.

- **Large Vessel Grounding.** This event is a documented incident of large vessel grounding, which would most likely occur during Fleet Week.

If areas of significant erosion are observed during the contingency hydrographic surveys that could potentially compromise remedy effectiveness, follow-up chemical monitoring of sediment, TZW/PW, and/or SW may be warranted. The need for any follow-up chemical monitoring would be determined in consultation with DEQ.

3.4 Institutional Controls

As part of the long-term maintenance of the remedy, institutional controls (ICs) will be implemented to ensure that the remedy will continue to provide long-term protection, while limiting activities that could potentially interfere with its effectiveness. Proposed ICs at PGM include the following:

- Prohibition on shallow and intermediate groundwater use beneath the former Block 5 area, especially in the vicinity of the seawall, where elevated chemical concentrations are present. NW Natural has already begun the process of obtaining an easement and equitable servitude preventing the use of shallow and intermediate groundwater and will continue to work with the upland property owner (the City of Portland) and DEQ to get this IC in place. There are no current or reasonably foreseeable uses of groundwater in this area because it is directly overlain by Waterfront Park, and there is a readily available municipal water supply for local businesses and residents.
- Establishment of a regulated navigation area (RNA) with the U.S. Coast Guard. The location of the proposed RNA is shown in Figure F-5. NW Natural will request that the U.S. Coast Guard record the following RNA for SDUs A, C1, and E:

[1] https://earthquake.usgs.gov/monitoring/nsmp/stations.php
[2] https://earthquake.usgs.gov/hazards/interactive/

Sediment disturbance activities including dredging, spudding, and large vessel anchoring require advance consultation and approval by the Oregon Department of Environmental Quality to prevent exposure of buried contamination and/or damage to the remedial cap. Contact the Oregon Department of Environmental Quality (Sarah Greenfield at 503-229-5245) or alternatively, call 811 prior to any sediment disturbance activity. Any work within 10 feet of the seawall is prohibited unless there is advance consultation and approval by DEQ and the City of Portland.

- The site cleanup area will also be registered with the Oregon Utility Notification Center (811 "One Call" center). Bounding coordinates will be provided to the 811 system that circumscribe all SDUs. If sediment disturbance activities are planned in the site cleanup area, NW Natural will notify DEQ within 48 hours of NW Natural's receipt of notice of such activities, DEQ and NW Natural will coordinate to recommend alternatives or mitigation measures associated with those activities, and NW Natural will propose and implement any repair or other measures necessary to ensure long-term protectiveness consistent with the ROD. As part of the long-term monitoring program, NW Natural will track and compile a record of notifications received through the 811 system regarding sediment-disturbing activities at the site and any mitigation activities performed.

4 Field Procedures

This section describes field procedures for performing hydrographic inspection surveys; collecting sediment, TZW, PW, and SW samples; location control; sample handling and transport; field QC requirements; field documentation; equipment decontamination; and management of IDW.

4.1 Hydrographic Survey Methods

Consistent with PGM project specifications (Appendix B, Specification 01 71 23), a licensed survey contractor will use multibeam equipment for scheduled and unscheduled (contingency) hydrographic inspection surveys. The contractor will employ an accepted method to locate and control horizontal position by real-time kinematic (RTK) GPS or post-processed kinematic GPS. Seabed elevations will be converted to the project vertical datum (COP) using spot elevation measurements and survey control points.

Multibeam data will be collected and processed in accordance with U.S. Army Corps of Engineers hydrographic surveying guidance (USACE 2013). The horizontal and vertical precision (i.e., repeatability) of the bathymetric data will be approximately 0.2 foot. The survey contractor will provide the processed XYZ data, elevation and isopach maps in hard copy and electronic formats. Electronic data files (XYZ files) will be submitted with a grid spacing of 1 foot or less. Consistent with project specifications for acceptance surveys during remedial construction, bathymetric data will be binned in 10-foot by 10-foot grids in flat areas and 3-foot by 3-foot grids in sloped areas for performance evaluations and comparisons to baseline survey data (i.e., cut and fill comparisons).

4.2 Field Sampling Methods

4.2.1 Surface Sediment Sampling

Twelve to sixteen composited surface sediment samples (LTM-01 through LTM-16) will be collected for chemical characterization at the locations shown in Figure F-3. Four locations (LTM-13 through LTM-16) on the armored cap will not be sampled during the baseline event, and subsequent sampling will be contingent on the accumulation of a sufficient thickness of new sediment during the early monitoring events. Coordinates for the grab sample locations are presented in Table F-3. At each of the 16 stations, three replicate samples will be collected in a triangular pattern, with each replicate separated by approximately 25 feet, and the three replicates will be composited for laboratory analysis. Composited samples will help to control statistical variability due to field heterogeneity and will provide more accurate and precise concentration measurements at each location.

4.2.1.1 Sediment Grab Sample Collection

Surface sediment grab samples will be collected from the top 4 inches (10 cm) of sediment at Stations LTM-01 through LTM-12. Surface sediment grab samples will also be collected from the layer of newly deposited sediment in areas protected with armor stone—Stations LTM-13 through LTM-16—if a sufficient thickness (2 to 4 inches) of new sediment has accumulated.

Sediment Grab Sample Collection Method. Surface sediment grab samples will be collected using a clamshell-type grab sampler. Samples will be collected in the following manner:

- The vessel will maneuver to the proposed location.
- The grab sampler will be decontaminated.
- A depth to the riverbed measurement will be taken with a weighted tape and recorded along with the time on the field data sheet.
- The grab sampler will be deployed to the riverbed.
- The winch cable to the grab sampler will be drawn taut and vertical.
- Location coordinates of the cable hoist will be recorded.
- The sample will be retrieved for processing on board the vessel.

If suitable grab samples cannot be collected due to limited accumulation of newly deposited material or refusal of the grab sampler by cap armor materials or other obstructions, diver-assisted surface samples (push cores or other) will be attempted, as described in Section 4.2.1.2.

Sediment Grab Sample Acceptance Criteria. Upon retrieval, the sediment grab samples will be evaluated against the following acceptability criteria:

- Grab sampler is not overfilled (i.e., sediment surface is not against the top of the sampler).
- Sediment surface is relatively flat, indicating minimal disturbance or winnowing during retrieval.
- Overlying water is present, indicating minimal leakage.
- Overlying water has low turbidity, indicating minimal sample disturbance.
- A target penetration depth of at least 2 inches is achieved.

4.2.1.2 Diver-Assisted Sediment Sample Collection

Four monitoring locations (LTM-13 through LTM-16) are sited in armored cap areas. At these locations, diver assistance may be needed to collect surface sediment samples, especially during the early monitoring rounds provided that sufficient newly deposited sediment (i.e., at least 2 inches) has accumulated.

Diver Core Collection Method. Diver-operated 4-inch hand core samplers will be used to collect surface sediment samples according to the following procedures:

- A single-line tendered diver will descend with the sampler.

- The diver will prepare the sampling device for deployment by removing a sliding door from the base of the sampler and opening a vent at the top of the sampler.
- The diver will work the tool into the sediment until it is flush with the mudline.
- The sliding door will be reinserted without disturbing the sample.
- The diver will return to the surface with the sample.

Diver Core Acceptance Criteria. Upon retrieval, the sediment sample will be evaluated against the following acceptance criteria:

- A target penetration depth of at least 2 inches is achieved.
- The sample contains less than 50% armor stone, by volume.

Due to the limited volume of these shallow cores, and possibly limited sediment accumulation depths, the diver may need to collect multiple cores from each location to have sufficient volume for all sediment analytical parameters. Other comparable diver-assisted surface sediment samplers may also be considered.

4.2.1.3 Sediment Sample Description

Acceptable grab and push core samples will be logged and processed for analysis as described in this section.

Photographs. Prior to processing, field personnel will take digital photographs of the undisturbed grab or push core samples alongside a measuring tape. A note card will be included in each photograph with the sample ID and date.

Geologic Description. A geologic description of each grab and push core sample will be completed. Sediment descriptions will follow ASTM International Method D2488-00, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedures)*. The sample descriptions will include, but are not limited to, the following observations as appropriate:

- Color
- Grain size
- Moisture content
- Density
- Organic matter
- Other field characteristics
  - Odor (e.g., hydrogen sulfide, petroleum, solvent)
  - Vegetation
  - Anthropogenic debris
  - Biological activity (e.g., shells, tubes, bioturbation, organisms)
  - Presence of visible contamination (e.g., sheen, oil, tar)

- Depth and distinctness of any stratigraphic contacts, including depth to the Year 0 post-remediation surface, if evident

The depth and distinctness of the contact between the newly deposited sediment and underlying remediation surface (e.g., GAC-amended cover, sand cover, or armor layer) will be carefully examined and photographed, and the thicknesses measured and recorded. If evident, the depth of this contact will be considered in the evaluation of sediment and TZW analytical results and may also be used to help set the depth of the screen interval for collocated TZW samples (see Section 4.2.2).

4.2.1.4 Sediment Processing

Sediment will be removed from the samplers with a decontaminated stainless-steel spoon, placed in a clean stainless-steel bowl or pot, and homogenized until uniform color and texture is achieved. If more than one grab sample or push core is needed to achieve the necessary sample volume, material from all replicate samples will be composited. In armored cap areas, care will be taken to exclude the gravel/cobble armor layer and retain only the newly deposited sediment.

Field personnel will then fill pre-cleaned, laboratory-supplied sample jars for analysis of target analytes. Each container will be clearly labeled with the name of the project, sample number, type of analysis, date, time, and initials of the person preparing the sample. This information will also be recorded in the field notes and on the chain-of-custody forms.

All reasonable efforts will be made to collect the required sediment sample volumes. However, testing the full suite of analytical parameters may not be possible at every location, in particular, in armored cap areas where low-volume, diver-assisted push cores are used. If sample volume is limited, sample jars will be filled in this order of priority:

1. PAHs
2. Target metals (lead, mercury, and zinc)
3. TPH (diesel and residual fractions)
4. TOC
5. Grain size

4.2.2 Transition Zone Water, Porewater, and Surface Water Sampling

Eight collocated TZW (or PW) and SW samples (LTM-09 through LTM-16) will be collected for chemical characterization at the locations shown in Figure F-3. Coordinates for these locations are presented in Table F-3. TZW samples will be extracted from existing or newly deposited surface sediments, whereas PW samples will be extracted from an artificial sand column placed in manhole-type sampling ports. It will generally be necessary to collect PW samples in lieu of TZW samples during the early monitoring events in SDUs C1 and E (i.e., stations LTM-13 through LTM-16). If sufficient new sediment (i.e., 12 inches, equal to the TZW point of compliance) has accumulated

over the rock armor layer of the cap at stations LTM-13 through LTM-16, TZW samples will be collected from the newly deposited sediment. If not, PW samples will be collected from specially designed manhole sampling ports installed in the armored cap, as shown in Figure F-4 and described in Section 3.2.3.

4.2.2.1 Transition Zone Water and Porewater Collection Methods

A stainless-steel push probe sampler with a standard screen interval of 8 to 12 inches bml connected to a low-flow peristaltic pump will be used to collect TZW samples, as depicted in Figures F-6 and F-7. An adjustable seal plate will be installed on the push probe sampler to allow for adjustments to the depth of the screen interval to better target newly deposited material or to collect deeper PW samples in manhole-type sampling ports. Shallower screen intervals may be considered, if needed, in armored cap areas lacking thick new sediment accumulations if short-circuiting with SW can be minimized. The push probe sampler may be deployed from a boat with rods or by a diver. Care will be taken during the deployment of the push probe sampler to minimize the disturbance of surface sediments.

Screen Depth. In general, 4-inch and 6-inch screen intervals will be used for TZW and PW sampling, respectively. The target screen interval for TZW is 8 to 12 inches bml at the base of the TZW compliance zone. In GAC-amended cover areas, the screen interval will include sampling of newly deposited sediment and, in the earlier monitoring rounds, may also include some portion of the underlying cover materials (Figure F-6). If there is insufficient new sediment in armored cap areas (LTM-13 to LTM-16), PW samples will instead be collected from manhole sampling ports (Figure F-4), just above the GAC-amended treatment layer at approximately 12 to 18 inches bml. As shown in Figure F-4, a barrier screen will be installed at the base of the concrete sampling ports to prevent the push probes from over-penetrating and sampling the underlying treatment layer (i.e., chemical isolation layer).

Sand Pack. The push probe sampler will be outfitted with a sand pack between the screen and the pump intake to help minimize the inflow of suspended sediments into the TZW/PW samples. The sand pack will be changed out between sampling stations as part of the decontamination procedure.

Purging and Sampling. TZW/PW will be purged from the push probe sampler using a low-flow peristaltic pump before sampling is conducted. Water will be removed at a slow rate to minimize the influx of suspended sediments and SW. A minimum of one "casing" volume will be purged from the probe and sampling tube or up to three casing volumes if flow rates allow.

Water Quality Parameters. Prior to TZW/PW sampling, SW at 12 inches above the mudline will be monitored for temperature and electrical conductivity. During purging and sampling, small aliquots of TZW/PW will also be monitored for temperature and conductivity to confirm that water quality parameters are stable and that SW is not short-circuiting into the probe and diluting the TZW/PW.

The TZW/PW temperature and conductivity values will be compared to the SW values to determine whether short-circuiting has occurred. Visual observations of turbidity or suspended sediments in the TZW samples will be recorded in the field notes.

4.2.2.2 Surface Water Collection Methods

SW will be collected from 12 inches above the mudline concurrent with the collection of TZW/PW samples. The SW tubing will be purged of three volumes using a low-flow peristaltic pump. Prior to sampling and during sampling, SW will be monitored for temperature and conductivity to ensure stability of water quality parameters. Visual observations of turbidity or suspended sediment in the SW samples will be recorded in the field notes. If high levels or increasing levels of turbidity or suspended sediment are observed, it could be indicative of riverbed disturbance in the vicinity of the intake port.

4.2.2.3 Transition Zone Water, Porewater, and Surface Water Processing

TZW, PW, and SW samples will be collected by filling pre-cleaned, laboratory-supplied sample bottles directly from dedicated peristaltic pump tubing. Each container will be clearly labeled with the name of the project, sample number, type of analysis, date, time, and initials of the person preparing the sample. This information will be recorded in the field notes and on the chain-of-custody forms. See Section 4.4 for sample handling and transport procedures for dispatching the samples to the analytical laboratory.

Analytical Priorities. Depending on the permeability and yield of the sediments, TZW and PW sample volumes may be limited, and testing the full suite of analytical parameters may not be possible at every location. Therefore, TZW and PW sample bottles will be filled in this order of priority:

1. PAHs (total)
2. BTEX (total)
3. PAHs (dissolved, filtered upon receipt at laboratory)
4. Free cyanide (total fraction, unfiltered)
5. Target metals—lead, mercury, and zinc (total and dissolved [field-filtered])
6. Hardness
7. TSS

There are not expected to be any volume limitations for SW collection.

Sample Filtration. Metals samples will be filtered in the field using a 0.45-micron in-line filter. Organics will be filtered upon receipt at the analytical laboratory using a 1-micron glass fiber filter. This will require close coordination with the laboratory to schedule the filtration as soon as possible after samples are received.

4.2.3 Sample Identification

Each surface sediment, TZW, PW, and SW sample will be assigned a unique alphanumeric identifier using this format:

- The first four digits indicate the year the sample is collected (e.g., 2020, 2025, etc.).
- This will be followed by a media identifier:
  - SED: surface sediment
  - TZW: transition zone water
  - PW: porewater
  - SW: surface water
- The media identifier will be followed by the sample location number (-01 through -16; Figure F-3).

For example, for a TZW sample collected in 2020 at Station LTM-01, the sample ID would be "2020-TZW-01."

For QA/QC samples, the following suffixes will be added to the sample IDs:

- D: duplicate
- FB: field blank
- RB: rinsate blank

For example, for a duplicate sample collected in 2020 at Station LTM-01, the sample ID would be "2020-TZW-01-D." For field and rinsate blanks, no station ID will be included in the sample ID. A rinsate blank collected from the TZW sampling equipment in 2020 would be "2020-TZW-RB."

4.3 Location Control

Horizontal Control. Horizontal positioning of the sediment grabs, TZW/PW push probes, and SW samplers will be determined by a differential global positioning system (DGPS). Target coordinates are listed in Table F-3. If necessary, the target coordinates may be modified in the baseline sampling event based on site conditions; however, whatever final coordinates are selected should be maintained throughout the duration of the long-term monitoring program to establish spatial continuity for trend analysis. Measured station positions will be converted to latitudinal and longitudinal coordinates (North American Datum of 1983) to the nearest 0.1 second. The accuracy of measured and recorded horizontal coordinates should be within 3 meters.

Vertical Control. A mudline elevation at each sampling station will be determined by measuring the water depth with a lead line or fathometer. The mudline measurement will be converted to an elevation by using the river stage measurements at an established benchmark such as the

U.S. Geological Survey Morrison Bridge Gauge and converting the gauge reading to the project datum (COP).

4.4 Sample Handling and Transport

The sediment, SW, and TZW/PW samples will be packed and delivered to the analytical laboratory using the following procedures:

- **Sample Packing.** Sediment jars will be packed in separate coolers from the TZW/PW bottles. Each jar or bottle will be packed carefully to prevent breakage and will be placed inside a cooler on bagged ice or blue ice for storage at approximately 4°C during transport to the analytical laboratory. Completed chain-of-custody forms will be enclosed in a plastic bag and taped to the inside lid of the cooler. The shipping containers will be clearly labeled, addressed, and affixed with signed and dated custody seals.
- **Sample Delivery.** Each cooler containing iced samples will be delivered to the analytical laboratory either by the field crew or by laboratory courier. The custody seal will be broken upon receipt of samples at the analytical laboratory. The receiver at the laboratory will record the temperature and condition of the samples and cross-check the sample inventory with the chain-of-custody form.

4.5 Field Quality Control

The integrity of the surface sediment samples will be controlled using the sample acceptance criteria and handling protocols described in Sections 4.2.1.1 and 4.2.1.2. The integrity of the TZW/PW and SW samples will be controlled by purging the probe chamber and sampling tube prior to sampling and by monitoring field parameters during purging and sampling, as described in Section 4.2.2.1. The chemical integrity of the field sampling procedures will be further controlled using QC samples, including rinsate blanks, field duplicates, and matrix spike/matrix spike duplicate (MS/MSD) samples, as described in this section.

4.5.1 Rinsate Blanks

A rinsate blank will be collected from the TZW/PW push probe sampler to assess the potential for cross-contamination by sampling equipment during each sampling event. The rinsate blank will consist of rinsing down the aforementioned sampling equipment with deionized water following sample collection and decontamination and then collecting the rinsate into sample bottles. The rinsate blank sample will be analyzed for the same chemical analyte list as the regular field samples. A rinsate blank will not be collected from the sediment grab sampler because it is used to sample a different media (i.e., sediment).

4.5.2 Field Duplicates

During each sampling event, one field duplicate sample will be collected for each media sampled (sediment, TZW/PW, and SW). The field duplicate will be obtained by collecting twice the amount of needed material from a representative location and splitting it into two unique samples (the original sample and a duplicate sample). The duplicate samples will be processed in exactly the same way as the original samples and will be submitted to the laboratory with a blind ID. The duplicates will be analyzed for the same constituents as the regular field samples to assess field heterogeneity and laboratory variability.

4.5.3 Matrix Spike/Matrix Spike Duplicates

If sufficient sample volume is available, additional sediment, TZW/PW, and SW will be collected to prepare site-specific MS/MSD samples for each of these media. If this is not possible because one or more of these media is volume-limited, then the laboratory will provide a generic matrix for the MS/MSD samples. The MS/MSD samples will provide information on whether the characteristics of PGM sediments, TZW/PW, or SW might cause chemical interferences that could affect laboratory detection or quantitation. The samples designated for MS/MSD analyses will be clearly marked on the COC forms.

4.6 Field Documentation

A complete record of field activities will be maintained, including the following:

- Health and safety tailgate forms
- Written and photographic documentation of all field activities
- Written documentation of sampling activities, including completion of field sampling forms for sediment grab sample collection and TZW/PW/SW sample collection
- Sediment grab sample logs (field descriptions)
- Photographic documentation of sediment grabs, with close-up photographs of any significant depositional contacts or visual evidence of contamination
- Chain-of-custody forms

On-site activities will be documented in indelible ink. The field notes are intended to provide sufficient data and observations to enable readers to reconstruct events that occurred during the sampling period. The field notes will clearly indicate any modifications to the procedures specified in this LTMMP. Field data sheets will be checked for completeness and accuracy by the field sampling coordinator and maintained in the project file after data entry and checking are complete.

Field sampling forms will be completed for each sediment and TZW/PW/SW sampling event. The field sampling forms will include the following information, as applicable:

- Date and time

- Weather
- Sampling personnel, including field supervisor and name of person or persons collecting and logging the sample
- Sampling location, including DGPS coordinates
- Water depth
- Any deviations from the approved LTMMP and, if appropriate, rationale for such deviations
- Agreements reached with DEQ on field decisions, including the subject, time, method of communication (e.g., telephone or email log), and decision rendered
- Other comments (e.g., sampling difficulties and unusual field conditions)

Sediment sampling forms will contain the following additional information:

- Penetration depth
- Sample depth
- Sediment characteristics, including any visible contacts

Water sampling forms (TZW/PW/SW) will contain the following additional information:

- Screen interval depth
- Purge volume
- Field parameter measurements

4.7 Equipment Decontamination

The sediment grab sampler will be decontaminated prior to use and between each station. Dedicated push probe sampler supplies, such as sample tubing and filter pack media, will be replaced between each station.

To prevent sample cross contamination, all other nondedicated sampling equipment (including the grab sampler and push probe sampler) or processing tools (including stainless-steel spoons and spatulas) that come in contact with sediment and water will undergo decontamination procedures prior to and between sample collection activities. The following decontamination steps will be followed:

- Rinse with potable water and wash with scrub brush until free of visible contamination.
- Wash with scrub brush and phosphate-free detergent (e.g., Alconox).
- Rinse with potable water.
- Visually inspect the sampler and repeat the scrub and rinse step, if necessary, until visual signs of contamination (or adhered sediment) are gone.
- Rinse with deionized water three times.

4.8 Investigation-Derived Waste

IDW, both sediment and water, will be contained, characterized, and disposed of in accordance with all applicable laws and the procedures outlined in the "Portland Gas Manufacturing Site Investigation-Derived Waste Management" memorandum (Anchor QEA 2017). Materials used for decontamination (e.g., liners, gloves, paper towels, and foil) will be placed into appropriate containers and staged for solid waste disposal. Once the sampling work has been completed, IDW will be disposed of at a permitted off-site solid waste disposal facility.

5 Laboratory Procedures, Quality Assurance, and Quality Control

The contract laboratory, analytical methods, and QA/QC procedures are discussed in this section.

5.1 Contract Laboratory

A laboratory accredited through the Oregon Environmental Laboratory Accreditation Program will perform the sediment, TZW, PW, and SW analytical work described herein. Sediment samples will be analyzed for PAHs, TPH-diesel and -residual, metals, TOC, and grain size. TZW/PW/SW samples will be analyzed for total and dissolved PAHs, BTEX, free cyanide, dissolved metals, hardness, and TSS.

In completing the chemical analyses for this project, the contract laboratory will be expected to meet the following minimum requirements:

- Adhere to the analytical methods and procedures specified in this LTMMP (Tables F-5 and F-6).
- Deliver PDF and electronic data as required.
- Meet reporting requirements for deliverables.
- Meet turnaround times for deliverables.
- Meet analytical holding times, storage, and preservation requirements (Table F-7).
- Implement specified QA/QC procedures, including DQOs, laboratory QC requirements, and performance evaluation testing requirements (Tables F-8 and F-9).
- Notify the QA Manager (typically NW Natural's consultant) of any QA/QC problems when they are identified to allow for quick resolution.
- Allow laboratory and data audits to be performed, if deemed necessary.

5.2 Data Quality Objectives

The DQOs for this project are to ensure that long-term monitoring data are of known and acceptable quality so that the project objectives described in Section 1.2 can be achieved and, specifically, to verify that the PGM cleanup action is meeting the sediment, TZW, and SW CULs specified in Table F-2. The quality of the laboratory data is assessed by precision, accuracy, representativeness, comparability, completeness and sensitivity parameters. Definitions of these data quality parameters, applicable QC procedures, and quantitative goals are discussed in this section.

5.2.1 Precision

Precision is the ability of an analytical method or instrument to reproduce its own measurement. It is a measure of the variability, or random error, in sampling, sample handling, and laboratory analysis that includes the following:

- **Repeatability.** The random error associated with measurements made by a single test operator on identical aliquots of test material in a given laboratory, with the same apparatus, under constant operating conditions
- **Reproducibility.** The random error associated with measurements made by different test operators, in different laboratories, using the same method but different equipment to analyze identical samples of test material

In the laboratory, *within-batch* precision is measured using replicate sample or QC analyses and is expressed as the relative percent difference (RPD) between the measurements. The *batch-to-batch* precision is determined from the variance observed in the analysis of standard solutions or laboratory control samples (LCS) from multiple analytical batches.

Field precision will be evaluated by the collection of field duplicates for chemistry samples at a frequency of 1 in 20 samples. Field chemistry duplicate precision will be screened against an RPD of 50% for sediment samples and 35% for water samples.

The equation used to express precision is RPD and is as follows:

Equation F-1

$$\text{RPD} = \frac{(C_1 - C_2) \times 100\%}{(C_1 + C_2) \div 2}$$

where:

RPD	=	relative percent difference
C_1	=	larger of the two observed values
C_2	=	smaller of the two observed values

Precision measurements can be affected by the nearness of a chemical concentration to the method reporting limit (MRL), where the RPD value increases. Precision will be evaluated by the difference between the results when the parent or duplicate sample result is less than five times the MRL, and the control limit will be less than the MRL for water samples and less than two times the MRL for solid samples.

5.2.2 Accuracy

Accuracy is a measure of the closeness of an individual measurement (or an average of multiple measurements) to the true or expected value. Accuracy is determined by calculating recovery values of results from analyses of laboratory-fortified blanks, standard reference materials, and calibration standard solutions. Laboratory-fortified (i.e., matrix-spiked) samples indicate the accuracy or bias in the sample matrix.

Accuracy is expressed as percent recovery of the measured value, relative to the true or expected value. If a measurement process produces results whose mean is not the true or expected value, the process is said to be biased. Bias is the systematic error either inherent in a method of analysis (e.g., extraction efficiencies) or caused by an artifact of the measurement system (e.g., contamination). Analytical laboratories utilize several QC measures to eliminate analytical bias, including systematic analysis of method blanks, LCS, and independent calibration verification standards. Because bias can be positive or negative, and because several types of bias can occur simultaneously, either the net, or total, bias can be evaluated in a measurement.

Laboratory accuracy will be evaluated against quantitative MS and surrogate spike recovery performance criteria provided by the laboratory. Accuracy can be expressed as a percentage of the true or reference value, or as a percent recovery in spiked blanks and samples. The equation used to express accuracy is as follows:

Equation F-2

$$\%R = \frac{100\% \times (S - U)}{C_{sa}}$$

where:

%R	=	percent recovery
S	=	measured concentration in the spiked aliquot
U	=	measured concentration in the unspiked aliquot
C_{sa}	=	actual concentration of spike added

5.2.3 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent an environmental condition. Assuming those objectives are met, the samples collected should be considered adequately representative of the environmental conditions they are intended to characterize. This is addressed through the development of a representative sampling design, as described in Section 3 of this LTMMP. In particular, long-term monitoring locations were selected to

provide representative coverage of the different SDUs and remedial technology applications, from MNR and EMNR to GAC-amended covers and armored caps.

5.2.4 Comparability

Comparability expresses the confidence with which one dataset can be evaluated in relation to another dataset. For this program, comparability of data will be established through the use of standard analytical methodologies and reporting formats and by using common traceable calibration and reference materials.

5.2.5 Completeness

Completeness is a measure of the amount of data that are determined to be valid in proportion to the amount of data collected. Completeness will be calculated as follows:

Equation F-3

$$\text{Completeness} = \frac{(Number\ of\ acceptable\ data\ points) \times 100}{Total\ number\ of\ data\ points}$$

The DQO for completeness for all components of this project is 95%. Data that have been qualified as estimated because the QC criteria were not met will be considered valid for assessing completeness. Data that have been qualified as rejected will not be considered valid for assessing completeness.

5.2.6 Sensitivity

Analytical sensitivities must be consistent with, or lower than, the project performance criteria (PGM CULs) in order to demonstrate compliance with this LTMMP. The target RLs specified in this LTMMP for each analytical parameter are expected to be less than their corresponding CULs (Tables F-5 and F-6; compare with Table F-2). Laboratory RLs are defined as the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions for the prescribed method. However, if RLs lower than CULs are not achieved, the QA Manager will work with the laboratory to ensure that reanalyses are performed and lower RLs are achieved, if possible.

If sufficiently low RLs cannot be achieved, efforts should be made to at least maintain laboratory method detection limits (MDLs) below CULs. The MDL is defined as the minimum concentration at which a given target analyte can be measured and reported with 99% confidence that the analyte concentration is greater than zero. Laboratory MDLs and RLs will be evaluated to verify method

sensitivity and applicability prior to the acceptance of a contract laboratory for this monitoring program.

5.3 Analytical Methods and Reporting Limits

Laboratory analytical methods and RLs are compiled in Table F-5 for sediment and Table F-6 for TZW/PW and SW. Based on a comparison with the PGM CULs shown in Table F-2, the laboratory RLs are expected to be at or below project CULs, allowing for accurate site management decisions to be made. In practice, sample dilution, high moisture content, low sample volume, matrix interference, or other unforeseen analytical complications may cause the laboratory RLs to rise above the CULs. In such instances, the data will be reviewed by the QA Manager and the laboratory to determine if an alternative course of action is warranted, or even possible, that would effectively lower the RLs.

5.4 Laboratory Quality Control Requirements

Laboratory QC procedures and analyses, where applicable, include initial and continuing instrument calibrations, standard reference materials, LCS, matrix replicates, MS, internal standard and surrogate spikes (for organic analyses), and method blanks. Table F-8 lists the frequency of analysis for field and laboratory QC samples, and Table F-9 summarizes the laboratory control limits for precision, accuracy, and completeness.

Results of the QC samples from each sample group will be reviewed by the analyst immediately after a sample group has been analyzed. Samples will be diluted and reanalyzed if target compounds are detected at levels that exceed their respective established calibration ranges. Extract cleanups will be conducted prior to dilution. The QC sample results will be evaluated to determine if control limits have been exceeded. If control limits are grossly exceeded in a sample group, the QA Manager will be contacted immediately, and corrective action (e.g., method modifications followed by reprocessing the affected samples) will be initiated prior to processing a subsequent group of samples.

5.4.1 Laboratory Instrument Calibration and Frequency

Initial calibrations will be conducted on laboratory instruments as required by the methods and manufacturers, after each major interruption to the analytical instrument, and when any ongoing calibration and subsequent corrective action does not meet method control criteria. Calibration verification will be analyzed following each initial calibration and will meet method criteria prior to analysis of samples. Continuing calibration verifications (CCV) will be performed daily prior to any sample analysis to track instrument performance. The frequency of CCVs varies with method. For gas chromatograph/mass spectrometer methods, one CCV will be analyzed every 12 hours. For gas chromatograph, metals, and inorganic methods, one CCV will be analyzed for every 10 field samples, or daily, whichever is specified in the method. If a CCV is out of control, the analysis must come to a

halt until the source of the control failure is eliminated or reduced to meet control specifications or until a new initial calibration is conducted. Project samples analyzed while an instrument calibration was out of control will be reanalyzed.

Instrument blanks or continuing calibration blanks provide information on the stability of the baseline established. Continuing calibration blanks will be analyzed immediately prior to, or immediately following, CCVs for each type of applicable analysis.

5.4.2 Laboratory Duplicates and Replicates

Analytical duplicates provide information on the precision of the analysis and are useful in assessing potential sample heterogeneity and matrix effects. Analytical duplicates and replicates are subsamples of the original sample that are prepared and analyzed as a separate sample. Laboratory duplicates are separate from, and in addition to, the field duplicates described in Section 4.5.2.

5.4.3 Matrix Spikes/Matrix Spike Duplicates

Analysis of MS samples provides information on the effects of the sample matrix on the accuracy of the sample quantification. By performing duplicate MS analyses, information on the precision of the analysis is also provided. If sample volume permits, extra site sediment, TZW/PW, and SW will be collected for laboratory MS/MSD analysis, as described in Section 4.5.3.

5.4.4 Method Blanks

Method blanks are analyzed to assess possible laboratory contamination at all stages of sample preparation and analysis. The method blank for all analyses must be less than the MRL of the respective target analyte. If a laboratory method blank exceeds this criterion for any analyte, and the concentration of the analyte or compound in any of the samples is less than five times the concentration found in the blank (less than 10 times for common contaminants), analyses must stop, and the source of contamination must be eliminated or reduced.

5.4.5 Laboratory Control Samples

LCS are analyzed to assess possible analytical bias at all stages of sample preparation and analysis. The LCS is a blank spiked sample that undergoes the same sample preparation procedures as the samples and MS samples. The LCS will provide information on the accuracy of the analytical process and, when analyzed in duplicate, will provide precision information, as well.

5.5 Laboratory Data Package

The laboratory will prepare detailed laboratory data packages documenting all activities associated with the project analyses. The following information will be included in this data package:

- **Project Narrative.** This summary, in the form of a cover letter, will discuss problems, if any, encountered during any aspect of analysis. This summary will discuss, but not be limited to, QC, sample shipment, sample storage, and analytical difficulties. Non-conformances and corrective actions will be documented.
- **Chain-of-Custody Records.** Legible copies of the chain-of-custody forms will be provided as part of the data package. This documentation will include the time of receipt and condition of the samples upon receipt by the laboratory. Additional internal tracking of sample custody by the laboratory will also be documented on a sample receipt form. The form must include sample shipping container temperatures measured at the time of sample receipt.
- **Sample Results.** The laboratory data package will summarize the results in PDF format for each sample analyzed, including the following information as applicable:
  - Field sample identification code and the corresponding laboratory identification code
  - Sample matrix
  - Date of sample extraction/preparation
  - Date and time of analysis
  - Weight and/or volume used for analysis
  - Final dilution or concentration factor
  - Instrument identification
  - Sample-specific MDLs/RLs
  - Analytical results with reporting units identified
  - Data qualifiers and their definitions
- **Quality Assurance/Quality Control Summaries.** Each QA/QC sample analysis will be documented with the same information required for the sample results. No recovery or blank corrections will be made by the laboratory. The required summaries include, but are not limited to, the following:
  - **Calibration Data.** This summary will report the concentrations of the initial calibration and daily calibration standards and the dates and times of analyses. The response factors, percent relative standard deviation values, percent difference values, and retention times for each analyte will be listed, as appropriate. Results for standards used to quantify instrument sensitivity will be documented.
  - **Internal Standards.** Internal standard area counts will be reported.
  - **Method Blanks.** The method blank analyses associated with each sample and the concentration of compounds of interest identified in these blanks will be reported.

- **Surrogate Spikes.** Surrogate spike recovery data for organic compounds will be reported, along with the name and concentration of the compounds added, percent recoveries, and control limits.
- **Matrix Spikes/Matrix Spike Duplicates.** MS/MSD recovery data, including the name and concentration of analytes added, percent recoveries, and control limits will be reported, as well as the RPD of MS and MSD results.
- **Matrix Duplicates.** This summary will report the parent sample and duplicate results and RPD values for matrix duplicate analyses.
- **Laboratory Control Samples.** LCS recovery data will be reported. The names and concentrations of analytes added, percent recoveries, and control limits will be reported, as well as RPD values for LCS duplicate analyses.
- **Relative Retention Times.** For gas chromatograph analyses, the relative retention time of each analyte detected in the samples for both primary and confirmational analyses will be reported.
- **Raw Data.** Legible copies of the original data generated by the laboratory will include the following as applicable:
    - Sample extraction, preparation, and cleanup logs
    - Instrument specifications and analysis logs for instruments used on days of calibration and analysis
    - Reconstructed ion chromatograms for samples, standards, blanks, calibrations, spikes, replicates, and reference materials for chromatography methods
    - Full scan chromatograms and quantitation reports for gas chromatograph or gas chromatograph/mass spectrometer analyses
    - Enhanced spectra of detected compounds with associated best-match spectra for each sample
    - Original instrument outputs for all metals and inorganic analyses
    - Analytical logs and calculation worksheets
    - Copies of sample preparation benchsheets

Instrument data will be fully restorable at the laboratory from electronic backup. The laboratory will maintain records relevant to project analyses for a minimum of 5 years. Data validation reports will be maintained in the central project files with the analytical data reports.

5.6 Data Management and Reporting

Laboratory data will be provided to the QA Manager in the EQuIS electronic data deliverable (EDD) format. Laboratory data that are electronically provided and loaded into the database will undergo a check against the laboratory hard copy data. Data will be validated or reviewed manually (see

Section 5.7), and qualifiers, if assigned, will be entered manually. The accuracy of manually entered data will be verified by a second party. Data tables will be produced in Microsoft Excel.

5.7 Data Validation

Laboratory data will be provided in both PDF and EQuIS EDD. Once data are received from the laboratory, QC procedures will be followed to provide an accurate evaluation of data quality. The data will be validated in accordance with the project-specific DQOs and control limits (Table F-9), analytical method criteria, and the laboratory's internal performance standards based on their standard operating procedures. A Stage 2B validation (EPA 2009) will be conducted by NW Natural's consultant or subconsultant, as directed by the QA Manager, in accordance with U.S. Environmental Protection Agency (EPA) National Functional Guidelines (EPA 2017a, 2017b). At a minimum, the following QC criteria will be evaluated:

- Data completeness
- Sample receipt
- Holding times
- Field QC
- Method blanks
- MDLs/RLs
- Internal standard area counts
- Surrogate recoveries
- LCSs
- MS/MSDs
- Standard reference materials
- Second column confirmation analyses
- Instrument tunes
- Instrument calibrations

The results of the data validation, including text assigning qualifiers in accordance with the EPA National Functional Guidelines and a tabular summary of qualifiers will be overseen by the QA Manager, who will conduct final review and confirmation of the validity of the data. A copy of the validation report will be included as an appendix to the long-term monitoring reports (see Section 6).

6 Reporting

Year 0 (baseline), Year 1 (bathymetry only), Year 2, and Year 5 Monitoring Reports will be prepared after their respective inspection and monitoring events summarizing the field and analytical results. The Year 10 Report will include additional reporting of summary statistics and a more detailed analysis of time trends.

6.1 Post-Event Review Meetings

The long-term monitoring program will be adaptively managed using post-event review meetings. Post-event reviews will be phased along with data collection activities. First, following receipt of bathymetric survey results, the physical data will be reviewed to assess whether the bathymetric performance criteria (see Section 2.1) have been met, and a recommendation will be provided to DEQ as to whether any modifications to the chemical monitoring event are appropriate. Subsequently, after all bathymetric and analytical data have been processed and validated, DEQ and NW Natural will meet to comprehensively review the event-specific monitoring results, as well as the cumulative results and trends obtained to date, and to discuss recommendations for follow-up actions, including potential contingency response actions, and future monitoring needs. Specific discussion items will include the following:

- Evaluation of the depth and extent of areas of elevation loss in active remediation areas and whether follow-up investigations are needed to determine if the physical integrity of the cap has been affected
- Evaluation of the magnitude and extent of any CUL exceedances in any media or increasing trends over time that would indicate exceedances are predicted to occur in the near future
- Adaptive management of the long-term monitoring program, including decisions regarding continued monitoring, increased or decreasing monitoring, or termination of monitoring at certain stations
- Planning and scoping of follow-up investigations or contingency response actions if RAOs are not being met, as described in Section 7.

6.2 Year 0, Year 1, Year 2, and Year 5 Monitoring Reports

Year 0 (baseline), Year 1 (bathymetry only), Year 2, and Year 5 Monitoring Reports will include the following information, as appropriate:

- Map of actual sampling locations
- Discussion of any deviations from the approved LTMMP and their effect, if any, on monitoring program objectives
- Maps comparing the current bathymetric elevations relative to baseline (Year 0) conditions and identification and quantification of areas and depths of sediment accumulation versus erosion or settlement

- Field description of sediment grab samples, including the depths and thicknesses of new sediment accumulations and contacts with remediation layers (sand cover, GAC-amended sand cover, and armor), if possible, including any visible evidence of mixing or scour
- Identification of any stations where surface sediment or TZW samples could not be collected due to insufficient new sediment
- Tabular summary of surface sediment, TZW, PW, and SW analytical results
- Data validation report
- Screening of results against sediment, TZW, and SW CULs
  - If TZW samples cannot be obtained in armored cap areas (i.e., SDUs C1 and E), PW samples will serve as a primary line of evidence for evaluating cap performance. (Note, in armored cap areas, screening of sediments against CULs may not be possible if there is insufficient sediment accumulation.)
- Spatial assessment of any observed exceedances of CULs

The Year 0, Year 1, Year 2, and Year 5 Monitoring Reports will be submitted to DEQ within 90 days of receipt of the final validated hydrographic and analytical data.

6.3 Year 10 Monitoring Report

After the results of three monitoring events have been collected, summary statistics and time trend analyses can be performed. The Year 10 Monitoring Report will include these additional data analyses and will support a comprehensive Year 10 review to assess the performance and effectiveness of the PGM site remedial action and to determine the need for continued monitoring or contingency response actions, if needed, at some or all stations (see Section 7).

The Year 10 Monitoring Report will include all data provided in previous reports, as well as the following additional analyses:

- **Site-Wide Summary Statistics.** Site-wide summary statistics of analytical results (mean, median, minimum, maximum) in sediment, TZW/PW, and SW will be compiled. In addition, the 90% upper confidence limit (UCL) on the site-wide mean concentrations will be calculated using ProUCL software (EPA 2013).
- **Time Trend Analysis.** Graphs of contaminant time trends will be prepared, both for individual stations and also on a site-wide basis. For individual stations with limited data points, the trend analysis may be more qualitative and based on visual inspection of the graphs to identify increasing, decreasing, or stable concentration trends. Data from like stations (e.g., MNR areas, GAC-amended cover areas) may be pooled together, potentially allowing for quantitative tests of statistical significance. These may include parametric test methods (e.g., lognormal regression) if the data conform to a standard distribution or alternative nonparametric test methods (e.g., Theil-Sen estimator) if they do not.

- **Remedy Performance Assessment.** Using the results of the first five monitoring events (Year 0, Year 1, Year 2, Year 5, and Year 10), a more comprehensive evaluation of the effectiveness of the PGM site cleanup and the achievement of sediment, TZW, and SW CULs will be performed. The Year 10 Report will provide recommendations as to whether MNR/EMNR areas (LTM-01 through LTM-08) that have met their RAOs can be retired from the monitoring program. The Year 10 Monitoring Report will also provide a recommendation and schedule for continued monitoring of treatment areas and armored cap areas (LTM-09 through LTM-16) beyond Year 10, as well as MNR and EMNR areas if CULs are not yet met. Alternatively, if CULs are not met in one or more media and the exceedances are attributed to on-site sources, recommendations for contingency response actions will be provided. The schedule for ongoing monitoring beyond Year 10 and the nature and scope of any contingency response actions will be subject to DEQ approval.

The Year 10 Monitoring Report will be submitted to DEQ within 120 days of receipt of the final validated hydrographic and analytical data.

7 Contingency Plan

The objective of this LTMMP is to evaluate the long-term effectiveness of the PGM site remedial action in achieving and maintaining CULs and RAOs in surface sediment, TZW/PW, and SW. If significant cap erosion is observed, if project CULs are not being met because of recontamination from residual sediments beneath capping areas (e.g., cap breakthrough), or if unacceptable recovery rates are occurring in MNR and EMNR areas, contingency response actions will be evaluated and implemented as needed. These evaluations will be performed by DEQ and NW Natural following each monitoring event during the post-event review meetings, as described in Section 6.1. Contingency response actions could include increased frequency of monitoring, additional monitoring stations or depths, alternative monitoring methods or media, or evaluation of supplemental remedial actions, such as placing additional sand cover material, GAC-amended sand cover material, or armor. On the other hand, if CULs are being consistently achieved and long-term projections are stable, monitoring may be decreased or discontinued. All contingency response actions and modifications to the monitoring program are subject to DEQ review and approval. A flow chart describing potential contingency response actions if remedy assessment criteria are not met is provided in Figure F-8.

7.1 Data Analysis

7.1.1 GAC Effects on Chemical Partitioning

In sediment samples containing visible GAC, bulk sediment concentrations of organic contaminants such as PAHs, BTEX, and TPH should be interpreted with caution because GAC has a high adsorptive capacity and ability to sequester organic contaminants (i.e., approximately 100 times higher than natural organic carbon). Due to uncertainties regarding the potential impacts of GAC on bulk sediment concentrations, a weight-of-evidence approach that considers all long-term monitoring media (sediment, TZW/PW, and SW) will therefore be used in evaluating remedy performance.

7.1.2 Concentration Time Trends

Determining whether concentration trends are increasing, decreasing, or stable over time and identifying the source of contaminants that may be causing increasing concentration trends are important considerations for evaluating remedy effectiveness and the need for contingency response actions. Initially, a qualitative analysis of time trends will be performed (i.e., concentration graphs), and by Year 10, sufficient data may be available to perform more quantitative trend analysis, as described in Section 6.2. It is expected that decreasing concentration trends will occur in MNR areas and some EMNR areas in response to ongoing natural recovery processes, whereas increasing trends are expected in cap and cover areas that are constructed with clean import material and then subsequently equilibrate with ambient sediments in transport in the Willamette River. Eventually, all

areas should stabilize at the equilibrium concentrations typical of this part of the river. Based on the prevailing sedimentation rates at the PGM site, it is expected that concentrations should stabilize within about 10 years at most monitoring locations unless there are changes in the ambient conditions in the Downtown Reach, such as new source inputs.

7.1.3 On-Site Versus Off-Site Sources

If CULs are exceeded at a particular station or stations during long-term monitoring, then further evaluation will be conducted to determine if the exceedances are caused by off-site or on-site sources. The following lines of evidence will be considered in determining the nature of the source contributions:

- Spatial analysis of monitoring data
  - Exceedances that tend to be observed uniformly throughout the entire site or preferentially on the marginal and less contaminated parts of the site would be a line of evidence for recontamination from off-site sources.
  - Exceedances that are spatially localized in areas where highly contaminated subsurface sediments are known to be present would be a line of evidence for recontamination from on-site residuals.
- If surface sediments are contaminated but the chemical integrity of the cap is confirmed through TZW and/or PW monitoring, this would be a line of evidence for deposition from off-site sources.
- Information regarding reported spills, releases, dredging, or construction projects in the site vicinity

If the source of recontamination remains uncertain, additional studies may need to be undertaken. These could include, but are not limited to, the following:

- Collecting background surface sediment or TZW samples upstream from the site
- Performing additional chemical analyses (for example, other metals or alkylated PAHs) to help distinguish different source signatures
- Collecting and analyzing subsurface sediment and TZW or PW from other depths to establish subsurface chemical gradients
- Reactivating the manhole-type sampling ports for collection of deeper PW samples to better assess the chemical integrity of the cap
- Collecting and analyzing other media, such as sediment trap samples

If recontamination is attributed to off-site sources, and absent these sources monitoring demonstrates that the remedy is otherwise completely effective, then no supplemental response actions will be required.

7.2 Remedy Performance Evaluation and Contingency Response

If physical or chemical performance criteria are not met at a particular station or stations, then an evaluation of supplemental response actions will be initiated in consultation with DEQ for the area represented by that station or stations, as summarized in Figure F-8. After each monitoring event, DEQ and NW Natural will conduct an evaluation of remedy performance during the post-event review meeting, as described in Section 6.1, and if needed, initiate planning of any required contingency response actions. Any recommended response actions to address performance deficiencies will be subject to DEQ review and approval.

7.2.1 Physical Performance Evaluation

Hydrographic surveys will be performed during each monitoring event, and during contingency events, as needed, to ensure that the physical integrity of the caps and covers are maintained and functioning as intended. If an unacceptable loss of cap or cover material has occurred, as determined using the specifications of Section 2.1, then contingency response actions will be evaluated in consultation with DEQ, including but not limited to the following:

- Further investigation of cap or cover conditions using divers, probes, sediment cores, or other physical inspection methods
- Evaluation of cap consolidation, and whether a lowering of cap elevation is caused by erosion of cap material versus compaction of underlying sediments
- Chemical monitoring of TZW or PW in breached cap areas to determine whether the chemical isolation properties of the cap have been compromised
- Chemical monitoring of surface sediment in eroded MNR/EMNR areas to determine whether buried contaminants have been exposed
- Implementation of cap or cover repairs, such as:
  - Augmenting the caps or covers in problem areas with additional sand, GAC-amended sand, or armor rock
  - Expanding the coverage of sand, GAC-amended sand, or armor rock
  - Consideration of additional best management practices or engineering controls during vessel docking

7.2.2 Chemical Performance Evaluation

7.2.2.1 MNR/EMNR Areas

Natural recovery periods of 10 to 30 years are generally considered acceptable for sediment cleanup projects. For example, natural recovery of the Portland Harbor Superfund Site is expected to take up to 30 years (EPA 2017). In contrast, much of the PGM site is expected to achieve CULs immediately following remedial construction, and remaining MNR and EMNR areas are expected to recover within 1 to 7 years after construction (see Appendix H). MNR and EMNR stations that have achieved

PGM CULs by Year 10 will be recommended for retirement from the monitoring program. If CULs are not achieved in MNR/EMNR areas by Year 10, and the contamination is not attributed to deposition from off-site sources, then contingency response actions will be evaluated in consultation with DEQ, including but not limited to the following:

- Additional investigation of ambient off-site sources to determine whether they are a cause or contributor to delayed recovery at PGM
- Reassessment of recovery periods based on analysis of existing time trends; if there is a decreasing trend in the monitoring record such that CULs are expected to be met in the near future, then supplemental response action decisions may be deferred until additional monitoring data are collected and the trend is either confirmed or not
- Implementation of MNR/EMNR repairs, such as the following:
  - Placement of additional sand cover material in problem EMNR areas, or amending the cover material with GAC
  - Adding sand covers to MNR areas (i.e., converting MNR to EMNR)

7.2.2.2 GAC-Amended Cap and Cover Areas

The PGM ROD states that long-term monitoring requirements will, in general, follow those outlined in Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) guidance documents. EPA's *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* provides the following guidance for long-term monitoring of sediment caps: "*Remedial action monitoring for capping generally includes monitoring of construction and placement* [note: construction monitoring is addressed in the PGM *Construction Quality Assurance and Control Plan*]*, and of cap performance during an initial period[…] In general, cap monitoring should be designed so that elements can be phased back or eliminated if the remedy is performing as expected and there has been no large-scale disturbance of the cap*." (EPA 2005, p. 8–14)

Contaminant transport in groundwater, as measured in PW and TZW, is a relatively slow process that occurs over time scales of decades to centuries (Appendix C). Therefore, if CULs are met through Year 10 in GAC-amended cap and cover areas, additional monitoring may still be warranted, although potentially at a reduced level of effort.

DEQ and NW Natural will meet as part of the Year 10 review process to determine an appropriate level of effort for monitoring these areas beyond Year 10. The evaluation will consider the current concentration levels in the various media and how close the concentrations are to the CULs, projected time trends based on the existing monitoring record, and whether the trends are stable, rising, diminishing, or erratic. Alternatively, if CULs are exceeded in surface sediment, TZW/PW, or

SW, and the contamination is not attributed to off-site sources, then contingency response actions will be evaluated, including but not limited to the following:

- Additional investigation of ambient off-site sources to determine whether they are a cause or contributor to observed CUL exceedances, which could involve collecting other lines of evidence, such as sediment trap data
- Increasing the monitoring frequency (i.e., scheduling the next event sooner than 5 years) to provide confirmation and increased confidence in the observed exceedances
- Adding supplemental monitoring locations or depths (e.g., more detailed sediment or TZW/PW profiles) to better define the area of impact and the subsurface gradients in the area of impact
- Implementation of cap or cover repairs, such as the following:
  - Placement of additional sand, GAC-amended sand, or armor material
  - Expanding the coverage of sand, GAC-amended sand, or armor material

In addition to the above response actions, supplemental dredging would also be considered but dredging would be inefficient if armor layers and GAC-amended treatment layers would have to be removed before additional contaminated sediment could be removed.

Monitoring and contingency response decisions are intended to be made on an SDU-by-SDU basis. For example, it may be that monitoring is continued in higher-risk SDUs while simultaneously being reduced or phased out in other lower-risk SDUs that are meeting their CULs and RAOs. Contingency response actions, if needed, will be directed at those SDUs where exceedances are observed or are predicted to occur in the near future.

If cap or cover repairs are deemed necessary in the future, any proposed placement of additional cap or cover material on the riverbed will need to consider whether additional permits or regulatory approvals would be required, in particular, substantive compliance with the City of Portland Flood Hazard Code. However, the existing hydraulic analysis of the full-scale PGM remedial action demonstrated that the project will have no measurable effect on flood rise in the Willamette River; therefore, flood-rise effects associated with cap or cover repairs that involve much smaller quantities of fill material are also expected to be negligible.

8 References

Anchor QEA (Anchor QEA, LLC), 2017. Memorandum to: Dan Hafley, Oregon Department of Environmental Quality. Regarding: Portland Gas Manufacturing Site Investigation-Derived Waste Management. October 20, 2017.

City of Portland, 2018a. *2035 Transportation System Plan*. City of Portland Bureau of Transportation. Ordinance Nos. 187832, 188177, and 188957. May 2018. Available from: https://www.portlandoregon.gov/transportation/77358.

City of Portland, 2018b. *2035 Comprehensive Plan*. City of Portland Bureau of Planning and Sustainability. December 2018. Available from: https://www.portlandoregon.gov/bps/2035-comp-plan.pdf.

DEQ (Oregon Department of Environmental Quality), 2017. *Record of Decision Selected Remedial Action for Former Portland Gas Manufacturing, Portland, Oregon*. Northwest Region Cleanup Section. June 2017.

EPA (U.S. Environmental Protection Agency), 2005. *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites*. Office of Solid Waste and Emergency Response. EPA-540-R-05-012. December 2005.

EPA, 2009. *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use*. Office of Solid Waste and Emergency Response. EPA 540-R-08-005. January 2009.

EPA, 2013. *ProUCL Version 5.0.00 User Guide*. Prepared by Lockheed Martin IS&GS-CIVIL. Prepared for Office of Research and Development. EPA/600/R-07/041. September 2013.

EPA, 2017a. *National Functional Guidelines for Superfund Organic Methods Data Review*. Office of Superfund Remediation and Technology Innovation (OSRTI). EPA 540 R 2017-002. January 2017.

EPA, 2017b. *National Functional Guidelines for Inorganic Superfund Methods Data Review*. Office of Superfund Remediation and Technology Innovation (OSRTI). EPA-540-R-2017-001. January 2017.

FEMA (Federal Emergency Management Agency), 2010. *Flood Insurance Study, City of Portland, Oregon*. Flood Insurance Study Number 410183V000B. Revised November 26, 2010.

ITRC (Interstate Technology and Regulatory Council), 2014. Contaminated Sediments Remediation: Remedy Selection for Contaminated Sediments. Guidance Document. August 2014.

USGS (U.S. Geological Survey), 2019. Unified Hazard Tool. Accessed online at: https://earthquake.usgs.gov/hazards/interactive.

Tables

Table F-1
Long-Term Monitoring Objectives and Assessment Criteria

Remedial Technology and Function	SDU[1]	Design	Post-Construction Conditions[2,3]	Monitoring Locations	Monitoring Activity/Media	Monitoring Schedule	Spatial Scale	Performance Criteria	Potential Follow-Up Actions
GAC-Amended Armored Cap Resist erosion from propwash or flood currents; isolate sediment contamination left in place and treat upward contaminant migration	**E**	Hot spot removal and place 1-foot minimum GAC-amended gravelly sand with 1-foot minimum armor stone	**Surface Sediment** Clean imported armor stone **Subsurface Sediment Below Armored Cap** Hot Spot Criteria Exceedances: Total PAH at 3 to 5 ft bml (PGM-15), 3 to 10(?) ft bml (PGM-16), 4 to 8 ft bml (PGM-40) Cleanup Level Exceedances: PAHs (minor TPH-diesel) at 2 ft. to max. 12 ft. bml	LTM-13 LTM-14	**Physical** Bathymetry **Chemical** Surface sediment[4] PW or TZW[5] SW	See Table F-4	**Physical** Evaluate site-wide, by SDU, and on 10-foot by 10-foot or 3-foot by 3-foot grid spacing established for post-construction acceptance survey. **Chemical**[7] Evaluate sediment and TZW aquatic life criteria CULs on a point-by-point basis. Evaluate sediment and SW bioaccumulation criteria CULs on a site-wide SWAC basis.	**Physical** Bathymetric survey results indicate sediment surface elevations are stable or increasing when compared to previous survey results. **Chemical** Sediment, TZW/PW, and/or SW CULs are met.	If performance criteria not met, consult with DEQ to determine potential follow-up response actions (see Figure F-7).
GAC-Amended Armored Cap Resist erosion from propwash or flood currents; isolate sediment contamination left in place and treat upward contaminant migration	**C1**	Dredge to design elevation and place 1-foot minimum GAC-amended gravelly sand with 1-foot minimum armor stone	**Surface Sediment** Clean imported armor stone **Subsurface Sediment Below Armored Cap** Hot Spot Criteria Exceedances: Total PAH at 7 to 9 ft bml (PGM-18), 2 to 4 ft bml (PGM-34), 2 to 3 ft bml (PGM-35), 3 to 5 ft bml (PGM-37) Cleanup Level Exceedances: PAHs (minor TPH-diesel, metals) at 2 ft to maximum 9 ft bml; PGM-39 is below CULs	LTM-15 LTM-16					
GAC-Amended Cover Isolate sediment contamination left in place and treat upward contaminant migration	**A, D**	Dredge to stabilize slope and place 1-foot minimum GAC-amended sand (D) or gravelly sand (A) cover	**Surface Sediment** Clean imported GAC-amended sand **Subsurface Sediment Below GAC-Amended Cover** Hot Spot Criteria Exceedances: Total PAH at 4 to 6 ft bml (PGM-24) and 3 ft to maximum 13 to 15 ft bml (PGM-05, PGM-06, PGM-08) Cleanup Level Exceedances: PAHs, TPH-diesel, metals at 2 feet to maximum 16 to 19 ft bml	LTM-09 LTM-10 LTM-11 LTM-12	**Physical** Bathymetry **Chemical** Surface sediment TZW SW				
EMNR Accelerate natural recovery of sediment exceeding CULs in depositional areas	**B2, C3, F1**	Place 1-foot minimum sand or gravelly sand cover	**Surface Sediment** Clean imported sand **Subsurface Sediment Below Sand Cover** Hot Spot Criteria Exceedances: None Cleanup Level Exceedances: PAHs, metals, TPH-diesel at 1 ft to maximum 8 to 9 ft bml (F1), maximum 6 ft bml (C3), and maximum 2 ft bml (B2) (Note: PDI did not confirm PGM-10 exceedance)	LTM-01 LTM-04 LTM-08	**Physical** Bathymetry **Chemical** Surface sediment		**Physical** Evaluate site-wide, by SDU, and on 10-foot by 10-foot or 3-foot by 3-foot grid spacing established for post-construction acceptance survey. **Chemical**[7] Evaluate sediment CULs on a point-by-point basis. Evaluate sediment bioaccumulation CULs on a site-wide SWAC basis.	**Physical** Bathymetric survey results indicate sediment surface elevations are stable or increasing when compared to previous survey results. **Chemical** Sediment CULs are met.	

Table F-1
Long-Term Monitoring Objectives and Assessment Criteria

Remedial Technology and Function	SDU[1]	Design	Post-Construction Conditions[2,3]	Monitoring Locations	Monitoring Activity/Media	Monitoring Schedule	Spatial Scale	Performance Criteria	Potential Follow-Up Actions
MNR Isolate and bury sediment exceeding CULs via sediment deposition	**B1, F2**	No active remediation	**Surface Sediment** Cleanup Level Exceedances: 1.5x TPH at UG07; 1.1x zinc at PGM-11B Already Below Cleanup Levels: PGM-03, PGM-04, PGM-09, PGM-11, G780; SS-04, SS-05, SS-08, SS-09, SS-10, SS-11 **Subsurface Sediment** Hot Spot Criteria Exceedance: Total PAH at 3 to 5 feet bml (one location only: PGM-11B in SDU B1) Cleanup Level Exceedances: PAHs, TPH-diesel, metals at 1 ft. to maximum 7 to 17 ft bml (F2) and maximum 5 to 7 ft bml (B1)	LTM-02 LTM-03 LTM-05 LTM-06 LTM-07	**Physical** Bathymetry **Chemical** Surface sediment	See Table F-4	**Physical** Evaluate site-wide, by SDU, and on 10-foot by 10-foot or 3-foot by 3-foot grid spacing established for post-construction acceptance survey. **Chemical**[7] Evaluate sediment CULs on a point-by-point basis. Evaluate sediment bioaccumulation CULs on a site-wide SWAC basis.	**Physical** Bathymetric survey results indicate sediment surface elevations are stable or increasing when compared to previous survey results. **Chemical** Sediment CULs are met.	If performance criteria not met, consult with DEQ to determine potential follow-up response actions (see Figure F-7).
Dredge Remove sediment exceeding CULs	**G**	Dredge to design elevation and place 6-inch minimum residual sand cover	**Surface Sediment** Clean residual cover **Subsurface Sediment –** Below CULs	None[6]	None	Not Applicable			

Notes:
1. See Figure F-2 for the spatial extent of sediment decision units (SDUs) and their associated remedial technology applications.
2. Includes estimated post-construction depths and thicknesses of residual contamination, including projected dredging and fill depths. Estimates do not include overdredging or overplacement allowances and should be confirmed with as-built surveys.
3. "Surface sediment" includes the top foot of sediment. "Subsurface sediment" includes all sediment deeper than 1 foot below mudline.
4. Surface sediment sampling above the armored treatment cap will occur once a minimum of 4 inches (10 cm) of new sediment has accumulated over the armor.
5. PW will be collected from manhole-type sampling ports at the armor/isolation layer interface until a minimum of 12 inches (30 cm) of new sediment has accumulated over the armor. PW results will be used for early evaluation of cap performance. Following a minimum of 12 inches of new sediment accumulation, TZW will be sampled in the newly accumulated sediment (see Section 2.2.3 for further discussion).
6. Dredging in SDU G fully removes all sediment with contaminant concentrations above the CULs; therefore, long-term monitoring is not required.
7. CULs are provided in Table F-2. See also Attachments 22a and 22b in the Record of Decision (DEQ 2017) for a list of CULs and hot spot criteria.
bml: below mudline
cm: centimeter
CUL: cleanup level
DEQ: Oregon Department of Environmental Quality
EMNR: enhanced monitored natural recovery
ft: feet
GAC: granular activated carbon
MNR: monitored natural recovery
PAH: polycyclic aromatic hydrocarbon
PDI: pre-design investigation
PGM: Portland Gas Manufacturing
PW: porewater
SDU: sediment decision unit
SW: surface water
SWAC: surface-weighted average concentration
TPH: total petroleum hydrocarbon
TZW: transition zone water

Table F-2
PGM Cleanup Levels

Analyte	Cleanup Level[1]	Units	Reference
Aquatic Life Criteria			
Sediment[2]			
Lead	128	mg/kg	PEC, MacDonald et al. 2000
Mercury	1.06	mg/kg	PEC, MacDonald et al. 2000
Zinc	459	mg/kg	PEC, MacDonald et al. 2000
Anthracene	845	µg/kg	PEC, MacDonald et al. 2000
Benz(a)anthracene	1,050	µg/kg	PEC, MacDonald et al. 2000
Benzo(a)pyrene	1,450	µg/kg	PEC, MacDonald et al. 2000
Chrysene	1,290	µg/kg	PEC, MacDonald et al. 2000
Fluoranthene	2,230	µg/kg	PEC, MacDonald et al. 2000
Fluorene	536	µg/kg	PEC, MacDonald et al. 2000
Naphthalene	561	µg/kg	PEC, MacDonald et al. 2000
Phenanthrene	1,170	µg/kg	PEC, MacDonald et al. 2000
Pyrene	1,520	µg/kg	PEC, MacDonald et al. 2000
Total PAH[3]	22,800	µg/kg	PEC, MacDonald et al. 2000
TPH-diesel	340	mg/kg	WAC 173-204, Table VI
TPH-residual	3,600	mg/kg	WAC 173-204, Table VI
Transition Zone Water[4]			
Free Cyanide	0.0052	mg/L	OAR 340-041, Table 30
Lead[5]	0.54	µg/L	OAR 340-041, Table 30
Mercury	0.012	µg/L	OAR 340-041, Table 30
Zinc[5]	36	µg/L	OAR 340-041, Table 30
2-Methylnaphthalene	72	µg/L	EPA 2003 Final Chronic Value
Acenaphthene	56	µg/L	EPA 2003 Final Chronic Value
Acenaphthylene	307	µg/L	EPA 2003 Final Chronic Value
Anthracene	21	µg/L	EPA 2003 Final Chronic Value
Benzene	130	µg/L	ORNL 1996 Tier II Value
Benzo(a)anthracene	2.2	µg/L	EPA 2003 Final Chronic Value
Benzo(a)pyrene	0.96	µg/L	EPA 2003 Final Chronic Value
Benzo(b)fluoranthene	0.68	µg/L	EPA 2003 Final Chronic Value
Benzo(g,h,i)perylene	0.44	µg/L	EPA 2003 Final Chronic Value
Benzo(k)fluoranthene	0.64	µg/L	EPA 2003 Final Chronic Value
Chrysene	2	µg/L	EPA 2003 Final Chronic Value
Dibenzo(a,h)anthracene	0.28	µg/L	EPA 2003 Final Chronic Value
Ethylbenzene	7.3	µg/L	ORNL 1996 Tier II Value
Fluoranthene	7.1	µg/L	EPA 2003 Final Chronic Value
Fluorene	39	µg/L	EPA 2003 Final Chronic Value
Indeno(1,2,3-c,d)pyrene	0.28	µg/L	EPA 2003 Final Chronic Value
Naphthalene	194	µg/L	EPA 2003 Final Chronic Value
Phenanthrene	19	µg/L	EPA 2003 Final Chronic Value
Pyrene	10	µg/L	EPA 2003 Final Chronic Value
Toluene	9.8	µg/L	ORNL 1996 Tier II Value

Table F-2
PGM Cleanup Levels

Analyte	Cleanup Level[1]	Units	Reference
Xylenes	13	µg/L	ORNL 1996 Tier II Value
Bioaccumulation Criteria (Site-Wide Mean and 90% UCL)			
Sediment[2,6]			
Fluoranthene	37,000	µg/kg	DEQ 2007
Pyrene	1,900	µg/kg	DEQ 2007
Near-Bottom Surface Water[7]			
Benzene	1.4	µg/L	OAR 340-041, Table 40
Benzo(a)anthracene	0.0018	µg/L	OAR 340-041, Table 40
Benzo(a)pyrene	0.0018	µg/L	OAR 340-041, Table 40
Benzo(b)fluoranthene	0.0018	µg/L	OAR 340-041, Table 40
Benzo(k)fluoranthene	0.0018	µg/L	OAR 340-041, Table 40
Chrysene	0.0018	µg/L	OAR 340-041, Table 40
Dibenzo(a,h)anthracene	0.0018	µg/L	OAR 340-041, Table 40
Ethylbenzene	210	µg/L	OAR 340-041, Table 40
Indeno(1,2,3-c,d)pyrene	0.0018	µg/L	OAR 340-041, Table 40
Toluene	1,500	µg/L	OAR 340-041, Table 40

Notes:

1. Certain cleanup levels may need to be adjusted for regional or local background conditions.
2. Applicability of cleanup levels in the top foot of sediment is based on a determination that the substrate is stable and not subject to significant erosion from currents or prop wash.
3. Cleanup levels include both total PAH and individual PAH criteria.
4. Cleanup levels for transition zone water are based on chronic ambient water quality criteria.
5. Lead and zinc water quality criteria are based on mean Willamette River hardness of 25 mg/L.
6. Surface sediment bioaccumulation criteria for PAHs are based on protection of fish, the most sensitive receptor group.
7. Surface water bioaccumulation criteria are based on protection of humans, the most sensitive receptor group, via fish consumption; the cleanup level is based on a fish ingestion rate of 175 g/day. Bioaccumulation criteria are only listed for those analytes whose criteria are more stringent than the corresponding benthic criteria.

µg/kg: micrograms per kilogram
µg/L: micrograms per liter
DEQ: Oregon Department of Environmental Quality
EPA: U.S. Environmental Protection Agency
g/day: gallons per day
mg/kg: milligrams per kilogram
mg/L: milligrams per liter
OAR: Oregon Administrative Rule
ORNL: Oak Ridge National Laboratory
PAH: polycyclic aromatic hydrocarbon
PEC: probable effects concentration
TPH: total petroleum hydrocarbon
UCL: upper confidence limit
WAC: Washington Administrative Code

Table F-3

Sample Location Coordinates and Analyte Matrix

Location Information					Analyte Matrix		
Location ID	Sediment Decision Unit	Remedial Application	Northing (North American Datum of 1983)	Easting (North American Datum of 1983)	Surface Sediment	TZW	Surface Water
LTM-01	B2	EMNR	685,572	7,646,023	X		
LTM-02	B1	MNR	685,498	7,646,052	X		
LTM-03	B1	MNR	685,410	7,646,074	X		
LTM-04	C3	EMNR	685,284	7,646,141	X		
LTM-05	F2	MNR	685,017	7,646,142	X		
LTM-06	F2	MNR	685,030	7,646,191	X		
LTM-07	F2	MNR	684,919	7,646,159	X		
LTM-08	F1	EMNR	684,962	7,646,215	X		
LTM-09	A	GAC Cover	685,320	7,646,082	X	X	X
LTM-10	A	GAC Cover	685,212	7,646,106	X	X	X
LTM-11	A	GAC Cover	685,105	7,646,126	X	X	X
LTM-12	D	GAC Cover	685,360	7,646,216	X	X	X
LTM-13	C1	Armored GAC Cap	685,208	7,646,165	X[1]	X[1]	X
LTM-14	C1	Armored GAC Cap	685,118	7,646,184	X[1]	X[1]	X
LTM-15	E	Armored GAC Cap	685,168	7,646,238	X[1]	X[1]	X
LTM-16	E	Armored GAC Cap	685,132	7,646,297	X[1]	X[1]	X

Notes:

1. Surface sediment and TZW sampling in Armored GAC Cap areas is contingent on sufficient new sediment accumulation over the armor stone; if sufficient new sediment has not accumulated, porewater will be sampled from specialized sampling ports, as shown in Figure F-3.

EMNR: enhanced monitored natural recovery

GAC: granular activated carbon

MNR: monitored natural recovery

TZW: transition zone water

Table F-4
Long-Term Monitoring Schedule

Monitoring Activity/Media	Remedial Technology	SDU[1]	Monitoring Stations	Point of Compliance	2020 Year 0[2]	2021 Year 1	2022 Year 2[3]	2025 Year 5	2030 Year 10	Beyond Year 2030[4]	Reporting Schedule	Contingency Event[5]
Surface sediment grab sample[6] PW/TZW[7] Near-bottom SW	GAC-Amended Armored Cap	**E**	LTM-13, LTM-14, LTM-15, LTM-16	0 to 4 inches bml above cap 0 to 12 inches bml above cap 12 inches above mudline	October/ November	--	July/ August	July/ August	July/ August	Ongoing on a schedule to be approved by DEQ	90 days after receipt of validated analytical and hydrographic data (Years 0, 1, 2, and 5); 120 days after validated data (Year 10)	Consult with DEQ
Surface sediment grab sample[6] PW/TZW[7] Near-bottom SW	GAC-Amended Armored Cap	**C1**	LTM-13, LTM-14, LTM-15, LTM-16	0 to 4 inches bml above cap 0 to 12 inches bml above cap 12 inches above mudline	October/ November	--	July/ August	July/ August	July/ August			
Surface sediment grab sample TZW Near-bottom SW	GAC-Amended Cover	**A, D**	LTM-09, LTM-10, LTM-11, LTM-12	0 to 4 inches bml 0 to 12 inches bml 12 inches above mudline	October/ November	--	July/ August	July/ August	July/ August			
Surface sediment grab sample	EMNR	**B2, C3, F1**	LTM-01, LTM-04, LTM-08	0 to 4 inches bml	October/ November	--	July/ August	July/ August	July/ August			
Surface sediment grab sample	MNR	**B1, F2**	LTM-02, LTM-03, LTM-05, LTM-06, LTM-07	0 to 4 inches bml	October/ November	--	July/ August	July/ August	July/ August			
Bathymetry	Project area-wide			Not applicable	October/ November	July	July/ August	July/ August	July/ August			Immediately following event

Notes:
1. See Figure F-2 for the spatial extent of sediment decision units (SDUs) and their associated remedial technology applications.
2. The Year 0 baseline event will be conducted as soon as practicable following remedial construction. Construction demobilization is currently scheduled for September but may change based on construction progress.
3. Bathymetry surveys will be scheduled in July following any winter/spring flooding and Fleet Week docking events. Subsequently, sediment, TZW/PW, and SW sampling will be conducted in August during a period of low river levels and corresponding high groundwater flux. This schedule allows for review of bathymetry results prior to chemical monitoring in case any sampling modifications are warranted based on bathymetry results.
4. The monitoring schedule beyond 2030 will be established during the 10-year review.
5. Bathymetric surveys will be performed immediately following a design-level contingency event (e.g., 100-year flood or significant earthquake), as described in Section 3.3.4. Additional chemical monitoring may be required upon consultation with DEQ.
6. Surface sediment sampling above the armored treatment cap will occur once a minimum of 4 inches (10 cm) of new sediment has accumulated over the armor.
7. PW will be collected from manhole-type sampling ports at the armor/isolation layer interface until a minimum of 12 inches (30 cm) of new sediment has accumulated over the armor. PW results will be used for early evaluation of cap performance. Following a minimum of 12 inches of new sediment accumulation, TZW will be sampled in the newly accumulated sediment (see Section 2.2.3 for further discussion).

bml: below mudline
cm: centimeter
DEQ: Oregon Department of Environmental Quality
EMNR: enhanced monitored natural recovery
GAC: granular activated carbon
MNR: monitored natural recovery
PW: porewater
SDU: sediment decision unit
SW: surface water
TZW: transition zone water

Table F-5
Analytical Parameters, Methods, and Reporting Limits – Sediment

Parameter	Unit	Analytical Method	Reporting Limit
Conventionals			
Total Solids	%	SM 2540G	1
Total Organic Carbon	%	EPA 9060A	0.1
Grain Size	%	ASTM D422	0.1
Metals			
Lead	mg/kg	EPA 6020	2
Mercury	mg/kg	EPA 7471A	0.02
Zinc	mg/kg	EPA 6020	1
Aromatic Hydrocarbons			
1-Methylnaphthalene	µg/kg	EPA 8270D SIM	8
2-Methylnaphthalene	µg/kg	EPA 8270D SIM	8
Acenaphthene	µg/kg	EPA 8270D SIM	4
Acenaphthylene	µg/kg	EPA 8270D SIM	4
Anthracene	µg/kg	EPA 8270D SIM	4
Benz[a]anthracene	µg/kg	EPA 8270D SIM	4
Benzo[a]pyrene	µg/kg	EPA 8270D SIM	4
Benzo[b]fluoranthene	µg/kg	EPA 8270D SIM	4
Benzo[g,h,i]perylene	µg/kg	EPA 8270D SIM	4
Benzo[k]fluoranthene	µg/kg	EPA 8270D SIM	4
Chrysene	µg/kg	EPA 8270D SIM	4
Dibenz[a,h]anthracene	µg/kg	EPA 8270D SIM	4
Fluoranthene	µg/kg	EPA 8270D SIM	4
Fluorene	µg/kg	EPA 8270D SIM	4
Indeno[1,2,3-c,d]pyrene	µg/kg	EPA 8270D SIM	4
Naphthalene	µg/kg	EPA 8270D SIM	8
Phenanthrene	µg/kg	EPA 8270D SIM	4
Pyrene	µg/kg	EPA 8270D SIM	4
Total Petroleum Hydrocarbons			
Diesel Range Organics	mg/kg	NWTPH-Dx	25
Residual Range Organics	mg/kg	NWTPH-Dx	50

Notes:
Detected results above the method detection limit and below the reporting limit will be reported as estimated.
µg/kg: micrograms per kilogram
ASTM: ASTM International
EPA: U.S. Environmental Protection Agency
mg/kg: milligrams per kilogram
NWTPH-Dx: Northwest total petroleum hydrocarbons – diesel range extended
SIM: selective ion monitoring
SM: standard method

Table F-6
Analytical Parameters, Methods, and Reporting Limits –
Transition Zone Water, Porewater, and Surface Water

Parameter	Unit	Analytical Method	Reporting Limit
Inorganics			
Free Cyanide	mg/L	ASTM D4282	0.005
Total Metals			
Calcium	µg/L	EPA 6020	100
Magnesium	µg/L	EPA 6020	25
Hardness	µg/L $CaCO_3$	Calculated	100
Dissolved Metals			
Lead	µg/L	EPA 6020	0.2
Mercury	µg/L	EPA 6021	0.08
Zinc	µg/L	EPA 6022	4.0
Aromatic Hydrocarbons			
1-Methylnaphthalene	µg/L	EPA 8270D SIM	0.04
2-Methylnaphthalene	µg/L	EPA 8270D SIM	0.04
Acenaphthene	µg/L	EPA 8270D SIM	0.02
Acenaphthylene	µg/L	EPA 8270D SIM	0.02
Anthracene	µg/L	EPA 8270D SIM	0.02
Benz[a]anthracene	µg/L	EPA 8270D SIM	0.02
Benzo[a]pyrene	µg/L	EPA 8270D SIM	0.02
Benzo[b]fluoranthene	µg/L	EPA 8270D SIM	0.02
Benzo[g,h,i]perylene	µg/L	EPA 8270D SIM	0.02
Benzo[k]fluoranthene	µg/L	EPA 8270D SIM	0.02
Chrysene	µg/L	EPA 8270D SIM	0.02
Dibenz[a,h]anthracene	µg/L	EPA 8270D SIM	0.02
Fluoranthene	µg/L	EPA 8270D SIM	0.02
Fluorene	µg/L	EPA 8270D SIM	0.02
Indeno[1,2,3-c,d]pyrene	µg/L	EPA 8270D SIM	0.02
Naphthalene	µg/L	EPA 8270D SIM	0.04
Phenanthrene	µg/L	EPA 8270D SIM	0.02
Pyrene	µg/L	EPA 8270D SIM	0.02
Volatile Organic Compounds			
Benzene	µg/L	EPA 8260B	0.2
Ethylbenzene	µg/L	EPA 8260B	0.5
Toluene	µg/L	EPA 8260B	1.0
Total Xylenes	µg/L	EPA 8260B	1.5

Notes:
Detected results above the method detection limit and below the reporting limit will be reported as estimated.
µg/L: micrograms per liter
EPA: U.S. Environmental Protection Agency
ASTM: ASTM International
$CaCO_3$: calcium carbonate
mg/L: milligrams per liter
SIM: selective ion monitoring

Table F-7
Sample Storage and Preservation Requirements

Parameter	Sample Size	Container Size and Type	Holding Time	Preservative
Sediment Samples				
PAHs	150 g	8-oz glass	14 days until extraction	Cool/4°C
			1 year until extraction	Freeze -20°C
			40 days after extraction	Cool/4°C
TPH-Dx	150 g	8-oz glass	14 days until extraction	Cool/4°C
			1 year until extraction	Freeze -20°C
			40 days after extraction	Cool/4°C
Total Metals, Total Solids	50 g	4-oz glass	6 months	Cool/4°C
			2 years	Freeze -20°C
Archive	500 g	16-oz plastic	Unknown	Cool/4°C
TZW/Surface Water/Rinse Blanks/Trip Blanks				
PAHs	500 mL	2 x 500 mL amber glass	7 days until extraction	Cool/4°C
			40 days after extraction	
BTEX	40 mL	2 x 40 mL VOA vials	14 days	HCl pH < 2, cool/4°C
Dissolved Metals	100 mL	500-mL HDPE	Field filtered; 6 months	HNO_3 pH < 2 after filtration, cool/4°C
Total Metals (for Hardness)	100 mL	500-mL HDPE	6 months	HNO3 pH < 2, cool/4°C
Free Cyanide	500 mL	500-mL HDPE	48 hours	NaOH pH > 12, cool/4°C

Notes:
BTEX: benzene, toluene, ethylbenzene, and xylene
g: gram
HDPE: high-density polyethylene
HCl: hydrochloric acid
HNO_3: nitric acid
mL: milliliter
NaOH: sodium hydroxide
oz: ounce
PAH: polycyclic aromatic hydrocarbon
TPH-Dx: total petroleum hydrocarbon – diesel range extended
TZW: transition zone water
VOA: volatile organic analysis

Table F-8
Field and Laboratory Quality Control Samples and Frequencies

Analysis Type	Field Duplicate	Rinsate Blank	Initial Calibration[a]	Ongoing Calibration	Matrix Duplicates[d]	Matrix Spikes	Matrix Spike Duplicates	SRM or LCS	Method Blanks	Surrogate Spikes
Free Cyanide	1 per 20 samples	1 per sampling event	Each batch	1 per 10 samples	1 per 20 samples	1 per 20 samples	NA	NA	NA	NA
Total Solids	1 per 20 samples	NA	Each batch[b]	NA	1 per 20 samples	NA	NA	NA	NA	NA
Metals	1 per 20 samples	1 per sampling event	Daily or each batch	1 per 10 samples	1 per 20 samples	1 per 20 samples	NA	1 per 20 samples	1 per 20 samples	NA
PAHs	1 per 20 samples	1 per sampling event	As needed[c]	Every 12 hours	NA	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	Every sample
TPH	1 per 20 samples	1 per sampling event	As needed[c]	Every 12 hours	NA	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	Every sample
BTEX	1 per 20 samples	1 per sampling event	As needed[c]	Every 12 hours	NA	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	Every sample

Notes:
a. Initial calibration verification and calibration blank must be analyzed at the beginning of each batch as applicable to the analysis.
b. Calibration and certification of drying ovens and weighing scales are conducted biannually.
c. Initial calibrations are considered valid until the ongoing continuing calibration no longer meets method specifications. At that point, a new initial calibration is performed.
d. A matrix spike/matrix spike duplicate (MS/MSD) may be analyzed in lieu of a matrix duplicate.
BTEX: benzene, toluene, ethylbenzene, and xylene
LCS: laboratory control sample
NA: not applicable
PAH: polycyclic aromatic hydrocarbon
SRM: standard reference material
TPH: total petroleum hydrocarbon

Table F-9
Analytical Quality Control Limits

Parameter	Precision	Accuracy	Completeness
Sediments			
Total Solids	± 30% RPD	NA	95%
Metals	± 35% RPD	75–125% R	95%
PAHs	± 50% RPD	50–150% R	95%
TPH-Dx	± 50% RPD	50–150% R	95%
Transition Zone Water			
Free Cyanide	± 25% RPD	80–120% R	95%
Metals, Including Hardness	± 25% RPD	80–120% R	95%
PAHs	± 35% RPD	60–140% R	95%
BTEX	± 35% RPD	60–140% R	95%

Notes:
BTEX: benzene, toluene, ethylbenzene, and xylene
NA: not applicable
PAH: polycyclic aromatic hydrocarbon
R: recovery
RPD: relative percent difference
TPH-Dx: total petroleum hydrocarbon – diesel range extended

Figures

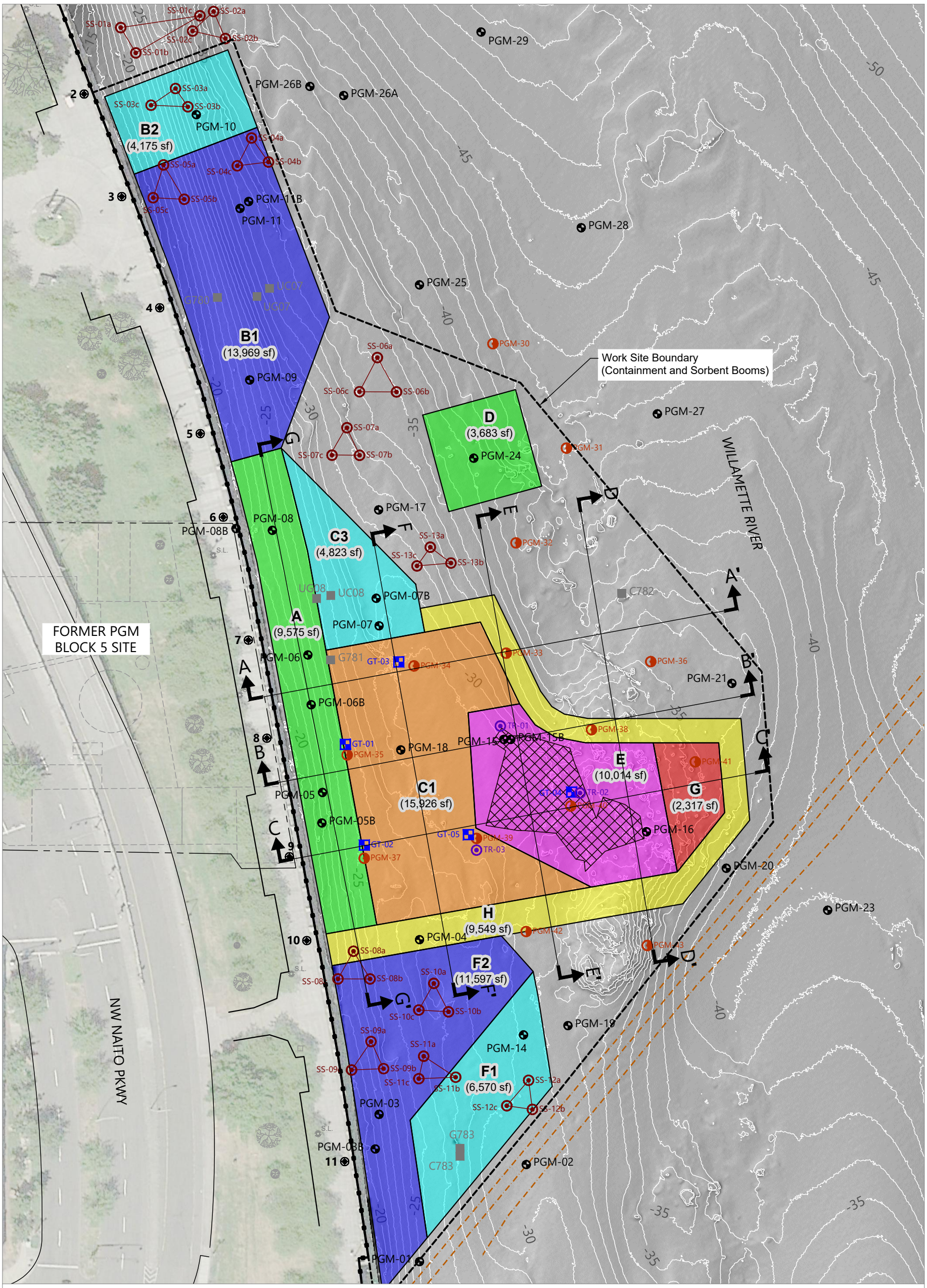
SOURCE: ©DeLorme, Topo USA®.

Publish Date: 2020/02/25 9:44 AM | User: hmerrick
Filepath: K:\Projects\0029-NW Natural Gas Co\Portland Gas Manufacturing Site\Design\0029-RP-019 (Vicinity Map-LT Monitoring).dwg FIG F-1

ANCHOR QEA

Figure F-1
Vicinity Map

Long-Term Monitoring and Maintenance Plan
Former Portland Gas Manufacturing Site



LEGEND:

- PGM Sediment Core Location
- Historical Sediment Sampling Location
- Surface Tar-Like Material
- City of Portland Sanitary Sewer Utilities (Approximate)
- Sediment Decision Unit Areas
- Work Site Boundary (Containment and Sorbent Booms)
- 2017 Bathymetric Contours (1-Foot Intervals)
- 2017 Surface Sediment Grab Sample – 3-Point Composite (EMNR/MNR Delineation)
- 2017 Sediment Chemistry Boring (Dredge and Cap Delineation)
- 2017 Geotechnical Boring
- 2017 Treatability Boring

REMEDIAL TECHNOLOGIES:

- B1, F2 — Monitored Natural Recovery (MNR)
- B2, C3, F1 — Enhanced MNR (EMNR)
- A, D — GAC-Amended Treatment Cover
- C1 — Partial Dredge and Armored Treatment Cap
- E — Surface Product Removal with Armored Treatment Cap
- G — Full Dredge and Residual Cover
- H — Partial Side Slope Dredge and Residual Cover

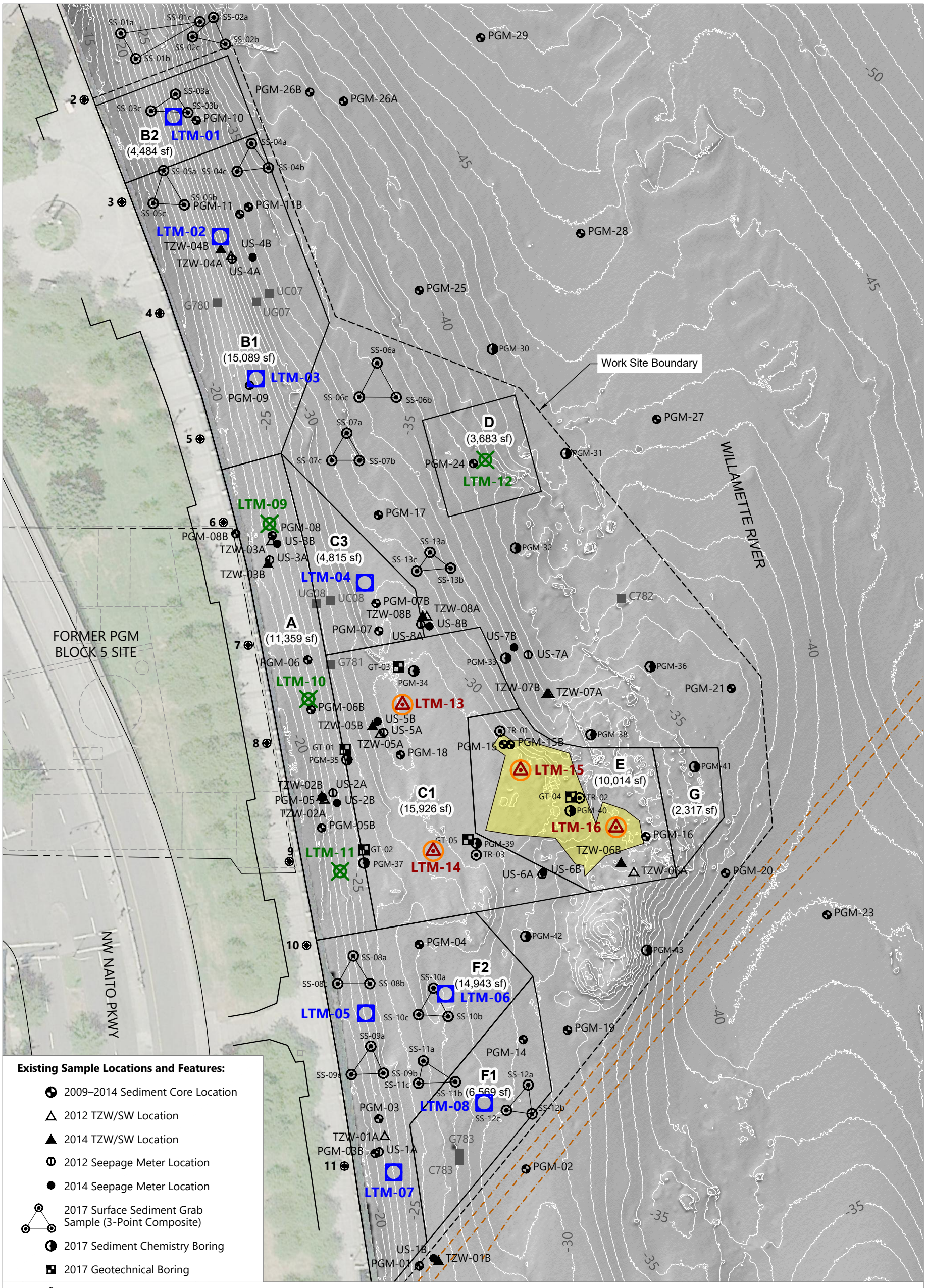
HORIZONTAL DATUM: Oregon State Plane North, NAD83, International Feet
VERTICAL DATUM: City of Portland Datum
NOTE: GAC = Granular Activated Carbon

Publish Date: 2020/02/25 9:45 AM | User: hmerrick Filepath: K:\Projects\0029-NW Natural Gas Co\Portland Gas Manufacturing Site\Design\0029-RP-030 (LTMMP).dwg F-2

ANCHOR QEA

Figure F-2
Sediment Decision Units

Long-Term Monitoring and Maintenance Plan
Former Portland Gas Manufacturing Site

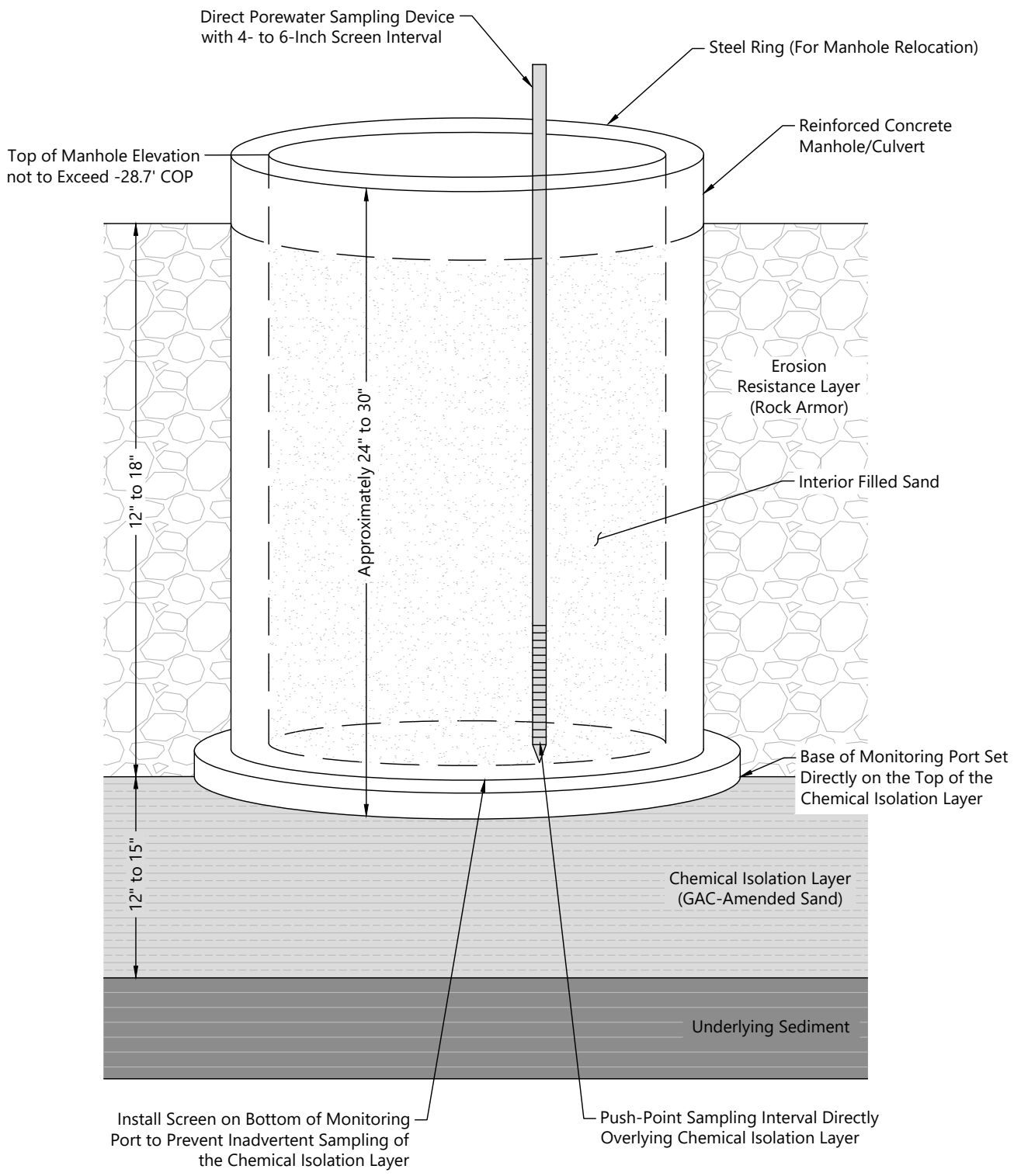


Publish Date: 2020/02/25 9:46 AM | User: hmerrick
Filepath: K:\Projects\0029-NW Natural Gas Co\Portland Gas Manufacturing Site\Design\0029-RP-020 (Sampling-Remedial Design-LT Monitoring).dwg FIG F-3

ANCHOR QEA

Figure F-3
Long-Term Monitoring Locations

Long-Term Monitoring and Maintenance Plan
Former Portland Gas Manufacturing Site

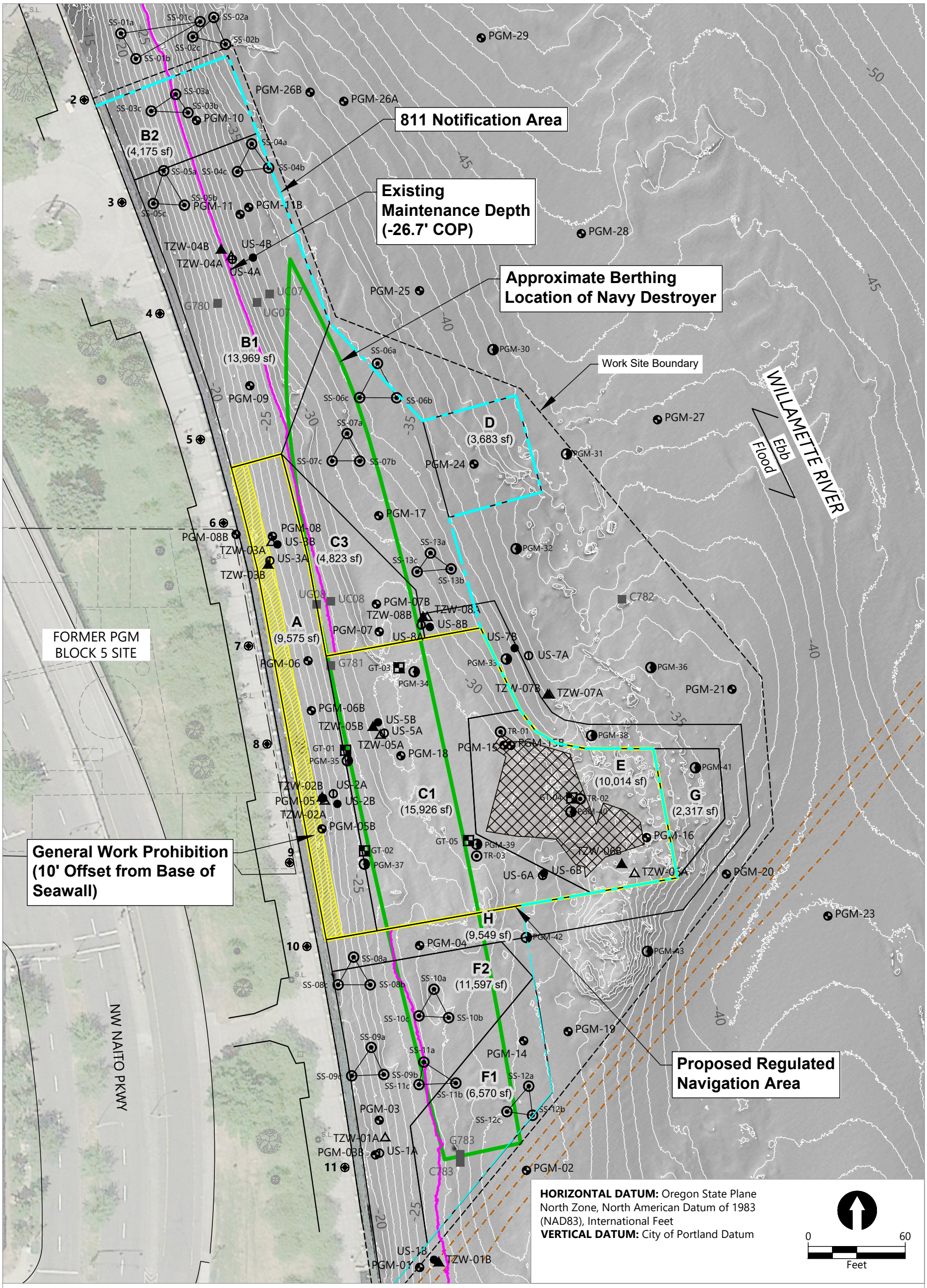


Publish Date: 2020/02/25 9:46 AM | User: hmerrick
Filepath: K:\Projects\0029-NW Natural Gas Co\Portland Gas Manufacturing Site\Design\0029-RP-037 (Sampling Schematic).dwg F-4

ANCHOR QEA

Figure F-4
Armored Cap Porewater Sampling Port Schematic

Long-Term Monitoring and Maintenance Plan
Former Portland Gas Manufacturing Site

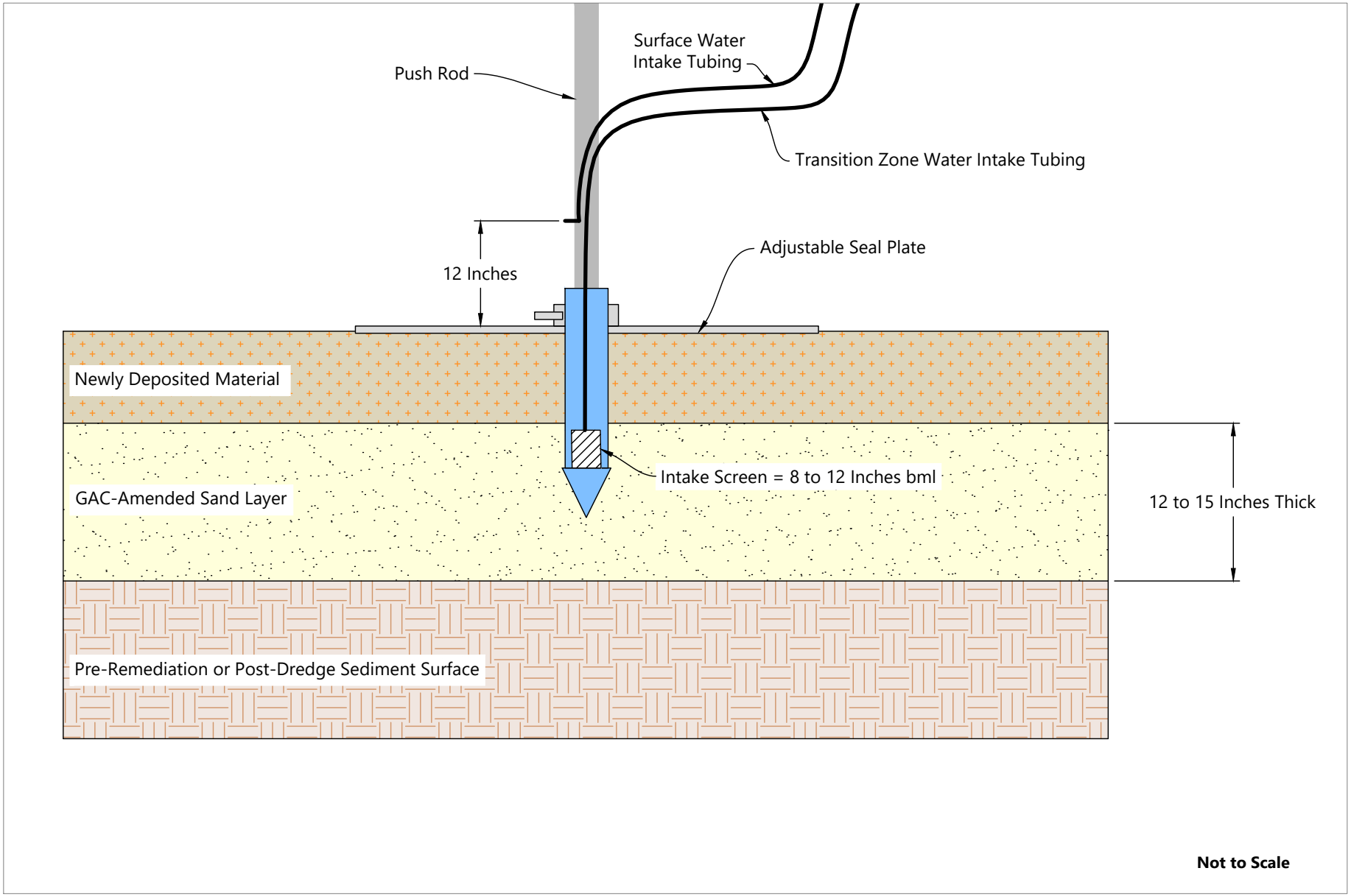


Publish Date: 2020/02/25 9:47 AM | User: hmerrick
Filepath: K:\Projects\0029-NW Natural Gas Co\Portland Gas Manufacturing Site\Design\0029-RP-038 (Prop-Inst-Controls).dwg F-5

ANCHOR QEA

Figure F-5
Proposed Regulated Navigation Area

Long-Term Monitoring and Maintenance Plan
Former Portland Gas Manufacturing Site

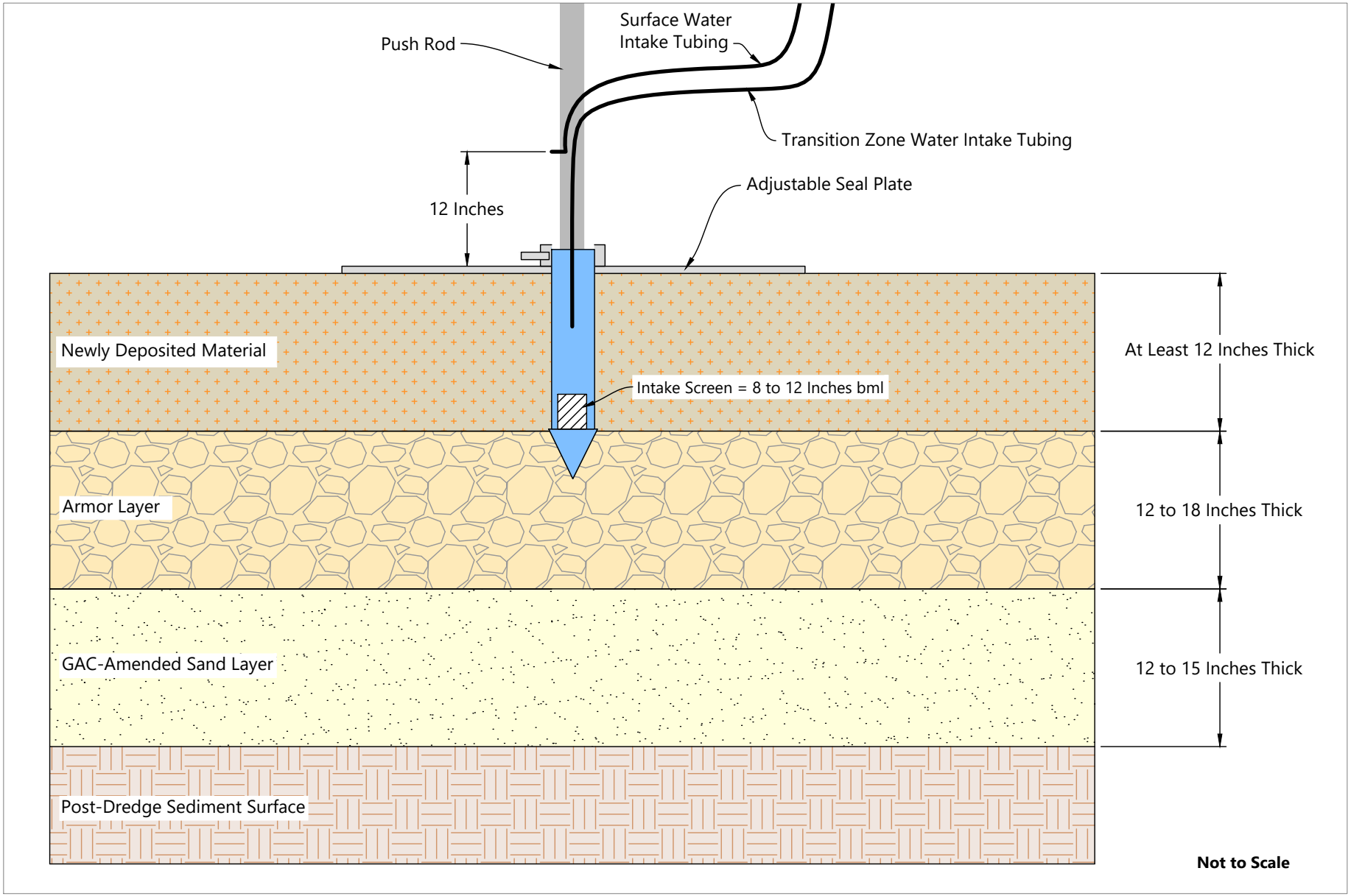


Publish Date: 2020/02/25 9:47 AM | User: hmerrick
Filepath: K:\Projects\0029-NW Natural Gas Co\Portland Gas Manufacturing Site\Design\0029-RP-021 (Push_Probe-LT Monitoring).dwg F-6

ANCHOR QEA

Figure F-6
TZW Push-Probe Sampler Diagram for GAC-Amended Cover Locations

Long-Term Monitoring and Maintenance Plan
Former Portland Gas Manufacturing Site

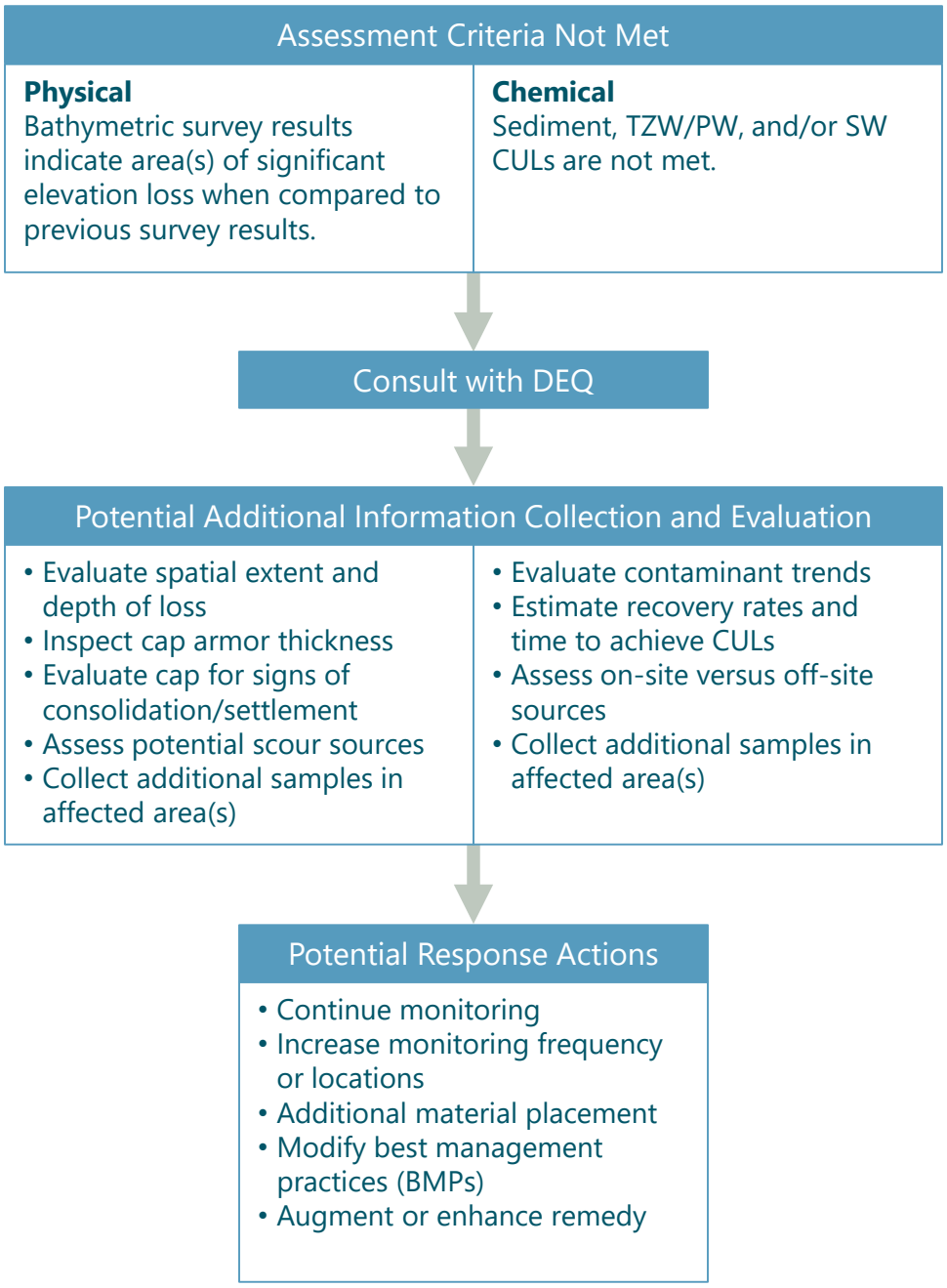


Publish Date: 2020/02/25 9:47 AM | User: hmerrick
Filepath: K:\Projects\0029-NW Natural Gas Co\Portland Gas Manufacturing Site\Design\0029-RP-022 (Push_Probe-_2-LT Monitoring).dwg F-7

ANCHOR QEA

Figure F-7
TZW Push-Probe Sampler Diagram for Armored Cap Locations

Long-Term Monitoring and Maintenance Plan
Former Portland Gas Manufacturing Site



Filepath: \\FUJI\Anchor\Projects\NW Natural\PGM\Design\07 Revised Final (100%) Design, V4\Working (all files)\Reports\App F_LTMMP\02 Figures

ANCHOR QEA

Figure F-8
Contingency Flow Chart (If Assessment Criteria Not Met)
Long-Term Monitoring and Maintenance Plan
Former Portland Gas Manufacturing Site

6720 South Macadam Avenue, Suite 125
Portland, Oregon 97219
503.670.1108

ANCHOR QEA

Technical Memorandum

June 22, 2022

To: Sarah Greenfield, Dan Hafley, and Heidi Nelson, Oregon Department of Environmental Quality

From: Todd Thornburg, Anchor QEA, LLC

cc: Bob Wyatt, NW Natural; Patty Dost, Pearl Legal Group; Kendra Skellenger, Anchor QEA, LLC

ECSI No. 1138

Re: Long-Term Monitoring and Maintenance Plan, Year 2 Addendum
Former Portland Gas Manufacturing Site

On behalf of NW Natural, Anchor QEA, LLC, is submitting this Year 2 Addendum (Addendum) to the *Long-Term Monitoring and Maintenance Plan* (LTMMP; Anchor QEA 2020, Appendix F) for the former Portland Gas Manufacturing (PGM) site. This Addendum describes recommended modifications to the Year 2 post-construction monitoring activities of the LTMMP, including additional sampling and analysis of sediment, surface water (SW), transition zone water (TZW), and porewater. The proposed sampling and analysis modifications are based on observed physical changes in bathymetric conditions relative to the post-construction baseline condition in some localized cover areas measured in October 2020, as presented in the *Year 0 Monitoring Report: PGM Long-Term Monitoring and Maintenance* (Anchor QEA 2021a).

A majority of the PGM site, and specifically the armored cap areas, are stable and depositional. However, there has been some redistribution and downstream transport of material resulting in a loss of elevation in a few particular cover areas— sediment decision units (SDUs) C3, D, and F1. Mixing and dispersion of cover material with existing sediments is an inherent characteristic of this remedial technology and a recognized process for sediment remedial design and the bathymetric performance criteria of the LTMMP. Nevertheless, areas where the cover thickness is less than the minimum 12-inch placement specification are targeted for more detailed Year 2 sampling and analysis, as described in this Addendum. The purpose of the proposed sampling and analysis modifications is to accurately monitor remedy performance and ensure site conditions remain protective of human health and the environment.

Unless specifically modified by this Addendum, Year 2 sampling and analysis activities will otherwise continue to follow the specifications of the LTMMP (Anchor QEA 2020, Appendix F).

This Addendum is organized as follows:

- Summary of Bathymetric Survey Results, 2020 to 2022
- Proposed Modifications to the Year 2 Monitoring Program
- Year 2 Sampling and Analysis Plan
- Year 2 Monitoring Schedule

Summary of Bathymetric Survey Results, 2020 to 2022

In July 2021 (Anchor QEA 2021b) and more recently in April and June 2022, the post-remediation physical condition of the PGM sediment cleanup site was assessed using high-resolution, multibeam bathymetry. A comparison of the current cover thickness, based on the most recent bathymetry survey (June 2022), to the design placement specification (minimum 12-inch placement thickness) forms the basis of the proposed modifications to the Year 2 monitoring program described in this Addendum.

A preliminary bathymetric condition survey performed on April 12, 2022, identified slight, localized additional sediment movements in cover areas relative to the 2021 survey, which were discussed with the Oregon Department of Environmental Quality (DEQ) during a teleconference on May 3, 2022. A follow-up bathymetric survey was performed on June 14, 2022, immediately after the Rose Festival's Fleet Week and immediately prior to the Year 2 field sampling activities. There were negligible changes in bathymetric elevations between the April and June surveys, with the exception of a relatively small scour hole that developed in a downstream monitored natural recovery (MNR) area, which was apparently caused by propwash during Navy vessel docking or undocking during Fleet Week.

Post-remediation bathymetric survey results are summarized as follows:

- **Armored GAC-Amended Caps:** The armored, granular activated carbon (GAC)-amended caps in SDU C1 and SDU E remained stable throughout the post-remediation survey period. SDU C1 was a depression finished below grade in the inner half of the dredge cut and has since accumulated a significant thickness of new sediment. This newly accumulated sediment on top of the armor rock should allow for sediment and direct TZW sampling in SDU C1 for the first time in the long-term monitoring program.
- **Sand Covers and GAC-Amended Sand Covers:** GAC-amended covers in SDU A and sand covers in SDU B2 have been stable throughout the survey period. Loss of cover material was evident in SDUs C3, D, and F1 during Year 1 (2020 to 2021) as the river was equilibrating with the newly constructed surface. After an initial period of hydrodynamic reworking of the riverbed, the site has been comparatively stable during Year 2 (2021 to 2022). Areas where the sand or GAC-amended sand cover thickness has decreased to less than the minimum 12-inch placement specification are targeted for supplemental Year 2 sampling.
- **Monitored Natural Recovery Areas:** MNR areas (SDUs B1 and F2) have been relatively stable throughout the survey period, with most areas showing no measurable change in elevation, with one localized exception. A relatively small scour hole, approximately 20 feet by 50 feet, developed in SDU B1 between the April 2022 and June 2022 surveys, apparently the result of propwash disturbance during Navy vessel docking or undocking during Fleet Week.

Significant deposition was observed in the outer part of SDU F2 as a result of sand cover material migrating downstream from SDU F1.

Proposed Modifications to the Year 2 Monitoring Plan

Figure 1 shows the proposed Year 2 monitoring locations superimposed on the current June 2022 bathymetry. Figures 2a through 2c provide bathymetric comparison maps denoting areas of deposition and erosion during the periods 2020-2021 (Year 1, Figure 2a), 2021-2022 (Year 2, Figure 2b), and 2020-2022 (cumulative post-construction period, Figure 2c). Figure 3 provides a bathymetric comparison map for the cumulative post-construction period (2020-2022) expressed as locally averaged elevation differences as per the previously established PGM bathymetric evaluation grid. Figure 4 is an isopach map of cap and cover thickness, plus any infill sedimentation on top of the caps and covers. This surface was prepared by comparing the June 2022 bathymetry to the 2020 pre-cap surface, which includes post-dredge and post-debris removal surfaces in removal areas combined with the pre-construction surface in non-removal areas (i.e., areas of cap or cover on grade). Figure 5 shows the accumulated thickness of new sediment on top of the rock armor layer to help determine the feasibility of sediment and direct TZW sampling over the armored cap.

Areas where the sand or GAC-amended sand cover thickness has decreased to less than the minimum 12-inch placement specification are targeted for supplemental Year 2 sampling. An area-by-area summary of Year 2 sampling modifications is provided in the following sections.

Armored, GAC-Amended Caps

As per the LTMMP, armored, GAC-amended caps (Stations LTM-14 through LTM-16) are to be sampled for the following: 1) sediment quality, when sufficient new sediment has accumulated over the rock armor to allow sediment sampling; and 2) colocated porewater quality, via the manhole sampling ports, until sufficient new sediment has accumulated to allow direct TZW sampling in the overlying sediment using push probes (i.e., Trident probes). As per the LTMMP, a minimum of 12 inches of new sediment accumulation is recommended to attempt direct TZW sampling, and a minimum of 2 inches of new sediment is recommended to attempt diver-assisted surface sediment sampling over the rock armor layer. However, the diver-assisted surface sediment corer has a 2-inch cutter head, such that 4 inches of new sediment accumulation will be required to provide a 2-inch depth of sediment in the corer.

The following is a summary of recommended Year 2 monitoring activities and modifications in SDUs with armored, GAC-amended caps:

- **SDU C1:** This inner part of the armored cap was finished below grade and has since accumulated between 0.5 and 2.5 feet of new sediment, as shown in Figure 5. This should be sufficient to allow both surface sediment grab sampling and direct TZW sampling at stations LTM-13 and LTM-14 in lieu of the manhole sampling ports, as per the LTMMP. The 3-point

composite surface sediment samples (SED-13 and SED-14) are colocated with their respective manholes. The TZW sample locations (TZW-13 and TZW-14) are sited adjacent to the manholes (within approximately 20 feet of the manholes) in areas with thicker sediment accumulations of at least 12 inches and are approximately colocated with the composited surface sediment samples, although slightly offset due to the presence of the manholes at the center location.

- **SDU E:** This deeper part of the armored cap has much less new sediment accumulation compared to SDU C1, and negligible accumulation in the outermost part of the cap (Figure 5). Direct TZW sampling does not appear to be feasible in SDU E during Year 2, and porewater samples will continue to be collected from the manhole sampling ports. The area near LTM-15 appears to have accumulated a few inches of new sediment, up to 6 inches (Figure 5). As a result, diver-assisted surface sediment sampling may be possible at LTM-15 and will be assessed by the diver during the field program. Surface sediment sampling at LTM-16 appears to be infeasible due to negligible sediment accumulation in that area, which will be field-verified by the diver.

GAC-Amended Covers

As per the LTMMP, GAC-amended covers (Stations LTM-09 through LTM-12) are to be sampled for the following: 1) sediment quality; and 2) colocated TZW quality via push probes (i.e., Trident probes). The following is a summary of recommended Year 2 monitoring activities and modifications in SDUs with GAC-amended covers:

- **SDU A:** SDU A has retained a substantial thickness of GAC-amended cover material. Sediment and TZW samples will continue to be collected as specified in the LTMMP.
- **SDU D:** SDU D shows inconsistent retention of GAC-amended cover material, with alternating thick and thin spots, specifically two contiguous areas below the minimum 12-inch placement specification, elongated transverse to the river current (Figure 4). As a result, sample coverage in SDU D will be increased from one LTMMP station (LTM-12) to two stations (LTM-12.1 and LTM-12.2). The three subsamples in each of the surface sediment composites will be positioned along the thinned cover areas, and the TZW samples will be collected at the centroid locations. Mixing of GAC into underlying sediments during placement is expected, so GAC content determinations (see Section 3.5.3.3 of the *Construction Quality Assurance and Control Plan* [Anchor QEA 2020, Appendix E) will be added to the sediment testing list in SDU D to assess the amount of GAC present in the remaining surface sediments.

Sand Covers

As per the LTMMP, sand covers (Stations LTM-01, LTM-04, and LTM-08) are to be sampled for sediment quality. The following is a summary of recommended Year 2 monitoring activities and modifications in SDUs with sand covers:

- **SDU B2:** SDU B2 has retained a substantial thickness of sand cover material (Figure 4). There is a minor area near the seawall that may have dropped below the 12-inch placement specification, although the difference is within the accuracy of the bathymetric survey. Nevertheless, the original LTMMP station (LTM-01) was relocated to the thinner cover area (LTM-01.1).
- **SDU C3:** SDU C3 shows inconsistent retention of sand cover material, with variable thick and thin spots. There is a particular area of thinning at the top of the dredging side slope on the north side of SDU C1, which has been rounded off by river currents. As a result, the original LTMMP station (LTM-04) was relocated to the thinned cover area at the top of the side slope (LTM-04.1).
- **SDU F1:** SDU F1 has experienced downstream transport of sand cover material, and a majority of SDU F1 has dropped below the 12-inch placement specification. As a result, sample coverage in SDU F1 was increased from one LTMMP station (LTM-08) to three stations (LTM-08.1, LTM-08.2, and LTM-08.3) during Year 2. These three stations are sited along the upstream portion of SDU F1 where the remaining sand cover is thinnest.

Monitored Natural Recovery Areas

As per the LTMMP, MNR areas (Stations LTM-02 and LTM-03 in SDU B1 and Stations LTM-05, LTM-06, and LTM-07 in SDU F2) are to be sampled for sediment quality. The following is a summary of recommended Year 2 monitoring activities and modifications in SDUs undergoing MNR:

- **SDU B1:** Mudline elevations in SDU B1 were stable in the post-construction period through the April 2022 bathymetric survey; however, a localized scour hole developed in the outer part of the area by the June 2022 survey. Due to the scour depth (2 to 2.5 feet at its deepest) and focused spatial extent of this feature (approximately 20 feet by 50 feet), it appears to have been caused by propwash from the docking or undocking of the visiting Navy ship during Fleet Week. As a result, the downstream LTMMP station (LTM-02) will be relocated directly over the scour hole (LTM-02.1). The observed scour did not affect the upstream station in SDU B1 (LTM-03), which will continue to be sampled as specified in the LTMMP.
- **SDU F2:** Mudline elevations in SDU F2 have been stable since the 2020 remedial action, with the exception of Station LTM-06, which is characterized by high sedimentation rates, evidently the result of in-migrating sand cover material from SDU F1. Sediment samples in SDU F2 will continue to be collected as specified in the LTMMP.

Year 2 Sampling and Analysis Plan

Recommended modifications to the Year 2 sampling and analysis protocols are described in this section. Unless specifically modified by this Addendum, Year 2 sampling and analysis activities will otherwise follow the specifications of the LTMMP (Anchor QEA 2020, Appendix F).

A matrix of Year 2 sample ID's and analytical testing requirements is shown in Table 1. Sample coordinates (in both Oregon state plane coordinates and latitude/longitude decimal degrees) for sediment and water samples are compiled in Table 2 and Table 3, respectively.

Sample Collection Methods

Surface Sediment Samples

Surface sediment grab samples will continue to be collected as three-point composite samples using a power-grab sampler operated by Research Support Services (RSS). The three contributing grab samples are generally configured as equilateral triangles approximately 25 feet on each side. In some of the new and relocated surface sediment composite samples, the equilateral geometry was modified to better target areas of thin cover, while maintaining a comparable footprint, as shown in Figure 4.

Diver-Assisted Surface Sediment Samples

Stations LTM-13 and LTM-14 appear to have sufficient new sediment to allow standard surface sediment sample collection using a boat-deployed power-grab sampler. If feasible, based on field conditions, divers will be used to collect three surface sediment grab samples at Station LTM-15, which appears to have up to 6 inches of new sediment (Figure 5). Diver-assisted sampling will also provide a back-up method for Stations LTM-13 and LTM-14 if acceptable power-grab samples cannot be collected from those areas. Based on the Year 2 bathymetry, it does not appear that Year 2 sediment sampling will be feasible at Station LTM-16. Diver-assisted surface sediment samples will be collected using a diver-operated, stainless-steel, 8-inch-diameter hand corer capable of penetrating the top 12 inches of sediment, or until the corer hits refusal on the armor layer. The hand corer has a 2-inch cutter head, such that 4 inches of new sediment accumulation will be required over the armor layer to recover a 2-inch sample in the corer.

Water Samples

TZW samples will continue to be collected using in situ push probes (Trident probes) operated by Coastal Monitoring Associates (CMA). Bathymetric survey results indicate significant new sediment has accumulated near LTM-13 and LTM-14 to allow direct TZW sampling of overlying sediment in lieu of the manhole sampling ports, as per the LTMMP.

Porewater samples will continue to be collected from the permanent manhole sampling ports at LTM-15 and LTM-16 using divers supplied by RSS. Insufficient new sediment has accumulated at these locations to allow direct TZW sampling.

Sample Location Offsets

Sample locations (both sediment and water) may need to be adjusted based on unexpected field conditions (e.g., presence of armor, debris, or other obstructions) and to find a more suitable substrate or a thicker accumulation of new sediment. If the required location adjustments result in more than a 30-foot offset from the original location or extend well outside the boundary of the SDU being investigated, DEQ will be contacted to discuss possible alternative locations.

Unused Surface Sediment Management

The LTMMP specifies that unused surface sediment remaining after sample collection will be containerized, characterized, and disposed of off site at a landfill (Anchor QEA 2020, see Section 4.8 of Appendix F). This procedure introduces unnecessary safety risks associated with maneuvering large heavy drums full of wet sediment on board the sampling vessel and offloading the drums to shore and results in a low-value use of landfill capacity. On the other hand, the environmental risk associated with these sediments is low, considering that all 13 surface sediment composite samples collected during the 2017 pre-design investigation (Anchor QEA 2018) and all 12 surface sediment composite samples collected during the baseline, Year 0 monitoring event (Anchor QEA 2021a) were below PGM cleanup levels.

Therefore, Anchor QEA is proposing to adopt the unused surface sediment management procedures that have been approved by the U.S. Environmental Protection Agency (EPA) for use in Portland Harbor (AECOM and Geosyntec 2018). According to these procedures, unused surface sediment is not inherently considered waste material and may be returned to the river at the sampling location if the sediment does not contain nonaqueous phase liquid or visible sheens. At PGM, sediments would also be excluded from the river if they contained tar-like material. Barring those exceptions, unused sediment will be lowered through the water column and carefully released near the mudline while an observer is posted to monitor for any visible turbidity at the water surface. Based on a review of the PGM permits (U.S. Army Corps of Engineers Nationwide Permit, Section 401 Water Quality Certification, Oregon Department of State Lands [DSL] Removal-Fill Permit Waiver, and DSL access agreement), with DEQ's approval of this Addendum, this proposed surface sediment management practice would be consistent with applicable permit conditions.

Laboratory Analytical Methods

Surface sediment analyses will be performed in accordance with LTMMP analytes, methods, and detection limits, as specified in LTMMP Table F-5 (Anchor QEA 2020, Appendix F). In addition, the two composited surface sediment samples from SDU D (2020-SED-12.1 and 2020-SED-12.2) will be

analyzed for GAC content at the Anchor QEA Environmental Geochemistry Laboratory using the same procedure that was used to verify in situ GAC content during cap and cover placement in the 2020 remedial action (Anchor QEA 2020, see Section 3.5.3.3 of Appendix E and Attachment E-1).

TZW, porewater, and SW analyses will be performed in accordance with LTMMP analytes, methods, and detection limits, as specified in LTMMP Table F-6 (Anchor QEA 2020, Appendix F).

A 1-week turnaround time will be requested from the subcontract analytical laboratory to help support more timely decisions by DEQ and NW Natural regarding the possible need for cover repairs during Year 2. Anchor QEA is currently in discussion with Apex Laboratories as well as other laboratories in the Pacific Northwest to determine if accelerated laboratory turnaround times are achievable.

Data Validation

The LTMMP (Section 5.7) indicates data validation will follow EPA Stage 2B validation procedures (EPA 2009) and will include evaluation of the following quality control (QC) criteria:

- Data completeness
- Sample receipt
- Holding times
- Field QC
- Method blanks
- Method detection limits/reporting limits
- Internal standard area counts
- Surrogate recoveries
- Laboratory control samples
- Matrix spike/matrix spike duplicates
- Standard reference materials
- Second column confirmation analyses
- Instrument tunes
- Instrument calibrations

Stage 2A data validation procedures are recommended during Year 2 and moving forward to allow more timely decisions to be made, which in Year 2 could potentially involve construction decisions. Stage 2A data validation provides an evaluation of 12 of the 14 required QC elements, excluding only the last two—instrument tunes and instrument calibrations. However, Stage 2A validation can be completed using a Level 2 laboratory report, whereas Stage 2B validation requires a Level 4 laboratory report, which generally takes 2 to 4 weeks longer for the laboratory to produce. In addition, most of the Stage 2A QC checks can be programmed to run automatically when the electronic data deliverables are loaded, which will quickly identify any significant data deficiencies. Although not be required for Stage 2A validation, NW Natural will nevertheless order a Level 4 report from the laboratory in case any issues are identified during Stage 2A validation that would require a higher level of investigation.

Year 2 Monitoring Schedule

If sediment, TZW/porewater, or SW is observed above PGM cleanup levels in surface sediments or the overlying water column where river receptors can potentially be exposed, DEQ and NW Natural

will discuss whether and what contingency actions may be warranted. One potential contingency action is placement of additional cover material (i.e., sand in SDUs C3 and F1 and GAC-amended sand in SDU D) to augment the cover thickness in areas affected by erosion and redistribution. Therefore, Year 2 monitoring activities will be implemented as quickly as practicable to allow time for contingency action, such as cover augmentation, to be performed during the in-water work window (July 1 through October 31, 2022), if it is determined that contingency action is needed.

The proposed schedule for Year 2 monitoring activities is as follows:

Work Week	Year 2 Monitoring Activity
June 8 to June 12	Rose Festival Fleet Week
June 13 to June 17	Bathymetry survey and processing, eTrac on site; NW Natural and DEQ discuss whether further modifications to Year 2 sampling program are needed
June 20 to June 24	TZW and SW sampling—RSS and CMA on site
June 27 to July 1	Surface sediment sampling—RSS on site
July 6 to July 8	Diver-assisted manhole porewater sampling and diver-assisted surface sediment sampling—RSS on site
July 11 to July 22	Laboratory analysis of sediment and water samples
July 25 to July 29	NW Natural and DEQ discuss Year 2 monitoring results and the possible need for contingency action during the 2022 in-water work window

References

AECOM and Geosyntec, 2018. *Pre-Remedial Design Investigation and Baseline Surface Sediment Field Sampling Plan*.

Anchor QEA (Anchor QEA, LLC), 2018. *Pre-Design Investigation Data Report*. Former Portland Gas Manufacturing Site. Prepared for NW Natural. August 27, 2018.

Anchor QEA, 2020. *Revised Final Design Report, Version 4.* Former Portland Gas Manufacturing Site. Prepared for NW Natural. March 2, 2020.

Anchor QEA, 2021a. *Year 0 Monitoring Report: PGM Long-Term Monitoring and Maintenance*. Former Portland Gas Manufacturing Site. Prepared for NW Natural. June 7, 2021.

Anchor QEA, 2021b. *Year 1 Monitoring Report: PGM Long-Term Monitoring and Maintenance*. Former Portland Gas Manufacturing Site. Prepared for NW Natural. December 23, 2021.

EPA (U.S. Environmental Protection Agency), 2009. *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use*. Office of Solid Waste and Emergency Response. EPA 540-R-08-005. January 2009.

Tables

Figures

Tables

Table 1
Year 2 Sample Analysis Matrix

LTMMP Station	Sediment Decision Unit	Remedial Application	Sample ID	Sediment Analysis		Water Analysis		
				Surface Sediment	GAC Content	TZW	Surface Water	Porewater
				LTMMP Table F-5	CQACP Sec. 3.5.3.3	LTMMP Table F-6		
LTM-01.1	B2	EMNR	2022-SED-01.1	X				
LTM-02.1	B1	MNR	2022-SED-02	X				
LTM-03	B1	MNR	2022-SED-03	X				
LTM-04.1	C3	EMNR	2022-SED-04.1	X				
LTM-05	F2	MNR	2022-SED-05	X				
LTM-06	F2	MNR	2022-SED-06	X				
LTM-07	F2	MNR	2022-SED-07	X				
LTM-08.1	F1	EMNR	2022-SED-08.1	X				
LTM-08.2			2022-SED-08.2	X				
LTM-08.3			2022-SED-08.3	X				
LTM-09	A	GAC Cover	2022-SED-09	X				
			2022-TZW-09			X		
			2022-SW-09				X	
LTM-10	A	GAC Cover	2022-SED-10	X				
			2022-TZW-10			X		
			2022-SW-10				X	
LTM-11	A	GAC Cover	2022-SED-11	X				
			2022-TZW-11			X		
			2022-SW-11				X	
LTM-12.1	D	GAC Cover	2022-SED-12.1	X	X			
			2022-TZW-12.1			X		
			2022-SW-12.1				X	
LTM-12.2			2022-SED-12.2	X	X			
			2022-TZW-12.2			X		
			2022-SW-12.2				X	

Table 1
Year 2 Sample Analysis Matrix

LTMMP Station	Sediment Decision Unit	Remedial Application	Sample ID	Sediment Analysis		Water Analysis		
				Surface Sediment	GAC Content	TZW	Surface Water	Porewater
				LTMMP Table F-5	CQACP Sec. 3.5.3.3	LTMMP Table F-6		
LTM-13	C1	Armored GAC Cap	2022-SED-13	X				
			2022-TZW-13			X		
			2022-SW-13				X	
LTM-14	C1	Armored GAC Cap	2022-SED-14	X				
			2022-TZW-14			X		
			2022-SW-14				X	
LTM-15	E	Armored GAC Cap	2022-SED-15	X[1]				
			2022-PW-15					X
			2022-SW-15				X	
LTM-16	E	Armored GAC Cap	2022-SED-16	X[1]				
			2022-PW-16					X
			2022-SW-16				X	

Notes:
1. Surface sediment and TZW sampling in armored GAC cap areas is contingent on sufficient new sediment accumulation over the armor stone.
CQACP: *Construction Quality Assurance and Control Plan* (Anchor QEA 2020, Appendix E)
EMNR: enhanced monitored natural recovery
GAC: granular activated carbon
LTMMP: *Long-Term Monitoring and Maintenance Plan* (Anchor QEA 2020, Appendix F)
MNR: monitored natural recovery
TZW: transition zone water

Table 2
Surface Sediment Grab Sample Coordinates

LTMMP Station	SDU	Sediment Sample ID	Oregon North (NAD83)		Decimal Degrees		Notes
			Northing	Easting	Longitude	Latitude	
LTM-01.1	B2	SED-01.1a	685,587	7,646,009	122.670110	45.526690	Estimated cover thickness less than 12 inches
		SED-01.1b	685,549	7,646,008	122.670109	45.526585	
		SED-01.1c	685,573	7,645,996	122.670160	45.526649	
LTM-02.1	B1	SED-02.1a	685,510	7,646,079	122.669829	45.526483	Estimated cover thickness less than 12 inches
		SED-02.1b	685,488	7,646,088	122.669790	45.526425	
		SED-2.1c	685,488	7,646,058	122.669907	45.526422	
LTM-03	B1	SED-03a	685,425	7,646,074	122.669839	45.526249	--
		SED-03b	685,403	7,646,087	122.669788	45.526191	
		SED-03c	685,403	7,646,062	122.669885	45.526189	
LTM-04.1	C3	SED-04.1a	685,286	7,646,153	122.669517	45.525875	Estimated cover thickness less than 12 inches
		SED-04.1b	685,262	7,646,158	122.669495	45.525808	
		SED-04.1c	685,258	7,646,133	122.669593	45.525795	
LTM-05	F2	SED-05a	685,031	7,646,137	122.669554	45.525174	--
		SED-05b	685,015	7,646,156	122.669475	45.525133	
		SED-05c	685,006	7,646,133	122.669565	45.525106	
LTM-06	F2	SED-06a	685,044	7,646,191	122.669341	45.525214	--
		SED-06b	685,022	7,646,204	122.669290	45.525156	
		SED-06c	685,022	7,646,179	122.669388	45.525154	
LTM-07	F2	SED-07a	684,933	7,646,159	122.669455	45.524908	--
		SED-07b	684,912	7,646,172	122.669404	45.524850	
		SED-07c	684,912	7,646,147	122.669502	45.524848	
LTM-08.1	F1	SED-08.1a	684,928	7,646,182	122.669367	45.524896	Estimated cover thickness less than 12 inches
		SED-08.1b	684,920	7,646,206	122.669273	45.524876	
		SED-08.1c	684,899	7,646,187	122.669345	45.524817	
LTM-08.2	F1	SED-08.2a	684,960	7,646,211	122.669256	45.524986	Estimated cover thickness less than 12 inches
		SED-08.2b	684,953	7,646,235	122.669163	45.524967	
		SED-08.2c	684,931	7,646,214	122.669242	45.524906	
LTM-08.3	F1	SED-08.3a	684,998	7,646,243	122.669134	45.525091	Estimated cover thickness less than 12 inches
		SED-08.3b	684,969	7,646,249	122.669109	45.525013	
		SED-08.3c	684,976	7,646,223	122.669210	45.525030	

Table 2
Surface Sediment Grab Sample Coordinates

LTMMP Station	SDU	Sediment Sample ID	Oregon North (NAD83)		Decimal Degrees		Notes
			Northing	Easting	Longitude	Latitude	
LTM-09	A	SED-09a	685,333	7,646,075	122.669827	45.525997	--
		SED-09b	685,321	7,646,097	122.669740	45.525966	
		SED-09c	685,308	7,646,075	122.669821	45.525928	
LTM-10	A	SED-10a	685,226	7,646,106	122.669692	45.525708	--
		SED-10b	685,205	7,646,119	122.669641	45.525649	
		SED-10c	685,205	7,646,094	122.669738	45.525647	
LTM-11	A	SED-11a	685,120	7,646,126	122.669604	45.525417	--
		SED-11b	685,098	7,646,139	122.669553	45.525358	
		SED-11c	685,098	7,646,114	122.669650	45.525356	
LTM-12.1	D	SED-12.1a	685,388	7,646,206	122.669319	45.526158	Estimated cover thickness less than 12 inches
		SED-12.1b	685,379	7,646,226	122.669240	45.526134	
		SED-12.1c	685,369	7,646,188	122.669388	45.526105	
LTM-12.2	D	SED-12.2a	685,360	7,646,210	122.669303	45.526082	Estimated cover thickness less than 12 inches
		SED-12.2b	685,352	7,646,235	122.669205	45.526062	
		SED-12.2c	685,345	7,646,194	122.669364	45.526040	
LTM-13	C1	SED-13a	685,221	7,646,168	122.669452	45.525699	Sufficient new sediment for Year 2 sampling
		SED-13b	685,200	7,646,180	122.669401	45.525641	
		SED-13c	685,200	7,646,155	122.669498	45.525639	
LTM-14	C1	SED-14a	685,131	7,646,185	122.669373	45.525452	Sufficient new sediment for Year 2 sampling
		SED-14b	685,109	7,646,198	122.669322	45.525394	
		SED-14c	685,109	7,646,173	122.669420	45.525392	
LTM-15	E	SED-15a	685,172	7,646,233	122.669194	45.525568	Possibly sufficient new sediment for diver-assisted Year 2 sampling
		SED-15b	685,150	7,646,245	122.669143	45.525510	
		SED-15c	685,150	7,646,220	122.669240	45.525508	
LTM-16	E	SED-16a	685,135	7,646,287	122.668979	45.525471	Insufficient new sediment for Year 2 sampling
		SED-16b	685,122	7,646,308	122.668895	45.525436	
		SED-16c	685,110	7,646,286	122.668980	45.525403	

Notes:
LTMMP: *Long-Term Monitoring and Maintenance Plan* (Anchor QEA 2020, Appendix F)
NAD83: North American Datum of 1983
SDU: sediment decision unit

Table 3

Transition Zone Water, Surface Water, and Porewater Sample Coordinates

Surface Water ID	TZW/Porewater ID	SDU	Oregon North (NAD83)		Decimal Degrees		Notes
			Northing	Easting	Longitude	Latitude	
2022-SW-09	2022-TZW-09	A	685,320	7,646,082	122.669796	45.525963	--
2022-SW-10	2022-TZW-10	A	685,212	7,646,106	122.669690	45.525668	--
2022-SW-11	2022-TZW-11	A	685,105	7,646,126	122.669602	45.525377	--
2022-SW-12.1	2022-TZW-12.1	D	685,379	7,646,207	122.669316	45.526133	--
2022-SW-12.2	2022-TZW-12.2	D	685,353	7,646,213	122.669291	45.526062	--
2022-SW-13	2022-TZW-13	C1	685,195	7,646,158	122.669489	45.525626	--
2022-SW-14	2022-TZW-14	C1	685,103	7,646,180	122.669392	45.525375	--
2022-SW-13	2022-PW-13	C1	685,207	7,646,168	122.669450	45.525659	Alternate fixed manhole location
2022-SW-14	2022-PW-14	C1	685,117	7,646,185	122.669372	45.525412	Alternate fixed manhole location
2022-SW-15	2022-PW-15	E	685,158	7,646,233	122.669192	45.525528	Fixed manhole location
2022-SW-16	2022-PW-16	E	685,122	7,646,293	122.668951	45.525437	Fixed manhole location

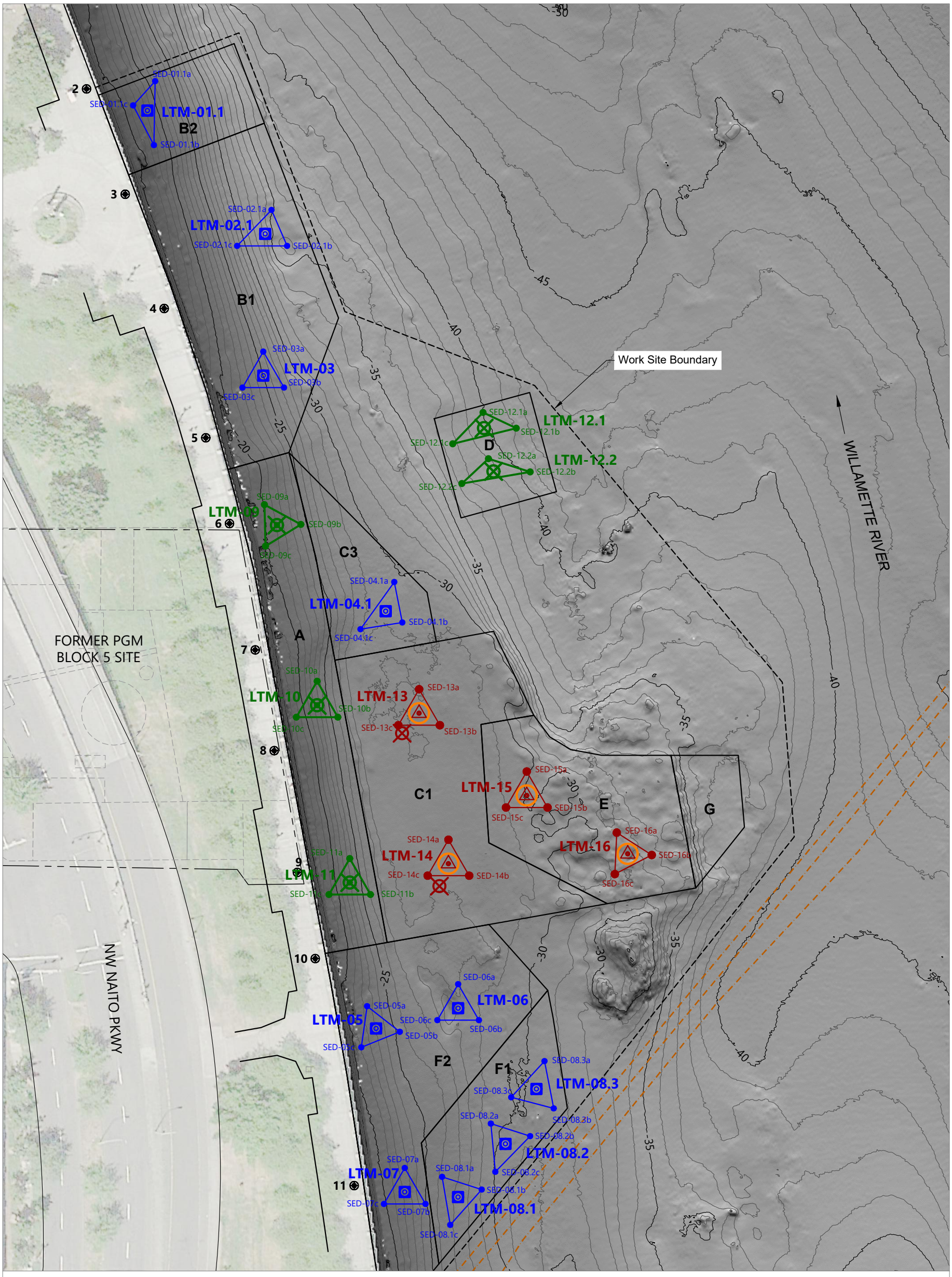
Notes:

NAD83: North American Datum of 1983

SDU: sediment decision unit

TZW: transition zone water

Figures



Existing Features:

- City of Portland Sanitary Sewer Utility
- A — Sediment Decision Unit Areas
- 2 — Bollard Location and Number
- 2022 Bathymetric Contours (1' & 5' Intervals)
- Direct TZW/SW Sample Adjacent to Manhole Sampling Device (Amored GAC-Amended Cap)

Long-Term Monitoring Locations:

- Surface Sediment Grab Sample (MNR/EMNR Areas)
- Colocated Surface Sediment Grab Sample and TZW/SW Sample (GAC-Amended Cover)
- Colocated Surface Sediment Grab Sample and Porewater Sample (Armored, GAC-Amended Cap)
- As-Built: Permanent, Manhole-Type Porewater Sampling Device

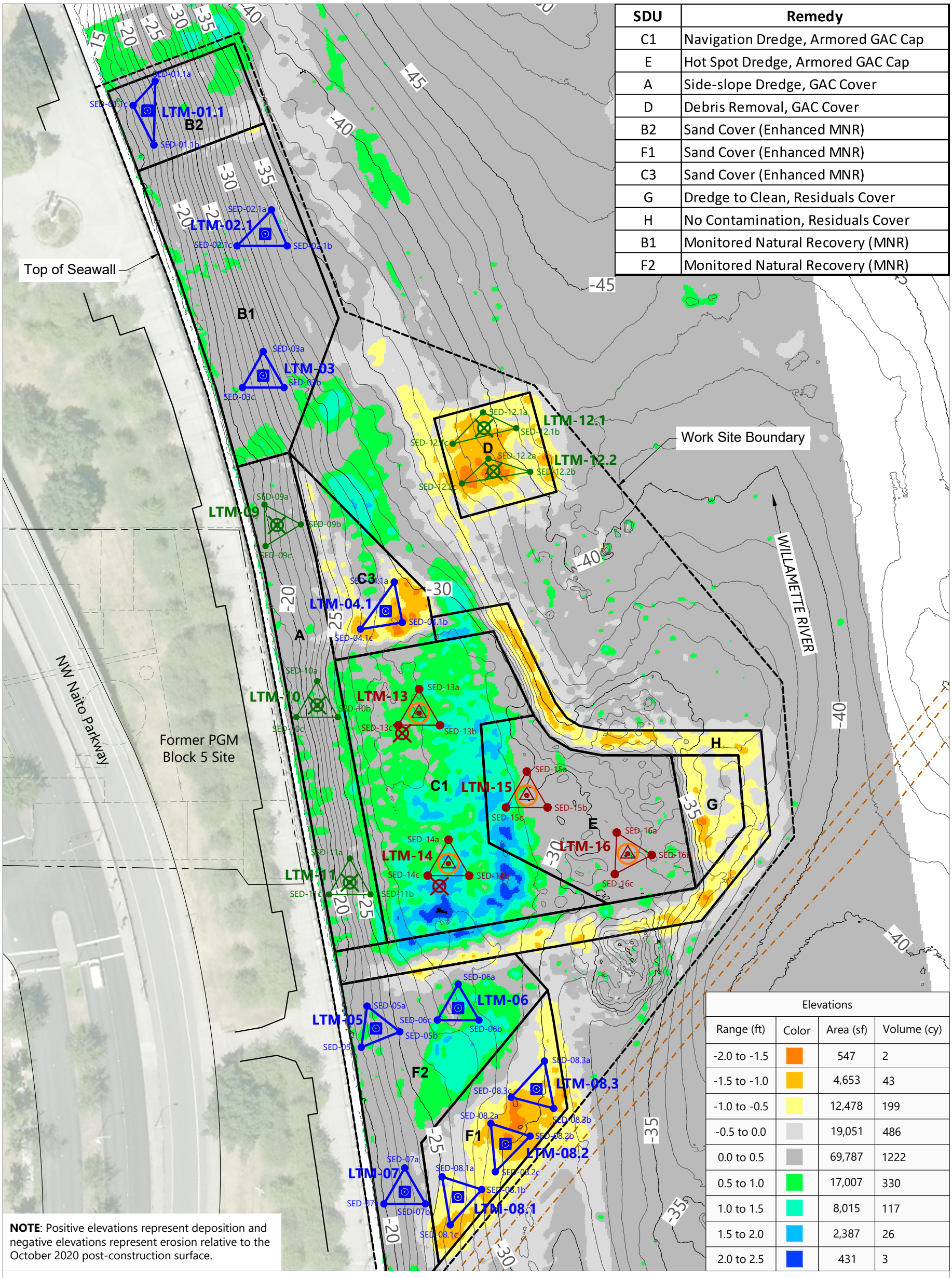
0 60
Feet

SOURCE: Year 2 hydrographic survey conducted by eTrac on June 14, 2022.
HORIZONTAL DATUM: Oregon State Plane North Zone NAD83, International Feet
VERTICAL DATUM: City of Portland (COP)

Publish Date: 2022/06/22 2:10 PM | User: jbigsby
Filepath: K:\Projects\0029-NW Natural Gas Co\Portland Gas Manufacturing Site_Long Term Monitoring_Year 2 Addendum\0029-RP-001 (Proposed Year 2 Mon Locs).dwg Figure 1

ANCHOR QEA

Figure 1
Proposed Year 2 Monitoring Locations
Long-Term Monitoring and Maintenance Plan, Year 2 Addendum
Former Portland Gas Manufacturing Site



SDU	Remedy
C1	Navigation Dredge, Armored GAC Cap
E	Hot Spot Dredge, Armored GAC Cap
A	Side-slope Dredge, GAC Cover
D	Debris Removal, GAC Cover
B2	Sand Cover (Enhanced MNR)
F1	Sand Cover (Enhanced MNR)
C3	Sand Cover (Enhanced MNR)
G	Dredge to Clean, Residuals Cover
H	No Contamination, Residuals Cover
B1	Monitored Natural Recovery (MNR)
F2	Monitored Natural Recovery (MNR)

Elevations			
Range (ft)	Color	Area (sf)	Volume (cy)
-2.0 to -1.5		547	2
-1.5 to -1.0		4,653	43
-1.0 to -0.5		12,478	199
-0.5 to 0.0		19,051	486
0.0 to 0.5		69,787	1222
0.5 to 1.0		17,007	330
1.0 to 1.5		8,015	117
1.5 to 2.0		2,387	26
2.0 to 2.5		431	3

NOTE: Positive elevations represent deposition and negative elevations represent erosion relative to the October 2020 post-construction surface.

Existing Features:

- City of Portland Sanitary Sewer Utility
- A — Sediment Decision Unit Areas
- Bollard Location and Number
- 2022 Bathymetric Contours (1' & 5' Intervals)
- Direct TZW/SW Sample Adjacent to Manhole Sampling Device (Amored GAC-Amended Cap)

Long-Term Monitoring Locations:

- Surface Sediment Grab Sample (MNR/EMNR Areas)
- Colocated Surface Sediment Grab Sample and TZW/SW Sample (GAC-Amended Cover)
- Colocated Surface Sediment Grab Sample and Porewater Sample (Armored, GAC-Amended Cap)
- As-Built: Permanent, Manhole-Type Porewater Sampling Device

0 60 Feet

SOURCE: Year 0 hydrographic survey conducted by Meyer Hydrographic on October 15, 2020. Year 1 hydrographic survey conducted by Meyer Hydrographic on July 28, 2021. Aerial Photograph from Oregon Metro, dated October 25, 2017.
HORIZONTAL DATUM: Oregon State Plane North Zone NAD83, International Feet
VERTICAL DATUM: City of Portland (COP)

Publish Date: 2022/06/22 2:11 PM | User: jbigsby
Filepath: K:\Projects\0029-NW Natural Gas Co\Portland Gas Manufacturing Site_Long Term Monitoring_Year 2 Addendum\0029-RP-004 (Isopach-2020 vs 2021).dwg Figure 2a

ANCHOR QEA

Figure 2a
2020 vs 2021 Bathymetry Comparison
Long-Term Monitoring and Maintenance Plan, Year 2 Addendum
Former Portland Gas Manufacturing Site

SDU	Remedy
C1	Navigation Dredge, Armored GAC Cap
E	Hot Spot Dredge, Armored GAC Cap
A	Side-slope Dredge, GAC Cover
D	Debris Removal, GAC Cover
B2	Sand Cover (Enhanced MNR)
F1	Sand Cover (Enhanced MNR)
C3	Sand Cover (Enhanced MNR)
G	Dredge to Clean, Residuals Cover
H	No Contamination, Residuals Cover
B1	Monitored Natural Recovery (MNR)
F2	Monitored Natural Recovery (MNR)

Top of Seawall

NW Naito Parkway

Former PGM Block 5 Site

WILLAMETTE RIVER

Work Site Boundary

LTM-01.1 (SED-01.1a, SED-01.1b, SED-01.1c)

LTM-02.1 (SED-02.1a, SED-02.1b, SED-02.1c)

LTM-03 (SED-03a, SED-03b, SED-03c)

LTM-12.1 (SED-12.1a, SED-12.1b, SED-12.1c)

LTM-12.2 (SED-12.2a, SED-12.2b, SED-12.2c)

LTM-09 (SED-09a, SED-09b, SED-09c)

LTM-04.1 (SED-04.1a, SED-04.1b, SED-04.1c)

LTM-10 (SED-10a, SED-10b, SED-10c)

LTM-13 (SED-13a, SED-13b, SED-13c)

LTM-15 (SED-15a, SED-15b, SED-15c)

LTM-16 (SED-16a, SED-16b, SED-16c)

LTM-14 (SED-14a, SED-14b, SED-14c)

LTM-11 (SED-11a, SED-11b, SED-11c)

LTM-06 (SED-06a, SED-06b, SED-06c)

LTM-05 (SED-05a, SED-05b, SED-05c)

LTM-08.3 (SED-08.3a, SED-08.3b, SED-08.3c)

LTM-08.2 (SED-08.2a, SED-08.2b, SED-08.2c)

LTM-08.1 (SED-08.1a, SED-08.1b, SED-08.1c)

LTM-07 (SED-07a, SED-07b, SED-07c)

B1, B2, C1, C3, A, D, E, F1, F2, G, H

-20, -25, -30, -35, -40, -45

Difference in Elevation Between Base Surface and Comparison Surface (Positive Values Indicate the Comparison Surface is a Higher Elevation)	
Vertical Difference in Feet	Color
-3.0 to -1.5	
-1.5 to -1.0	
-1.0 to -0.5	
-0.5 to 0.0	
0.0 to 0.5	
0.5 to 1.0	
1.0 to 1.5	

NOTE: Positive elevations represent deposition, and negative elevations represent erosion relative to the July 2021 surface.

Existing Features:

- City of Portland Sanitary Sewer Utility
- A — Sediment Decision Unit Areas
- Bollard Location and Number
- 2022 Bathymetric Contours (1' & 5' Intervals)
- Direct TZW/SW Sample Adjacent to Manhole Sampling Device (Amored GAC-Amended Cap)

Long-Term Monitoring Locations:

- Surface Sediment Grab Sample (MNR/EMNR Areas)
- Colocated Surface Sediment Grab Sample and TZW/SW Sample (GAC-Amended Cover)
- Colocated Surface Sediment Grab Sample and Porewater Sample (Armored, GAC-Amended Cap)
- As-Built: Permanent, Manhole-Type Porewater Sampling Device

0 60 Feet

SOURCE: Year 1 hydrographic survey conducted by Meyer Hydrographic on July 28, 2021. Year 2 hydrographic survey conducted by eTrac on June 14, 2022. Aerial Photograph from Oregon Metro, dated October 25, 2017.
HORIZONTAL DATUM: Oregon State Plane North Zone NAD83, International Feet
VERTICAL DATUM: City of Portland (COP)

Publish Date: 2022/06/22 2:11 PM | User: jbigsby
Filepath: K:\Projects\0029-NW Natural Gas Co\Portland Gas Manufacturing Site_Long Term Monitoring_Year 2 Addendum\0029-RP-0005 (Isopach-2021 vs 2022-Year 2).dwg Figure 2b

ANCHOR QEA

Figure 2b
2021 vs June 2022 Bathymetry Comparison
Long-Term Monitoring and Maintenance Plan, Year 2 Addendum
Former Portland Gas Manufacturing Site

SDU	Remedy
C1	Navigation Dredge, Armored GAC Cap
E	Hot Spot Dredge, Armored GAC Cap
A	Side-slope Dredge, GAC Cover
D	Debris Removal, GAC Cover
B2	Sand Cover (Enhanced MNR)
F1	Sand Cover (Enhanced MNR)
C3	Sand Cover (Enhanced MNR)
G	Dredge to Clean, Residuals Cover
H	No Contamination, Residuals Cover
B1	Monitored Natural Recovery (MNR)
F2	Monitored Natural Recovery (MNR)

Top of Seawall

Work Site Boundary

NW Naito Parkway

Former PGM Block 5 Site

WILLAMETTE RIVER

NOTE: Positive elevations represent deposition, and negative elevations represent erosion relative to the October 2020 post-construction surface.

Difference in Elevation Between Base Surface and Comparison Surface (Positive Values Indicate the Comparison Surface is a Higher Elevation)	
Vertical Difference in Feet	Color
-3.0 to -1.5	
-1.5 to -1.0	
-1.0 to -0.5	
-0.5 to 0.0	
0.0 to 0.5	
0.5 to 1.0	
1.0 to 1.5	
1.5 to 2.0	
2.0 to 2.5	
2.5 to 3.0	

Existing Features:

- City of Portland Sanitary Sewer Utility
- A — Sediment Decision Unit Areas
- Bollard Location and Number
- 2022 Bathymetric Contours (1' & 5' Intervals)
- Direct TZW/SW Sample Adjacent to Manhole Sampling Device (Amored GAC-Amended Cap)

Long-Term Monitoring Locations:

- Surface Sediment Grab Sample (MNR/EMNR Areas)
- Colocated Surface Sediment Grab Sample and TZW/SW Sample (GAC-Amended Cover)
- Colocated Surface Sediment Grab Sample and Porewater Sample (Armored, GAC-Amended Cap)
- As-Built: Permanent, Manhole-Type Porewater Sampling Device

0 60 Feet

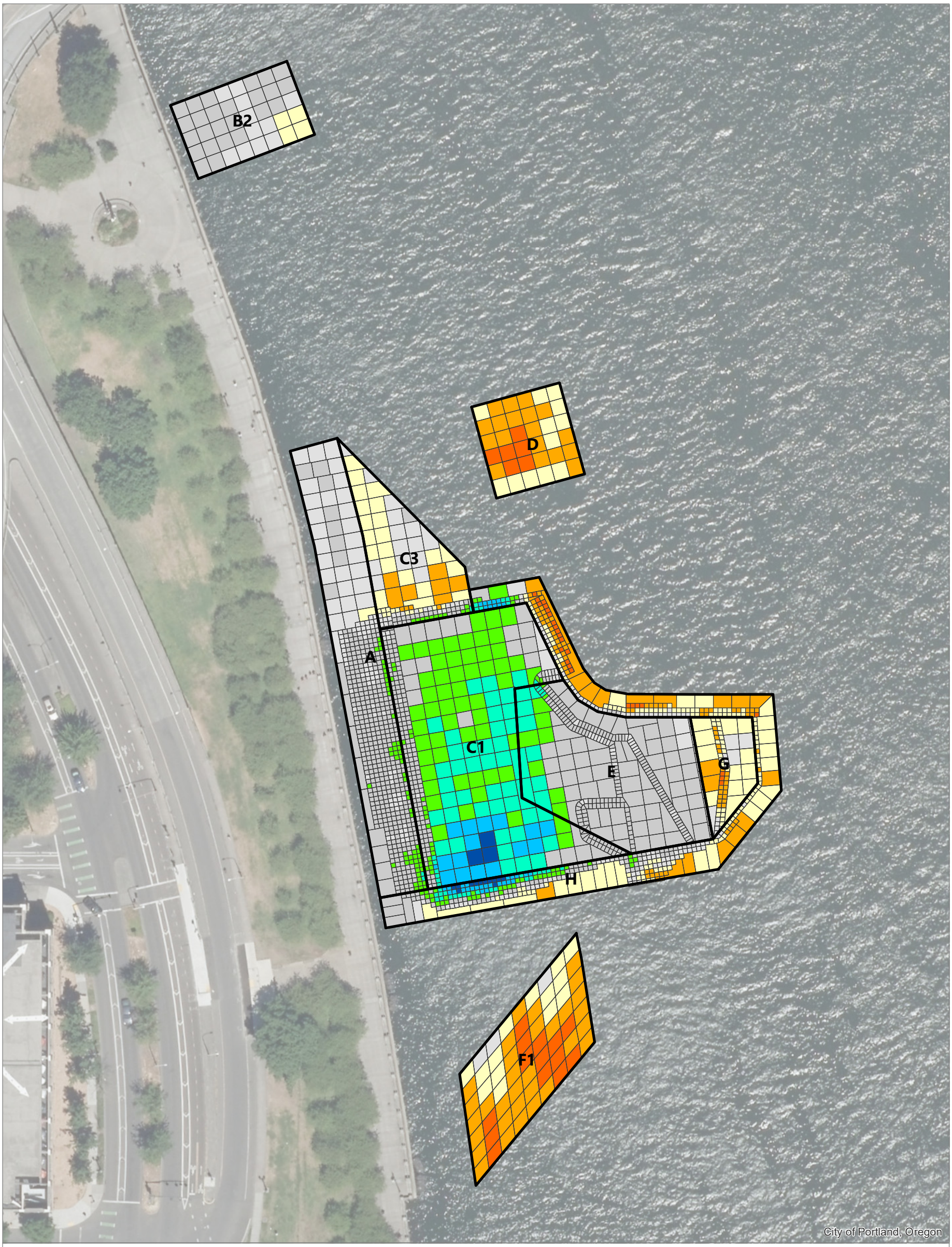
SOURCE: Year 0 hydrographic survey conducted by Meyer Hydrographic on October 15, 2020. Year 2 hydrographic survey conducted by eTrac on June 14, 2022. Aerial Photograph from Oregon Metro, dated October 25, 2017.
HORIZONTAL DATUM: Oregon State Plane North Zone NAD83, International Feet
VERTICAL DATUM: City of Portland (COP)

Publish Date: 2022/06/22 2:12 PM | User: jbigsby
Filepath: K:\Projects\0029-NW Natural Gas Co\Portland Gas Manufacturing Site_Long Term Monitoring_Year 2 Addendum\0029-RP-006 (Isopach-2020 vs 2022-Year 2).dwg Figure 2c

ANCHOR QEA

Figure 2c
2020 vs June 2022 Bathymetry Comparison

Long-Term Monitoring and Maintenance Plan, Year 2 Addendum
Former Portland Gas Manufacturing Site



Mean Elevation Difference in Feet[1]

- -1.9 to -1.5
- -1.4 to -1
- -0.9 to -0.5
- -0.4 to 0
- 0.1 to 0.5
- 0.6 to 1
- 1.1 to 1.5
- 1.6 to 2
- 2.1 to 2.4

NOTES:

1. Positive elevations represent deposition, and negative elevations represent erosion relative to the October 2020 post-construction surface.
2. Year 2 bathymetric survey data for June 14, 2022 provided by eTrac, Inc.
3. Vertical datum is City of Portland, International Feet.
4. Horizontal datum is NAD83 Oregon State Plane North, International Feet.
5. Aerial imagery provided by City of Portland, Oregon, and dated summer 2018.

0 80

Feet

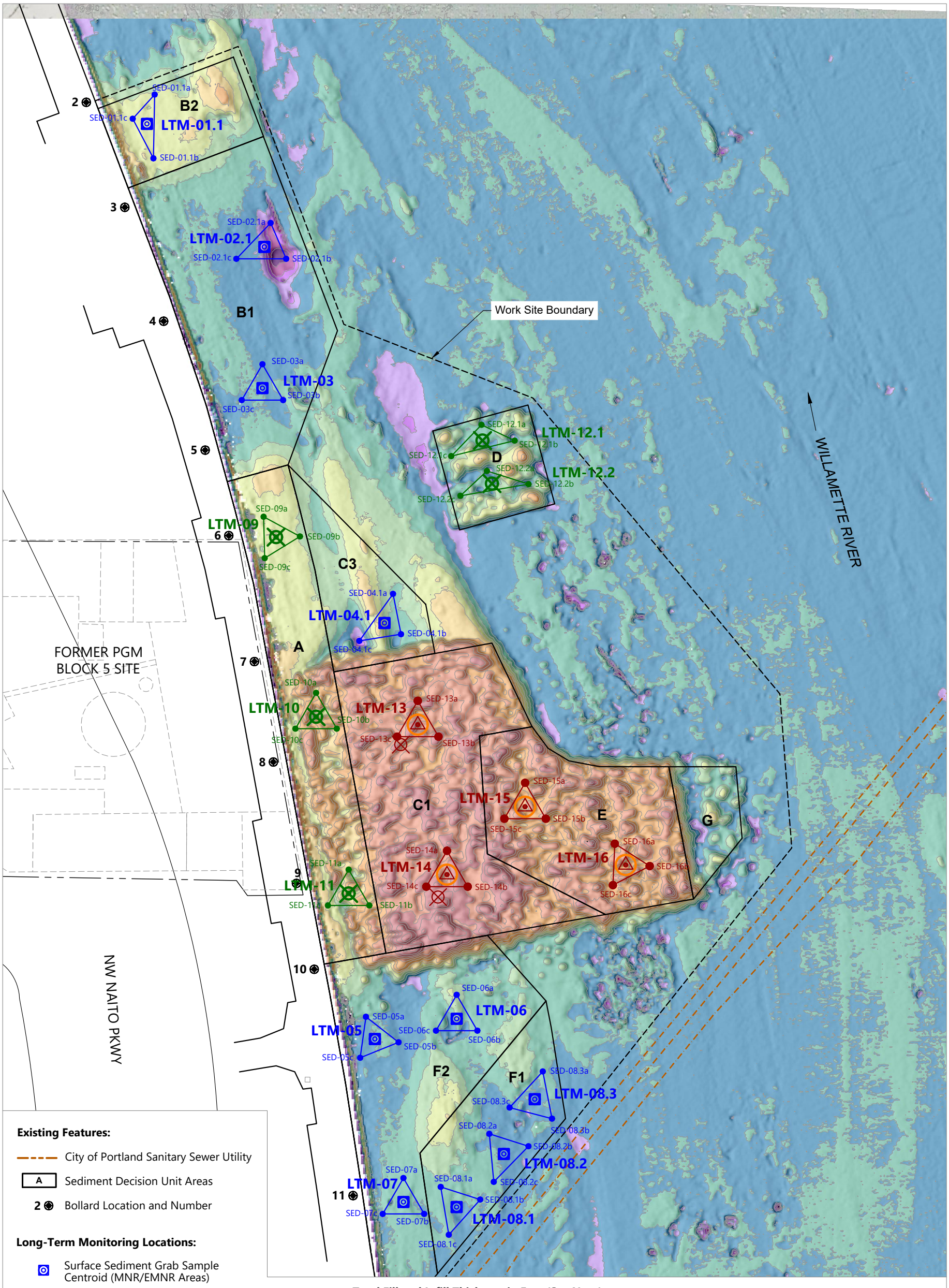
Publish Date: 2022/06/22, 1:14 PM | User: cgardner
Filepath: Q:\Jobs\NW_Natural_Gas_0029\Portland_Gas_Manufacturing\Maps\Reports\PostConstrMonitoring_Year02\2022_06\PGM_PCR_Yr2_vs_Yr0_BathyComparison_DeltaInFeet.mxd

ANCHOR QEA

Figure 3

2020 vs June 2022 Bathymetry Grid Comparison

Long-Term Monitoring and Maintenance Plan, Year 2 Addendum
Former Portland Gas Manufacturing Site



Existing Features:

- City of Portland Sanitary Sewer Utility
- A — Sediment Decision Unit Areas
- 2 — Bollard Location and Number

Long-Term Monitoring Locations:

- Surface Sediment Grab Sample Centroid (MNR/EMNR Areas)
- Colocated Surface Sediment Grab Sample and TZW/SW Sample (GAC-Amended Cover)
- Direct TZW/SW Sample Adjacent to Manhole Sampling Device (Amored GAC-Amended Cap)
- Colocated Surface Sediment Grab Sample and Porewater Sample (Armored, GAC-Amended Cap)
- As-Built: Permanent, Manhole-Type Porewater Sampling Device

Total Fill and Infill Thickness in Feet (See Note)

< -2 to -2	> 0.5 to 1
> -2 to -1.5	> 1 to 1.5
> -1.5 to -1	> 1.5 to 2
> -1 to -0.5	> 2 to 3
> -0.5 to 0	> 3 to 4
> 0 to 0.5	> 4

NOTE: Total thickness above the pre-cap elevation surface; this includes cap, cover, and armor material placed during the 2020 remediation (fill material) as well as any newly deposited sediment that has accumulated on top of the cap and cover material since remediation (infill material).

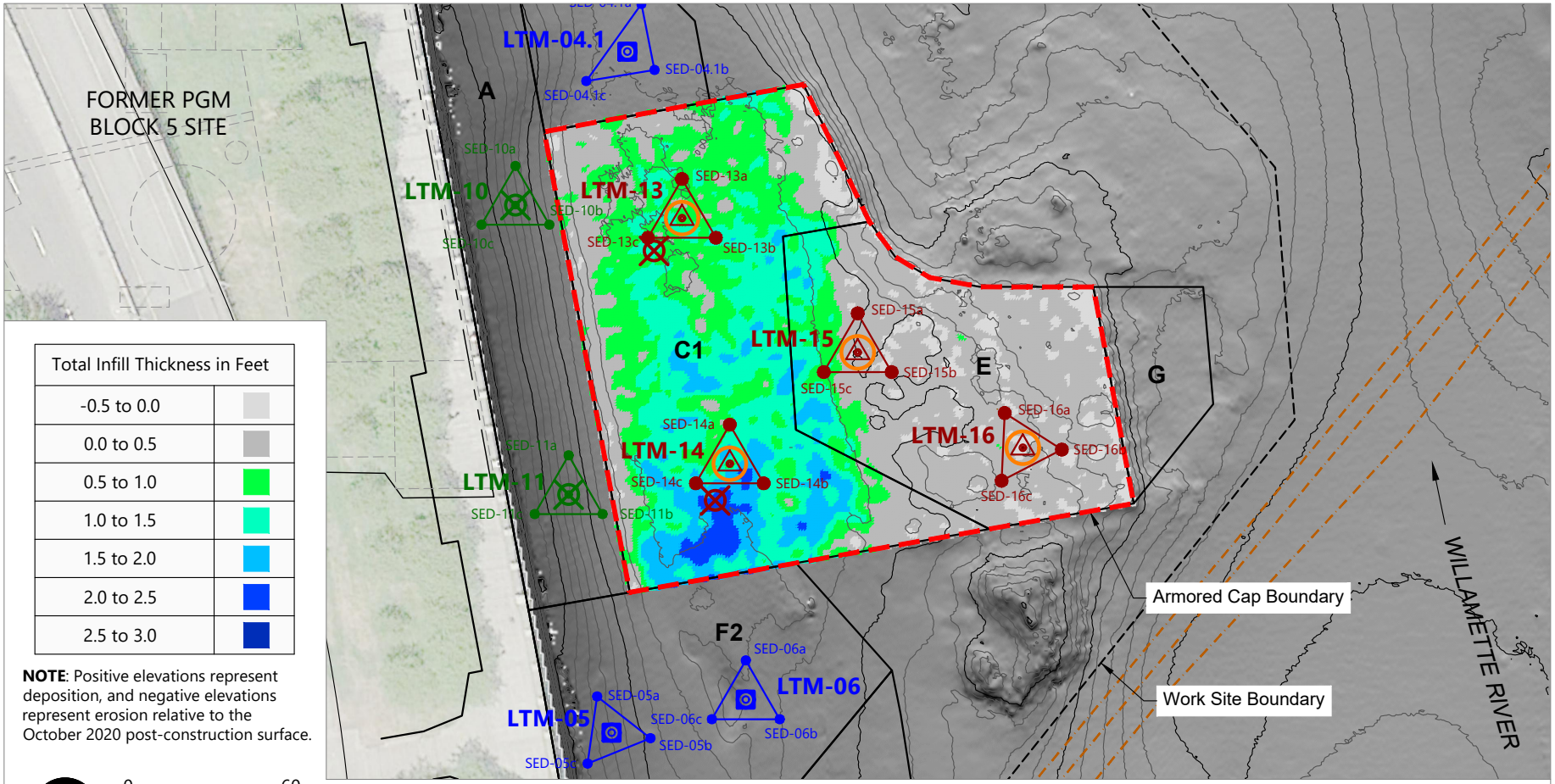
0 60
Feet

HORIZONTAL DATUM: Oregon State Plane North Zone NAD83, International Feet
VERTICAL DATUM: City of Portland (COP)

Publish Date: 2022/06/22 2:12 PM | User: jbigsby
Filepath: K:\Projects\0029-NW Natural Gas Co\Portland Gas Manufacturing Site_Long Term Monitoring_Year 2 Addendum\0029-RP-002 (Year 2 Cap, Cover, Infill Thickness).dwg Figure 4

ANCHOR QEA

Figure 4
June 2022 Cap, Cover, and Infill Thickness
Long-Term Monitoring and Maintenance Plan, Year 2 Addendum
Former Portland Gas Manufacturing Site



Total Infill Thickness in Feet	
-0.5 to 0.0	
0.0 to 0.5	
0.5 to 1.0	
1.0 to 1.5	
1.5 to 2.0	
2.0 to 2.5	
2.5 to 3.0	

NOTE: Positive elevations represent deposition, and negative elevations represent erosion relative to the October 2020 post-construction surface.

0 60
Feet

SOURCE: Year 0 hydrographic survey conducted by Meyer Hydrographic on October 15, 2020. Year 2 hydrographic survey conducted by eTrac on June 14, 2022. Aerial photograph from Oregon Metro, dated October 25, 2017.
HORIZONTAL DATUM: Oregon State Plane North Zone NAD83, International Feet
VERTICAL DATUM: City of Portland (COP)

Existing Features:

- City of Portland Sanitary Sewer Utility
- A — Sediment Decision Unit Areas
- 2022 Bathymetric Contours (1' & 5' Intervals)

Long-Term Monitoring Locations:

- Surface Sediment Grab Sample Centroid (MNR/EMNR Areas)
- Colocated Surface Sediment Grab Sample and TZW/SW Sample (GAC-Amended Cover)
- Direct TZW/SW Sample Adjacent to Manhole Sampling Device (Amored GAC-Amended Cap)
- Colocated Surface Sediment Grab Sample and Porewater Sample (Armored, GAC-Amended Cap)
- As-Built: Permanent, Manhole-Type Porewater Sampling Device

Publish Date: 2022/06/22 2:12 PM | User: jbigsby
Filepath: K:\Projects\0029-NW Natural Gas Co\Portland Gas Manufacturing Site_Long Term Monitoring_Year 2 Addendum\0029-RP-003 (Total Infill Thickness over Armored Cap Area).dwg Figure 5

ANCHOR QEA

Figure 5
June 2022 Total Infill Thickness Over Armored Cap Area
Long-Term Monitoring and Maintenance Plan, Year 2 Addendum
Former Portland Gas Manufacturing Site