TECHNICAL MEMORANDUM
CONTAMINATED RIVERBANK SOIL EXTENT
REMEDIAL DESIGN SERVICES, SWAN ISLAND BASIN PROJECT AREA
CERCLA DOCKET NO. 10-2021-001
PORTLAND HARBOR SUPERFUND SITE
PORTLAND, MULTNOMAH COUNTY, OREGON

1.0 INTRODUCTION

This Contaminated Riverbank Soil Extent Technical Memorandum presents the results of horizontal refinement of riverbank soil contamination within the Swan Island Basin (SIB) Project Area within the Portland Harbor Superfund Site in Portland, Multnomah County, Oregon. Bridgewater Group, Inc., Pacific Groundwater Group, Mott MacDonald, and HydroGeoLogic, Inc. (HGL) performed the work on behalf of the SIB Remedial Design (RD) Group based on the requirements of the Portland Harbor Superfund Site Record of Decision (ROD) (EPA, 2017) and the Administrative Settlement Agreement and Order on Consent (ASAOC) (EPA, 2021a). The work was performed in accordance with the final PDI Work Plan, which the U.S. Environmental Protection Agency (EPA) approved in May 2022 (HGL, 2022).

1.1 OBJECTIVES AND SCOPE

Riverbank characterization was conducted to fulfill three purposes: (1) address data gaps necessary to complete the source control sufficiency assessment; (2) determine the full extent of contamination exceeding the ROD cleanup levels (CULs), remedial action levels (RALs), and principal threat waste (PTW) thresholds; and (3) provide data necessary to support RD for remediation of contaminated riverbank soils (Appendix D of EPA, 2021b). The objective of this memorandum is to:

- Refine the lateral extent of contamination in relation to CULs, RALs, and PTW thresholds, and
- Estimate the total surface area of contaminated riverbank soil.

To accomplish the objective, the following technical analysis was performed:

- Horizontal interpolations of riverbank soil exceedances and thickness of exceedances.

1.2 PROJECT AREA BACKGROUND

The SIB Project Area is the active cleanup area designated in the ROD between approximately River Mile (RM) 8.1 and RM 9.2 on the northeast side of the Willamette River. The SIB Project Area is approximately 1.1 miles in length, 117 acres in size, and includes riverbanks from top of the bank to the river (Figure 1-1). The ROD defines riverbanks as areas from the top of bank (TOB) down to

mean low water (MLW).[1] However, the ROD does not provide a boundary for in-river sediments subject to inclusion in the Sediment Management Area footprint versus the riverbank footprint. Therefore, to avoid overlapping extents, for the purposes of this memorandum, the +13 feet (ft) North American Vertical Datum of 1988 (NAVD88) is applied as the lower limit of the riverbank and upper limit of in-river sediment, which is consistent with the EPA Remedial Investigation report, Figure 2.2-1 and Appendix A3, Table A3-5 which reads (EPA, 2016):

> *"An elevation of +13 ft NAVD88 (mean high water mark [MHWM]) is the elevation defining the shoreline boundary of the Portland Harbor Superfund site."*

For the purposes of this memorandum, the +13 ft NAVD88 contour is referred to as the lower limit and TOB as the upper limit of the riverbank interpolation area boundary.

2.0 EVALUATION OF RIVERBANK DATA

Appendix D of the *Remedial Design Guidelines and Considerations for the Portland Harbor Superfund Site* (RDGC) (EPA, 2021b) presents a flowchart (Figure 4) outlining the riverbank evaluation and sampling process for Portland Harbor Superfund Site. The flowchart outlines the site-specific riverbank sampling and evaluation process for SIB ROD riverbanks and ROD riverbanks pending characterization. The guidance requires the characterization of the entire lateral extent of contamination.

2.1 HISTORICAL DATA

The ROD (EPA, 2017) identified three sections of riverbank within the SIB Project Area as areas with known contamination. The locations of those riverbanks are shown on Figure 2-1. A description of each is below:

- One riverbank along the Project Fleet Owner LLC/Shipyard Commerce Center (SCC)[2] property on the Swan Island peninsula (1,487 lineal feet [ft] of bulkheads, a historical wooden retaining wall, and/or riprap below ordinary high water [OHW] and vegetated soil above OHW) (DEQ Environmental Cleanup Site Information [ECSI] 271);
- The riverbank along SCC's Dry Dock Basin and Ballast Water Treatment Plant on the end of the Swan Island peninsula (224 lineal ft of engineered bank consisting of riprap below OHW and vegetated soil above OHW); and
- One 911-ft-long riverbank, armored with riprap below OHW and vegetated soil above OHW, along the U.S. Navy and Marine Reserve Center (ECSI 5109) in the Mocks Bottom portion of the SIB Upland Area.

Two non-ROD riverbanks were identified by HGL based on ROD CUL exceedances in soil during previous investigations: a 713-ft-long unarmored sand riverbank at the head of SIB, and a 587-ft-

[1] MLW datum, per *Guidance for River Bank Characterizations and Evaluations at the Portland Harbor Superfund Site* (EPA, 2019) is 7.28 ft NAVD88.
[2] Formerly Port of Portland Shipyard and Swan Island Upland Facility for the Oregon Department of Environmental Quality Remedial Investigation and source control evaluations performed between 2000 and 2016.

long armored bank along the Port of Portland's N. Lagoon Avenue property adjacent to SIB (Figure 2-1).

Characterization data was available for only three shoreline properties in the SIB Upland Area: The City of Portland property with a public boat ramp at the head of SIB and two former operable units (OU1 and OU3) of the former Portland Shipyard Swan Island Upland Facility (SIUF). Detected concentrations of metals, polychlorinated biphenyl (PCBs), and polycyclic hydrocarbons (PAHs) exceeded the ROD CULs at SIUF OU1 at the current SCC property, and PCBs exceeded the RAL and PTW threshold. In addition, CULs were exceeded in samples collected at SIUF OU3 at the Port of Portland's N. Lagoon Avenue property and the City of Portland's property at the head of SIB. Because the lateral extents of the exceedances were not defined and not all ROD contaminants of concern (COCs) were analyzed, additional characterization was performed as part of the riverbank characterization effort. The more recent data collected as part of the PDI are used in this evaluation.

2.2 PRE-DESIGN INVESTIGATION DATA

Figure 2-2 shows the locations of surface and subsurface riverbank samples collected as part of the PDI in 2022 (HGL, 2023). HGL collected and analyzed 276 surface samples and 123 deeper samples from 3 depth intervals (0-1, 1-2 and 2-3 ft), at 3 elevations (TOB, OHW, and MLW) along the riverbank at 119 transects. Samples were collected to 2 ft from at least 1 elevation at 49 transects (95 samples). Samples were collected to 3 ft from at least 1 elevation at 19 transects (28 samples). Samples from only 56 transects were collected at depths greater than the surface interval due to extensive armoring and other confining features in the subsurface. As a result, bounding the vertical extent of contamination across the entire riverbank was not possible using hand sampling methods.

Contamination is defined by exceedances of (1) the CULs for ROD Table 17 COCs and (2) the RALs, practical quantitation limits (PQLs), and PTW thresholds for ROD Table 21 COCs. A list of Table 17 and Table 21 COCs and applicable threshold concentrations are presented in Table 2-1. For the purposes of this memorandum, the CUL/RAL/PQL/PTW thresholds are referred to collectively as threshold criteria. Figures 2-3 through 2-5 show the extent of threshold criteria exceedances in surface and subsurface soil.

3.0 METHODS

The Natural Neighbor interpolation method was used to refine the horizontal extent of riverbank soil contamination. EPA used this interpolation method in the Feasibility Study, Proposed Plan, and ROD and continues to recommend this interpolation approach in the RDGC (EPA, 2022). The Natural Neighbor method calculates the value of each unknown point based on the surrounding measured values. The contributions of these surrounding measured values are weighted based on the area overlap between the interpolated point's Thiessen polygon versus the Thiessen polygons of the original dataset of measured values.

Natural Neighbor does not predict values outside of the range of measured values, it does not predict values outside of the convex hull of the measured values, and it does not consider anisotropy or other statistical measures. Therefore, Natural Neighbor is straightforward, deterministic, nonparametric, widely used, and it is suitable for many distributions of input data.

3.1 SURFACE SOIL HORIZONTAL EXTENT

The surface soil horizontal extent of contamination is calculated using ESRI's ArcGIS Pro 3.1. and the Natural Neighbor interpolation function of the Spatial Analyst extension. Riverbank surface soil (0-1 ft interval) sample results were used as the input dataset. The COC concentrations were interpolated separately, and then combined for an interpolation for each of the threshold criteria (CUL, RAL/PQL, and PTW thresholds).

The horizontal extent interpolation process included the following steps:

1. Generated an input riverbank dataset that included all surface soil sample results from the 2022 PDI riverbank sampling, including non-detections[3] (HGL, 2023).
2. Along the riverbank areas with collected data, created points placed 100 ft upland from the TOB contour, which were assigned values of '0'. Because the Natural Neighbor interpolation method does not predict values outside of the domain of input points, these added upland points serve to extend interpolated COC concentrations to cover all elevations along sampled riverbank areas.
3. Interpolated each riverbank soil/sediment COC from ROD Table 17 and ROD Table 21 in surface soil. Interpolations were performed on a 10 by 10 ft grid using Natural Neighbor.
4. Interpolated results were classified based on whether the interpolated concentrations exceeded or did not exceed the threshold criteria for the interpolated COC.
5. For each criterion (CUL, RAL, and PTW), created a combined interpolation result for all COCs. This produced three combined COC interpolation results.
6. Within each combined interpolation result, grid cells were classified as exceeding when one or more COC had an interpolated concentration exceeding their threshold criteria at that location. For grid cells where all interpolated COC concentrations for a given criteria did not exceed their thresholds, the combined interpolation result was classified as non-exceeding.
7. Clipped the combined interpolation results to between the TOB contour and the +13 ft NAVD88 contour boundaries. While the results for samples collected at MLW were included in the interpolations, final interpolation extents did not include the MLW data collected from elevations below +13 ft NAVD88. The MLW data collected from elevations below +13 ft NAVD88 are included in the in-water sediment interpolations. The lateral portions of the SIB shoreline without surface soil input data were also clipped out of the final results.[4]

The surface soil extent of contamination includes the top 1 ft of riverbank soil with measured and predicted chemical concentrations exceeding threshold criteria.

[3] Data summation and reduction rules were followed for non-detections in accordance with the Program Data Management Plan (EPA, 2021b)
[4] This step applies to the sheet pile wall area in SCC's drydock basin and Berth 301.

3.2 SUBSURFACE SOIL HORIZONTAL EXTENT

The subsurface soil horizontal extent of contamination is evaluated using the COC exceedance interpolations for the 1-2 ft and 2-3 ft interval depths of riverbank soil sample data. Although not all locations have sample results at all depths, the relative interpolated extent of soil exceedances provides a measure of changes in chemical concentrations with increasing soil depth. The COC concentrations were interpolated separately, and then combined for an interpolation for each of the threshold criteria (CUL, RAL/PQL, and PTW thresholds).

The subsurface soil horizontal extent interpolation process included the following steps:

1. Generated an input riverbank dataset that included all subsurface depth interval soil sample results from the 2022 PDI riverbank sampling (HGL, 2023).
2. Along the riverbank areas with collected data, created points placed 100 ft upland from the TOB contour which were assigned values of '0'. Because the Natural Neighbor interpolation method does not predict values outside of the domain of input points, these added upland points serve to extend interpolated COC concentrations to cover all elevations along sampled riverbank areas.
3. Interpolated each riverbank soil/sediment COC from ROD Table 17 and ROD Table 21 for each depth interval in subsurface soil. Interpolations were performed on a 10 by 10 ft grid using Natural Neighbor.
4. Interpolated results were classified based on whether the interpolated concentrations exceeded or did not exceed the threshold criteria for the interpolated COC.
5. For each criterion (CUL, RAL, and PTW) and depth interval (1-2 ft and 2-3 ft), created a combined interpolation result for all COCs. This produced six combined COC interpolation results.
6. Within each combined interpolation result, grid cells were classified as exceeding when one or more COCs had an interpolated concentration exceeding their threshold criteria at that location. For grid cells where all interpolated COC concentrations for a given criteria did not exceed their thresholds, the combined interpolation result was classified as non-exceeding.
7. Clipped the combined interpolation results to between the TOB contour and the +13 ft NAVD88 contour boundaries. While the results for samples collected at MLW were included in the interpolations, final interpolation extents did not include the MLW data collected from elevations below +13 ft NAVD88. The MLW data collected from elevations below +13 ft NAVD88 are included in the in-water sediment interpolations. The lateral portions of the SIB shoreline without subsurface soil data were also clipped out of the final results.[5]

[5] No samples were collected between 1-2 ft bgs in most areas of the riverbank along the Swan Island side of the basin and adjacent to the Shipyard Commerce Center drydock basin due to extensive armoring and the presence of sheet pile. No samples were collected between 2-3 ft bgs in most riverbank areas on both sides of the basin due to extensive armoring and the presence of sheet pile.

The subsurface soil extent of contamination includes riverbank soil from 1 to 3 ft below ground surface (bgs) with measured and predicted chemical concentrations exceeding threshold criteria.

3.3 ESTIMATED SURFACE AREA OF THRESHOLD CRITERIA EXCEEDANCES

The surface area of the riverbank and threshold criteria exceedances were estimated for the +13 ft NAVD88 to TOB polygon using ArcGIS Pro 3.1 and the Natural Neighbor interpolation method. Each riverbank soil depth interval has a different extent of available data, decreasing with increasing depth. A polygon was created for each depth interval, representing riverbank soil areas in the vicinity of sample data at each given depth. Subsurface samples do not exist at some areas of the riverbank which makes subsurface interpolation incomplete. For the purposes of calculating threshold criteria exceedance areas and 2-dimensional (2D) surface areas, only grid cells with their centroid inside these polygons were included in the calculations. The estimated threshold criteria exceedance areas do not precisely match the total 2D area of the riverbank because of the extra areas added and subtracted around the edge of the polygons (where portions of a grid cell are included or excluded from the area calculations based on the location of its centroid in respect to the original polygon). Based on the availability of data, the total 2D area of the riverbank between 0 and 1 ft bgs was estimated to be 650,000 square ft (sq ft), 477,000 sq ft between 1 and 2 ft bgs, and 296,000 sq ft between 2 and 3 ft bgs.

4.0 INTERPOLATION RESULTS

This section summarizes the results for the horizontal interpolation of threshold criteria exceedances in riverbank soil and associated areas based on data availability.

4.1 SURFACE SOIL HORIZONTAL EXTENT AND SURFACE AREA OF THRESHOLD CRITERIA CONTAMINATION

The interpolation procedures described in Section 3.1 were used to produce three interpolations for the surface riverbank soil (Figures 4-1 through 4-3). Interpolations for individual Table 21 COCs are included in Attachment A. The following summarizes the estimated horizontal extent and surface area of threshold criteria exceedances in the riverbank's surface soil.

4.1.1 Cleanup Level Exceedances

Figure 4-1 shows CUL exceedances in the 0-1 ft interval; CUL exceedances were widespread and estimated to include 650,000 sq ft of the riverbank's surface between 0 and 1 ft bgs that was sampled (100 percent).

4.1.2 Remedial Action Level Exceedances

Figure 4-2 shows RAL exceedances in the 0-1 ft interval; RAL exceedances were less widespread than CUL exceedances and estimated to include 420,000 sq ft of the riverbank's surface between 0 and 1 ft bgs that was sampled (65 percent).

4.1.3 Principal Threat Waste Threshold Exceedances

Figure 4-3 shows PTW threshold exceedances in the 0-1 ft interval; PTW threshold exceedances were less widespread than CUL and RAL exceedances and estimated to include 131,000 sq ft of the riverbank's surface between 0 and 1 ft bgs that was sampled (20 percent).

4.2 SUBSURFACE SOIL HORIZONTAL EXTENT OF CONTAMINATION AND SURFACE AREA OF THRESHOLD CRITERIA CONTAMINATION

The interpolation procedures described in Section 3.2 were used to produce three interpolations for the subsurface riverbank soil (Figures 4-4 through 4-9). Interpolations for individual Table 21 COCs are included in Attachment A. The following summarizes the estimated horizontal extent and surface area of threshold criteria exceedances in the riverbank's subsurface soil, based on the limited available dataset.

4.2.1 Cleanup Level Exceedances

Figure 4-4 shows CUL exceedances in the 1-2 ft interval; similar to the 0-1 ft interval, CUL exceedances were widespread and estimated to include 477,000 sq ft of the riverbank's surface between 1 and 2 ft bgs (100 percent), including the percentage of areas with sample results and not the percentage of the entire riverbank. Figure 4-5 shows CUL exceedances in the 2-3 ft interval; CUL exceedances were less widespread, based on data availability, and estimated to include 296,000 sq ft of the riverbank between 2 and 3 ft bgs (100 percent).

4.2.2 Remedial Action Level Exceedances

Figure 4-6 shows RAL exceedances in the 1-2 ft interval; RAL exceedances were less extensive and estimated to include 153,000 sq ft of the riverbank's surface between 1 and 2 ft bgs (32 percent), based on data availability and extent and not the percentage of the entire riverbank. Figure 4-7 shows RAL exceedances in the 2-3 ft interval; RAL exceedances were limited to 3 areas of the riverbank, based on data availability, and estimated to include 78,000 sq ft of the riverbank between 2 and 3 ft bgs (26 percent).

4.2.3 Principal Threat Waste Threshold Exceedances

Figure 4-8 shows PTW threshold exceedances in the 1-2 ft interval; PTW threshold exceedances were limited to 3 areas and estimated to include 13,000 sq ft of the riverbank's surface between 1 and 2 ft bgs (3 percent), based on data availability and extent and not the percentage of the entire riverbank. No PTW threshold exceedances were interpolated in the 2-3 ft interval based on data availability (Figure 4-9).

5.0 REFERENCES

HydroGeoLogic, Inc. (HGL), 2022. *Pre-Design Investigation Work Plan, Revision 3,* CERCLA Docket No. 10-2021-001. Prepared for the Swan Island Remedial Design Group, Overland Park, Kansas. May.

HGL, 2024. *Riverbank Characterization Data Report, Revision 1*, Remedial Design Services Swan Island Basin Project Area CERCLA Docket No. 10-2021-001. April.

U. S. Environmental Protection Agency (EPA), 2016. *Final Remedial Investigation Report*, Portland Harbor RI/FS, U.S. Environmental Protection Agency Region 10, Seattle, WA. February 8.

EPA, 2017. *Record of Decision*, Portland Harbor Superfund Site, Portland Oregon. United States Environmental Protection Agency Region 10, Seattle, Washington. January.

EPA, 2020. *Errata #2 for Portland Harbor Superfund Site Record of Decision ROD Table 17*. Memorandum from Sean Sheldrake to Portland Harbor Site File. January 14.

EPA, 2021a. *Administrative Settlement Agreement and Order on Consent for Remedial Design*. Swan Island Basin Project Area, CERCLA Docket No. 10-2021-001 - 7, Region 10. January 20.

EPA, 2021b. *Remedial Design Guidelines and Considerations*, Portland Harbor Superfund Site. Portland, Oregon. April 23.

EPA, 2022. *Remedial Design Guidelines and Considerations, Appendix B, Section 12*, Portland Harbor Superfund Site. Portland, Oregon. April 15.

Table

List of Figures

Attachment

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TABLE

Table 2-1
CUL, RAL, PQL, and PTW Threshold Criteria
Contaminated Riverbank Soil Extent; Swan Island Basin Project Area,
Portland, Oregon

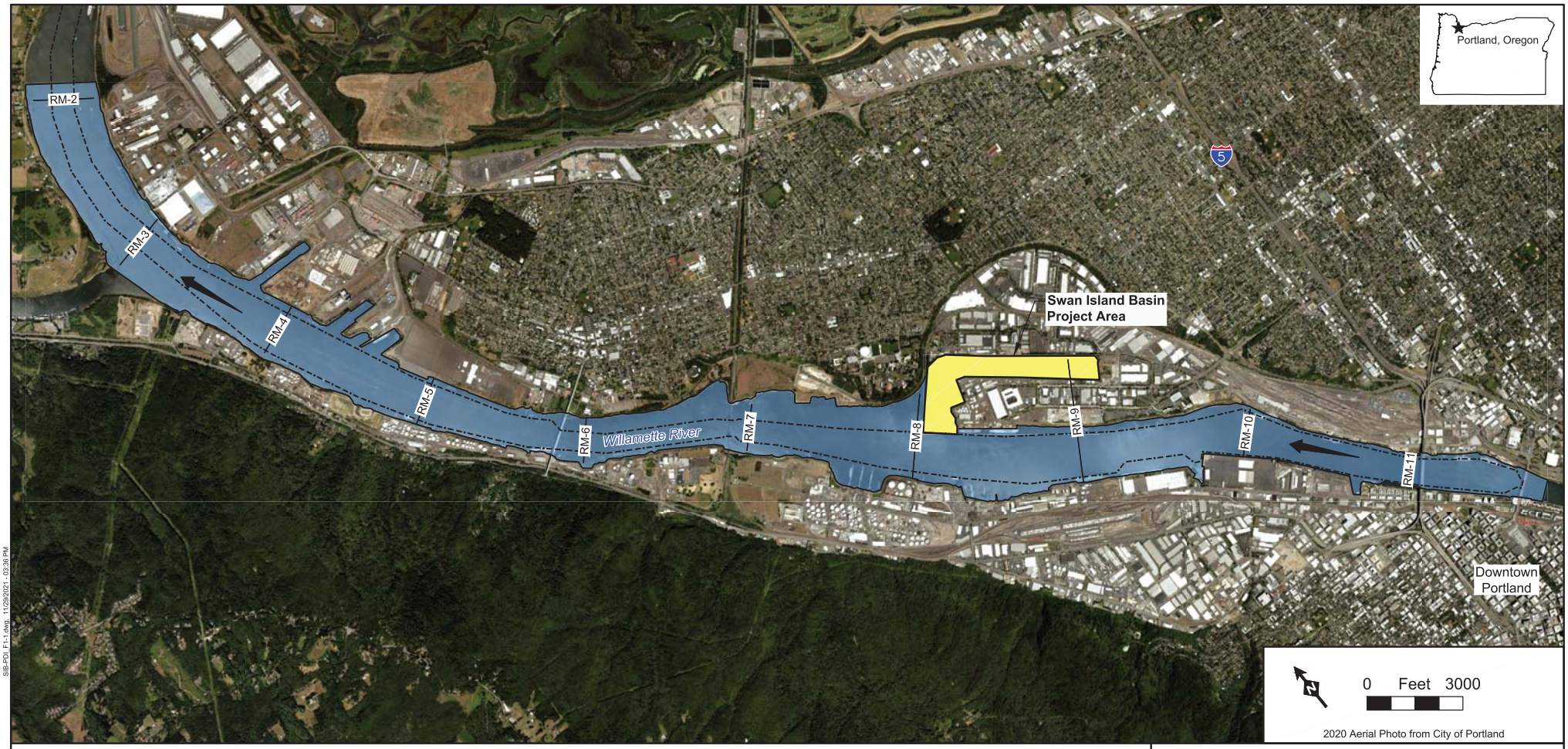
Contaminant of Concern	Threshold Type	Threshold Value
Aldrin	CUL	2 µg/kg
Arsenic	CUL	3 mg/kg
Bis(2-ethylhexyl)phthalate	CUL	135 µg/kg
Cadmium	CUL	0.51 mg/kg
Chlordanes	CUL	1.4 µg/kg
Copper	CUL	359 mg/kg
DDx	CUL/RAL	6.1 µg/kg/ 160 µg/kg
DDD	CUL	114 µg/kg
DDE	CUL	50 µg/kg
DDT	CUL	246 µg/kg
Dieldrin	CUL	0.07 µg/kg
Lindane	CUL	5 µg/kg
Lead	CUL	196 mg/kg
Mercury	CUL	0.085 mg/kg
Total PCBs	CUL/RAL/PTW	9 µg/kg /75 µg/kg /200 µg/kg
Total PAHs	CUL/RAL	23,000 µg/kg 30,000 µg/kg
2,3,7,8-TCDD	PQL	1 pg/g
1,2,3,7,8-PeCDD	PQL	2.5 pg/g
2,3,4,7,8-PeCDF	CUL/RAL	0.0002 µg/kg / 0.2 µg/kg
2,3,7,8-TCDF	CUL/PTW	0.00040658 µg/kg/ 0.6 µg/kg
1,2,3,4,7,8-HxCDF	CUL/PTW	0.0004 µg/kg/ 0.4 µg/kg
Total cPAHs	CUL/PTW	774 µg/kg 774,000 µg/kg
TPH-Diesel	CUL	91 mg/kg
Tributyltin	CUL	3080 µg/kg
Zinc	CUL	459 mg/kg
Naphthalene	PTW	140,000 µg/kg

Acronyms:
µg/kg = microgram per kilogram
mg/kg = milligrams per kilogram
pg/g = picogram per gram
cPAH = carcinogenic polycyclic aromatic hydrocarbon
CUL = cleanup level
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
DDx = DDD + DDE + DDT
HxCDF = 1,2,3,4,7,8-hexachlorodibenzofuran
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
PCDD = polychlorinated dibenzodioxins
PCDF = polychlorinated dibenzofurans
PeCDD = 1,2,3,7,8-pentachlorodibenzo-p-dioxin
PeCDF = 2,3,4,7,8-pentachlorodibenzofuran
PTW = principal threat waste
PQL = Practical Quantitation Limit
RAL = remedial action level
TCDD = 2,3,7,8-tetrachlorodibenzo-p-dioxin
TCDF = 2,3,7,8-tetrachlorodibenzofuran
TPH = total petroleum hydrocarbon

Footnotes:
a) CUL values sourced from *Errata #2 for Portland Harbor Superfund Site Record of Decision ROD Table 17*, dated January 14, 2020. RAL and PTW values are sourced from *Errata #3 for Portland Harbor Superfund Site Record of Decision, Table 6 and Table 21*, dated September 7, 2022.

b) PQL values are used for threshold criteria rather than the RAL for 2,3,7,8-TCDD and 1,2,3,7,8-PeCDD from *Evaluation of consistently and reliably attained practical quantitation limits for 2,3,7,8-TCDD and 1,2,3,7,8-PeCDD for use in Sediment Management Area delineation at the Portland Harbor Superfund Site*, dated September 7, 2022.

FIGURES



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- Federal Navigation Channel (NOAA, 2016)
- River Flow Direction
- Swan Island Basin Project Area
- Portland Harbor Superfund Site Boundary (River Mile 1.9 to 11.8)

Notes:
NOAA - National Oceanic and Atmospheric Administration
RM - River Mile
SIB - Swan Island Basin

Source:
NOAA, 2016. Booklet Chart, Willamette River – Swan Island Basin, NOAA Chart 18527 at URL: https://www.charts.noaa.gov/BookletChart/18527_BookletChart.pdf - Navigation Channel

Figure 1-1
SIB Project Area Location Map

Prepared on: 10/1/2023

Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
HGL
MOTT MACDONALD
BRIDGEWATER GROUP

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U.S. Navy and Marine Reserve Center
The Marine Salvage Consortium Inc.
Port of Portland Dredge Base
ATC Leasing Co
Current Swan Island Dock Company
N BASIN AVE
U.S. Coast Guard Marine Safety Unit
U.S. Navy Pier
Marine Consortium Dock
Port of Portland Dredge Base
Berth 311
Swan Island Boat Ramp
City of Portland
U.S. Coast Guard Dock
U.S. Coast Guard Pier
Swan Island Basin
Berth 302
Berth 303
Berth 304
Berth 305
Berth 306
Berth 307
Berth 308
Wind Tunnel
Anchor Park LLC
Lagoon Wharf
Berth 301
Pier A
Dry Dock 5
Quay Wall
Freightliner
Port of Portland
N DOLPHIN ST
N COMMERCE ST
N CHANNEL AVE
Berth 309
Dry Dock 3
Shipyard Commerce Center
Berth 310
Pier C
SCC Floating Docks
Dry Dock Basin
East Pier
West Pier
Vigorous Dry Dock
Demo Pier
Berth 313
Willamette Wharf
Berth 314
Pier D
Berth 312
Willamette River
0 Feet 400
2021 Aerial Photo from City of Portland

- Project Area Grid
- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot Boundary

2010 City of Portland Sample Location
- Surface Soil Transect Composite
- Surface Soil Transect

2011 Port of Portland Swan Island Upland Facility Sample Location
- SIUF OU1
- SIUF OU3 (estimated)
- Properties with Known Contaminated Riverbanks (EPA, 2017)
- Previous Riverbank Investigation Area Exceeding Cleanup Levels (ODEQ ECSI)

M Project Area Grid Label

River Flow Direction

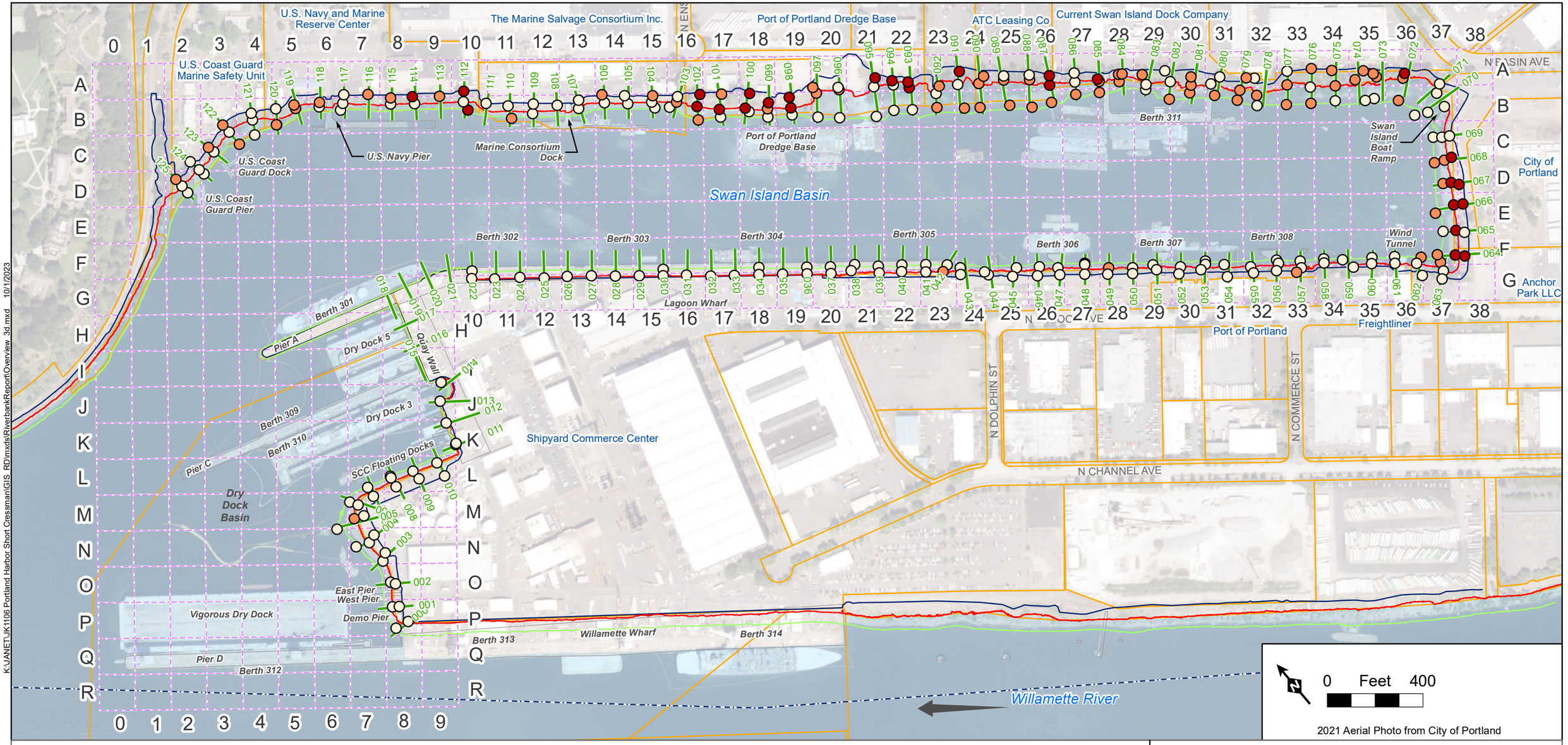
Notes:
ECSI - Environmental Cleanup Site Information database
EPA - U.S. Environmental Protection Agency
ODEQ - Oregon Department of Environmental Quality
OU - Operable Unit
SCC – Shipyard Commerce Center
SIUF - Swan Island Upland Facility
USACE – U.S. Army Corps of Engineers

Figure 2-1

Historical Riverbank Sample Locations and Exceedances

Prepared on: 11/7/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
HGL MOTT MACDONALD
BRIDGEWATER GROUP



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- Project Area Grid
- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot Boundary
- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)
- Shoreline Inspection Transects
- River Bank Sample Locations
- Sample Depths (feet)
  - 0-1
  - 0-2
  - 0-3
- M Project Area Grid Label
- River Flow Direction

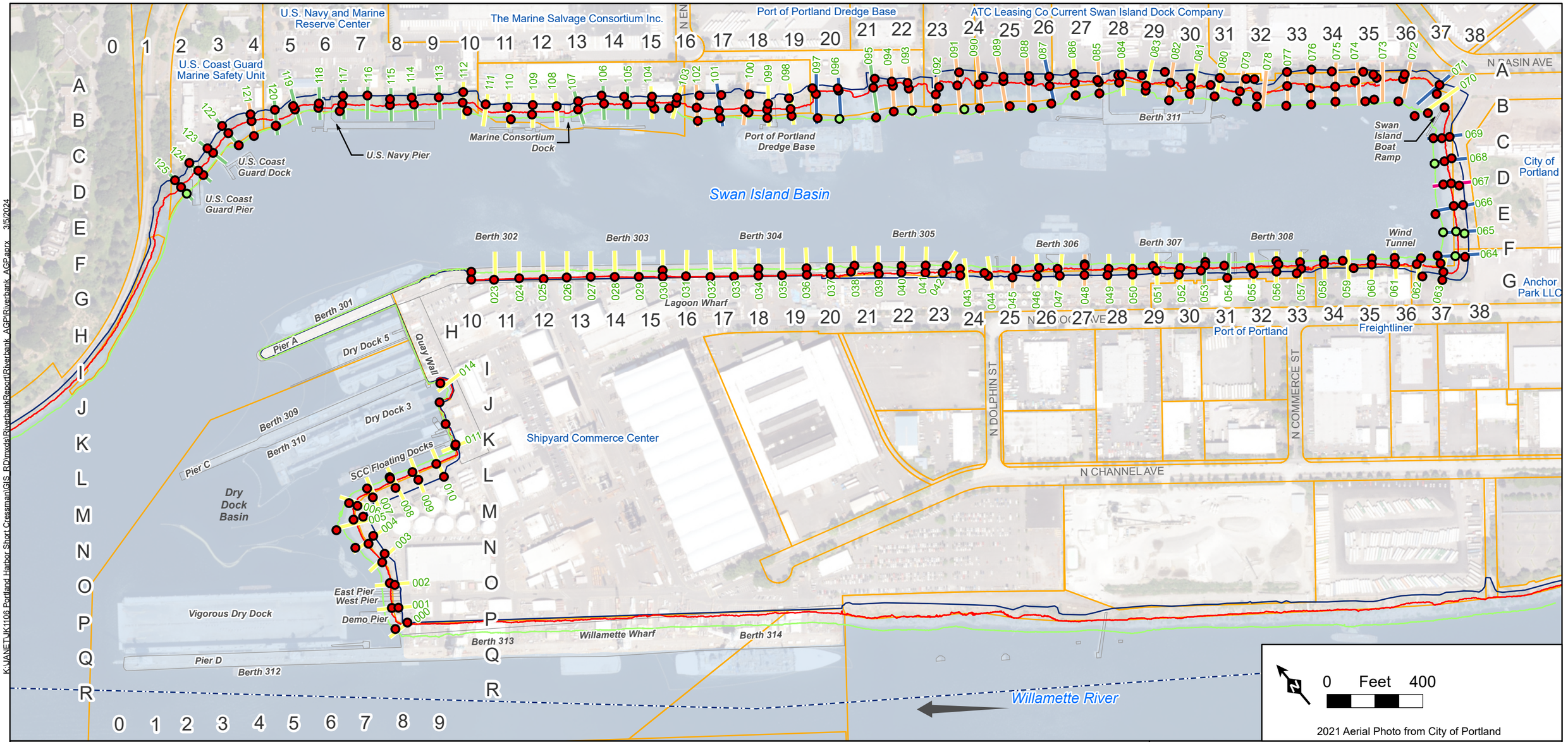
Notes:
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

Figure 2-2

Riverbank Sample Locations and Intervals

Prepared on: 11/7/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
HGL
MOTT MACDONALD
BRIDGEWATER GROUP



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- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot Boundary
- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)

Bank Erosion Hazard Index (BEHI) Rating

- Extreme
- Very High
- High
- Moderate
- Low

Riverbank Sample Location

- At least one ROD COC Above CUL
- No ROD COCs Above CUL

M Project Area Grid Label

River Flow Direction

Notes:
COC – Contaminants of Concern
CUL – Cleanup Level
ROD – Record of Decision
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

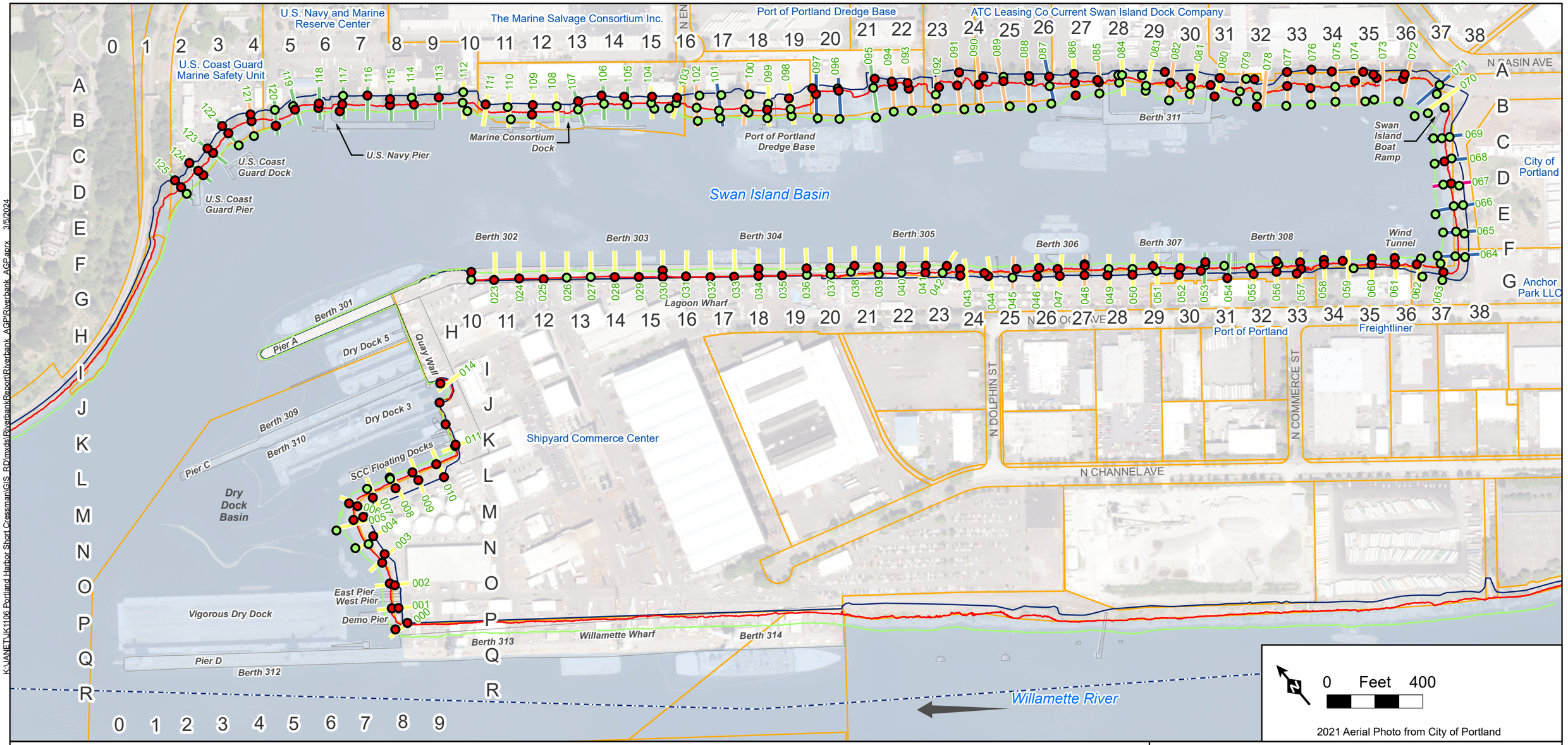
Sample Summary/Depth			
Depth/ Elevation	0-1 feet	1-2 feet	2-3 feet
TOB	90	40	17
OHW	111	31	10
MLW	75	24	1
Total (399)	276	95	28

Figure 2-3

Riverbank Soil Sample CUL Exceedances

Prepared on: 3/5/2024
Riverbank Characterization Data Report
Swan Island Basin

PACIFIC groundwater GROUP
HGL MOTT MACDONALD
BRIDGEWATER GROUP



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- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot Boundary
- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)

Bank Erosion Hazard Index (BEHI) Rating

- Extreme
- Very High
- High
- Moderate
- Low

Riverbank Sample Location

- At least one ROD COC Above RAL
- No ROD COCs Above RAL

M Project Area Grid Label

River Flow Direction

Notes:
COC – Contaminants of Concern
RAL – Remedial Action Level
ROD – Record of Decision
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

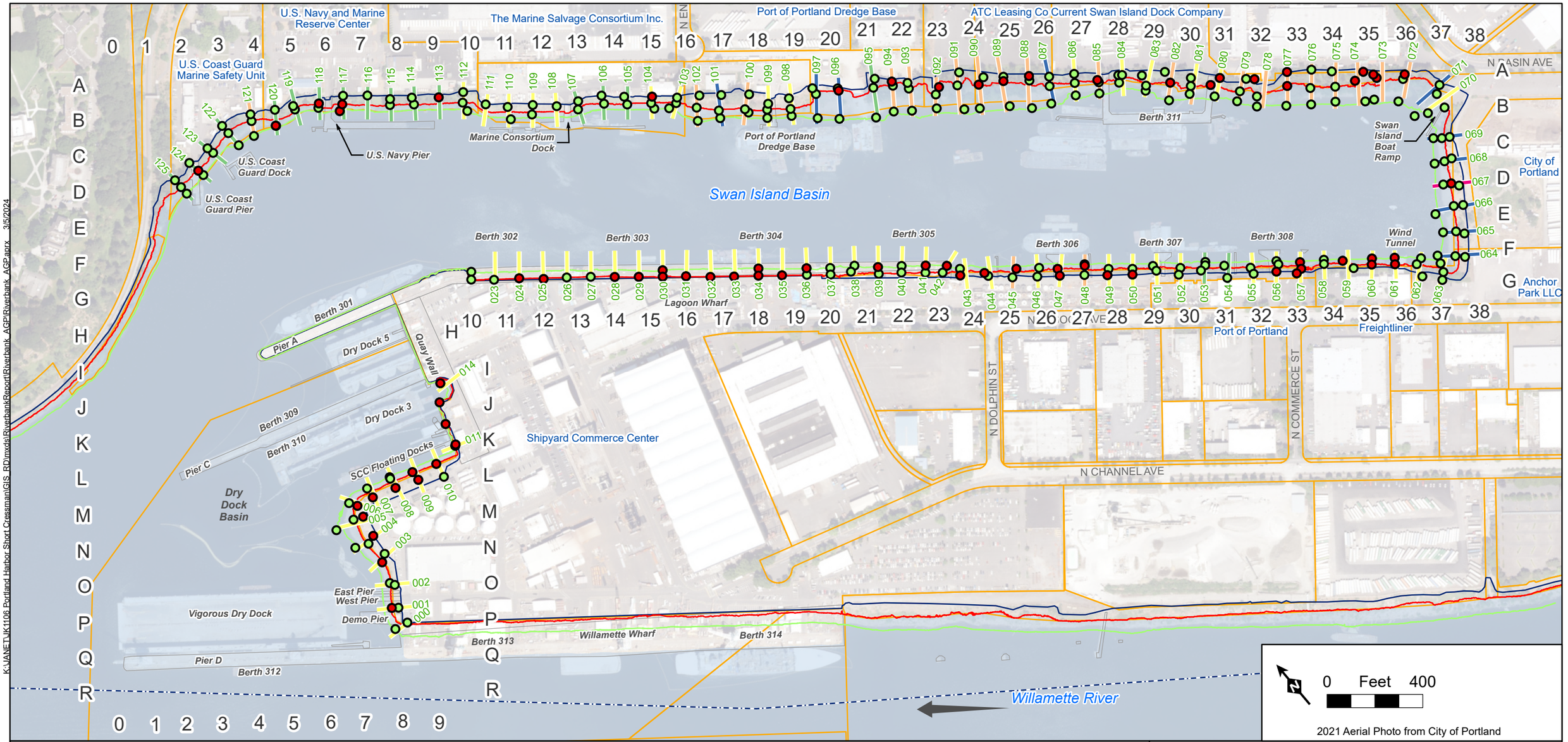
Sample Summary/Depth			
Depth/ Elevation	0-1 feet	1-2 feet	2-3 feet
TOB	90	40	17
OHW	111	31	10
MLW	75	24	1
Total (399)	276	95	28

Figure 2-4

Riverbank Soil Sample RAL Exceedances

Prepared on: 3/5/2024
Riverbank Characterization Data Report
Swan Island Basin

PACIFIC groundwater GROUP
HGL MOTT MACDONALD
BRIDGEWATER GROUP



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Federal Navigation Channel (USACE, 2020)
Docks and Structures
Tax Lot Boundary
Top of Bank (TOB)
Ordinary High Water (OHW)
Mean Low Water (MLW)

Bank Erosion Hazard Index (BEHI) Rating
- Extreme
- Very High
- High
- Moderate
- Low

Riverbank Sample Location
- At least one ROD COC Above PTW
- No ROD COCs Above PTW

M Project Area Grid Label

River Flow Direction

Notes:
COC – Contaminants of Concern
PTW – Cleanup Level
ROD – Principal threat waste
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

Sample Summary/Depth			
Depth/ Elevation	0-1 feet	1-2 feet	2-3 feet
TOB	90	40	17
OHW	111	31	10
MLW	75	24	1
Total (399)	276	95	28

Figure 2-5

Riverbank Soil Sample PTW Exceedances

Prepared on: 3/5/2024
Riverbank Characterization Data Report
Swan Island Basin

PACIFIC groundwater GROUP
HGL MOTT MACDONALD
BRIDGEWATER GROUP

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U.S. Navy and Marine Reserve Center
The Marine Salvage Consortium Inc.
Port of Portland Dredge Base
ATC Leasing Co
Current Swan Island Dock Company
N BASIN AVE
U.S. Coast Guard Marine Safety Unit
Marine Consortium Dock
Port of Portland Dredge Base
Berth 311
Swan Island Boat Ramp
City of Portland
U.S. Navy Pier
U.S. Coast Guard Dock
U.S. Coast Guard Pier
Swan Island Basin
Berth 302
Berth 303
Berth 304
Berth 305
Berth 306
Berth 307
Berth 308
Wind Tunnel
Anchor Park LLC
Lagoon Wharf
Port of Portland
Freightliner
Berth 301
Pier A
Dry Dock 5
Quay Wall
N DOLPHIN ST
N COMMERCE ST
Berth 309
Dry Dock 3
Berth 310
Pier C
SCC Floating Docks
Shipyard Commerce Center
N CHANNEL AVE
Dry Dock Basin
East Pier
West Pier
Demo Pier
Vigorous Dry Dock
Berth 313
Willamette Wharf
Berth 314
Pier D
Berth 312
Willamette River
0 Feet 400
2021 Aerial Photo from City of Portland

- Tax Lot Boundary
- Docks and Structures
- Federal Navigation Channel (USACE, 2020)
- Top of Bank (TOB)
- Mean Low Water (MLW)
- Ordinary High Water (OHW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Extent of Riverbank Soil Interpolation (0 to 1 feet)

- Below CUL
- Above CUL

M Project Area Grid Label

River Flow Direction

Notes:
CUL – Cleanup Level
NAVD88 – North American Vertical Datum of 1988
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

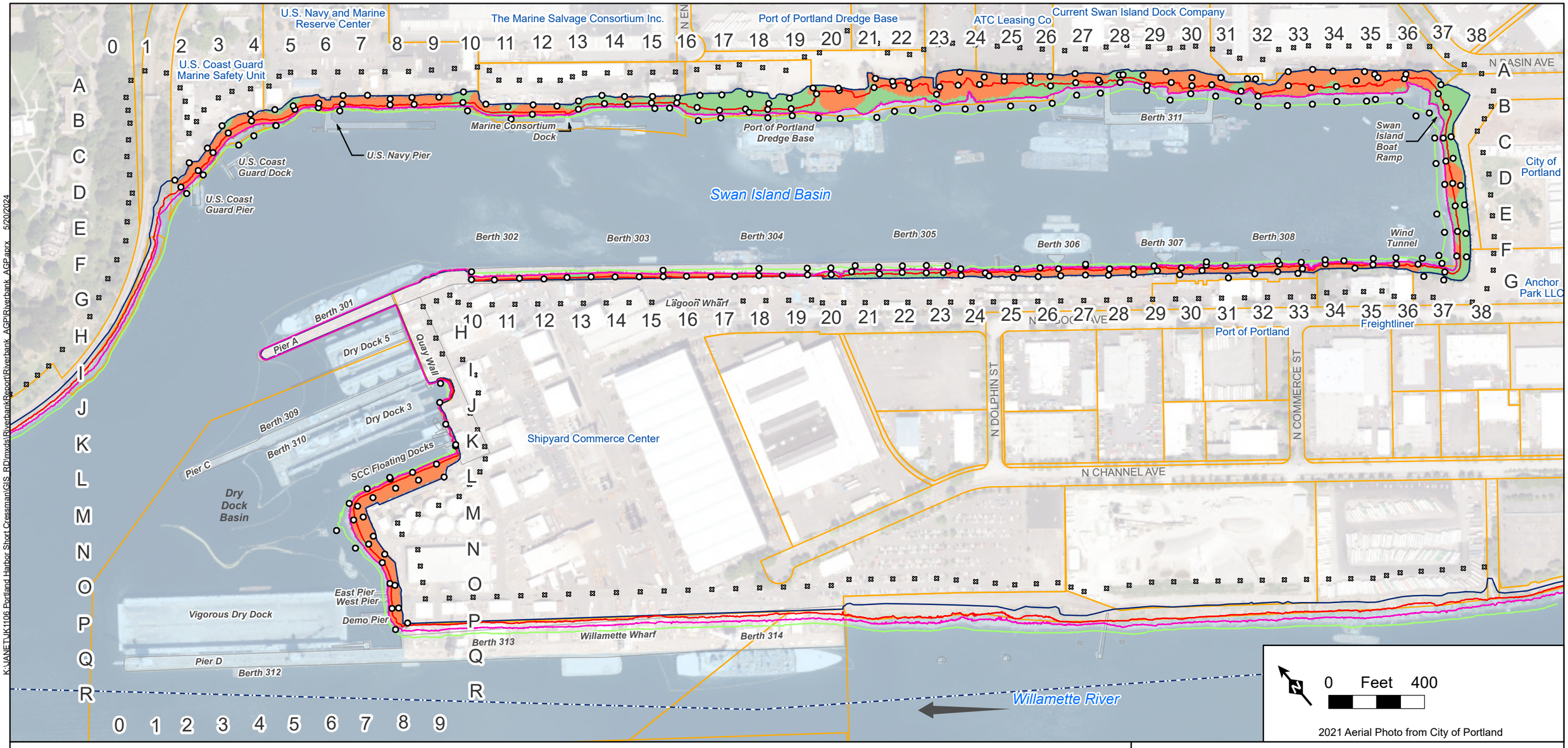
Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Non-detected analytical results were interpolated using the detection limit value. As a result, the interpolation is a conservative estimate of exceedances

Figure 4-1

Horizontal Extent of Surface Riverbank Soil CUL Exceedances (0-1 feet below ground surface)

Prepared on: 5/20/2024
Contaminated Riverbank Soil Extent
Swan Island Basin



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- Tax Lot Boundary
- Docks and Structures
- Federal Navigation Channel (USACE, 2020)
- Top of Bank (TOB)
- Mean Low Water (MLW)
- Ordinary High Water (OHW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Extent of Riverbank Soil Interpolation (0 to 1 feet)

- Below RAL/PQL
- Above RAL/PQL

M Project Area Grid Label

River Flow Direction

Notes:
NAVD88 – North American Vertical Datum of 1988
PQL – Practical Quantitation Limit
RAL – Remedial Action Level
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Portland Lidar, 2019
OHW and MLW Source – EPA, 2019

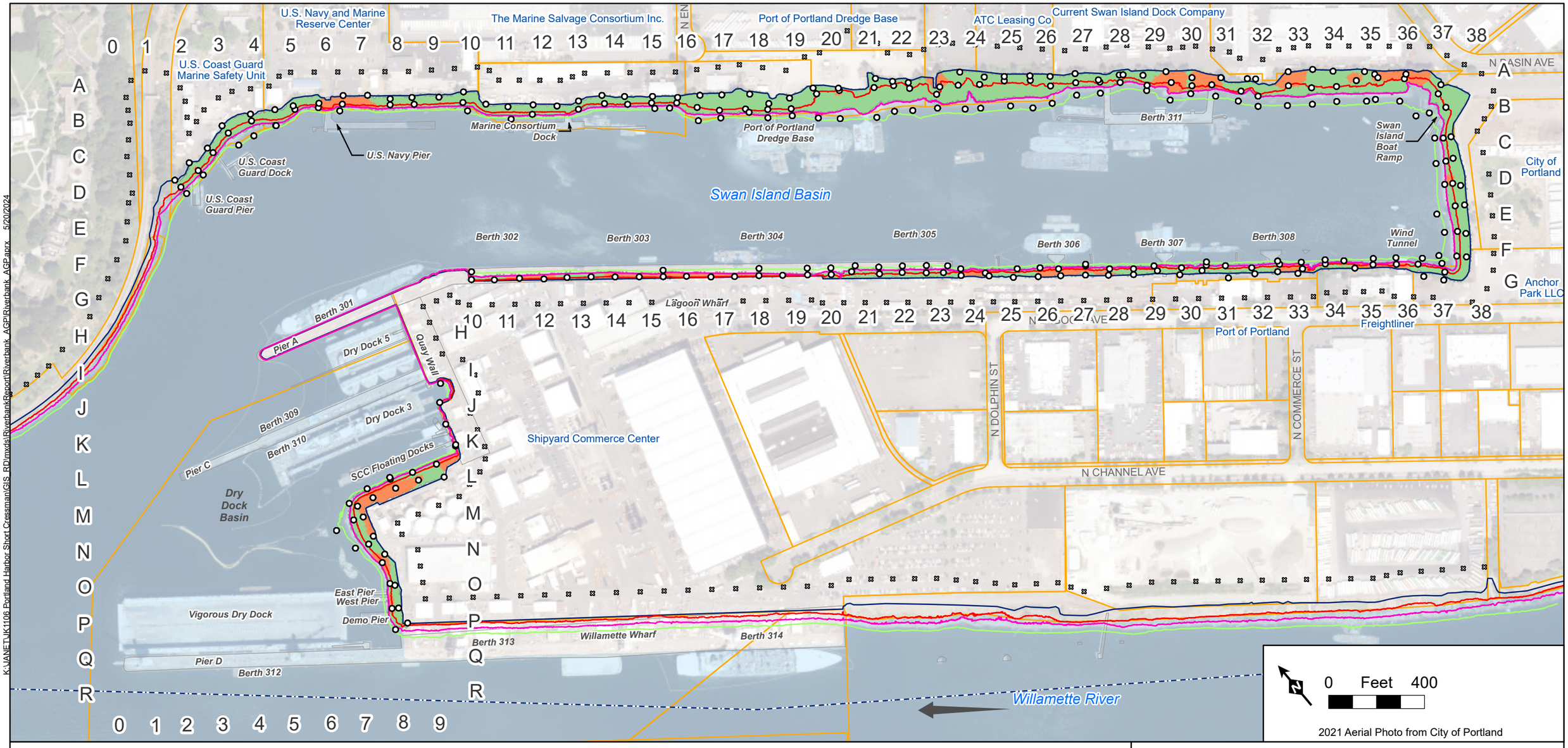
Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Non-detected analytical results were interpolated using the detection limit value. As a result, the interpolation is a conservative estimate of exceedances

Figure 4-2

Horizontal Extent of Surface Riverbank Soil RAL/PQL Exceedances (0-1 feet below ground surface)

Prepared on: 5/20/2024
Contaminated Riverbank Soil Extent
Swan Island Basin



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- Tax Lot Boundary
- Docks and Structures
- Federal Navigation Channel (USACE, 2020)
- Top of Bank (TOB)
- Mean Low Water (MLW)
- Ordinary High Water (OHW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Extent of Riverbank Soil Interpolation (0 to 1 feet)

- Below PTW
- Above PTW

M Project Area Grid Label

River Flow Direction

Notes:
NAVD88 – North American Vertical Datum of 1988
PTW – Principal threat waste
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

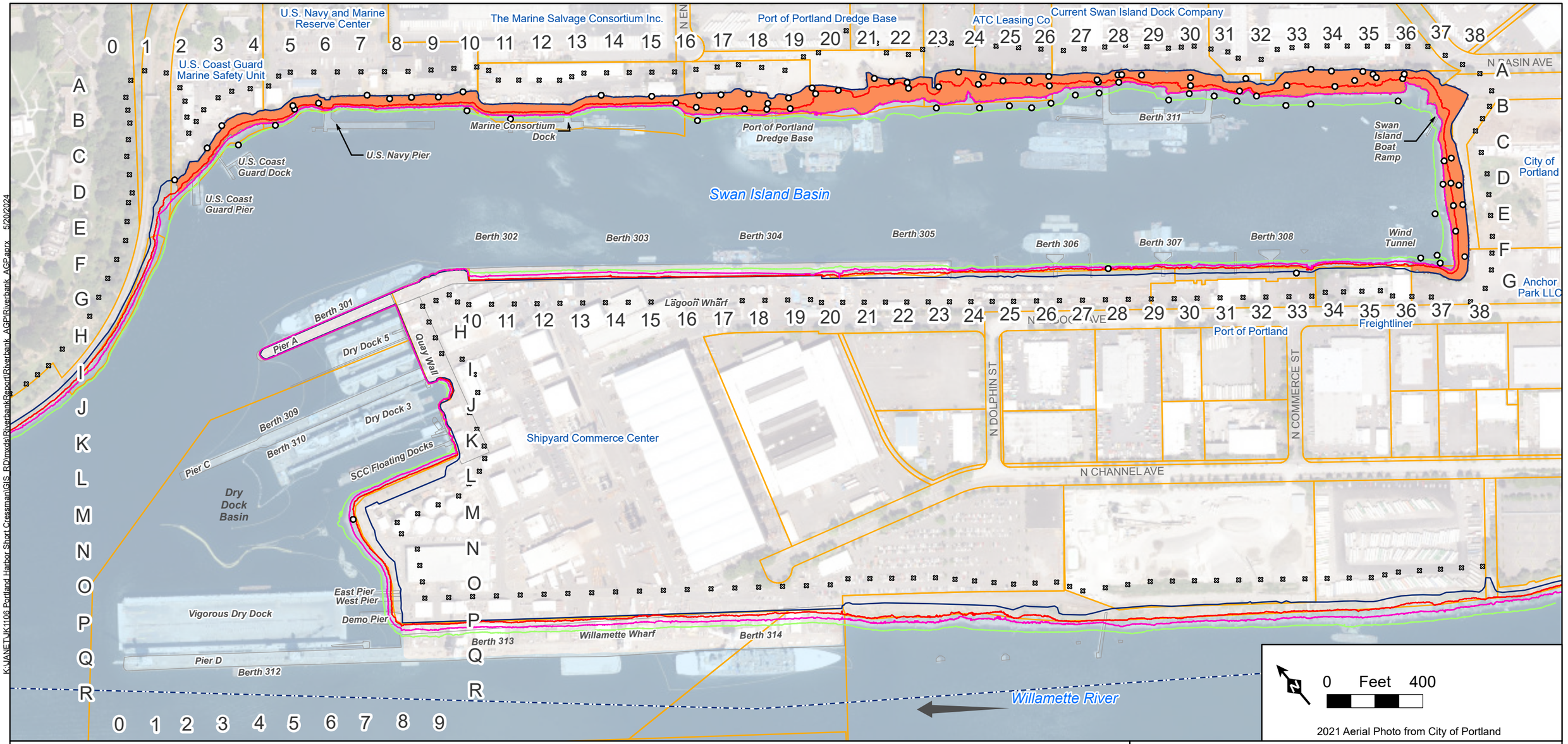
Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Non-detected analytical results were interpolated using the detection limit value. As a result, the interpolation is a conservative estimate of exceedances

Figure 4-3

Horizontal Extent of Surface Riverbank Soil PTW Exceedances (0-1 feet below ground surface)

Prepared on: 5/20/2024
Contaminated Riverbank Soil Extent
Swan Island Basin



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- Tax Lot Boundary
- Docks and Structures
- Federal Navigation Channel (USACE, 2020)
- Top of Bank (TOB)
- Mean Low Water (MLW)
- Ordinary High Water (OHW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Extent of Riverbank Soil Interpolation (1 to 2 feet)

- Below CUL
- Above CUL

M Project Area Grid Label

River Flow Direction

Notes:
CUL – Cleanup Level
NAVD88 – North American Vertical Datum of 1988
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

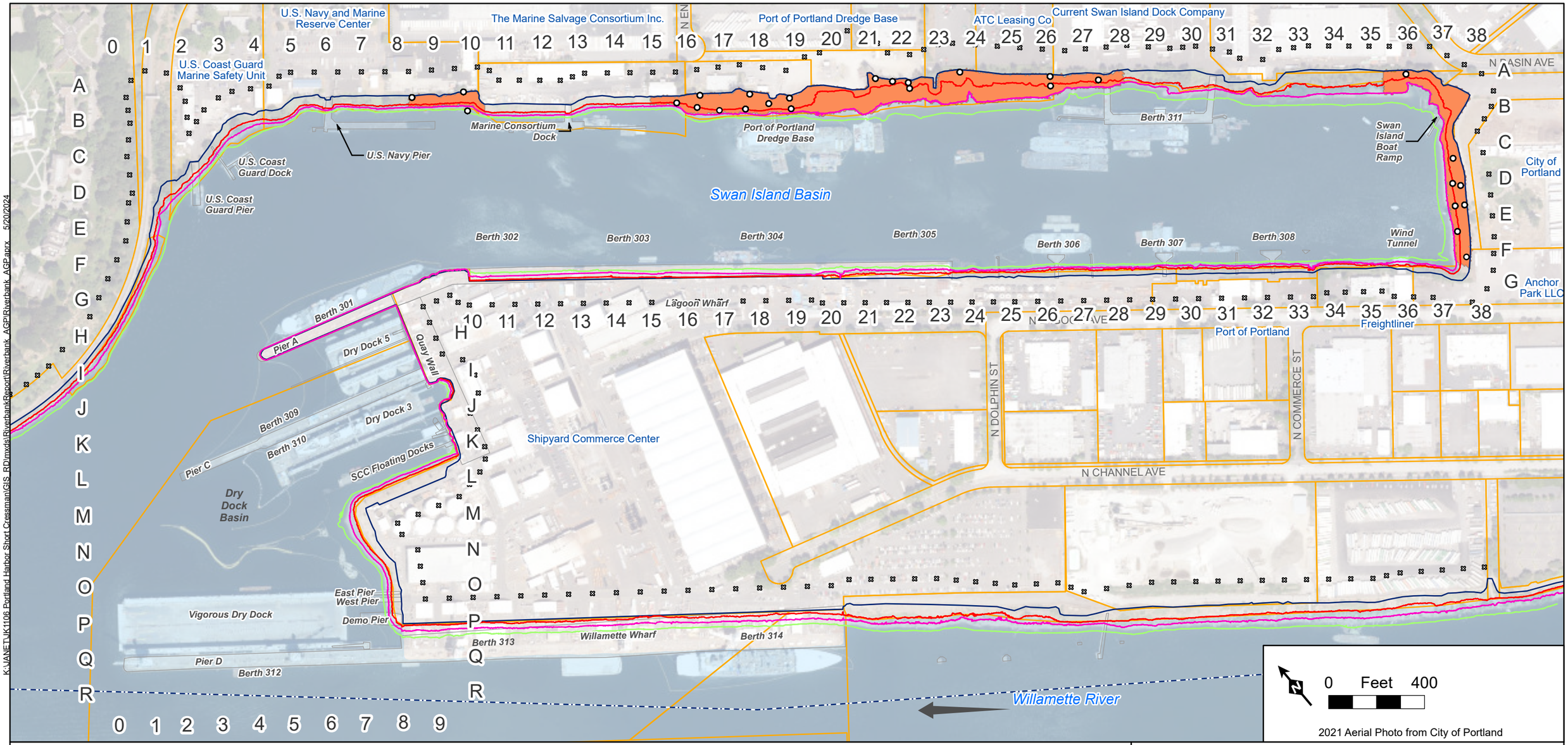
Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Non-detected analytical results were interpolated using the detection limit value. As a result, the interpolation is a conservative estimate of exceedances

Figure 4-4

Horizontal Extent of Subsurface Riverbank Soil CUL Exceedances (1-2 feet below ground surface)

Prepared on: 5/20/2024
Contaminated Riverbank Soil Extent
Swan Island Basin



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- Tax Lot Boundary
- Docks and Structures
- Federal Navigation Channel (USACE, 2020)
- Top of Bank (TOB)
- Mean Low Water (MLW)
- Ordinary High Water (OHW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Extent of Riverbank Soil Interpolation (2 to 3 feet)

- Below CUL
- Above CUL

M Project Area Grid Label

River Flow Direction

Notes:
CUL – Cleanup Level
NAVD88 – North American Vertical Datum of 1988
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

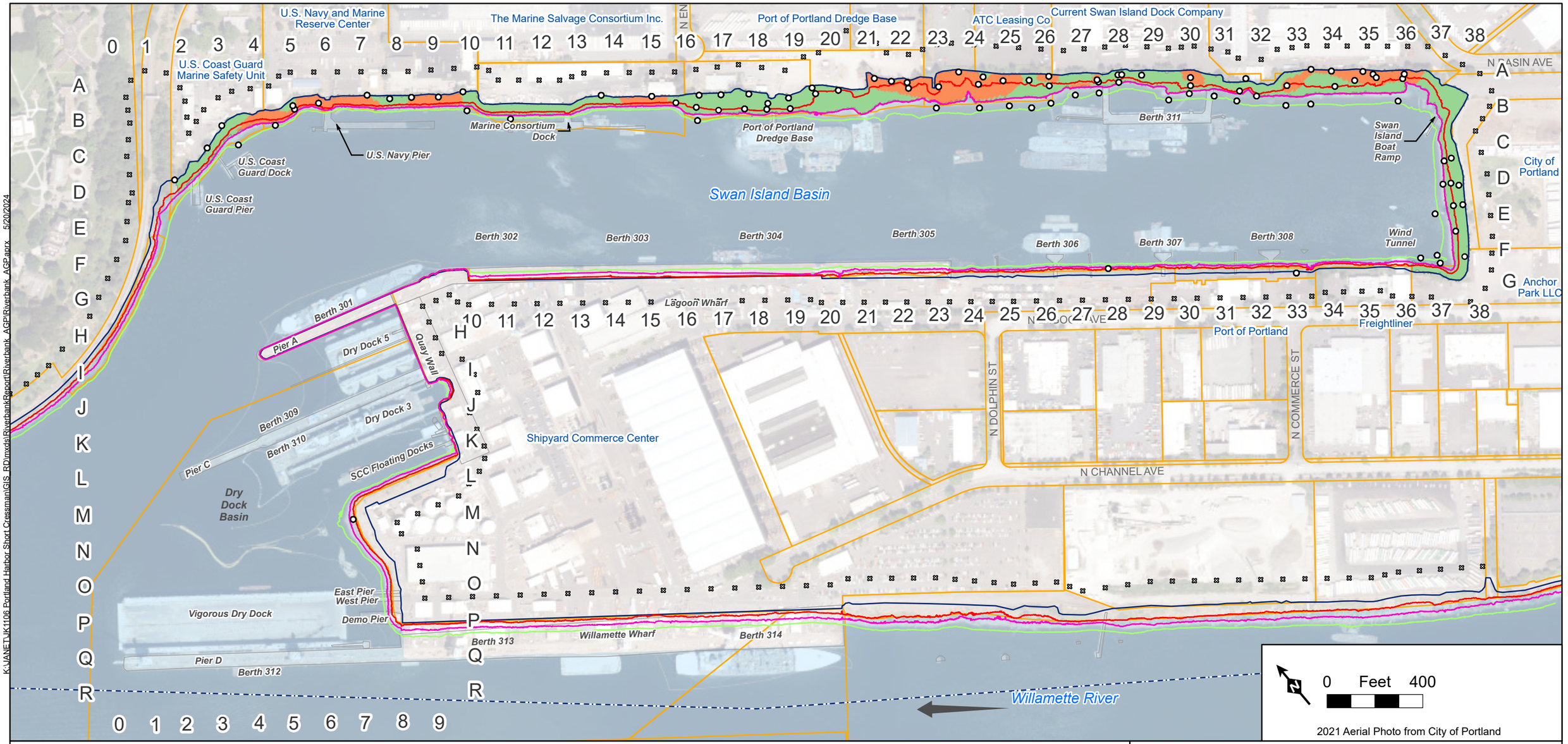
Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Non-detected analytical results were interpolated using the detection limit value. As a result, the interpolation is a conservative estimate of exceedances

Figure 4-5

Horizontal Extent of Subsurface Riverbank Soil CUL Exceedances (2-3 feet below ground surface)

Prepared on: 5/20/2024
Contaminated Riverbank Soil Extent
Swan Island Basin



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- Tax Lot Boundary
- Docks and Structures
- Federal Navigation Channel (USACE, 2020)
- Top of Bank (TOB)
- Mean Low Water (MLW)
- Ordinary High Water (OHW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Extent of Riverbank Soil Interpolation (1 to 2 feet)

- Below RAL/PQL
- Above RAL/PQL

M Project Area Grid Label

River Flow Direction

Notes:
NAVD88 – North American Vertical Datum of 1988
PQL – Practical Quantitation Limit
RAL – Remedial Action Level
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Portland Lidar, 2019
OHW and MLW Source – EPA, 2019

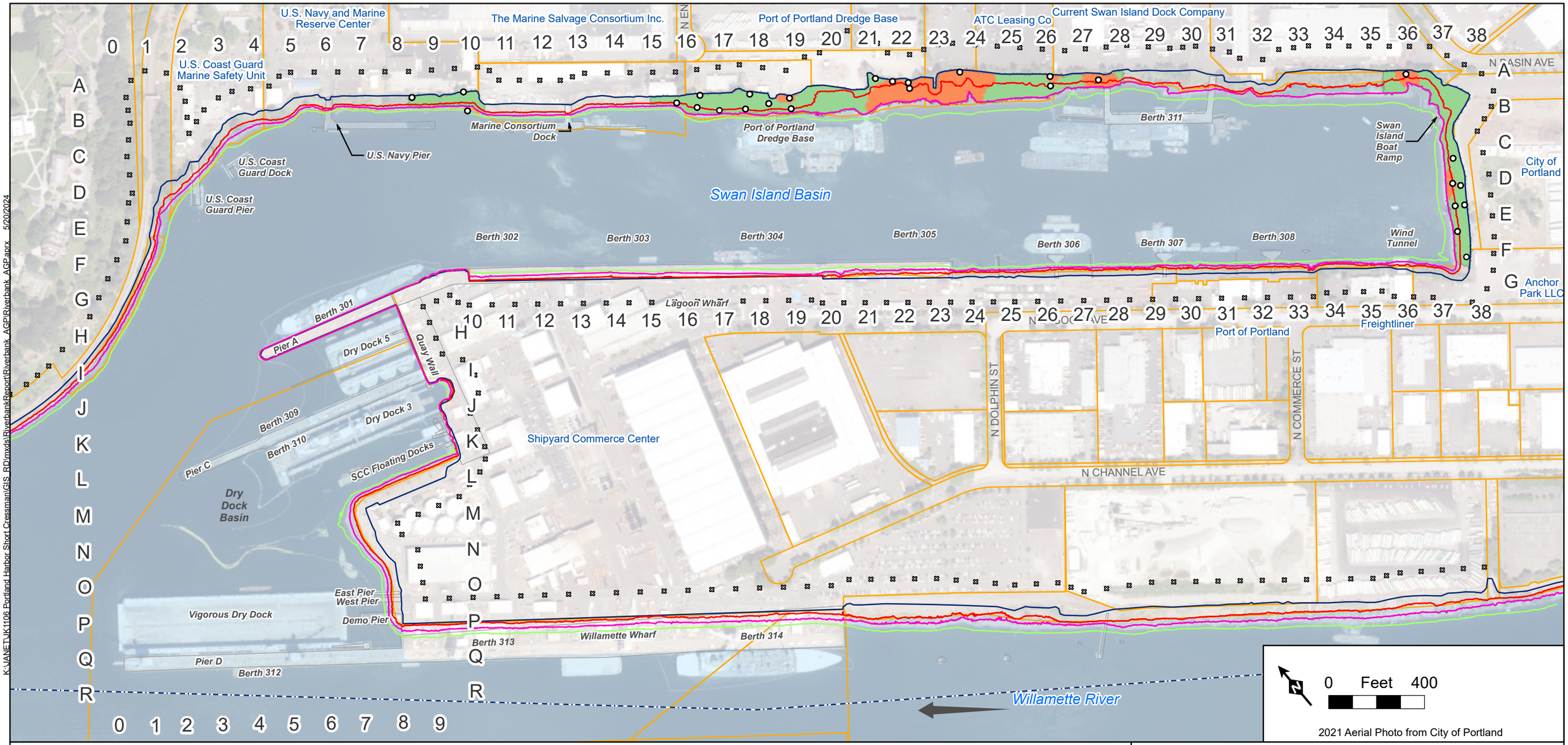
Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Non-detected analytical results were interpolated using the detection limit value. As a result, the interpolation is a conservative estimate of exceedances

Figure 4-6

Horizontal Extent of Subsurface Riverbank Soil RAL/PQL Exceedances (1-2 feet below ground surface)

Prepared on: 5/20/2024
Contaminated Riverbank Soil Extent
Swan Island Basin



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- Tax Lot Boundary
- Docks and Structures
- Federal Navigation Channel (USACE, 2020)
- Top of Bank (TOB)
- Mean Low Water (MLW)
- Ordinary High Water (OHW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Extent of Riverbank Soil Interpolation (2 to 3 feet)

- Below RAL/PQL
- Above RAL/PQL

M Project Area Grid Label

River Flow Direction

Notes:
NAVD88 – North American Vertical Datum of 1988
PQL – Practical Quantitation Limit
RAL – Remedial Action Level
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Portland Lidar, 2019
OHW and MLW Source – EPA, 2019

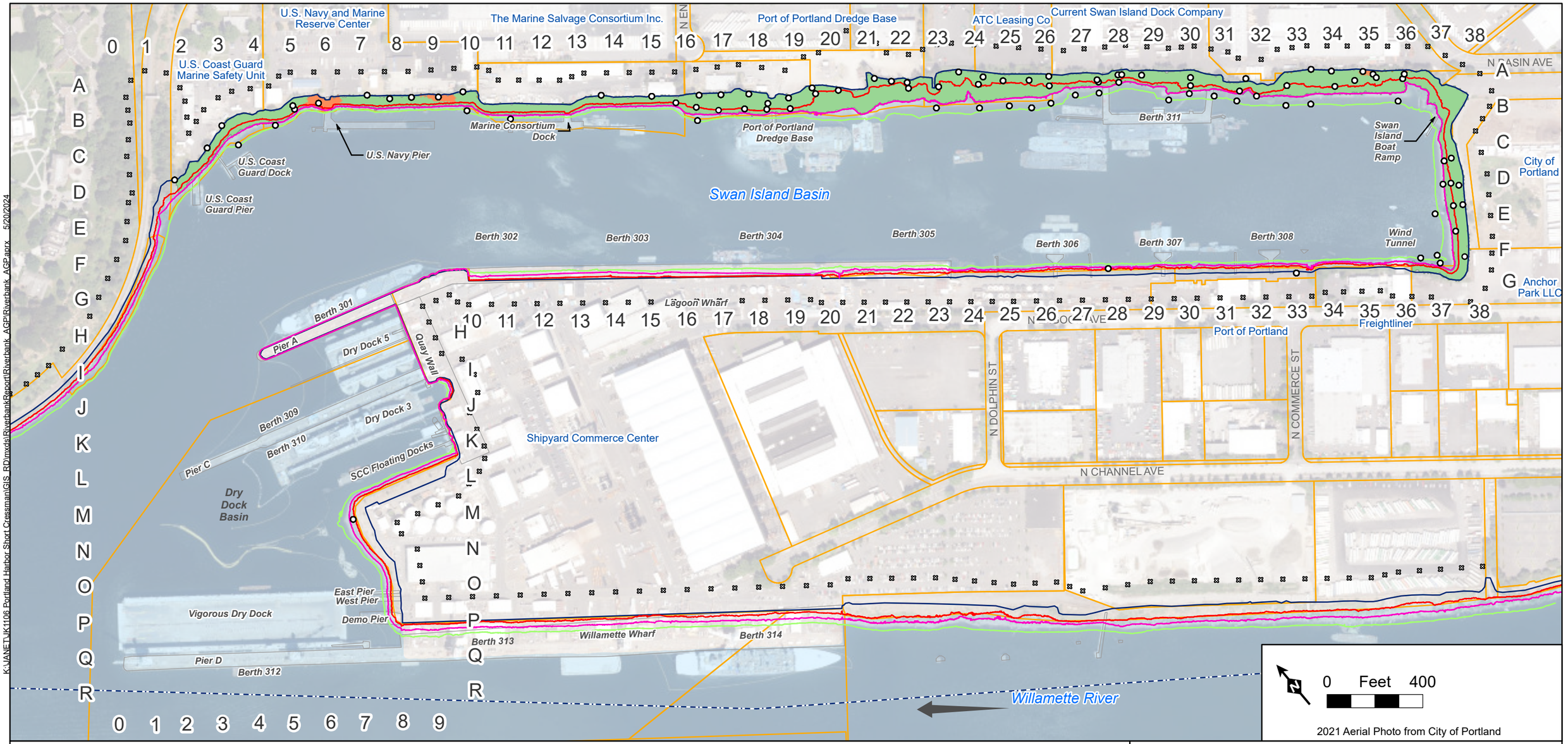
Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Non-detected analytical results were interpolated using the detection limit value. As a result, the interpolation is a conservative estimate of exceedances

Figure 4-7

Horizontal Extent of Subsurface Riverbank Soil RAL/PQL Exceedances (2-3 feet below ground surface)

Prepared on: 5/20/2024
Contaminated Riverbank Soil Extent
Swan Island Basin



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- Tax Lot Boundary
- Docks and Structures
- Federal Navigation Channel (USACE, 2020)
- Top of Bank (TOB)
- Mean Low Water (MLW)
- Ordinary High Water (OHW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Extent of Riverbank Soil Interpolation (1 to 2 feet)

- Below PTW
- Above PTW

M Project Area Grid Label

River Flow Direction

Notes:
NAVD88 – North American Vertical Datum of 1988
PTW – Principal threat waste
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

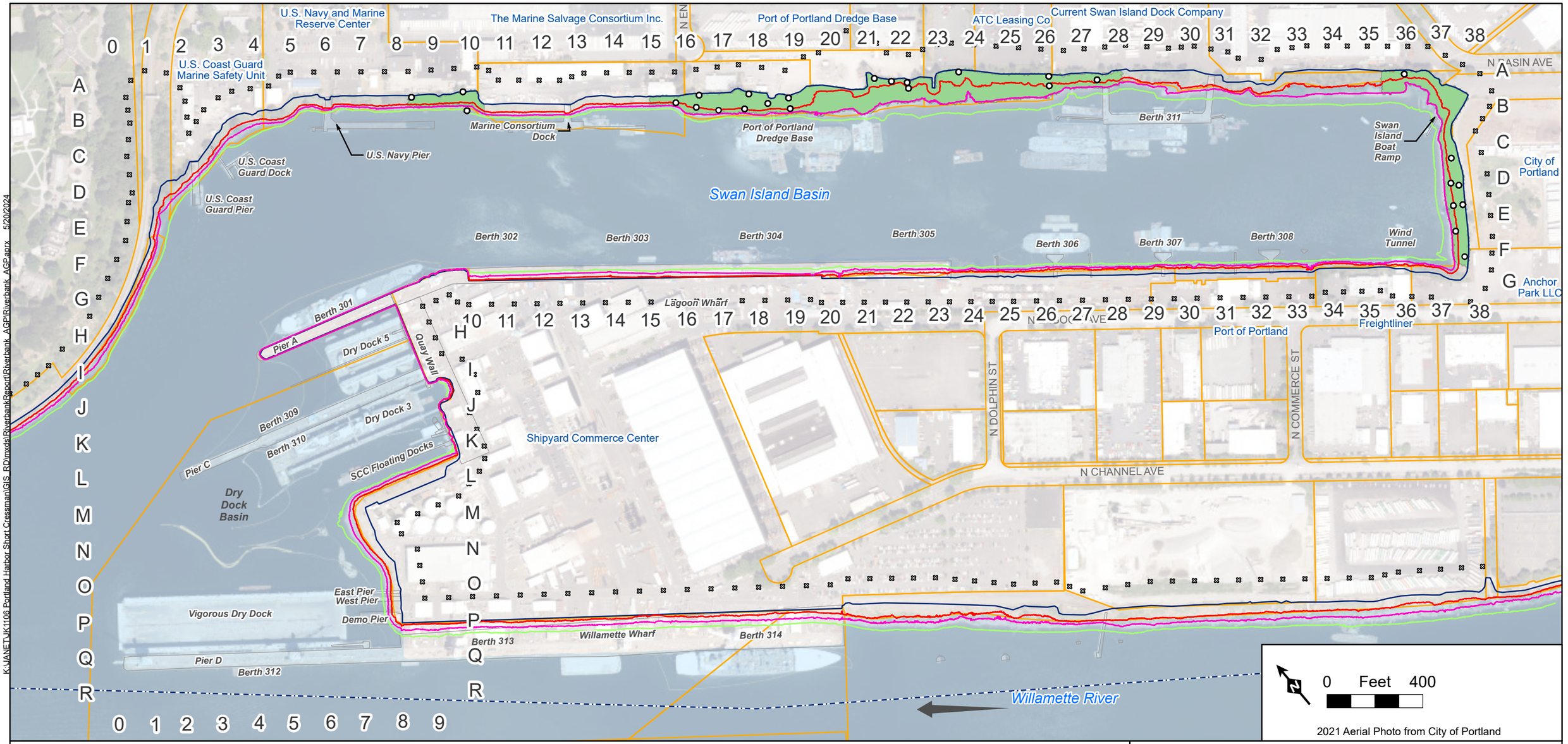
Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Non-detected analytical results were interpolated using the detection limit value. As a result, the interpolation is a conservative estimate of exceedances

Figure 4-8

Horizontal Extent of Subsurface Riverbank Soil PTW Exceedances (1-2 feet below ground surface)

Prepared on: 5/20/2024
Contaminated Riverbank Soil Extent
Swan Island Basin



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- Tax Lot Boundary
- Docks and Structures
- Federal Navigation Channel (USACE, 2020)
- Top of Bank (TOB)
- Mean Low Water (MLW)
- Ordinary High Water (OHW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Extent of Riverbank Soil Interpolation (2 to 3 feet)

- Below PTW
- Above PTW

M Project Area Grid Label

River Flow Direction

Notes:
NAVD88 – North American Vertical Datum of 1988
PTW – Principal threat waste
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Non-detected analytical results were interpolated using the detection limit value. As a result, the interpolation is a conservative estimate of exceedances

Figure 4-9

Horizontal Extent of Subsurface Riverbank Soil PTW Exceedances (2-3 feet below ground surface)

Prepared on: 5/20/2024
Contaminated Riverbank Soil Extent
Swan Island Basin

ATTACHMENT A
FOCUSED COC INTERPOLATIONS

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U.S. Navy and Marine Reserve Center
The Marine Salvage Consortium Inc.
Port of Portland Dredge Base
ATC Leasing Co
Current Swan Island Dock Company
U.S. Coast Guard Marine Safety Unit
N BASIN AVE
U.S. Navy Pier
Marine Consortium Dock
Port of Portland Dredge Base
Berth 311
Swan Island Boat Ramp
City of Portland
U.S. Coast Guard Dock
U.S. Coast Guard Pier
Swan Island Basin
Berth 302
Berth 303
Berth 304
Berth 305
Berth 306
Berth 307
Berth 308
Wind Tunnel
Anchor Park LLC
Lagoon Wharf
Berth 301
Pier A
Dry Dock 5
Quay Wall
Port of Portland
Freightliner
N DOLPHIN ST
N COMMERCE ST
N CHANNEL AVE
Berth 309
Dry Dock 3
Berth 310
Pier C
SCC Floating Docks
Shipyard Commerce Center
Dry Dock Basin
East Pier
West Pier
Demo Pier
Vigorous Dry Dock
Berth 313
Willamette Wharf
Berth 314
Pier D
Berth 312
Willamette River
0 Feet 400
2021 Aerial Photo from City of Portland

- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot Boundary
- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Interpolated Extent of Total PCBs

- Below RAL and PTW
- Above RAL and Below PTW
- Above RAL and PTW

M Project Area Grid Label

River Flow Direction

Notes:
NAVD88 – North American Vertical Datum of 1988
PCB – polychlorinated biphenyl
PTW – Principal threat waste
RAL – Remedial Action Level
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

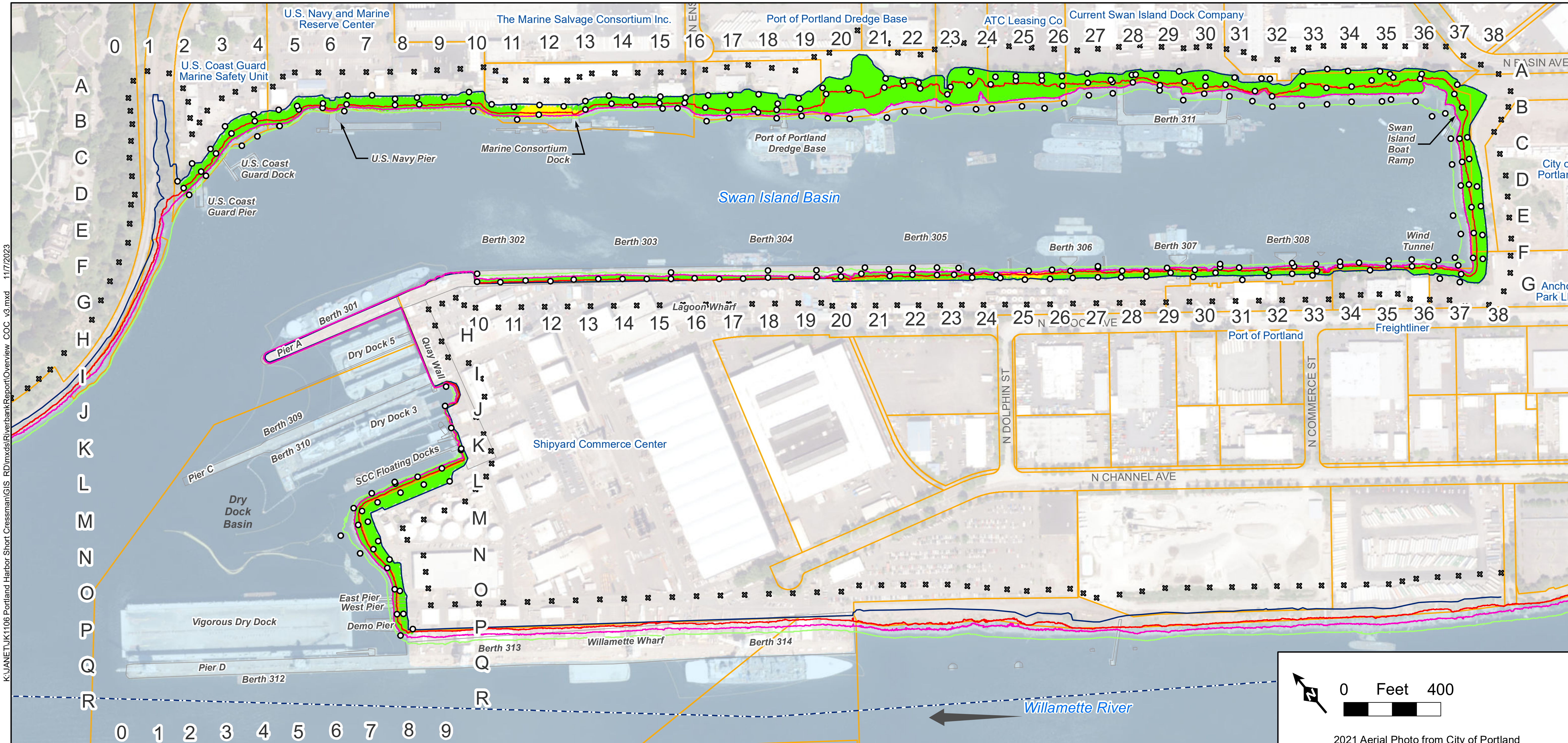
Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-1

Surface Extent of RAL and PTW Exceedances for Total PCBs (0-1 feet Below Ground Surface)

Prepared on: 11/7/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
HGL MOTT MACDONALD
BRIDGEWATER GROUP



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- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot Boundary
- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Interpolated Extent of Total PAHs
- Below RAL
- Above RAL

M Project Area Grid Label

River Flow Direction

Notes:
NAVD88 – North American Vertical Datum of 1988
PAHs – polycyclic aromatic hydrocarbons
PTW – Principal threat waste
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

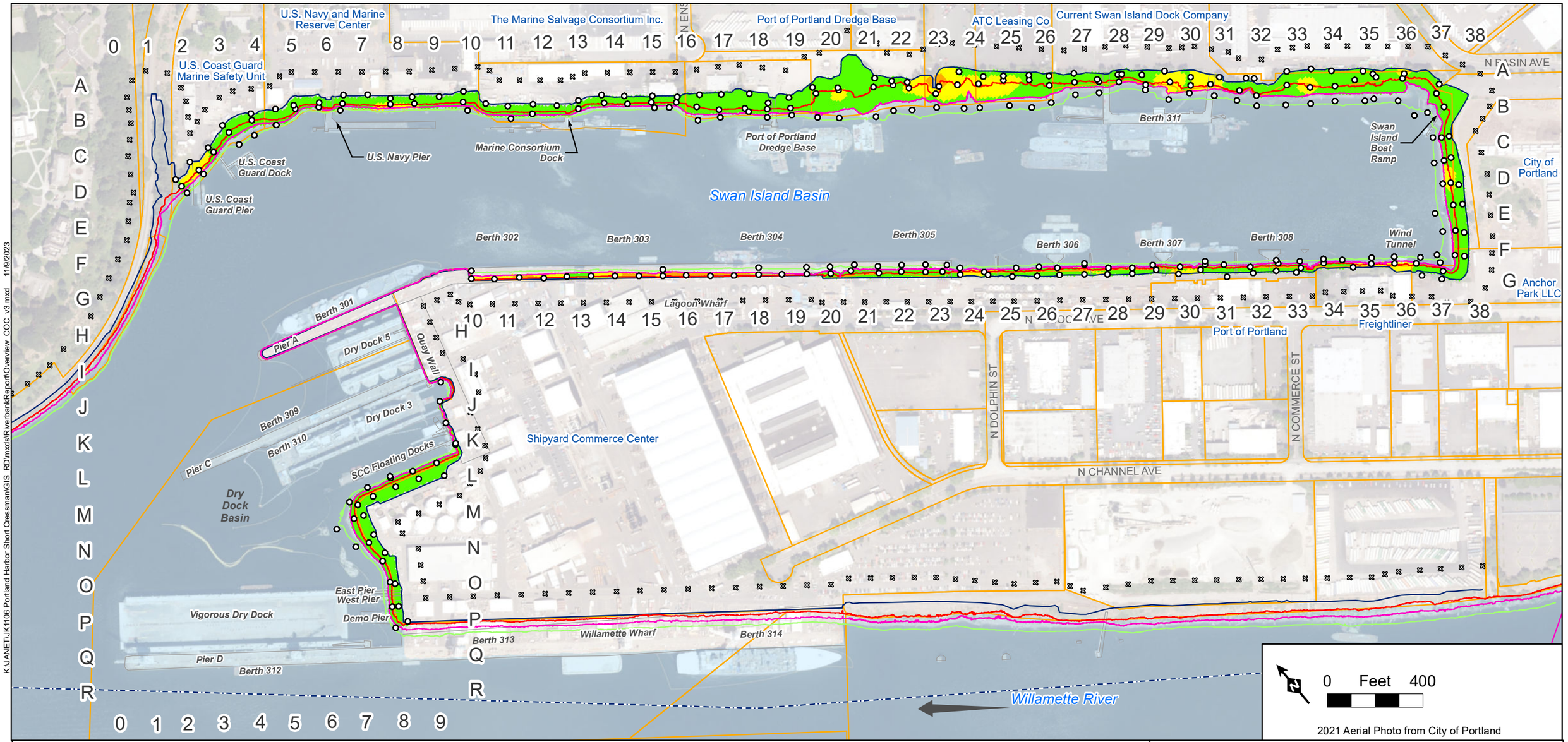
Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-2

Surface Extent of RAL Exceedances for Total PAHs (0-1 feet Below Ground Surface)

Prepared on: 11/7/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
HGL
MOTT MACDONALD
BRIDGEWATER GROUP



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- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot Boundary
- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Interpolated Extent of TCDD

- Below PQL and PTW
- Above PQL and Below PTW
- Above PQL and PTW

M Project Area Grid Label

River Flow Direction

Notes:
NAVD88 – North American Vertical Datum of 1988
PQL – Practical quantitation limit
PTW – Principal threat waste
SCC – Shipyard Commerce Center
TCDD – 2,3,7,8-tetrachlorodibenzo-p-dioxin
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

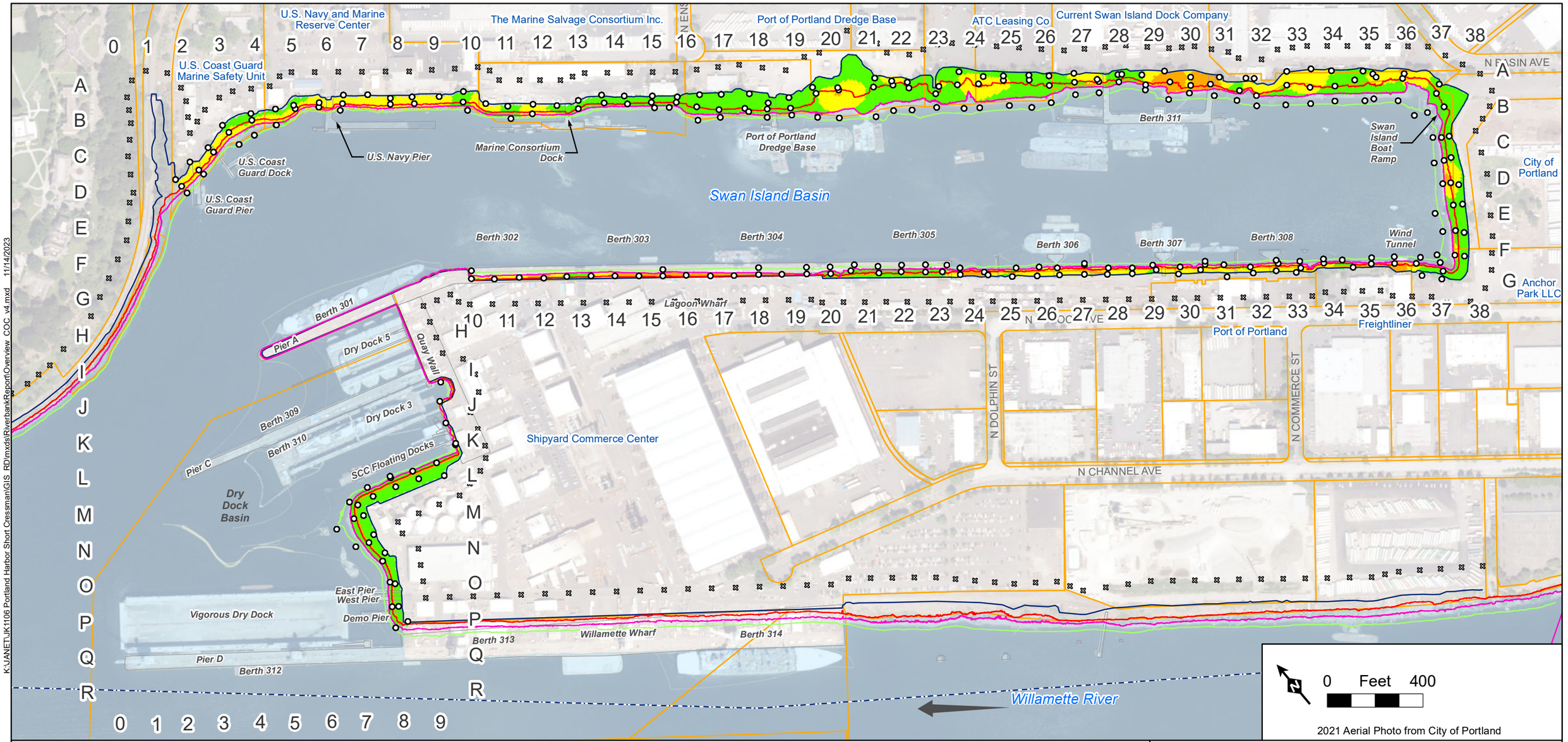
Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-3

Surface Extent of PQL and PTW Exceedances for TCDD (0-1 feet Below Ground Surface)

Prepared on: 11/9/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
HGL MOTT MACDONALD
BRIDGEWATER GROUP



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- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot Boundary
- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Interpolated Extent of PeCDD

- Below PQL and PTW
- Above PQL and Below PTW
- Above PQL and PTW

M Project Area Grid Label

River Flow Direction

Notes:
NAVD88 – North American Vertical Datum of 1988
PeCDD – polychlorinated dibenzodioxins
PQL – Practical quantitation limit
PTW – Principal threat waste
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

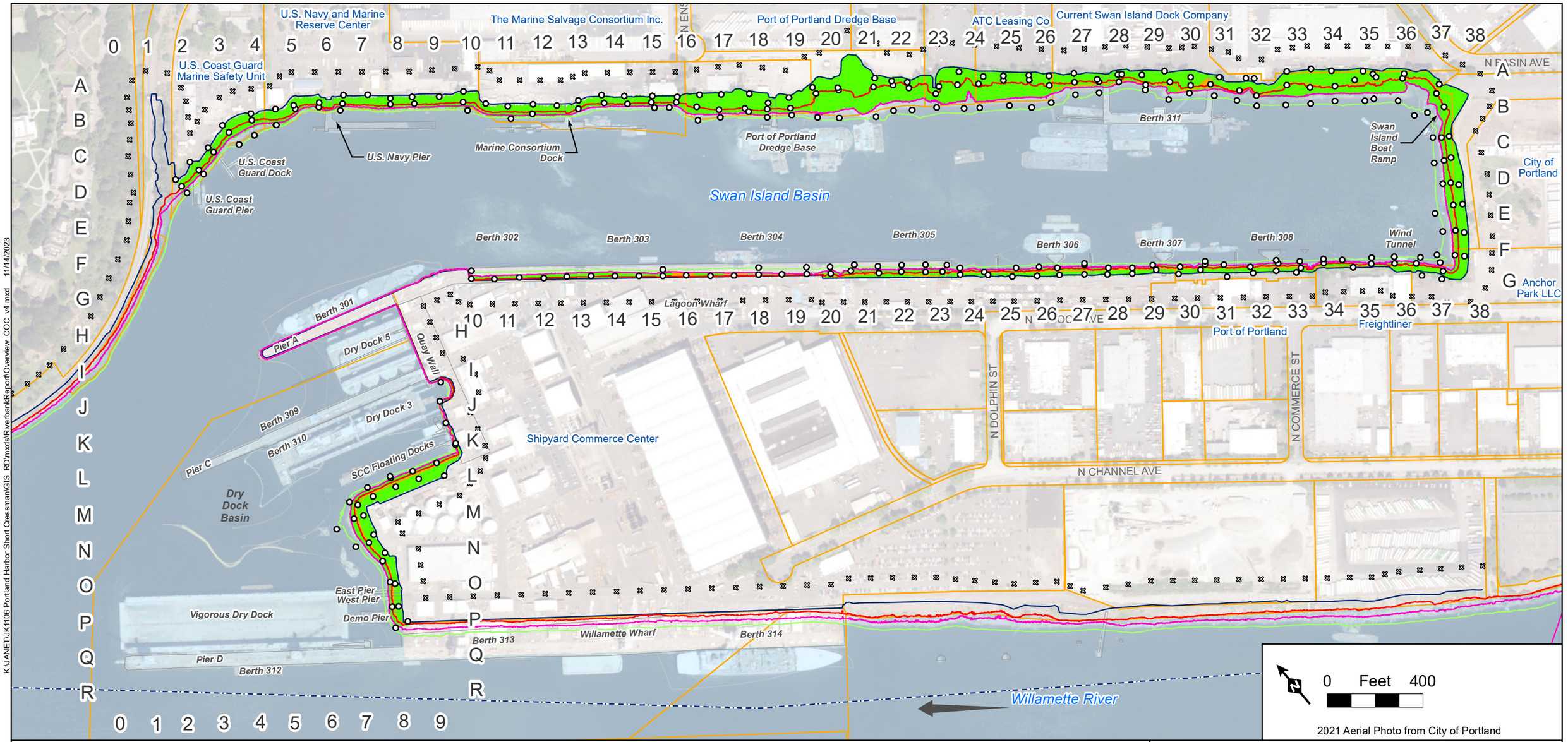
Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-4

Surface Extent of PQL and PTW Exceedances for PeCDD (0-1 feet Below Ground Surface)

Prepared on: 11/14/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
HGL MOTT MACDONALD
BRIDGEWATER GROUP



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- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot Boundary
- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Interpolated Extent of PeCDF

- Below RAL and PTW
- Above RAL and Below PTW
- Above RAL and PTW

M Project Area Grid Label

River Flow Direction

Notes:
NAVD88 – North American Vertical Datum of 1988
PeCDF – 2,3,4,7,8-pentachlorodibenzofuran
PTW – Principal threat waste
RAL – Remedial Action Level
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-5

Surface Extent of RAL and PTW Exceedances for PeCDF (0-1 feet Below Ground Surface)

Prepared on: 11/14/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
HGL MOTT MACDONALD
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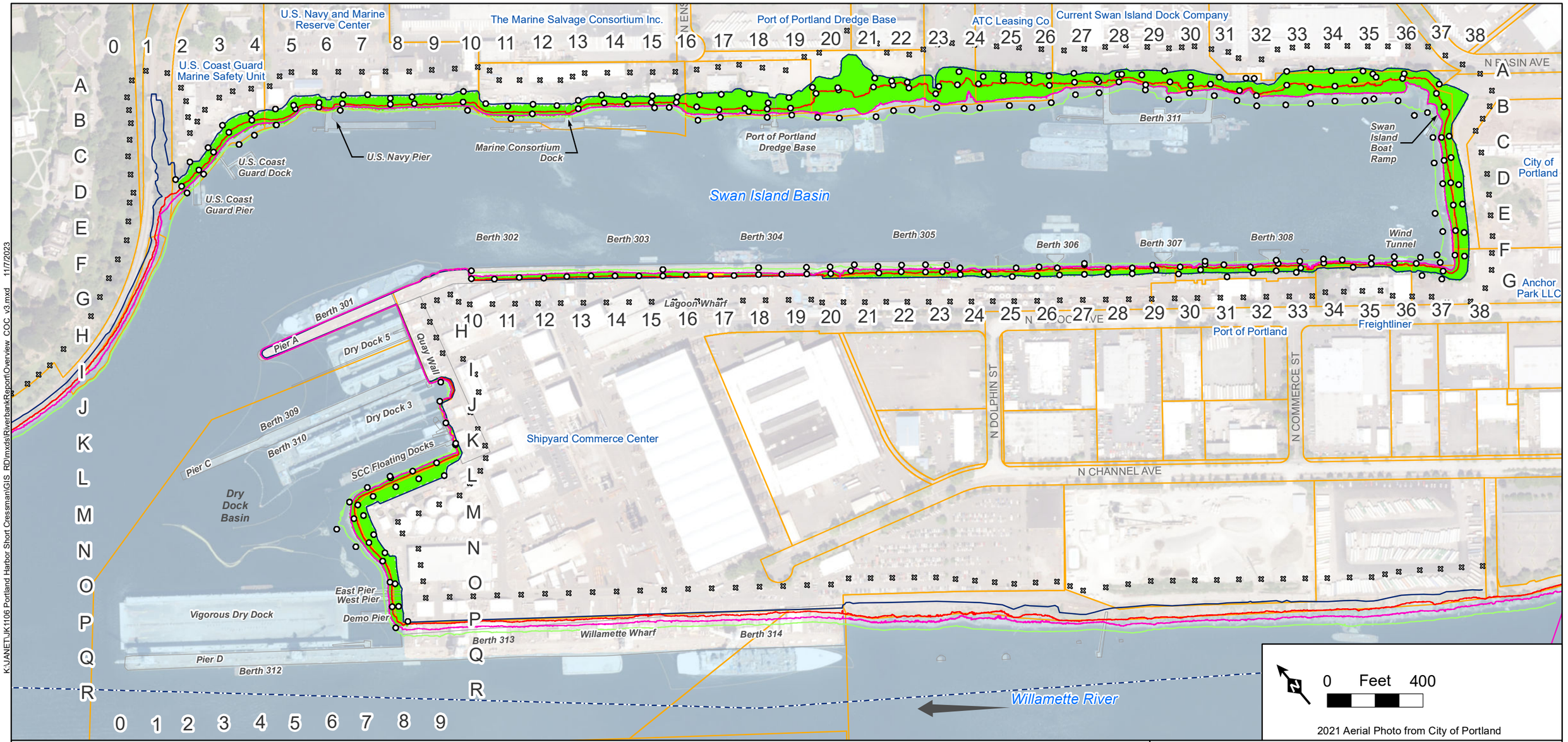

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- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot Boundary
- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Interpolated Extent of DDx

- Below RAL and PTW
- Above RAL and Below PTW
- Above RAL and PTW

M Project Area Grid Label

River Flow Direction

Notes:
DDD – dichlorodiphenyldichloroethane
DDE – dichlorodiphenyldichloroethylene
DDT – dichlorodiphenyltrichloroethane
DDx – DDD + DDE + DDT
NAVD88 – North American Vertical Datum of 1988
PTW – Principal threat waste
RAL – Remedial Action Level
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-6

Surface Extent of RAL and PTW Exceedances for DDx (0-1 feet Below Ground Surface)

Prepared on: 11/7/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
HGL MOTT MACDONALD
BRIDGEWATER GROUP

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Berth 302
Berth 303
Berth 304
Berth 305
Berth 306
Berth 307
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Pier A
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Pier C
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East Pier
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Vigorous Dry Dock
Berth 313
Willamette Wharf
Berth 314
Pier D
Berth 312
Willamette River
0 Feet 400
2021 Aerial Photo from City of Portland

- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot Boundary
- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Interpolated Extent of TCDF
- Below PTW
- Above PTW

M Project Area Grid Label

River Flow Direction

Notes:
NAVD88 – North American Vertical Datum of 1988
PTW – Principal threat waste
SCC – Shipyard Commerce Center
TCDF – 2,3,7,8-tetrachlorodibenzofuran
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

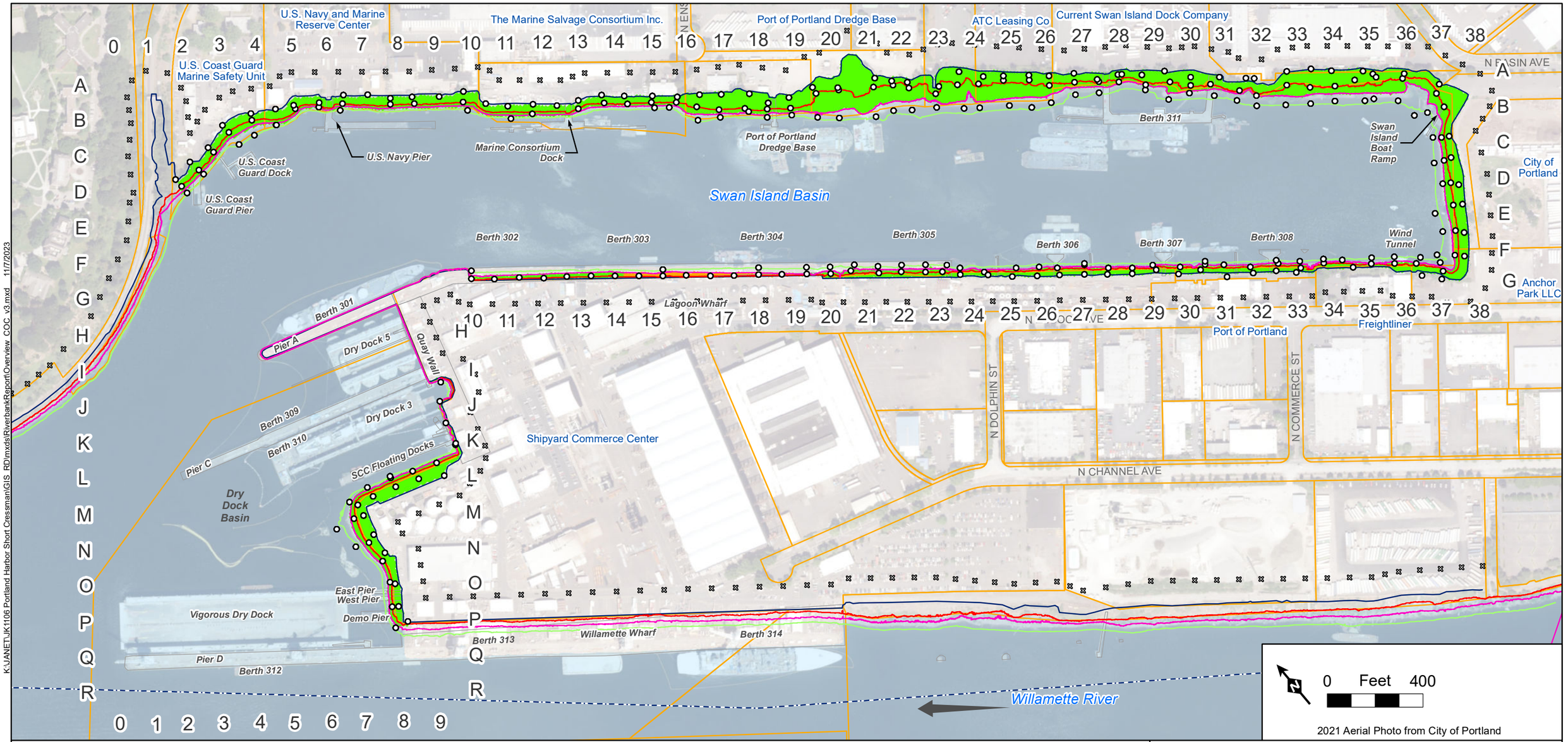
Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-7

Surface Extent of PTW Exceedances for TCDF (0-1 feet Below Ground Surface)

Prepared on: 11/7/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
HGL
MOTT MACDONALD
BRIDGEWATER GROUP



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- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot Boundary
- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Interpolated Extent of HxCDF

- Below PTW
- Above PTW

M Project Area Grid Label

River Flow Direction

Notes:
HxCDF – 1,2,3,4,7,8-hexachlorodibenzofuran
NAVD88 – North American Vertical Datum of 1988
PTW – Principal threat waste
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

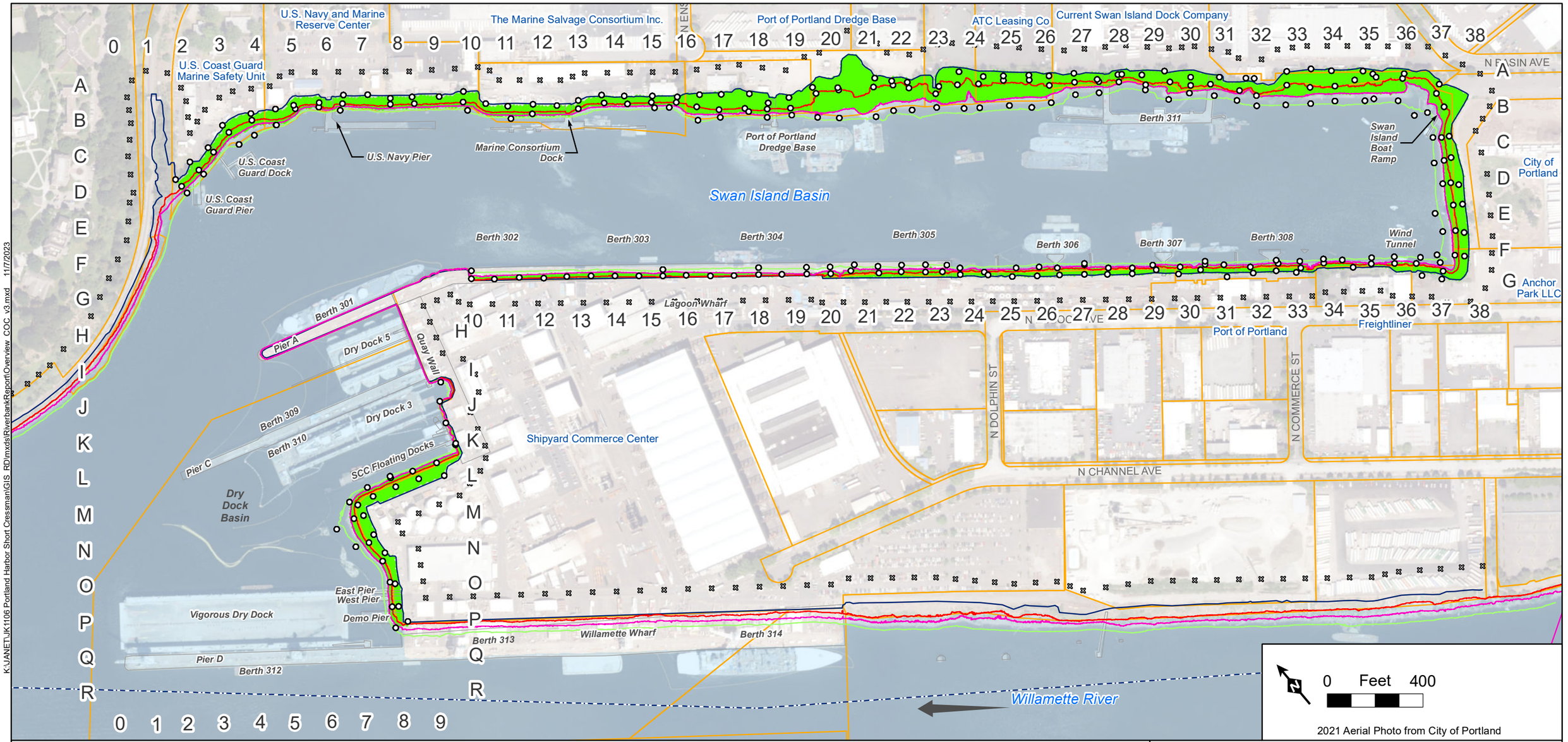
Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-8

Surface Extent of PTW Exceedances for HxCDF (0-1 feet Below Ground Surface)

Prepared on: 11/7/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
HGL MOTT MACDONALD
BRIDGEWATER GROUP



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- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot Boundary
- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Interpolated Extent of Total cPAHs

- Below PTW
- Above PTW

M Project Area Grid Label

River Flow Direction

Notes:
cPAHs – carcinogenic polycyclic aromatic hydrocarbons
NAVD88 – North American Vertical Datum of 1988
PTW – Principal threat waste
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-9

Surface Extent of PTW Exceedances for Total cPAHs (0-1 feet Below Ground Surface)

Prepared on: 11/7/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
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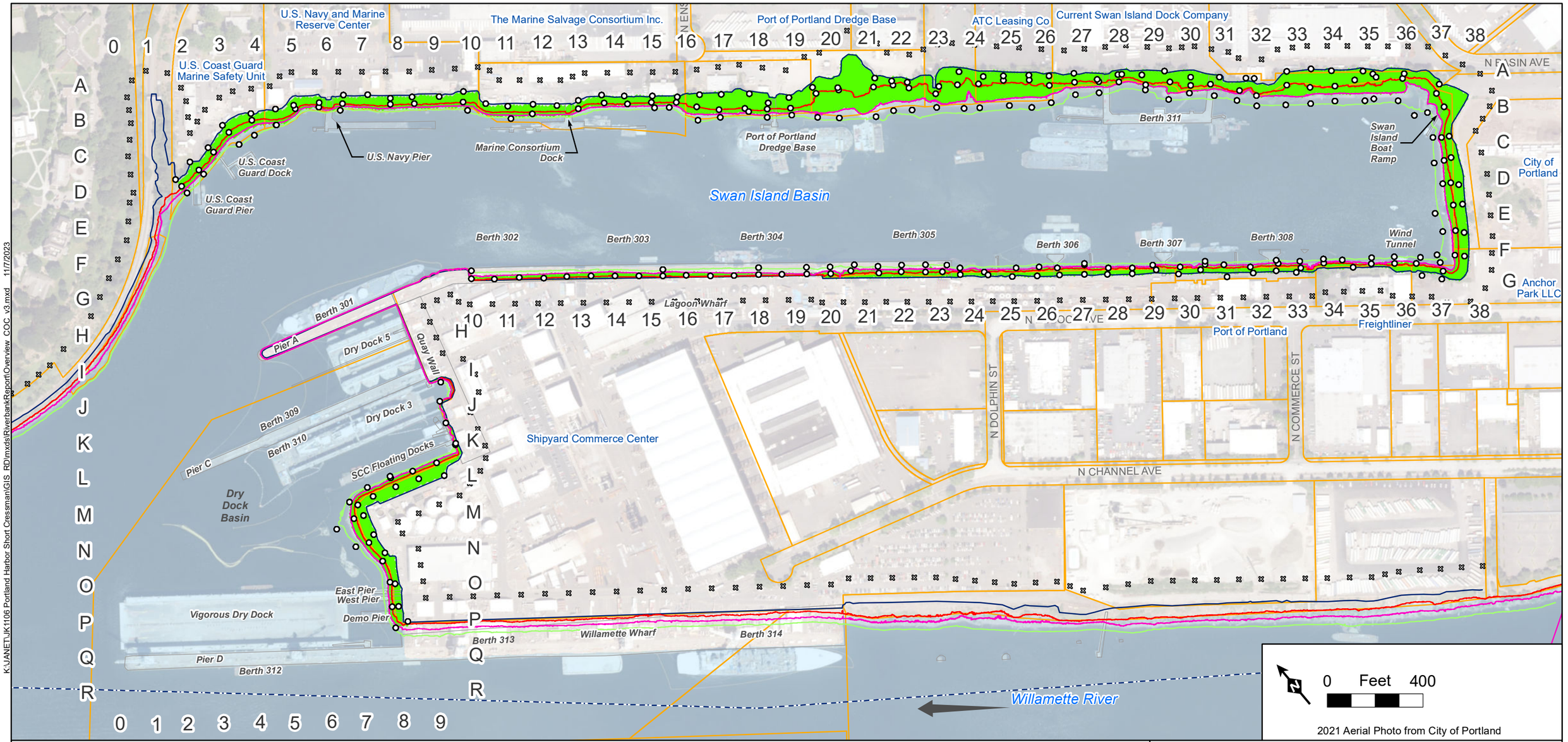

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- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot Boundary
- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Interpolated Extent of Naphthalene

- Below PTW
- Above PTW

M Project Area Grid Label

River Flow Direction

Notes:
NAVD88 – North American Vertical Datum of 1988
PTW – Principal threat waste
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-10

Surface Extent of PTW Exceedances for Naphthalene (0-1 feet Below Ground Surface)

Prepared on: 11/7/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
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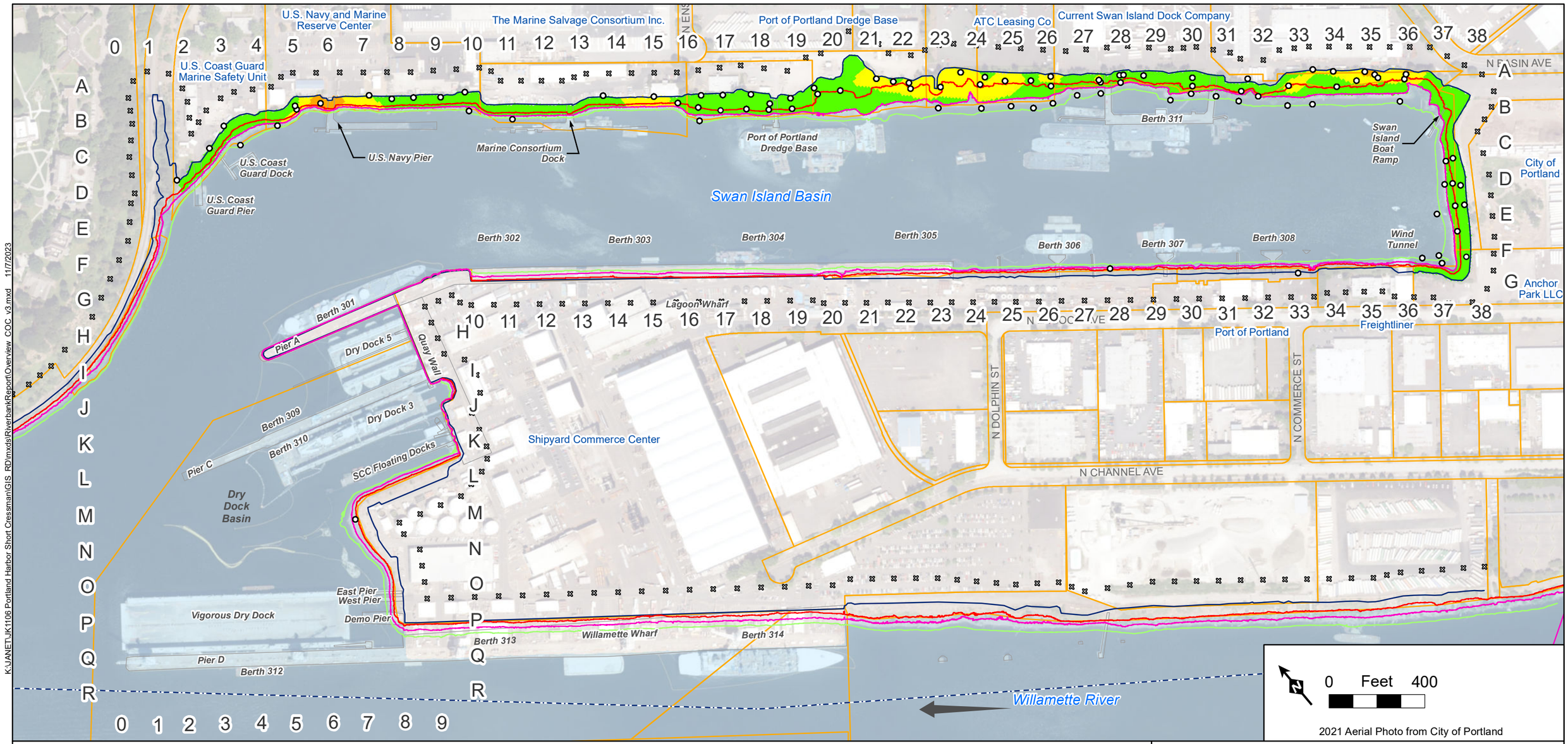
BRIDGEWATER GROUP



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Federal Navigation Channel (USACE, 2020)
Docks and Structures
Tax Lot Boundary
Top of Bank (TOB)
Ordinary High Water (OHW)
Mean Low Water (MLW)

13-foot NAVD88 Contour
Riverbank Sample Location
Location of Zero Value used in interpolation

Interpolated Extent of Total PCBs
Below RAL and PTW
Above RAL and Below PTW
Above RAL and PTW

M Project Area Grid Label

River Flow Direction

Notes:
NAVD88 – North American Vertical Datum of 1988
PCB – polychlorinated biphenyl
PTW – Principal threat waste
RAL – Remedial Action Level
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-11

Extent of RAL and PTW Exceedances for Total PCBs (1-2 feet Below Ground Surface)

Prepared on: 11/7/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

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City of Portland
U.S. Coast Guard Dock
U.S. Coast Guard Pier
Swan Island Basin
Berth 302
Berth 303
Berth 304
Berth 305
Berth 306
Berth 307
Berth 308
Wind Tunnel
Anchor Park LLC
Lagoon Wharf
Berth 301
Pier A
Dry Dock 5
Quay Wall
Port of Portland
Freightliner
N DOLPHIN ST
N COMMERCE ST
N CHANNEL AVE
Berth 309
Dry Dock 3
Pier C
Berth 310
SCC Floating Docks
Shipyard Commerce Center
Dry Dock Basin
East Pier
West Pier
Demo Pier
Vigorous Dry Dock
Berth 313
Willamette Wharf
Berth 314
Pier D
Berth 312
Willamette River
0 Feet 400
2021 Aerial Photo from City of Portland

- Federal Navigation Channel (USACE, 2020)
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- Tax Lot Boundary
- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Interpolated Extent of Total PAHs

- Below RAL
- Above RAL

M Project Area Grid Label

River Flow Direction

Notes:
NAVD88 – North American Vertical Datum of 1988
PAHs – polycyclic aromatic hydrocarbons
PTW – Principal threat waste
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-12

Extent of RAL Exceedances for Total PAHs (1-2 feet Below Ground Surface)

Prepared on: 11/7/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
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U.S. Coast Guard Marine Safety Unit
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Berth 311
Swan Island Boat Ramp
City of Portland
U.S. Coast Guard Dock
U.S. Coast Guard Pier
Swan Island Basin
Berth 302
Berth 303
Berth 304
Berth 305
Berth 306
Berth 307
Berth 308
Wind Tunnel
Anchor Park LLC
Lagoon Wharf
Berth 301
Pier A
Dry Dock 5
Quay Wall
Port of Portland
Freightliner
N DOLPHIN ST
N COMMERCE ST
N CHANNEL AVE
Berth 309
Dry Dock 3
Pier C
Berth 310
SCC Floating Docks
Shipyard Commerce Center
Dry Dock Basin
East Pier
West Pier
Demo Pier
Vigorous Dry Dock
Berth 313
Willamette Wharf
Berth 314
Pier D
Berth 312
Willamette River
0 Feet 400
2021 Aerial Photo from City of Portland

- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot Boundary
- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Interpolated Extent of TCDD
- Below PQL and PTW
- Above PQL and Below PTW
- Above PQL and PTW

M Project Area Grid Label

River Flow Direction

Notes:
NAVD88 – North American Vertical Datum of 1988
PQL – Practical quantitation limit
PTW – Principal threat waste
SCC – Shipyard Commerce Center
TCDD – 2,3,7,8-tetrachlorodibenzo-p-dioxin
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-13

Extent of RAL and PTW Exceedances for TCDD (1-2 feet Below Ground Surface)

Prepared on: 11/9/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
HGL MOTT MACDONALD
BRIDGEWATER GROUP

Notes:
NAVD88 – North American Vertical Datum of 1988
PeCDD – polychlorinated dibenzodioxins
PQL – Practical quantitation limit
PTW – Principal threat waste
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-14

Extent of PQL and PTW Exceedances for PeCDD (1-2 feet Below Ground Surface)

Prepared on: 11/14/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
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Willamette River
U.S. Navy Pier
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Swan Island Boat Ramp
U.S. Coast Guard Dock
U.S. Coast Guard Pier
Berth 302
Berth 303
Berth 304
Berth 305
Berth 306
Berth 307
Berth 308
Wind Tunnel
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Pier A
Dry Dock 5
Quay Wall
Berth 309
Dry Dock 3
Berth 310
Pier C
SCC Floating Docks
Dry Dock Basin
East Pier
West Pier
Demo Pier
Vigorous Dry Dock
Berth 313
Willamette Wharf
Berth 314
Pier D
Berth 312

0 Feet 400

2021 Aerial Photo from City of Portland

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- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Interpolated Extent of PeCDF

- Below RAL and PTW
- Above RAL and Below PTW
- Above RAL and PTW

M Project Area Grid Label

River Flow Direction

Notes:
NAVD88 – North American Vertical Datum of 1988
PeCDF – 2,3,4,7,8-pentachlorodibenzofuran
PTW – Principal threat waste
RAL – Remedial Action Level
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-15

Extent of RAL and PTW Exceedances for PeCDF (1-2 feet Below Ground Surface)

Prepared on: 11/14/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
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BRIDGEWATER GROUP

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2021 Aerial Photo from City of Portland

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- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Interpolated Extent of DDx

- Below RAL and PTW
- Above RAL and Below PTW
- Above RAL and PTW

M Project Area Grid Label

River Flow Direction

Notes:
DDD – dichlorodiphenyldichloroethane
DDE – dichlorodiphenyldichloroethylene
DDT – dichlorodiphenyltrichloroethane
DDx – DDD + DDE + DDT
NAVD88 – North American Vertical Datum of 1988
PTW – Principal threat waste
RAL – Remedial Action Level
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-16

Extent of RAL and PTW Exceedances for DDx (1-2 feet Below Ground Surface)

Prepared on: 11/7/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
HGL MOTT MACDONALD
BRIDGEWATER GROUP

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2021 Aerial Photo from City of Portland

- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot Boundary
- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Interpolated Extent of TCDF
- Below PTW
- Above PTW

M Project Area Grid Label

River Flow Direction

Notes:
NAVD88 – North American Vertical Datum of 1988
PTW – Principal threat waste
SCC – Shipyard Commerce Center
TCDF – 2,3,7,8-tetrachlorodibenzofuran
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

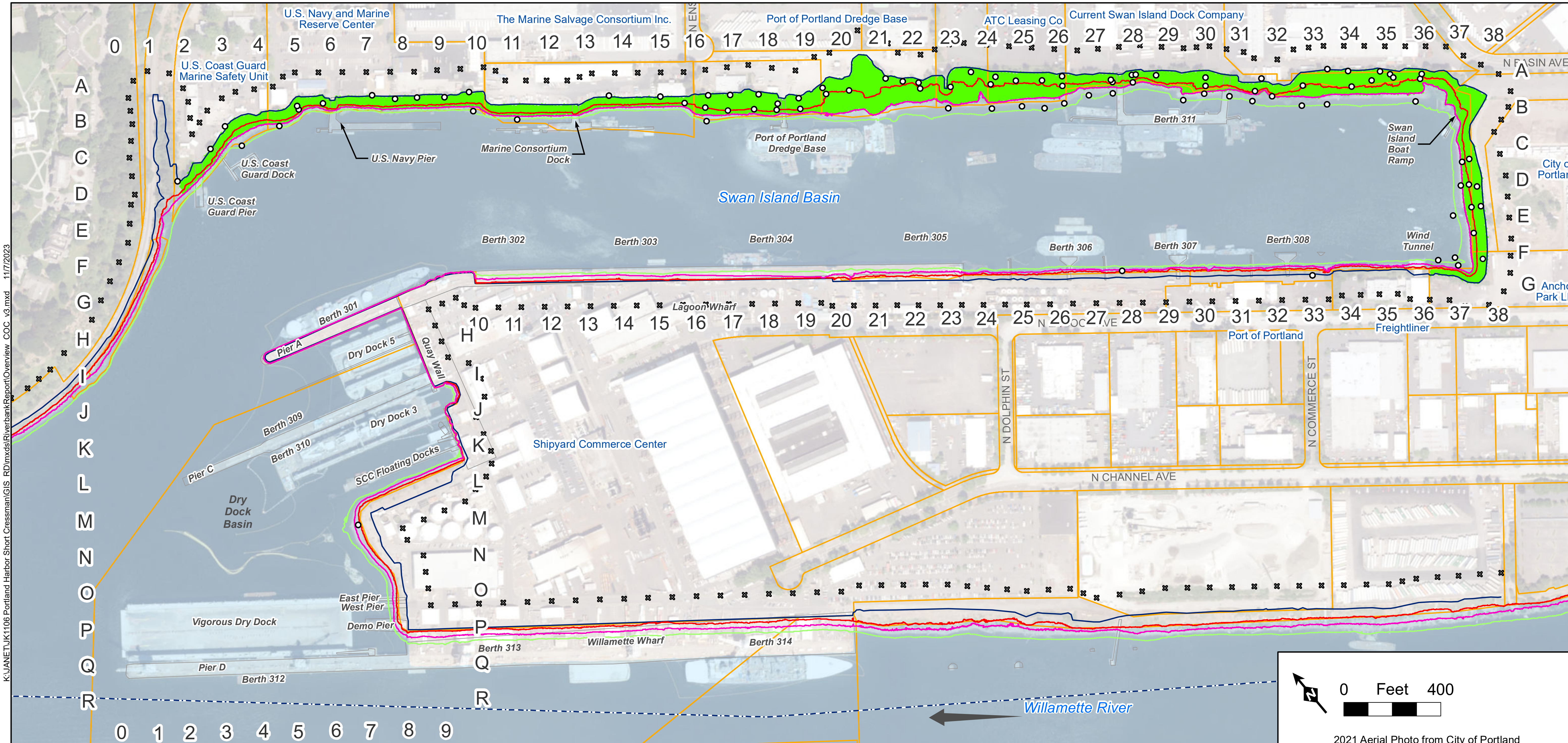
Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-17

Extent of PTW Exceedances for TCDF (1-2 feet Below Ground Surface)

Prepared on: 11/7/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
HGL MOTT MACDONALD
BRIDGEWATER GROUP



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- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot Boundary
- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Interpolated Extent of HxCDF

- Below PTW
- Above PTW

M Project Area Grid Label

River Flow Direction

Notes:
HxCDF – 1,2,3,4,7,8-hexachlorodibenzofuran
NAVD88 – North American Vertical Datum of 1988
PTW – Principal threat waste
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

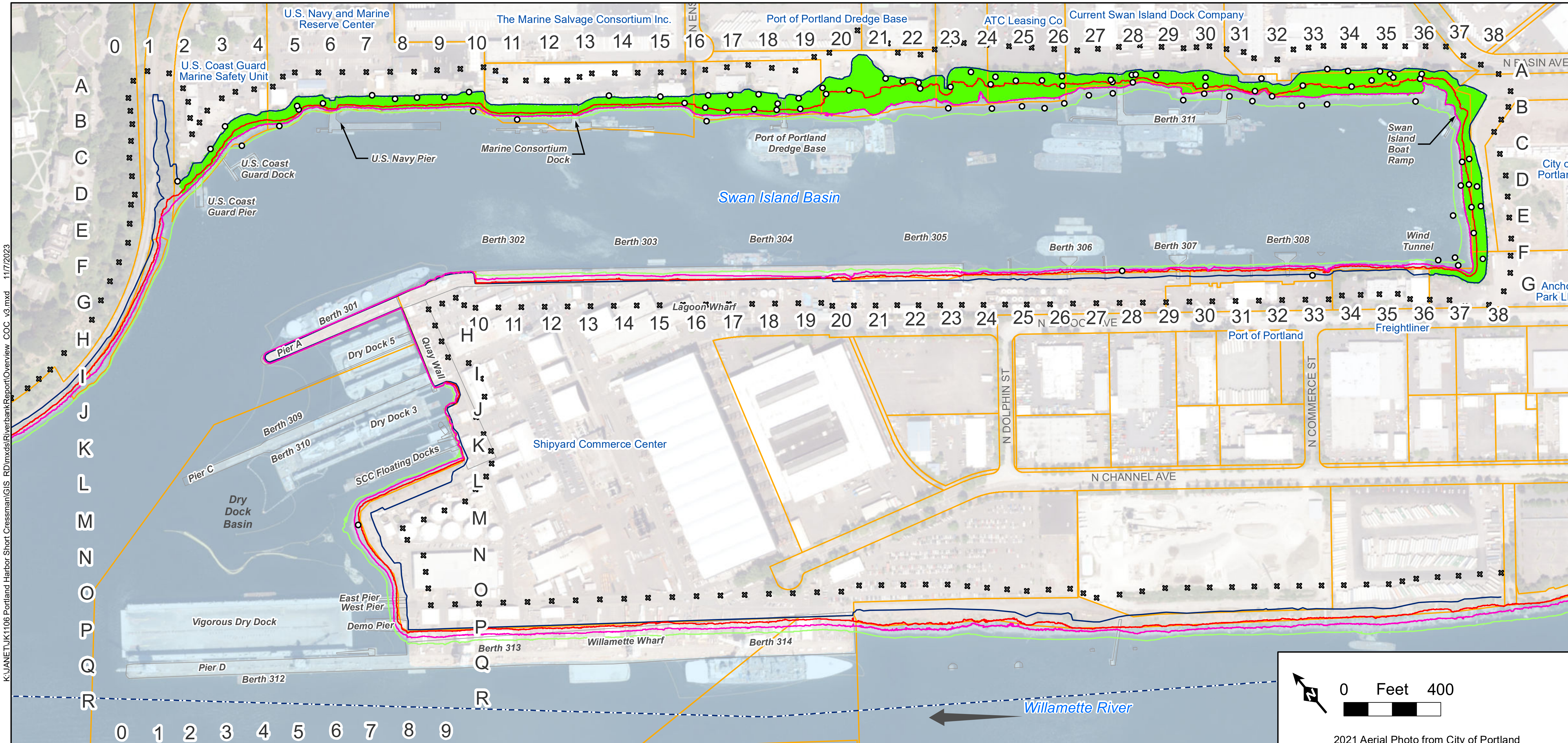
Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-18

Extent of PTW Exceedances for HxCDF (1-2 feet Below Ground Surface)

Prepared on: 11/7/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
HGL
MOTT MACDONALD
BRIDGEWATER GROUP



- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot Boundary
- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Interpolated Extent of Total cPAHs

- Below PTW
- Above PTW

M Project Area Grid Label

River Flow Direction

Notes:
cPAHs – carcinogenic polycyclic aromatic hydrocarbons
NAVD88 – North American Vertical Datum of 1988
PTW – Principal threat waste
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-19

Extent of PTW Exceedances for Total cPAHs (1-2 feet Below Ground Surface)

Prepared on: 11/7/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
HGL
MOTT MACDONALD
BRIDGEWATER GROUP

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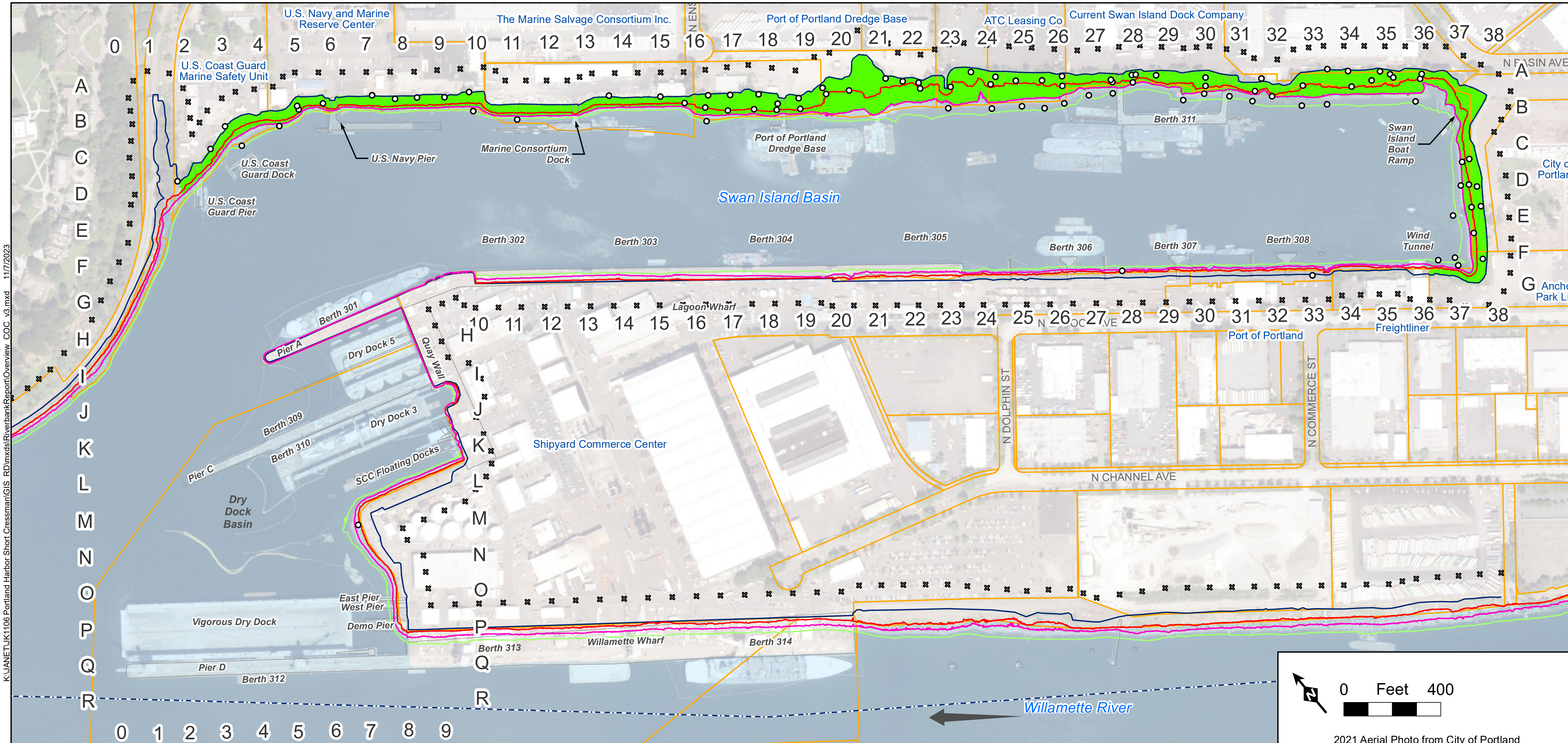

Federal Navigation Channel (USACE, 2020)
Docks and Structures
Tax Lot Boundary
Top of Bank (TOB)
Ordinary High Water (OHW)
Mean Low Water (MLW)
13-foot NAVD88 Contour
Riverbank Sample Location
Location of Zero Value used in interpolation
Interpolated Extent of Naphthalene
Below PTW
Above PTW

M Project Area Grid Label

River Flow Direction

Notes:
NAVD88 – North American Vertical Datum of 1988
PTW – Principal threat waste
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-20

Extent of PTW Exceedances for Naphthalene (1-2 feet Below Ground Surface)

Prepared on: 11/7/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
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BRIDGEWATER GROUP

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U.S. Navy and Marine Reserve Center
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Current Swan Island Dock Company
U.S. Coast Guard Marine Safety Unit
N BASIN AVE
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Berth 302
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Berth 307
Berth 308
Wind Tunnel
Anchor Park LLC
Berth 301
Pier A
Dry Dock 5
Quay Wall
Lagoon Wharf
N CHANNEL AVE
Port of Portland
Freightliner
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Dry Dock 3
Pier C
Berth 310
SCC Floating Docks
Shipyard Commerce Center
Dry Dock Basin
East Pier
West Pier
Demo Pier
Vigorous Dry Dock
Berth 313
Willamette Wharf
Berth 314
Pier D
Berth 312
Willamette River
0 Feet 400
2021 Aerial Photo from City of Portland

- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot Boundary
- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Interpolated Extent of Total PCBs

- Below RAL and PTW
- Above RAL and Below PTW
- Above RAL and PTW

M Project Area Grid Label

River Flow Direction

Notes:
NAVD88 – North American Vertical Datum of 1988
PCB – polychlorinated biphenyl
PTW – Principal threat waste
RAL – Remedial Action Level
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-21

Extent of RAL and PTW Exceedances for Total PCBs (2-3 feet Below Ground Surface)

Prepared on: 11/7/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
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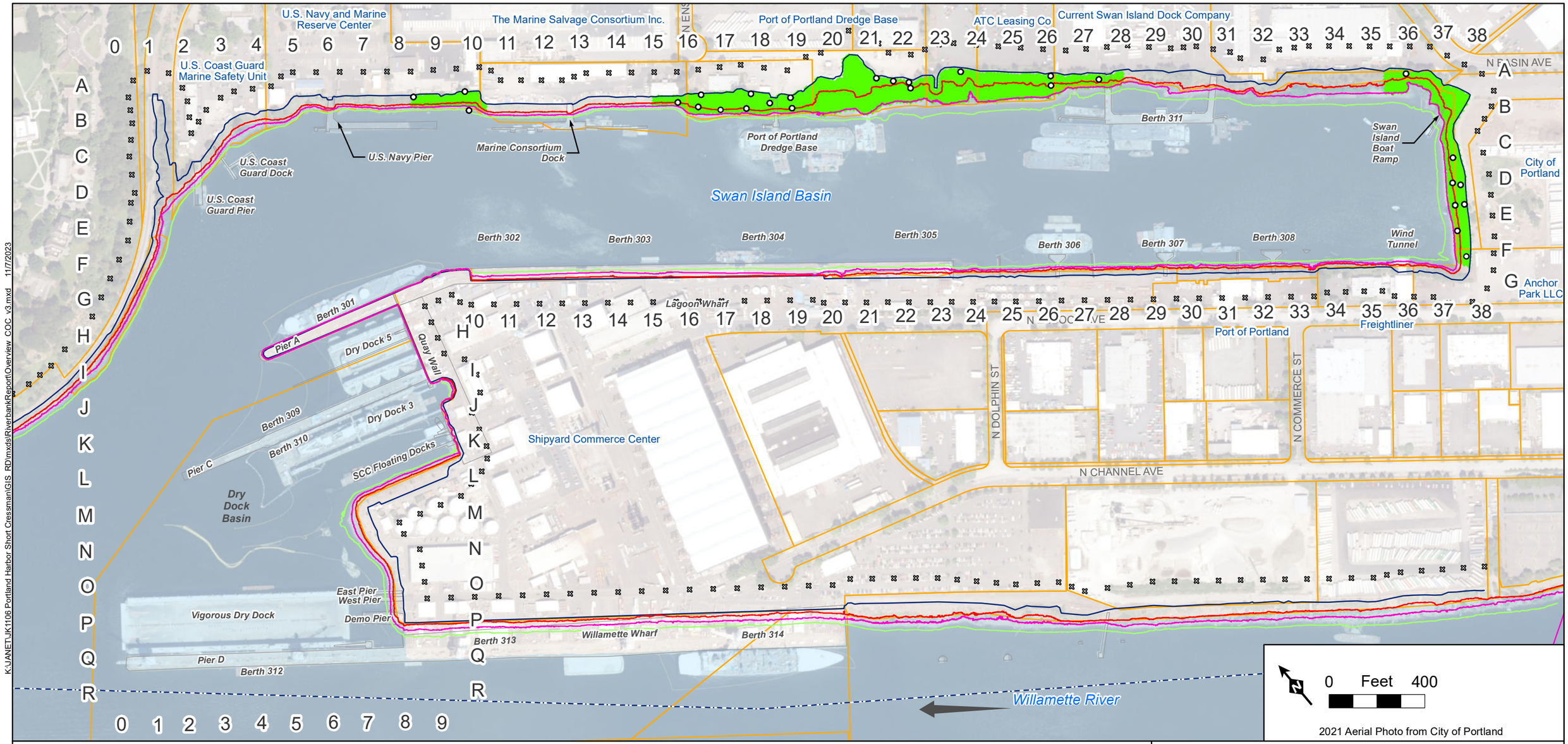
MOTT MACDONALD
BRIDGEWATER GROUP



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- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot Boundary
- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Interpolated Extent of Total PAHs

- Below RAL
- Above RAL

M Project Area Grid Label

River Flow Direction

Notes:
NAVD88 – North American Vertical Datum of 1988
PAHs – polycyclic aromatic hydrocarbons
PTW – Principal threat waste
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-22

Extent of RAL Exceedances for Total PAHs (2-3 feet Below Ground Surface)

Prepared on: 11/7/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
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BRIDGEWATER GROUP

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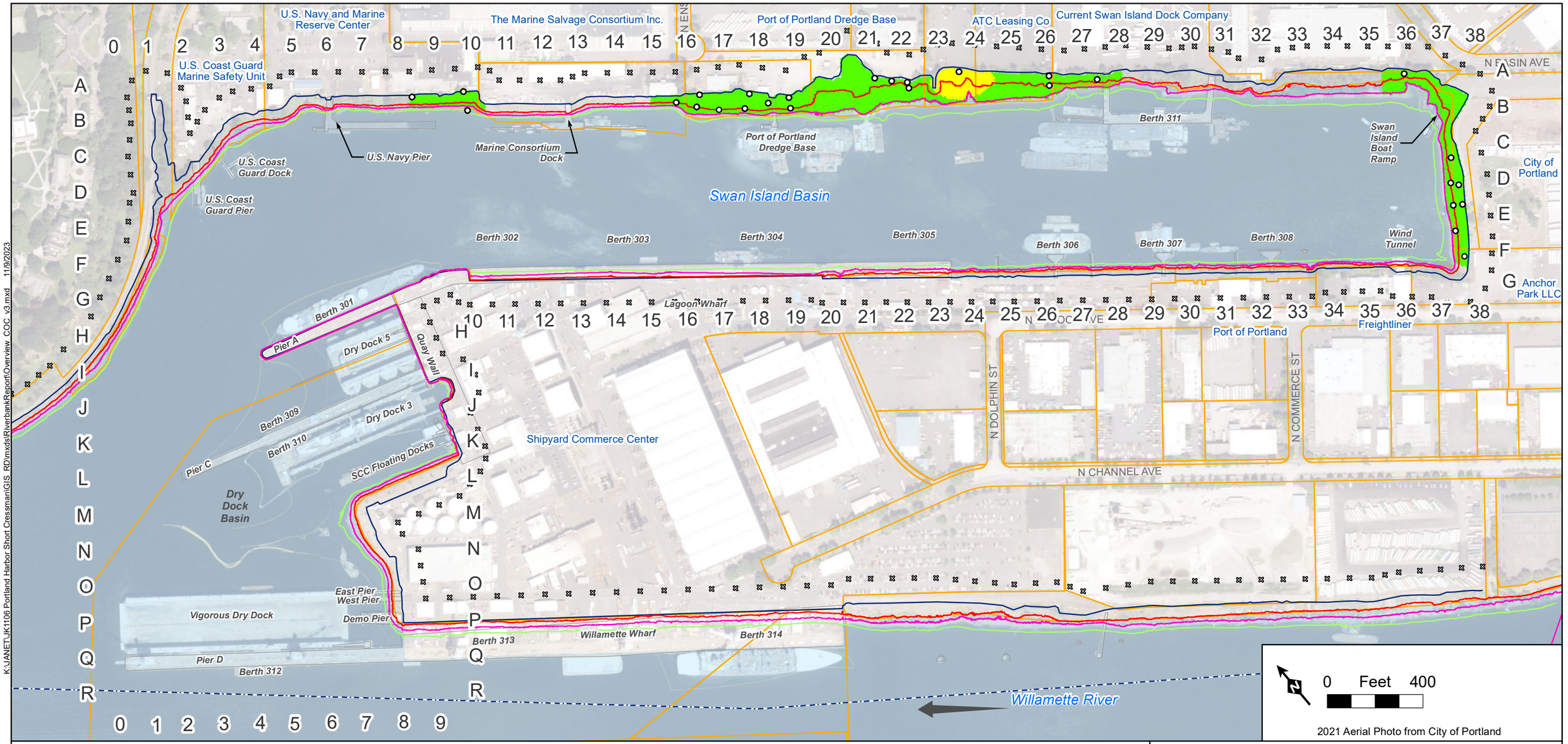

- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot Boundary
- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Interpolated Extent of TCDD

- Below PQL and PTW
- Above PQL and Below PTW
- Above PQL and PTW

M Project Area Grid Label

River Flow Direction

Notes:
NAVD88 – North American Vertical Datum of 1988
PQL – Practical quantitation limit
PTW – Principal threat waste
SCC – Shipyard Commerce Center
TCDD – 2,3,7,8-tetrachlorodibenzo-p-dioxin
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-23

Extent of PQL and PTW Exceedances for TCDD (2-3 feet Below Ground Surface)

Prepared on: 11/9/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
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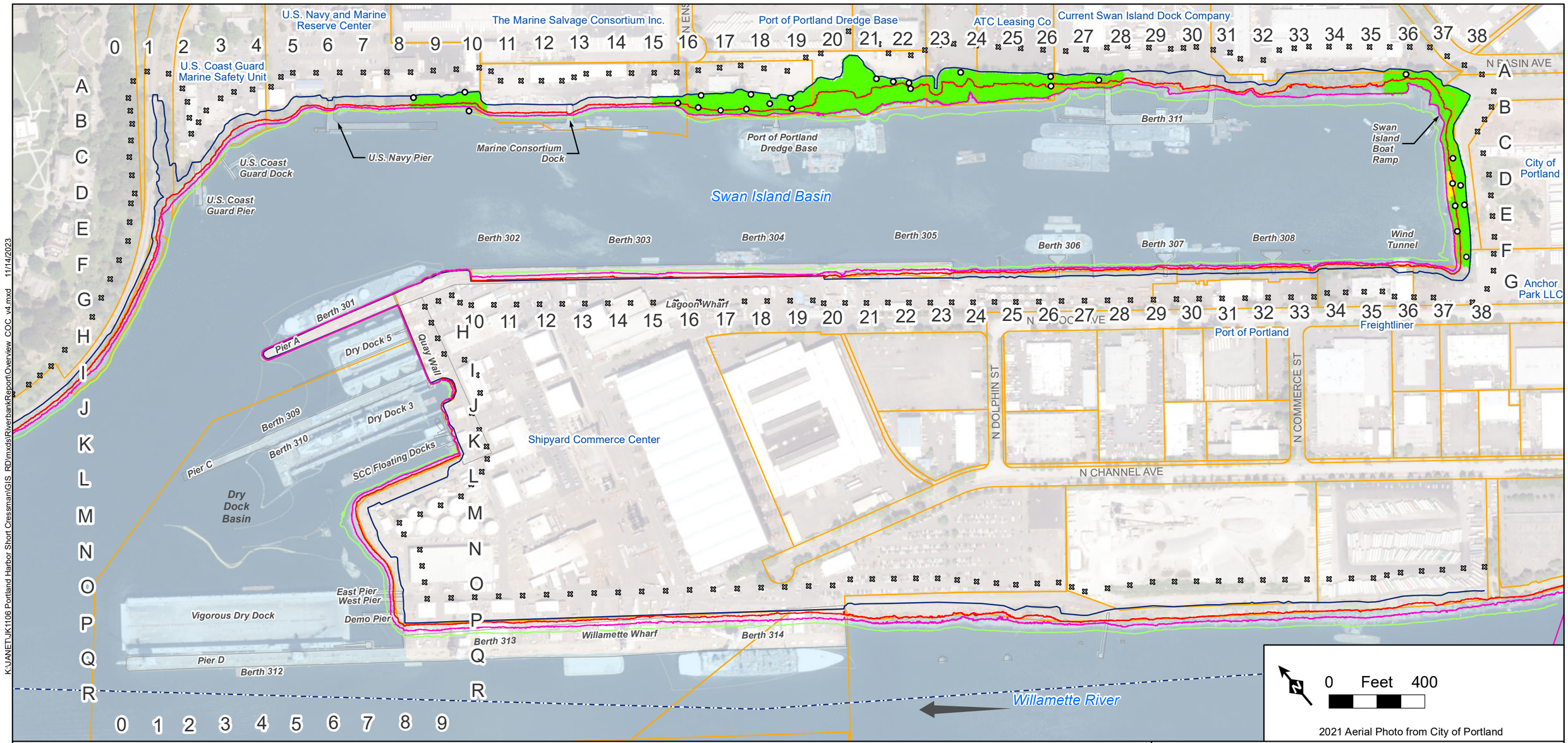
BRIDGEWATER GROUP



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- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot Boundary
- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Interpolated Extent of PeCDD

- Below PQL and PTW
- Above PQL and Below PTW
- Above PQL and PTW

M Project Area Grid Label

River Flow Direction

Notes:
NAVD88 – North American Vertical Datum of 1988
PeCDD – polychlorinated dibenzodioxins
PQL – Practical quantitation limit
PTW – Principal threat waste
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-24

Extent of PQL and PTW Exceedances for PeCDD (2-3 feet Below Ground Surface)

Prepared on: 11/14/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
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BRIDGEWATER GROUP

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U.S. Navy and Marine Reserve Center
The Marine Salvage Consortium Inc.
Port of Portland Dredge Base
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Current Swan Island Dock Company
U.S. Coast Guard Marine Safety Unit
N BASIN AVE
U.S. Navy Pier
Marine Consortium Dock
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Berth 311
Swan Island Boat Ramp
City of Portland
U.S. Coast Guard Dock
U.S. Coast Guard Pier
Swan Island Basin
Berth 302
Berth 303
Berth 304
Berth 305
Berth 306
Berth 307
Berth 308
Wind Tunnel
Anchor Park LLC
Lagoon Wharf
Berth 301
Pier A
Dry Dock 5
Quay Wall
Port of Portland
Freightliner
N DOLPHIN ST
N COMMERCE ST
N CHANNEL AVE
Berth 309
Dry Dock 3
Pier C
Berth 310
SCC Floating Docks
Shipyard Commerce Center
Dry Dock Basin
East Pier
West Pier
Demo Pier
Vigorous Dry Dock
Berth 313
Willamette Wharf
Berth 314
Pier D
Berth 312
Willamette River
0 Feet 400
2021 Aerial Photo from City of Portland

- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot Boundary
- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Interpolated Extent of PeCDF

- Below RAL and PTW
- Above RAL and Below PTW
- Above RAL and PTW

M Project Area Grid Label

River Flow Direction

Notes:
NAVD88 – North American Vertical Datum of 1988
PeCDF – 2,3,4,7,8-pentachlorodibenzofuran
PTW – Principal threat waste
RAL – Remedial Action Level
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-25

Extent of RAL and PTW Exceedances for PeCDF (2-3 feet Below Ground Surface)

Prepared on: 11/14/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
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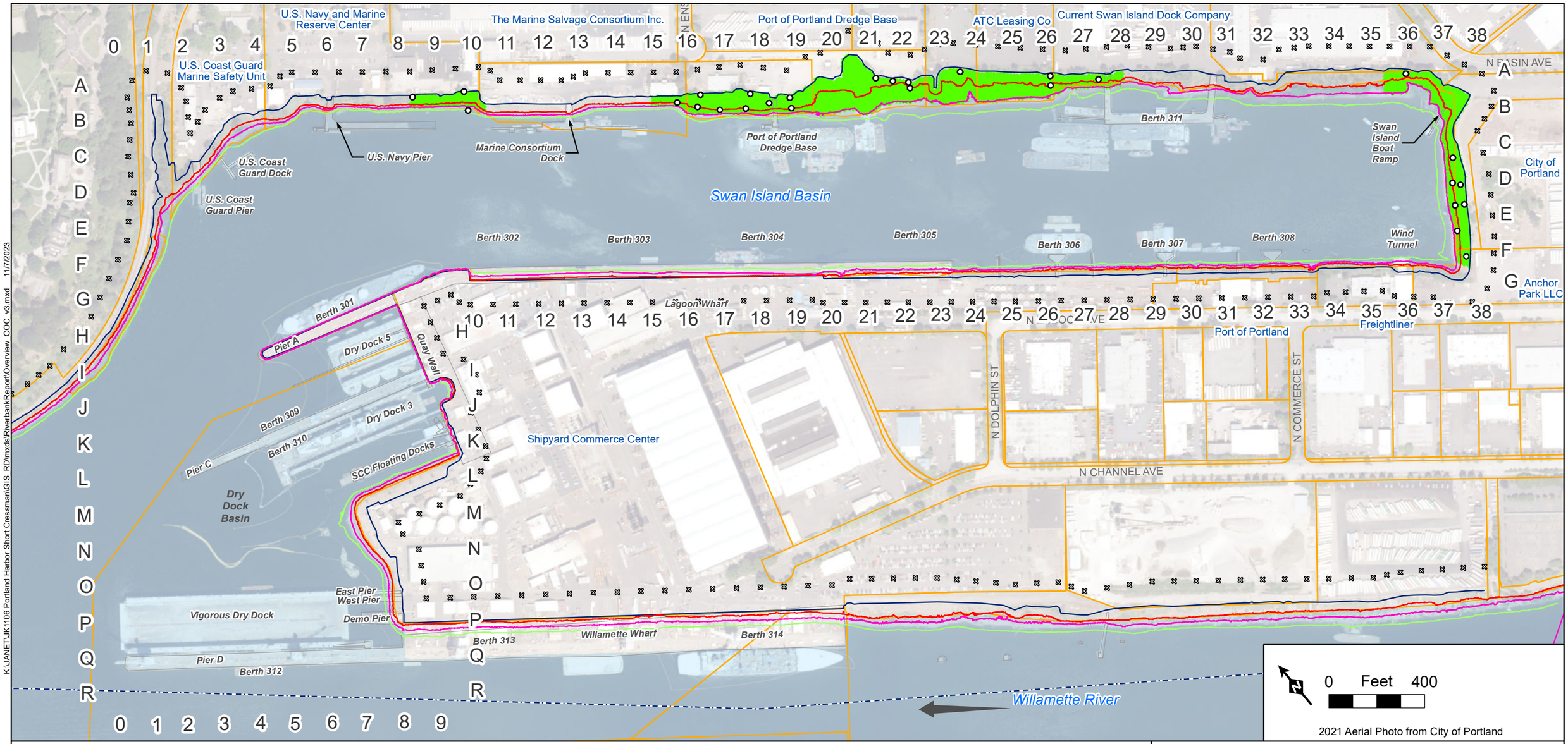

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- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot Boundary
- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Interpolated Extent of DDx

- Below RAL and PTW
- Above RAL and Below PTW
- Above RAL and PTW

M Project Area Grid Label

River Flow Direction

Notes:
DDD – dichlorodiphenyldichloroethane
DDE – dichlorodiphenyldichloroethylene
DDT – dichlorodiphenyltrichloroethane
DDx – DDD + DDE + DDT
NAVD88 – North American Vertical Datum of 1988
PTW – Principal threat waste
RAL – Remedial Action Level
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-26

Extent of RAL and PTW Exceedances for DDx (2-3 feet Below Ground Surface)

Prepared on: 11/7/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
HGL MOTT MACDONALD
BRIDGEWATER GROUP

U.S. Navy and Marine Reserve Center
The Marine Salvage Consortium Inc.
Port of Portland Dredge Base
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Current Swan Island Dock Company
U.S. Coast Guard Marine Safety Unit
N BASIN AVE
U.S. Navy Pier
Marine Consortium Dock
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U.S. Coast Guard Dock
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Berth 302
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Berth 306
Berth 307
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Wind Tunnel
Anchor Park LLC
Lagoon Wharf
N CHANNEL AVE
Port of Portland
Freightliner
N DOLPHIN ST
N COMMERCE ST
Berth 301
Pier A
Dry Dock 5
Quay Wall
Berth 309
Dry Dock 3
Berth 310
Pier C
SCC Floating Docks
Shipyard Commerce Center
Dry Dock Basin
East Pier
West Pier
Demo Pier
Vigorous Dry Dock
Berth 313
Willamette Wharf
Berth 314
Pier D
Berth 312
Willamette River
0 Feet 400
2021 Aerial Photo from City of Portland

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- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot Boundary
- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Interpolated Extent of TCDF

- Below PTW
- Above PTW

M Project Area Grid Label

River Flow Direction

Notes:
NAVD88 – North American Vertical Datum of 1988
PTW – Principal threat waste
SCC – Shipyard Commerce Center
TCDF – 2,3,7,8-tetrachlorodibenzofuran
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-27

Extent of PTW Exceedances for TCDF (2-3 feet Below Ground Surface)

Prepared on: 11/7/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
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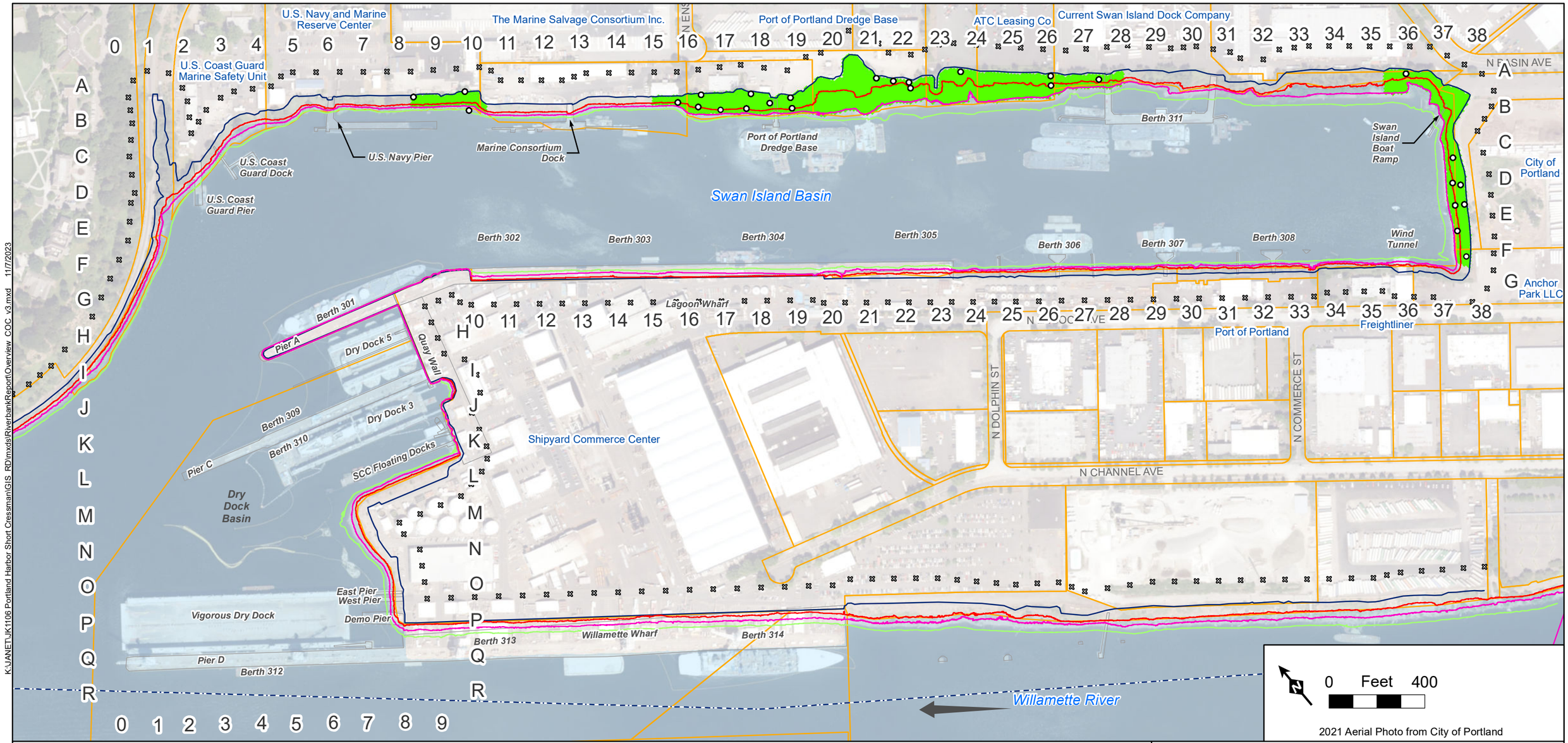

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- Federal Navigation Channel (USACE, 2020)
- Docks and Structures
- Tax Lot Boundary
- Top of Bank (TOB)
- Ordinary High Water (OHW)
- Mean Low Water (MLW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Interpolated Extent of HxCDF

- Below PTW
- Above PTW

M Project Area Grid Label

River Flow Direction

Notes:
HxCDF – 1,2,3,4,7,8-hexachlorodibenzofuran
NAVD88 – North American Vertical Datum of 1988
PTW – Principal threat waste
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-28

Extent of PTW Exceedances for HxCDF (2-3 feet Below Ground Surface)

Prepared on: 11/7/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
HGL MOTT MACDONALD
BRIDGEWATER GROUP

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Berth 311
Swan Island Boat Ramp
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U.S. Coast Guard Dock
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- Mean Low Water (MLW)
- 13-foot NAVD88 Contour
- Riverbank Sample Location
- Location of Zero Value used in interpolation

Interpolated Extent of Total cPAHs

- Below PTW
- Above PTW

M Project Area Grid Label

River Flow Direction

Notes:
cPAHs – carcinogenic polycyclic aromatic hydrocarbons
NAVD88 – North American Vertical Datum of 1988
PTW – Principal threat waste
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

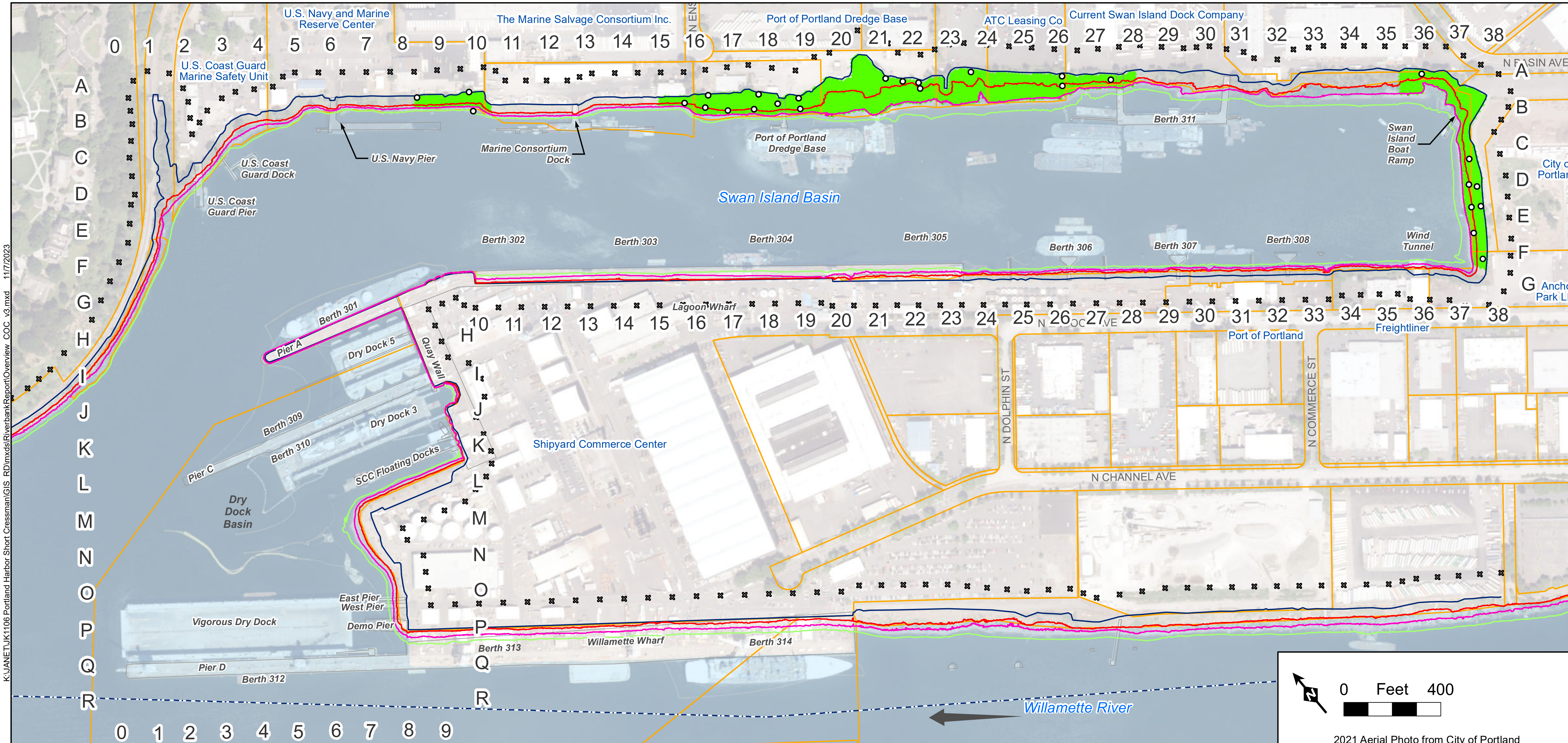
Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-29

Extent of PTW Exceedances for Total cPAHs (2-3 feet Below Ground Surface)

Prepared on: 11/7/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
HGL MOTT MACDONALD
BRIDGEWATER GROUP



Federal Navigation Channel (USACE, 2020)
Docks and Structures
Tax Lot Boundary
Top of Bank (TOB)
Ordinary High Water (OHW)
Mean Low Water (MLW)

13-foot NAVD88 Contour
Riverbank Sample Location
Location of Zero Value used in interpolation

Interpolated Extent of Naphthalene
Below PTW
Above PTW

M Project Area Grid Label

River Flow Direction

Notes:
NAVD88 – North American Vertical Datum of 1988
PTW – Principal threat waste
SCC – Shipyard Commerce Center
USACE – U.S. Army Corps of Engineers

TOB Source – City of Porland Lidar, 2019
OHW and MLW Source – EPA, 2019

Interpolation conducted in ArcGIS Pro 3.1.2 using the Natural Neighbor interpolation function of the Spatial Analyst extension

Figure A-30

Extent of PTW Exceedances for Naphthalene (2-3 feet Below Ground Surface)

Prepared on: 11/7/2023
Contaminated Riverbank Soil Extent
Swan Island Basin

PACIFIC groundwater GROUP
HGL
MOTT MACDONALD
BRIDGEWATER GROUP

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