

30% Remedial Design Basis of Design Report

Appendix D

RAA Development and Dredge Prism

Design Supporting Documents

1 Introduction

This appendix includes supporting figures and a table used during remedial action area (RAA) development and dredge prism design as part of Lower Duwamish Waterway (LDW) middle reach Preliminary (30%) remedial design. The various components of this appendix are as follows:

- Figure D1-1: RAA Boundaries, Remedial Action Level (RAL) Exceedance Areas, RAL Exceedance Locations, and Vertical Extent Data, Series Legend
 - Series legend for Figures D1-1a through D1-1n
- Figures D1-1a through D1-1n: RAA Boundaries, RAL Exceedance Areas, RAL Exceedance Locations, and Vertical Extent Data
 - These figures show various layers of significance that contribute to where the RAA boundaries were drawn based on requirements of the *Record of Decision* (EPA 2014). Information in these figures includes RAL exceedance area boundaries, design dataset sample locations and results, vertical cores profiles, intertidal/subtidal delineation, designation of LDW features of significance (e.g., RC 1 areas, shoal areas), and more.
- Figures D1-2a and D1-2b: Total Polychlorinated Biphenyl (PCB) Combined Surface and Subsurface Sediment Indicator Kriging Interpolation with RAA Boundaries
 - These figures show the RAA boundaries with respect to the PCB indicator kriging probability bands.
- Figures D1-3a and D1-3b: Thiessen Polygons at RAL Exceedance Areas 8 and 9
 - These figures show two areas (RAL exceedance areas 8 and 9) that are driven by non-PCB contaminants of concern to help identify extent of Thiessen polygons representing surface and subsurface exceedances.
- Table D1-1: Dredge Prism Development – Vertical Basis of Design
 - This table presents the elevation/depth of contamination for vertical data within each dredging RAA to indicate the basis of the resulting required dredge elevation/thickness.

**Table D1-1
Dredge Prism Development – Vertical Basis of Design**

RAA Subarea	Area Type	RAL Exceedance Type	Elevation or Depth of Contamination Based on Vertical Core Data Within RAA	Basis of Dredge Elevation/Thickness ^{1,2}	Required Dredge Elevation/Thickness	Technology	Are there Data Gaps Related to Depth of Contamination?
1A	FNC	Subsurface	1586 bounded at -21.2 ft MLLW	Dredge to DOC (-21.2 ft MLLW)	-21.5 ft MLLW, 1-ft overdredge	Dredge, RMC	No
1B	FNC	Subsurface	1582 unbounded at -26.3 ft MLLW	Dredge to accommodate placement of a 5-ft standard engineered cap (top of cap must be below -19 ft MLLW)	-24 ft MLLW, 1-ft overdredge	PD&C	No – Vertical extent of contamination is unbounded but not a data gap because of selected technology
2	FNC	Subsurface	No vertical core; subsurface (0–60 cm) RAL interval exceedance (SC1577)	Dredge based on 0-60 cm RAL interval exceedance	2-ft thickness cut, 1-ft overdredge	Dredge, RMC	Yes – Phase III data are needed.
4	Subtidal	Subsurface	No vertical core; subsurface (0–60 cm) RAL interval exceedance (SC1573)	Dredge based on 0-60 cm RAL interval exceedance	2-ft thickness cut, 1-ft overdredge	Dredge, RMC	Yes – Phase III data are needed.
5B	Intertidal, Subtidal	Subsurface	1560 unbounded at 5.4-ft depth (refusal)	Dredge to accommodate placement of a 3-ft modified engineered cap	3-ft thickness cut, 1-ft overdredge	PD&C	Yes – Phase III data are needed.
6	Intertidal	Surface	Surface (0–10 cm) RAL interval exceedance (SS1235); bounded by subsurface (0-45 cm) sample with no exceedances	Dredge based on surface-only exceedance and intertidal location	0.5-ft thickness cut, 0.5-ft overdredge	Dredge, Backfill	No
7	Subtidal, FNC	Subsurface	1563 bounded at -19 ft MLLW	Dredge to DOC (-19 ft MLLW)	-19 ft MLLW, 1-ft overdredge	Dredge, Backfill/RMC	No
8A	Intertidal	Surface	Surface (0–10 cm) RAL interval exceedance (SS1564, SS1561); bounded by subsurface (0-45 cm) samples with no exceedances	Dredge based on surface-only exceedances and intertidal location	0.5-ft thickness cut, 0.5-ft overdredge	Dredge, Backfill	No
8B	Intertidal, Subtidal	Subsurface	1562 unbounded at 6-ft depth (refusal)	Dredge to accommodate placement of a 4.5-ft modified engineered cap	4.5-ft thickness cut, 1-ft overdredge	PD&C	No – Vertical extent of contamination is unbounded but not a data gap because of selected technology
8D	Subtidal	Subsurface	1532 bounded at 2-ft depth	Dredge to DOC (2-ft thickness)	1.5-ft thickness cut, 1-ft overdredge	Dredge, Backfill/RMC	No
8E	Subtidal	Subsurface	1528 bounded at 2.5-ft depth	Dredge to DOC (2.5-ft thickness)	2.5-ft thickness cut, 1-ft overdredge	Dredge, Backfill	No
8F	Intertidal	Subsurface	1527 bounded at 5.4-ft depth	Dredge to DOC (5.5-ft thickness)	5.5-ft thickness cut, 1-ft overdredge	Dredge, Backfill	No
9A	Intertidal	Subsurface	1556 unbounded at 4.5-ft depth (refusal)	Dredge to accommodate placement of a 4.5-ft modified engineered cap	4.5-ft thickness cut, 1-ft overdredge	PD&C	No – Vertical extent of contamination is unbounded, but not a data gap because of selected technology.
9B	Intertidal, Subtidal	Subsurface	1555 unbounded at 2.9-ft depth (refusal)	Dredge to refusal (2.9-ft thickness); consider depth limitation because of utility crossing	3-ft thickness cut, 1-ft overdredge	Dredge, Backfill	TBD (pending additional information regarding utility corridor)
9C	Intertidal	Subsurface	1552 bounded at 2.5-ft depth	Dredge to DOC (2.5-ft thickness)	2.5-ft thickness cut, 1-ft overdredge	Dredge, Backfill	No
9D	Intertidal	Surface, Subsurface	1551 unbounded at 4.3-ft depth (refusal)	Dredge to accommodate placement of a 4-ft modified engineered cap	4-ft thickness cut, 1-ft overdredge	PD&C	No – Vertical extent of contamination is unbounded; not a data gap because of selected technology
9E	Intertidal, Subtidal	Surface	Surface (0-10 cm) RAL interval exceedance (numerous locations); bounded by subsurface (0-45 cm or 0-60 cm) samples with no exceedances	Dredge based on surface-only exceedances	1-ft thickness cut, 1-ft overdredge	Dredge, Backfill	No
9F	Intertidal	Surface, Subsurface	1540 bounded at 3.9-ft depth	Dredge to DOC (3.9-ft thickness)	4-ft thickness cut, 1-ft overdredge	Dredge, Backfill	No
			1543 bounded at 3.4-ft depth				

RAA Subarea	Area Type	RAL Exceedance Type	Elevation or Depth of Contamination Based on Vertical Core Data Within RAA	Basis of Dredge Elevation/Thickness ^{1,2}	Required Dredge Elevation/Thickness	Technology	Are there Data Gaps Related to Depth of Contamination?
9G	FNC	Surface	Surface (0–10 cm) RAL interval exceedance (SS1230); bounded by adjacent subsurface (0–60 cm) sample with no exceedances	Dredge based on surface-only exceedance	-24 ft MLLW, 1-ft overdredge	Dredge, RMC	No
9H	Subtidal	Surface, Subsurface	1544 bounded at 6.9-ft depth	Dredge to DOC (6.9-ft thickness)	7-ft thickness cut, 1-ft overdredge	Dredge, RMC	No
9I	Intertidal, Subtidal	Surface, Subsurface	1519 bounded at 2.5-ft depth	Dredge to DOC (2.5-ft thickness)	2.5-ft thickness cut, 1-ft overdredge	Dredge, Backfill/RMC	No
			1522 bounded at 2.5-ft depth				
			1536 bounded at 2-ft depth				
9J	FNC	Subsurface	1520 unbounded at -24 ft MLLW	Dredge to accommodate placement of a 5-ft standard engineered cap (top of cap must be below -24 ft MLLW)	-29 ft MLLW, 1-ft overdredge	PD&C	No – Vertical extent of contamination is unbounded; not a data gap because of selected technology
			1529 bounded at -24.5 ft MLLW				
			1531 unbounded at -22.6 ft MLLW (refusal)				
			1534 bounded at -27.8 ft MLLW				
			1535 bounded at -29.8 ft MLLW				
			LDW12/1541 bounded at -22 ft MLLW				
			1542 unbounded at -31.8 MLLW				
9K	FNC	Subsurface	1558 unbounded at -24 ft MLLW	Dredge depth limited because of utility offset	-22 ft MLLW, 1-ft overdredge	AST, Dredge	No – The vertical extent of contamination is unbounded, but it is not a data gap because of utility limitations. However, if additional utility information becomes available that allows for deeper characterization, additional Phase III data could be needed.
11	FNC	Surface, Subsurface	1503 bounded at -28.1 ft MLLW	Dredge to DOC (-28.9 ft MLLW)	-29 ft MLLW, 1-ft overdredge	Dredge, RMC	No
			1510 bounded at -28.9 ft MLLW				
			1511 bounded at -26.9 ft MLLW				
12	Intertidal, Subtidal	Subsurface	Subsurface (0–45 cm) RAL interval exceedance; unbounded at 1.5 ft (IT1508) (refusal)	Dredge based on 0-45 cm RAL interval exceedance	1.5-ft thickness cut, 1-ft overdredge	Dredge, Backfill	Yes – Phase III data are needed.
14	FNC	Subsurface	1482 bounded at -23 ft MLLW	Dredge to accommodate placement of a 5-ft standard engineered cap (top of cap must be below -24 ft MLLW))	-29 ft MLLW, 1-ft overdredge	PD&C	No – Vertical extent of contamination is unbounded but not a data gap because of selected technology
			1488 unbounded at -25 ft MLLW				
			1489 unbounded at -32 ft MLLW				
			1183 bounded at -20 ft MLLW				
			1501 unbounded at -24 ft MLLW				
			1502 unbounded at -24 ft MLLW				
15A	Subtidal	Subsurface	1490 bounded at -21.7 ft MLLW	Dredge to DOC (-21.7 ft MLLW)	-22 ft MLLW, 1-ft overdredge	Dredge, RMC	No
15B	Subtidal	Subsurface	1493 unbounded at -26.7 ft MLLW	Dredge to accommodate placement of a 5-ft standard engineered cap	-26 ft MLLW, 1-ft overdredge	PD&C	No – Vertical extent of contamination is unbounded but not a data gap because of selected technology
16	Subtidal	Surface	Surface (0–10 cm) RAL interval exceedance (SS1179); bounded by subsurface (0–60 cm) sample with no exceedances	Dredge based on surface-only exceedance	1-ft thickness cut, 1-ft overdredge	Dredge, Backfill	No
17	Intertidal, Subtidal	Surface	Surface (0–10 cm) RAL interval exceedance (LDW18-5thAveS)	Dredge based on surface-only exceedance	1-ft thickness cut, 1-ft overdredge	Dredge, Backfill	No
			1486 bounded at 1.5-ft depth				

RAA Subarea	Area Type	RAL Exceedance Type	Elevation or Depth of Contamination Based on Vertical Core Data Within RAA	Basis of Dredge Elevation/Thickness ^{1,2}	Required Dredge Elevation/Thickness	Technology	Are there Data Gaps Related to Depth of Contamination?
18	FNC	Surface	Surface (0–10 cm) RAL interval exceedance (SS1170); bounded by subsurface (0–60 cm) sample with no exceedances	Dredge based on surface-only exceedance	1-ft thickness cut, 1-ft overdredge	Dredge, RMC	No
19	Subtidal	Surface	Surface (0–10 cm) RAL interval exceedance (SS1171); bounded by subsurface (0–60 cm) sample with no exceedances (SC1171)	Dredge based on surface-only exceedance	1-ft thickness cut, 1-ft overdredge	Dredge, RMC	No
20B	Intertidal	Surface	1154 surface (0–10 cm) RAL interval exceedance (SS1154); bounded by subsurface (0–45 cm) sample with no exceedances (IT1154)	Dredge based on surface-only exceedances and intertidal location	0.5-ft thickness cut, 0.5-ft overdredge	Dredge, Backfill	No
			1469 surface (0–10 cm) RAL interval exceedance (SS1469); bounded by subsurface (0–45 cm) sample with no exceedances (IT1469)				
			LDW-SS2027-A surface (0–10 cm) RAL interval exceedance				
20C	Subtidal	Subsurface	1468 results pending	Dredge to accommodate placement of a 3-ft modified engineered cap	3-foot thickness cut, 1-ft overdredge	Dredge, Habitat Cap	No – Vertical extent of contamination is unbounded but not a data gap because of selected technology
			1470 unbounded at 7.7-ft depth				
21A	Intertidal	Surface, Subsurface	1456 subsurface (0–45 cm) RAL interval exceedance (no vertical collected because of refusal)	Dredge to refusal (4-ft thickness)	4-ft thickness cut, 1-ft overdredge	Dredge, Backfill	Yes – Phase III data are needed to determine vertical extent of contamination.
			1457 unbounded at 4-ft depth (refusal)				
21C	Intertidal	Surface	Surface (0–10 cm) RAL interval exceedance (SS1142); bounded by subsurface (0–45 cm) sample with no exceedances (IT1142)	Dredge based on surface-only exceedances and intertidal location	0.5-ft thickness cut, 0.5-ft overdredge	Dredge, Backfill	No
			1448 bounded throughout (no interval > surface RAL)				
22	FNC	Subsurface	1406 unbounded at -31 ft MLLW	Dredge to accommodate placement of a 5-ft standard engineered cap (top of cap must be below -24 ft MLLW)	-29 ft MLLW, 1-ft overdredge	PD&C	No – Vertical extent of contamination is unbounded but not a data gap because of selected technology
			1409 unbounded at -29.9 ft MLLW				
			1416 unbounded at -29.9 ft MLLW				
			1421 unbounded at -31.8 ft MLLW				
			1431 unbounded at -32.2 ft MLLW				
			1439 unbounded at -31.7 ft MLLW				
			1451 unbounded at -31.8 ft MLLW				
1460 unbounded at -29.9 ft MLLW							
23A	Subtidal	Subsurface	1424 unbounded at -24.6 ft MLLW (refusal)	Dredge to accommodate placement of a 5-ft standard engineered cap	-20 ft MLLW, 1-ft overdredge	PD&C	No – Vertical extent of contamination is unbounded but not a data gap because of selected technology
			1425 unbounded at -19.9 ft MLLW				
			1432 unbounded at -27 ft MLLW				
			1433 bounded at -11.7 ft MLLW				
			1441 unbounded at -26.9 ft MLLW				
			1442 unbounded at 16.1 ft MLLW (refusal)				
			1452 bounded at -21.3 ft MLLW				
			1453 unbounded at -24.7 MLLW				
24B	Intertidal	Surface	1609 0–45 cm interval > surface RAL (refusal)	Dredge to DOC (1.6-ft thickness)	2-ft thickness cut, 1-ft overdredge	Dredge, Backfill	No
			FS2154-A-SE DOC deeper than 1.6 ft depth (bounded at approximately 3.3 ft depth)				
24C	Intertidal		1607 bounded at -1.3 ft MLLW (refusal)	Dredge to DOC (-1.8 ft MLLW)	-2 ft MLLW, 1-ft overdredge	Dredge, Backfill	

RAA Subarea	Area Type	RAL Exceedance Type	Elevation or Depth of Contamination Based on Vertical Core Data Within RAA	Basis of Dredge Elevation/Thickness ^{1,2}	Required Dredge Elevation/Thickness	Technology	Are there Data Gaps Related to Depth of Contamination?
		Surface, Subsurface	1606 bounded at 2.8 ft MLLW	Note that cores are ordered from the inner part of the inlet towards the neck of the inlet.			No – Phase III data are not anticipated to improve certainty regarding the DOC in this area; confirmation samples will be taken following dredging to confirm dredge depth.
			<i>FS2154-B-SE bounded at approximately 0 ft MLLW</i>				
			<i>FS2154-C-SE bounded at approximately 2 ft MLLW</i>				
			1605 bounded at 1.2 ft MLLW				
			1604 unbounded at 2.1 ft MLLW (refusal)				
			1603 unbounded at 0.5 ft MLLW (refusal)				
			<i>FS2154-D-SE bounded at approximately -1 ft MLLW</i>				
			1610 unbounded at 2.3 ft MLLW (refusal)				
			<i>FS2154-F-SE bounded at approximately -1 ft MLLW</i>				
			<i>FS2154-G-SE bounded at approximately 0 ft MLLW</i>				
			1601 bounded at -1.8 ft MLLW				
			1602 unbounded at 1.4 ft MLLW (refusal)				
			1600 bounded at 0.6 ft MLLW				
<i>FS2154-H-SE unbounded at approximately -2 ft MLLW</i>							
24D	Intertidal	Surface, Subsurface	1612 bounded at 0.4 ft MLLW (refusal)	Dredge to DOC (-3 ft MLLW)	-3 feet MLLW, 1-ft overdredge	Dredge, Backfill	No
			1611 unbounded at 0.4 ft MLLW (refusal)				
			<i>FS2154-I-SE bounded at approximately -3 ft MLLW</i>				
			1599 bounded at -2 ft MLLW				
			1598 unbounded at 4 ft MLLW (refusal)				
			<i>FS2154-J-SE bounded at approximately -3 ft MLLW</i>				
			1597 bounded at +4.4 ft MLLW				
1596 unbounded at -1.9 ft MLLW (refusal)							
24E	Intertidal	Surface, Subsurface	1595 bounded at 3.3-ft depth	Dredge to DOC (3.3-ft thickness)	3.5-ft thickness cut, 1-ft overdredge	Dredge, Backfill	No
24F	Intertidal	Surface, Subsurface	1593 bounded at 1.5-ft depth <i>FS2154-L-SE bounded at approximately -0.5 ft MLLW (2.8-ft depth)</i>	Dredge to DOC (1.5-ft thickness)	1.5-ft thickness cut, 1-ft overdredge	Dredge, Backfill	No
24G	Intertidal	Surface, Subsurface	<i>FS2154-K-SE bounded at approximately 4.4-ft depth</i> 1594 bounded at 1.5-ft depth	Dredge to DOC (4.4-ft thickness)	4.5-ft thickness cut, 1-ft overdredge	Dredge, Backfill	No
24H	Intertidal	Surface	<i>FS2154-M-SE bounded at approximately 1.2-ft depth</i> LDW-SC40 bounded at 1.3 ft	Dredge to DOC (1.3-ft thickness)	1.5-ft thickness cut, 1-ft overdredge	Dredge, Backfill	No
24I	Intertidal	Subsurface	1428 unbounded at 7.8-ft depth	Dredge to accommodate placement of a 4-ft modified engineered cap	4-ft thickness cut, 1-ft overdredge	PD&C	No – Vertical extent of contamination is unbounded; not a data gap because of selected technology
24J	Intertidal, Subtidal	Surface	surface (0–10 cm) RAL interval exceedance (SS1127); bounded by subsurface (0-45) sample with no exceedance (IT1127)	Dredge based on surface-only exceedance	1-ft thickness cut, 1-ft overdredge	Dredge, Backfill	No
27A	Intertidal, Subtidal	Surface, Subsurface	1411 is bounded at 2.5-ft depth 1413 is bounded at 2.5-ft depth 1418 is bounded at 2.5-ft depth	Dredge to DOC (2.5-ft thickness)	2.5-ft thickness cut, 1-ft overdredge	Dredge, Backfill	No
27C	Intertidal	Subsurface	1404 bounded at 3.4-ft depth	Dredge to DOC (3.4-ft thickness)	3.5-ft thickness cut, 1-ft overdredge	Dredge, Backfill	No

RAA Subarea	Area Type	RAL Exceedance Type	Elevation or Depth of Contamination Based on Vertical Core Data Within RAA	Basis of Dredge Elevation/Thickness ^{1,2}	Required Dredge Elevation/Thickness	Technology	Are there Data Gaps Related to Depth of Contamination?
29	Intertidal, Subtidal	Surface	Surface (0–10 cm) RAL interval exceedance (SS1077); bounded by subsurface (0–60 cm) sample with no exceedances (SC1077)	Dredge based on surface-only exceedance and intertidal location	0.5-ft thickness cut, 0.5-ft overdredge	Dredge, Backfill	No
30B	FNC	Surface, Subsurface	1382 unbounded at -34.3 ft MLLW	Dredge to accommodate placement of a 5-ft standard engineered cap (top of cap must be below -24 ft MLLW)	-29 ft MLLW, 1-ft overdredge	PD&C	No – Vertical extent of contamination is unbounded but not a data gap because of selected technology
			1383 unbounded at -34.5 ft MLLW				
			1384 unbounded at -31.2 ft MLLW				
			1385 unbounded at -33.4 ft MLLW				
			1387 unbounded at -31.1 ft MLLW				
30C	FNC	Surface, Subsurface	1346 bounded at -36.9 ft MLLW (refusal)	Dredge depth limited because of utilidor offset	-35 ft MLLW, 1-ft overdredge	AST	No
			1347 unbounded at -36.4 ft MLLW (refusal)				
30D	FNC	Subsurface	1343 bounded at -36.9 ft MLLW (refusal)	Dredge to accommodate placement of a 5-ft standard engineered cap (top of cap must be below -34 ft MLLW))	-39 ft MLLW, 1-ft overdredge	PD&C	No – Vertical extent of contamination is unbounded but not a data gap because of selected technology
			1344 bounded at -38.9 ft MLLW				
30E	FNC	Subsurface	1339 unbounded at -36.4 ft MLLW	Dredge to accommodate placement of a 5-ft standard engineered cap (top of cap must be below -34 ft MLLW)	-39 ft MLLW, 1-ft overdredge	PD&C	No – Vertical extent of contamination is unbounded but not a data gap because of selected technology
			1341 unbounded -37.9 ft MLLW (refusal)				
30F	FNC	Subsurface	1325 unbounded at -41.8 ft MLLW	Dredge to accommodate placement of a 5-ft standard engineered cap (top of cap must be below -34 ft MLLW)	-39 ft MLLW, 1-ft overdredge	PD&C	No – Vertical extent of contamination is unbounded but not a data gap because of selected technology
			1328 unbounded at -41.8 ft MLLW				
			1335 unbounded at -41.8 ft MLLW				
			1336 unbounded at -36.2 ft MLLW (refusal)				
			1340 bounded at -38.9 ft MLLW				
31B	Intertidal	Subsurface	1369 unbounded at 3.3-ft depth	Dredge to accommodate placement of a 5-ft standard engineered cap; 3H:1V slope cut starting at edge of RAA 30D	3H:1V side slope, beginning 15 ft inside the FNC boundary (to avoid impacts to upland utility infrastructure)	PD&C	No –Phase III data are not anticipated to improve certainty regarding the DOC in this area; confirmation samples will be taken following dredging to confirm whether an engineered cap is needed.
			1370 unbounded at 1.5-ft depth (refusal)				
			1371 unbounded at -29.3 ft MLLW (refusal)				
			1372 unbounded at -21.8 ft MLLW				
			1373 bounded at 2.5-ft depth (native material)				
31C	Intertidal, Subtidal	Subsurface	<u>Cores in high-elevation intertidal:</u> 1359, 1361, 1362, 1364, and 1368 unbounded at between 2.0- and 3.1-ft depth (refusal for all cores)	Dredge to accommodate placement of a 5-ft standard engineered cap; 3H:1V slope cut starting at edge of RAA 30E	3H:1V side slope cut at edge of FNC	PD&C	No –Phase III data are not anticipated to improve certainty regarding the DOC in this area; confirmation samples will be taken following dredging to determine whether an engineered cap is needed.
			<u>Cores in lower-elevation intertidal:</u> 1351, 1352, 1355, 1358, 1360, 1363, and 1367 unbounded at between 5.3 and 6.7 ft depth, corresponding to -9.2 to -10.7 ft MLLW (refusal for all cores)				
			<u>Cores in shallow subtidal:</u> 1350 unbounded at -17 ft MLLW (refusal) 1354 bounded at -17 ft MLLW 1357 unbounded at -16.8 ft MLLW (refusal) 1366 unbounded at -11.8 ft MLLW (refusal)				

RAA Subarea	Area Type	RAL Exceedance Type	Elevation or Depth of Contamination Based on Vertical Core Data Within RAA	Basis of Dredge Elevation/Thickness ^{1,2}	Required Dredge Elevation/Thickness	Technology	Are there Data Gaps Related to Depth of Contamination?
			<i>Cores in deep elevation subtidal (along FNC):</i> 1353 unbounded at -31.4 ft MLLW (refusal) 1356 unbounded at -32.1 ft MLLW (refusal); note that intervals above -18.6 ft MLLW are below RALs 1365 unbounded at -22.8 ft MLLW (refusal)				
31D	Intertidal	Subsurface	1374 unbounded at 4.5-ft depth (refusal)	Dredge to accommodate placement of a 3-ft modified engineered cap	3-ft thickness cut, 1-ft overdredge	PD&C	No – Vertical extent of contamination is unbounded but not a data gap because of selected technology
34A	Subtidal	Subsurface	1312 unbounded at -15.3 ft MLLW (refusal)	Dredge to refusal (-15.3 ft MLLW)	-15.5 ft MLLW, 1-ft overdredge	Dredge, Backfill/RMC	Yes – Phase III data are needed.
34B	Subtidal	Subsurface	1310 bounded at 2-ft depth	Dredge to DOC (2-ft thickness)	2-ft thickness cut, 1-ft overdredge	Dredge, RMC	No
35A	Intertidal, Subtidal	Surface	Surface (0–10 cm) RAL interval exceedance (SS1034); bounded by subsurface (0–45 cm) sample with no exceedances (IT1034)	Dredge based on surface-only exceedance and intertidal location	0.5-ft thickness cut, 0.5-ft overdredge	Dredge, Backfill	No
			Surface (0–10 cm) RAL interval exceedance (SS1317); bounded by subsurface (0–45 cm) sample with no exceedances (IT1317)				
			1318 has no intervals above surface RAL				
36	Subtidal	Subsurface	1321 bounded at 3-ft depth	Dredge to DOC (3-ft thickness)	3-ft thickness cut, 1-ft overdredge	Dredge, RMC	No

Notes:

1. Elevations are based on RTK-DGPS field measurements, as discussed in Section 4.2 of the *Basis of Design Report*.
2. When defined, dredge thicknesses to accommodate caps includes a preliminary allowance for placement tolerances. Those will be refined during Intermediate (60%) remedial design.
3. Bold text identifies sample locations where the depth of contamination is not considered to be vertically bounded, as described in Section 4.2 of the *Basis of Design Report*.
4. Gray italic text identifies non-LDWG cores for which there is a higher level of uncertainty associated with the depth of contamination (e.g., due to low core recoveries).

AST: area-specific technology

cm: centimeter

DOC: depth of contamination

FNC: federal navigation channel

ft: foot

H:V: horizontal to vertical (ratio)

MLLW: mean lower low water

RAA: remedial action area

RAL: remedial action level

RMC: residuals management cover

RTK-DGPS: real-time kinematic differential global positioning system

PD&C: partial dredge and cap

RMC: residuals management cover

TBD: to be determined

2 Reference

EPA (U.S. Environmental Protection Agency), 2014. *Record of Decision*. Lower Duwamish Waterway Superfund Site. U.S. Environmental Protection Agency Region 10. November 2014.

Figures

Surface (0-10 cm) sampling location

- Exceeds RAL
- Does not exceed RAL

Intertidal (0-45 cm) core location

- Exceeds RAL
- Does not exceed RAL

Subtidal (0-60 cm) core location

- Exceeds RAL
- Does not exceed RAL

Other sampling locations

- ∇ Vertical extent (non-RAL interval)
- Surface (0-10 cm), archive
- Intertidal (0-45 cm) archive
- Subtidal (0-60 cm) archive
- ∇ Vertical extent (non-RAL interval) archive
- ∇ Vertical extent (non-RAL interval) not collected because of core refusal
- Shoaling core
- Core without appropriate RAL interval
- Surface (0-10 cm) bioassay passed
- Subtidal (0-60 cm) bioassay passed
- Sample above MHHW not included in the interpolation dataset
- Upland soil sample
- 30% RD RAA daylight boundary^a
- 30% RD RAA placement area
- 30% RD RAA toe of cut
- 1 RAL exceedance area boundary
- Combined surface and subsurface sediment PCB indicator kriging RAL exceedance area
- Additional Thiessen polygon RAL exceedance area for other COCs

location ID	year	RAL exceedance factor
LDW23-SS1003	2023	2.0

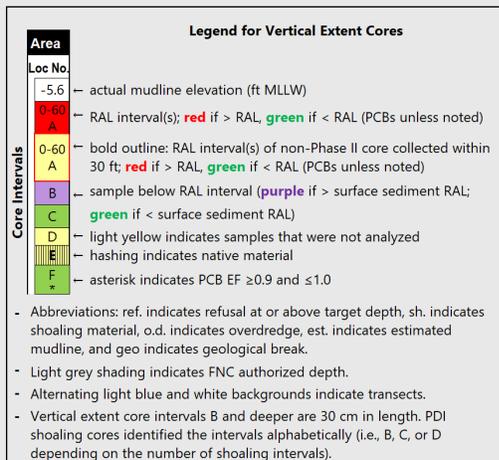
0-10 cm: Phenol: 2.0

depth interval chemical

Exceedance boxes include RAL exceedances and near-exceedances for all COCs and intervals collected at that location.

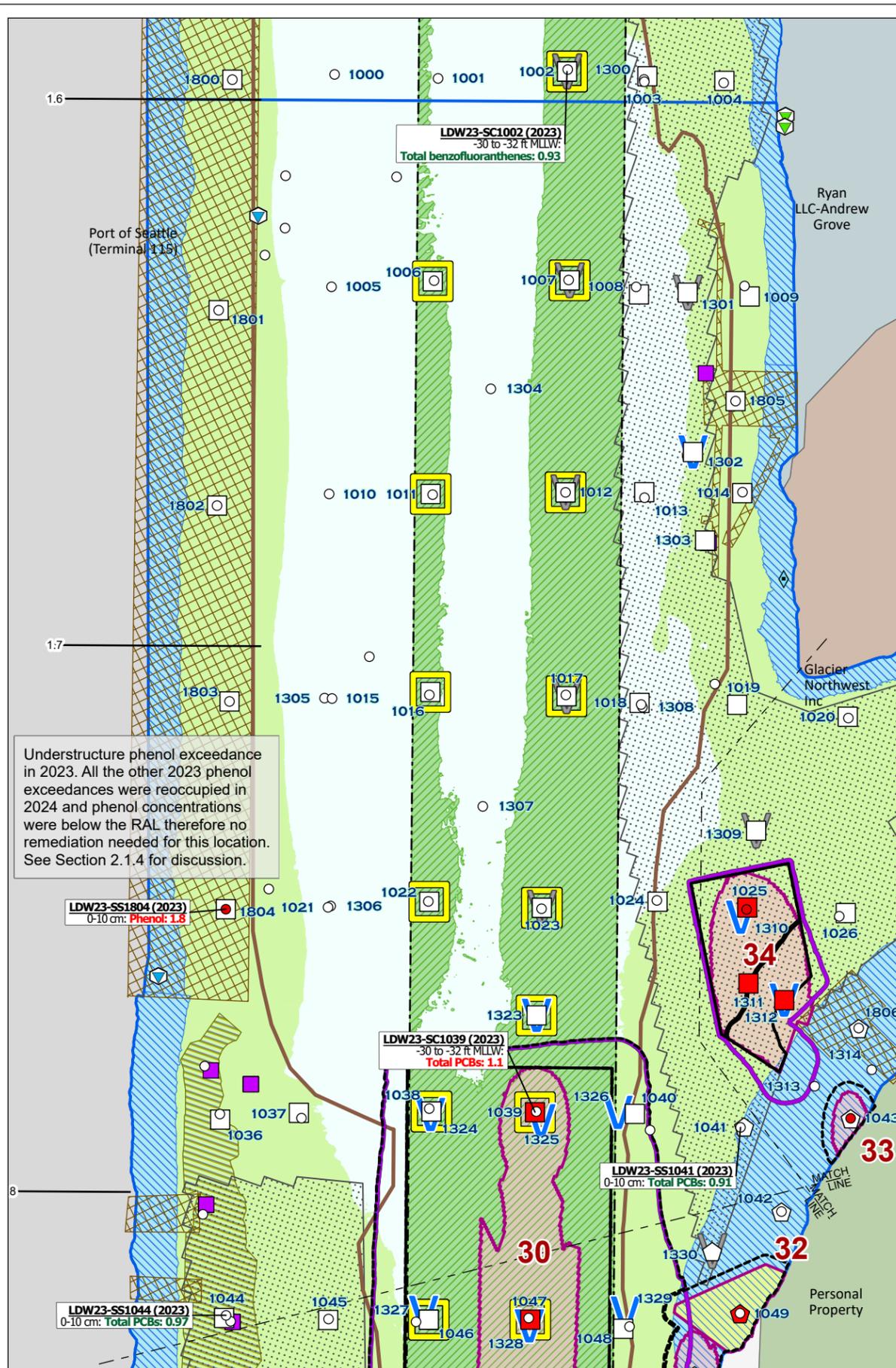
Outfall classification

- CSO^b
- CSO/storm drain^b
- CSO/EOF^b
- EOF/storm drain^b
- Private storm drain^b
- Public storm drain^b
- Reservoir overflow^b
- Stream, channel, or ditch^b
- Abandoned/inactive outfall^b
- Removed outfall^b
- Pipe of unresolved origin and/or use^b
- Not an outfall^b
- Recovery Category 1
- Historical USACE overdrudge extent
- Beach play area
- Georgetown WWTS diffuser pipe
- Utility corridor
- Bridge
- Dock/pier
- Marina
- Sand cover placement
- Boundary area thin-layer placement
- Talon Shoreline Stabilization Project
- Boyer maintenance dredging (2012)
- Intertidal area
- Potential vessel scour area
- Shoal area
- Below the navigation depth in the FNC and below potential vessel scour depth outside the FNC
- Not covered by bathymetric survey
- Bridge footing
- LDW Superfund Boundary (MHHW)^c
- Early Action Area
- King Co tax parcel
- Federal Navigation Channel authorized depth boundary
- Federal Navigation Channel
- River mile



^a For 30% RD, daylight boundaries are not shown for dredge areas that are based on thickness cuts.
^b Outfalls are based on the Ecology 2020 survey, as updated by LDWG as of February 20, 2024; the revised outfall layer is pending approval by LDWG, EPA, and Ecology.
^c The 2010 MHHW boundary has been updated based on 2021 LiDAR data collected by King County.

Figure D1-1. RAA Boundaries, RAL Exceedance Areas, RAL Exceedance Locations, and Vertical Extent Data, Series Legend



RM 1.6 to RM 1.75 - FNC										
Location	1002	1006	1007	1011	1012	1016	1017	1022	1023	
Mudline	-26.9	-29.3	-27.8	-29.3	-28.3	-29.8	-28.5	-29.4	-28.8	
Core Target:	-34 ft									
-27 to -28 ft	sh. A									
-28 to -29 ft	sh. B		sh. A		sh. A		sh. A		sh. A	
-29 to -30 ft	sh. B	sh. B	sh. B	sh. A	sh. B	sh. A	sh. B	sh. A	sh. A	
-30 to -31 ft	o.d.									
-31 to -32 ft	C	A	B	A	B	A	B	A	B	
-32 to -33 ft	C	B	C	B	C	B	C	B	C	
-33 to -34 ft										

RM 1.6 E		Area 30 N - FNC				
Location	1301	1302	1323	1324	1325	1326
Mudline	-23.2	-23.0	-29.2	-29.3	-26.0	-23.2
Core Target	-40 ft	-40 ft	-41 ft	-41 ft	-41 ft	20 ft
Older Loc.	-	-	-	1038	1039	1040
-23 to -24 ft	0-60 A	0-60 A +			0-60 A	
-24 to -25 ft	B	B			B	
-25 to -26 ft	C	C			sh. A	C
-26 to -27 ft	D	D			sh. B	D
-27 to -28 ft	E	E			sh. B	E
-28 to -29 ft	F	F	sh. o.d.	sh. o.d.	sh. B	F
-29 to -30 ft	G	G	sh. o.d.	sh. o.d.	sh. B	G
-30 to -31 ft	H	H	A	A	C	H
-31 to -32 ft	I	I	B	B	D	I
-32 to -33 ft	J	J	C	C	E	J
-33 to -34 ft	K	K	D	D	F	K
-34 to -35 ft	L	L	E	E	G	L
-35 to -36 ft	ref.	M	F	F	H	M
-36 to -37 ft		N	G	G	I	N
-37 to -38 ft		O	H	H	J	O
-38 to -39 ft	ref.		I	I	K	P
-39 to -40 ft			J	J	L	Q
-40 to -41 ft			K	K	M	R
-41 to -42 ft						
-42 to -43 ft					N	

- Surface (0-10 cm) sampling location**
- Exceeds RAL
 - Does not exceed RAL
- Intertidal (0-45 cm) core location**
- ⬠ Exceeds RAL
 - ⬡ Does not exceed RAL
- Subtidal (0-60 cm) core location**
- ⬢ Exceeds RAL
 - ⬣ Does not exceed RAL
- Other sampling locations**
- ∇ Vertical extent (non-RAL interval)
 - ∇ Vertical extent (non-RAL interval) archive
 - Shoaling core
 - Core without appropriate RAL interval
 - ⬤ Upland soil sample
 - ⬥ 30% RD RAA daylight boundary^a
 - ⬦ 30% RD RAA placement area
 - ⬧ 30% RD RAA toe of cut
 - ⬨ 1 RAL exceedance area boundary
 - Combined surface and subsurface sediment PCB indicator kriging RAL exceedance area
 - Additional Thiessen polygon RAL exceedance area for other COCs

Legend for Vertical Extent Cores

Area	Core Interval	Description
-5.6	-	actual mudline elevation (ft MLLW)
A	0-60	RAL interval(s); red if > RAL, green if < RAL (PCBs unless noted)
B	0-60	bold outline: RAL interval(s) of non-Phase II core collected within 30 ft; red if > RAL, green if < RAL (PCBs unless noted)
C	0-60	sample below RAL interval (purple if > surface sediment RAL; green if < surface sediment RAL)
D	0-60	light yellow indicates samples that were not analyzed
E	0-60	hashing indicates native material
F	0-60	asterisk indicates PCB EF ≥0.9 and ≤1.0

Abbreviations: ref. indicates refusal at or above target depth; sh. indicates shoaling material; o.d. indicates overdrill; est. indicates estimated mudline, and geo indicates geological break.
 Light grey shading indicates FNC authorized depth.
 Alternating light blue and white backgrounds indicate transects.
 Vertical extent core intervals B and deeper are 30 cm in length; PDI shoaling cores identified the intervals alphabetically (i.e., B, C, or D depending on the number of shoaling intervals).

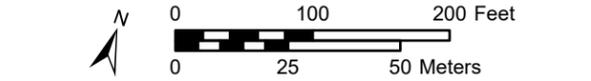
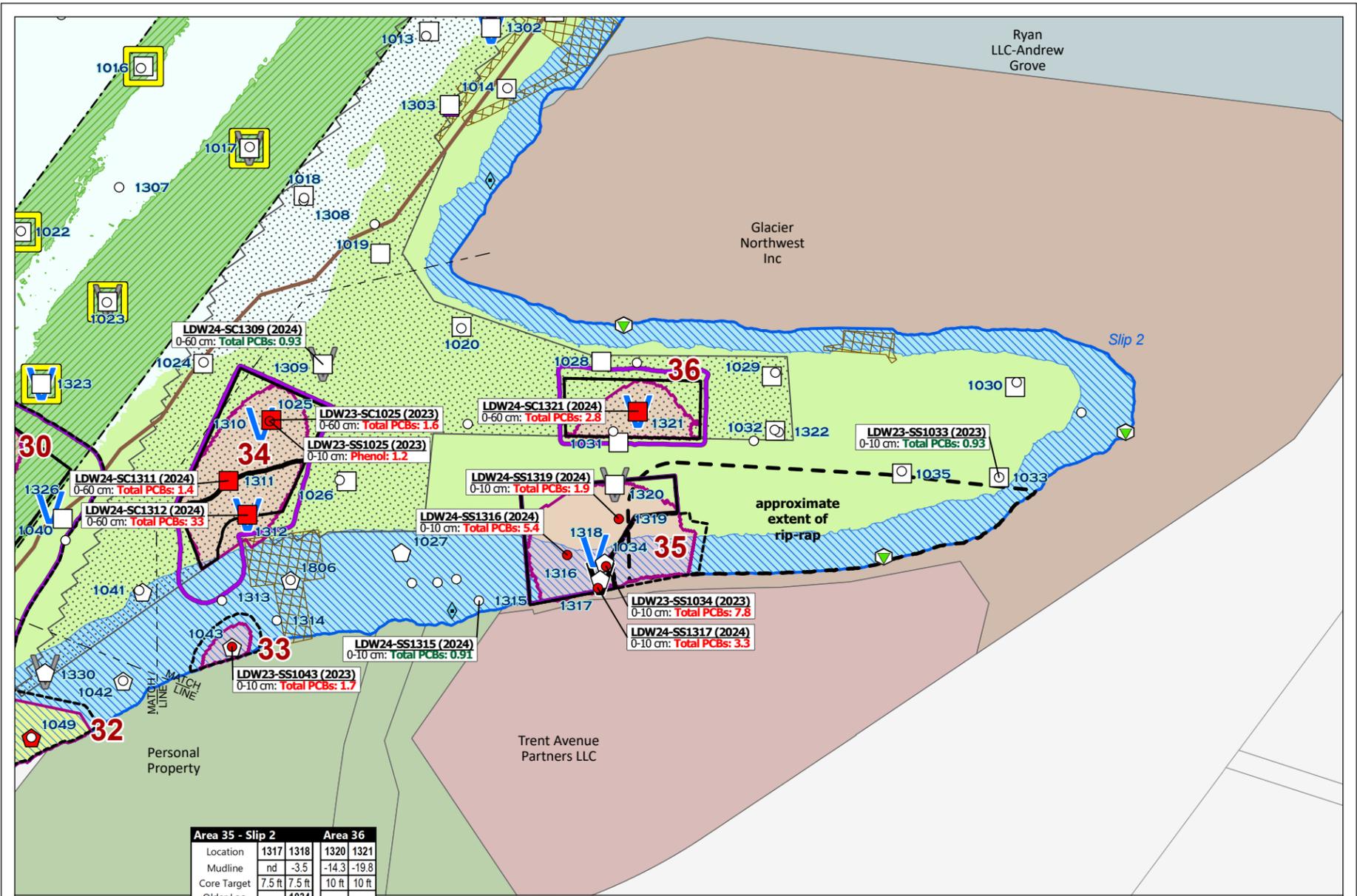


Figure D1-1a. RAA Boundaries, RAL Exceedance Areas, RAL Exceedance Locations, and Vertical Extent Data, RM 1.6 to RM 1.8

APPENDIX D - RAA DEVELOPMENT AND DREDGE PRISM DESIGN
 30% REMEDIAL DESIGN BASIS OF DESIGN
 REPORT FOR THE LDW MIDDLE REACH
 OCTOBER 27, 2025



Area 35 - Slip 2		Area 36	
Location	1317 1318	1320 1321	
Mudline	nd -3.5	-14.3 -19.8	
Core Target	7.5 ft 7.5 ft	10 ft 10 ft	
Older Loc.	- 1034	-	

Area 34 - Slip 2			
Location	1312	1310	1309
Mudline	-8.1	-17.1	-19.7
Core Target	-21 ft	10 ft	10 ft
Older Loc.	-	1025	-
-8 to -9 ft	0-60 A		
-9 to -10 ft	B		
-10 to -11 ft	C		
-11 to -12 ft	D		
-12 to -13 ft	E		
-13 to -14 ft	F		
-14 to -15 ft	ref.		
-15 to -16 ft	ref.		
-16 to -17 ft		0-60 A	
-17 to -18 ft		B	
-18 to -19 ft		C	
-19 to -20 ft		D	
-20 to -21 ft		E	
-21 to -22 ft		F	
-22 to -23 ft		G	
-23 to -24 ft		H	
-24 to -25 ft		I	
-25 to -26 ft		J	
-26 to -27 ft		geo E	
-27 to -28 ft		F	
-28 to -29 ft		G	
-29 to -30 ft		H	
-30 to -31 ft		I	

5 to 4 ft	est. 0-45 A		
4 to 3 ft	A		
break	ref.		
-3 to -4 ft	0-45 A		
-4 to -5 ft	B		
-5 to -6 ft	C		
-6 to -7 ft	D		
-7 to -8 ft	E		
-8 to -9 ft	ref.		
-9 to -10 ft			
-10 to -11 ft			
-11 to -12 ft			
-12 to -13 ft			
-13 to -14 ft			
-14 to -15 ft			
-15 to -16 ft		0-60 A	
-16 to -17 ft		B	
-17 to -18 ft		C	
-18 to -19 ft		D	
-19 to -20 ft		E	
-20 to -21 ft		F	
-21 to -22 ft		G	0-60 A
-22 to -23 ft		H	
-23 to -24 ft		I	
-24 to -25 ft		J	
-25 to -26 ft		geo E	
-26 to -27 ft		F	
-27 to -28 ft		G	
-28 to -29 ft		H	
-29 to -30 ft		I	
-30 to -31 ft		geo I	

Surface (0-10 cm) sampling location

- Exceeds RAL
- Does not exceed RAL

Intertidal (0-45 cm) core location

- Exceeds RAL
- Does not exceed RAL

Subtidal (0-60 cm) core location

- Exceeds RAL
- Does not exceed RAL

Other sampling locations

- ∨ Vertical extent (non-RAL interval)
- ∨ Vertical extent (non-RAL interval) archive
- ∨ Vertical extent (non-RAL interval) not collected because of core refusal
- Shoaling core
- Core without appropriate RAL interval

- 30% RD RAA daylight boundary^a
- 30% RD RAA placement area
- 30% RD RAA toe of cut
- 1 RAL exceedance area boundary
- Combined surface and subsurface sediment PCB indicator kriging RAL exceedance area
- Additional Thiessen polygon RAL exceedance area for other COCs

Legend for Vertical Extent Cores

Area	Loc No.	Description
-5.6		actual mudline elevation (ft MLLW)
B, A		RAL interval(s); red if > RAL, green if < RAL (PCBs unless noted)
0-60		bold outline: RAL interval(s) of non-Phase II core collected within 30 ft; red if > RAL, green if < RAL (PCBs unless noted)
B		sample below RAL interval (purple if > surface sediment RAL; green if < surface sediment RAL)
C		light yellow indicates samples that were not analyzed
D		hashing indicates native material
E		asterisk indicates PCB EF ≥ 0.9 and ≤ 1.0

Abbreviations: ref. indicates refusal at or above target depth, sh. indicates shoaling material, o.d. indicates overdrudge, est. indicates estimated mudline, and geo indicates geological break.

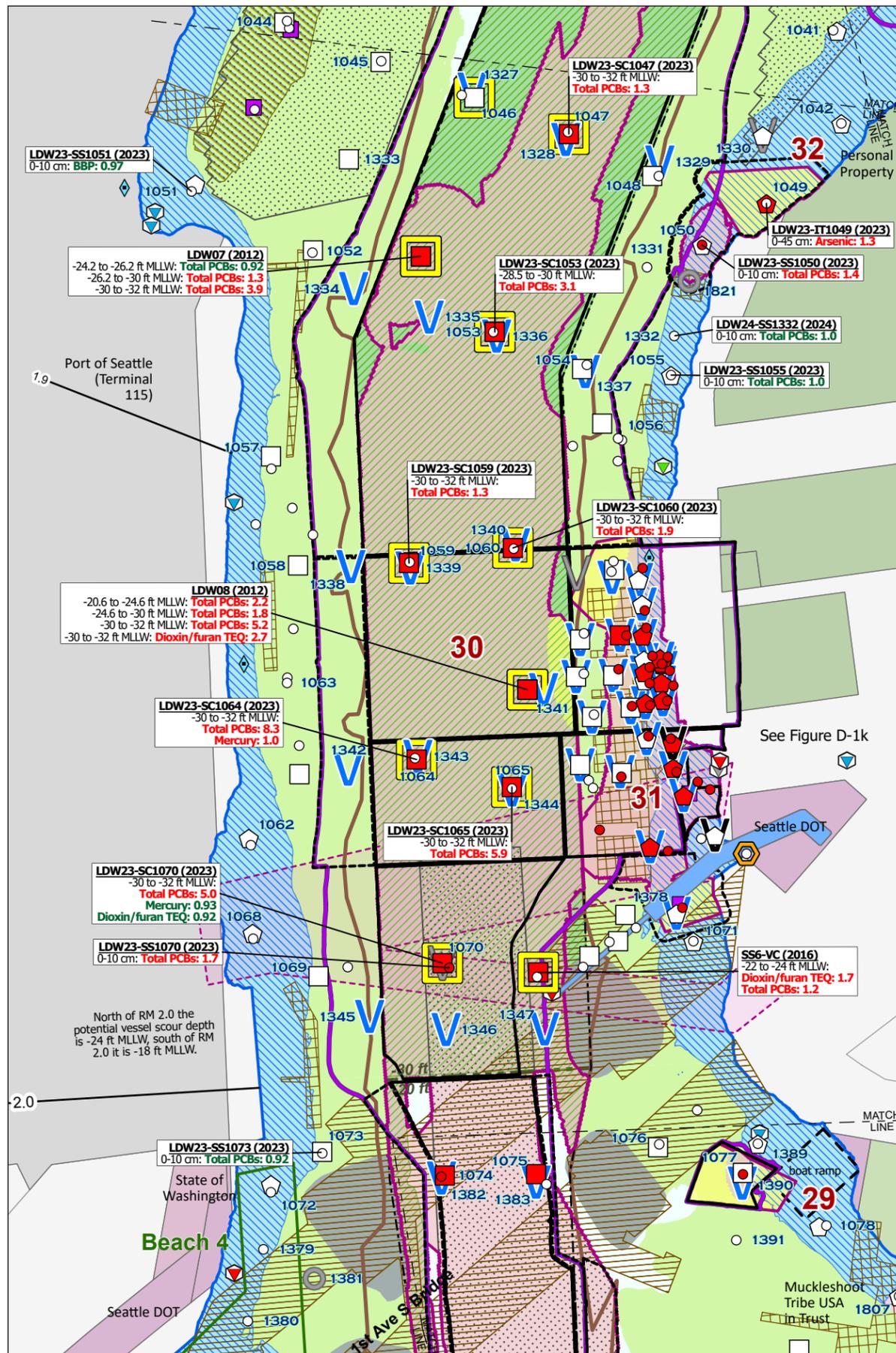
Light grey shading indicates FNC authorized depth.

Alternating light blue and white backgrounds indicate transects.

Vertical extent core intervals B and deeper are 30 cm in length. PDI shoaling cores identified the intervals alphabetically (i.e., B, C, or D depending on the number of shoaling intervals).



Prepared by craigh, 10/27/2025; W:\Projects\Duwamish\AOC\GIS\Maps and Analyses\Design\30 Percent Design.aprx; Fig D1-1 17652 Phase II design data series - portrait



Area 30 - FNC and Sideslopes													Area 32						
Location	1327	1328	1329	1334	1335	1336	1337	1338	1339	1340	1348	1341	1342	1343	1344	1070	1345	1346	1347
Mudline	-26.0	-24.5	-11.6	-19.0	-25.6	-25.2	-13.9	-18.2	-23.3	-20.5	-14.4	-16.4	-16.2	-26.1	-22.5	-28.0	-15.1	-28.1	-19.9
Core Target	-41 ft	-41 ft	20 ft	20 ft	-41 ft	-41 ft	20 ft	20 ft	-41 ft	-41 ft	20 ft	-41 ft	20 ft	-41 ft	-41 ft	-34 ft	20 ft	-41 ft	-41 ft
Older Loc.	1046	1047	1048	-	-	1053	1054	-	1059	1060	-	LDW08	-	1064	1065	-	-	-	-
-11 to -12 ft																			
-12 to -13 ft																			
-13 to -14 ft																			
-14 to -15 ft																			
-15 to -16 ft																			
-16 to -17 ft																			
-17 to -18 ft																			
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-39 to -40 ft																			
-40 to -41 ft																			
-41 to -42 ft																			
-42 to -43 ft																			
-43 to -44 ft																			
-44 to -45 ft																			

Area 32	
Location	1330
Mudline	-0.2
Core Target	7.5 ft
Older Loc.	-

Surface (0-10 cm) sampling location

- Exceeds RAL
- Does not exceed RAL

Intertidal (0-45 cm) core location

- Exceeds RAL
- Does not exceed RAL

Subtidal (0-60 cm) core location

- Exceeds RAL
- Does not exceed RAL

Other sampling locations

- ∇ Vertical extent (non-RAL interval)
- Surface (0-10 cm), archive
- ∇ Vertical extent (non-RAL interval) archive
- ∇ Vertical extent (non-RAL interval) not collected because of core refusal
- Shoaling core
- Core without appropriate RAL interval
- Sample above MHHW not included in the interpolation dataset
- Upland soil sample
- 30% RD RAA daylight boundary^a
- 30% RD RAA placement area
- 30% RD RAA toe of cut
- 1 RAL exceedance area boundary
- Combined surface and subsurface sediment PCB indicator kriging RAL exceedance area
- Additional Thiessen polygon RAL exceedance area for other COCs
- Georgetown WWTS diffuser pipe
- Utility corridor
- Federal Navigation Channel authorized depth boundary

Legend for Vertical Extent Cores

- Area No. 30
- Legend for Vertical Extent Cores
- actual mudline elevation (ft MLLW)
- RAL interval(s); red if > RAL, green if < RAL (PCBs unless noted)
- bold outline: RAL interval(s) of non-Phase II core collected within 30 ft; red if > RAL, green if < RAL (PCBs unless noted)
- sample below RAL interval (purple if > surface sediment RAL; green if < surface sediment RAL)
- light yellow indicates samples that were not analyzed
- hatching indicates native material
- asterisk indicates PCB EF ≥ 0.9 and ≤ 1.0

Abbreviations: ref. indicates refusal at or above target depth; sh. indicates shoaling material; o.d. indicates overdrill; est. indicates estimated mudline, and geo indicates geological break.

Light grey shading indicates FNC authorized depth.

Alternating light blue and white backgrounds indicate transects.

Vertical extent core intervals B and deeper are 30 cm in length; PDI shoaling cores identified the intervals alphabetically (i.e., B, C, or D depending on the number of shoaling intervals).

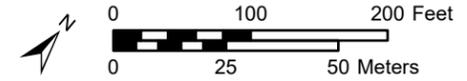
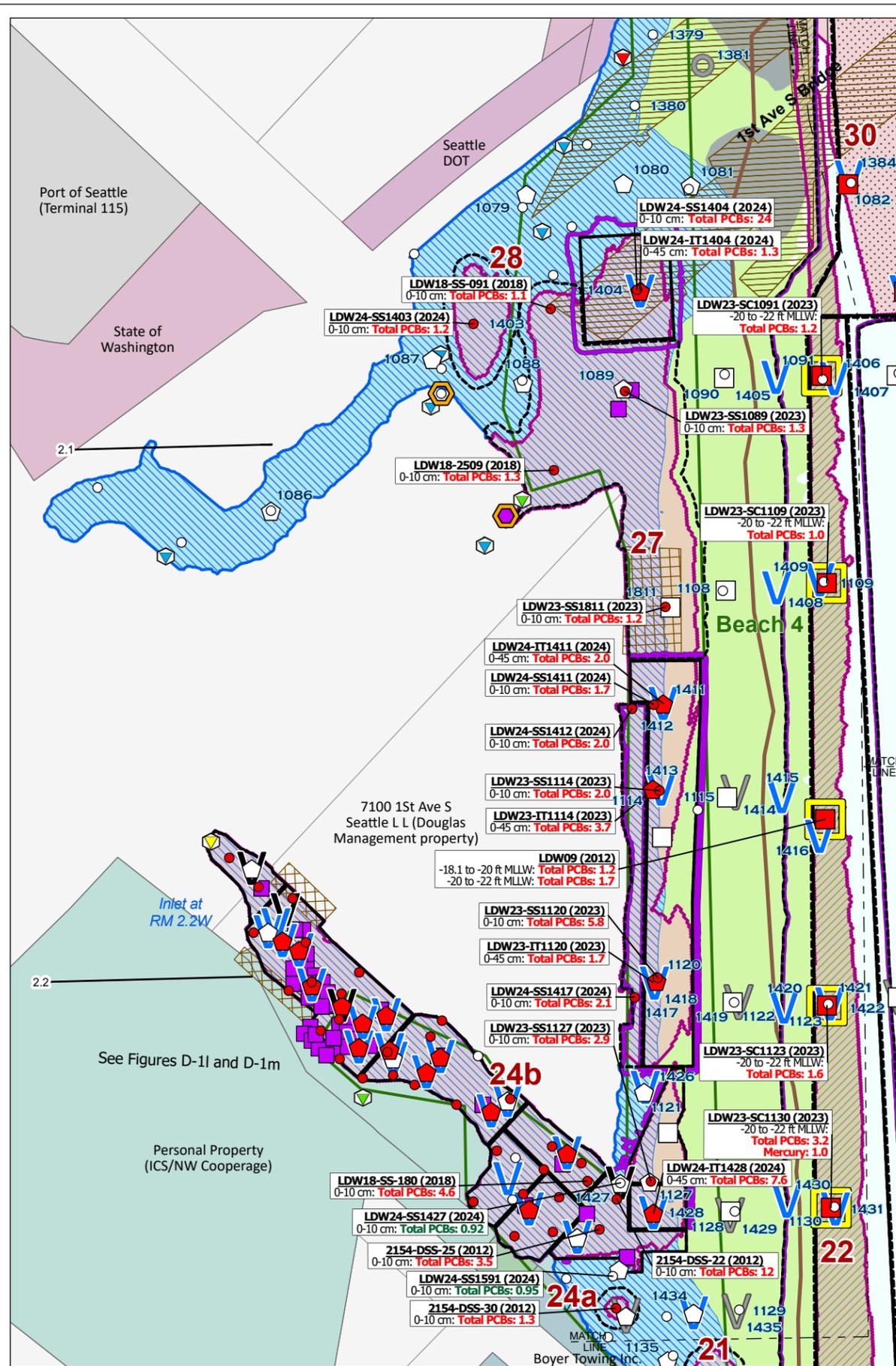


Figure D1-1c. RAA Boundaries, RAL Exceedance Areas, RAL Exceedance Locations, and Vertical Extent Data, RM 1.8 to RM 2.0

APPENDIX D - RAA DEVELOPMENT AND DREDGE PRISM DESIGN
 30% REMEDIAL DESIGN BASIS OF DESIGN
 REPORT FOR THE LDW MIDDLE REACH
 OCTOBER 27, 2025



Area 22 - FNC and Sideslopes		1405	1406	1408	1409	1414	1415	1416	1419	1420	1421	1429	1430	1431	1435
Location		-14.3	-20.8	-15.5	-17.0	-12.9	-16.6	-18.7	-9.6	-14.2	-18.1	-9.6	-16.3	-18.2	-7.4
Mudline		15 ft	-31 ft	15 ft	-31 ft	10 ft	15 ft	-31 ft	10 ft	15 ft	-31 ft	10 ft	15 ft	-31 ft	10 ft
Core Target		-	1091	-	1109	1115	-	LDW09	1122	-	1123	1128	-	1130	-
Older Loc.		-	-	-	-	-	-	-	-	-	-	-	-	-	-
-7 to -8 ft															0-60
-8 to -9 ft															A
-9 to -10 ft															B
-10 to -11 ft															C
-11 to -12 ft															D
-12 to -13 ft															E
-13 to -14 ft															F
-14 to -15 ft															geo G
-15 to -16 ft															H
-16 to -17 ft															I
-17 to -18 ft															
-18 to -19 ft															
-19 to -20 ft															
-20 to -21 ft															
-21 to -22 ft															
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-25 to -26 ft															
-26 to -27 ft															
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-29 to -30 ft															
-30 to -31 ft															
-31 to -32 ft															
-32 to -33 ft															
-33 to -34 ft															
-34 to -35 ft															

Area 27		1404	1411	1413	1418	1426	Area 24		
Location		0.3	-3.6	-3.5	-3.5	-2.5	nd	-2.9	-2.4
Mudline		7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
Core Target		-	-	1114	1120	1121	-	-	-
Older Loc.		-	-	-	-	-	-	-	-
3 to 2							est.		
** break **							0-45		
1 to 0 ft							A		
0 to -1 ft							B		
-1 to -2 ft							C		
-2 to -3 ft							D		
-3 to -4 ft							E		
-4 to -5 ft							F		
-5 to -6 ft							G		
-6 to -7 ft							H		
-7 to -8 ft							I		
-8 to -9 ft							J		
-9 to -10 ft							K		
-10 to -11 ft							L		
-11 to -12 ft							M		
-12 to -13 ft							N		
-13 to -14 ft							O		

- Surface (0-10 cm) sampling location**
- Exceeds RAL
 - Does not exceed RAL
- Intertidal (0-45 cm) core location**
- Exceeds RAL
 - Does not exceed RAL
- Subtidal (0-60 cm) core location**
- Exceeds RAL
 - Does not exceed RAL
- Other sampling locations**
- ∇ Vertical extent (non-RAL interval)
 - Surface (0-10 cm), archive
 - ∇ Vertical extent (non-RAL interval) archive
 - ∇ Vertical extent (non-RAL interval) not collected because of core refusal
 - Shoaling core
 - Core without appropriate RAL interval
 - Sample above MHHW not included in the interpolation dataset
 - Upland soil sample
 - 30% RD RAA daylight boundary^a
 - 30% RD RAA placement area
 - 30% RD RAA toe of cut
 - 1 RAL exceedance area boundary
 - Combined surface and subsurface sediment PCB indicator kriging RAL exceedance area

Legend for Vertical Extent Cores

Area	Core Interval	Color	Notes
-5.6	-	Red	actual mudline elevation (ft MLLW)
0-60	A	Red	RAL interval(s); red if > RAL, green if < RAL (PCBs unless noted)
0-60	A	Green	RAL interval(s) of non-Phase II core collected within 30 ft; red if > RAL, green if < RAL (PCBs unless noted)
0-60	B	Purple	sample below RAL interval (purple if > surface sediment RAL)
0-60	C	Green	green if < surface sediment RAL
0-60	D	Light Yellow	light yellow indicates samples that were not analyzed
0-60	E	Hashing	hashing indicates native material
0-60	F	Asterisk	asterisk indicates PCB EF > 0.9 and ≤ 1.0

Abbreviations: ref. indicates refusal at or above target depth; sh. indicates shoaling material; o.d. indicates overdrill; est. indicates estimated mudline, and geo indicates geological break.
 Light grey shading indicates FNC authorized depth.
 Alternating light blue and white backgrounds indicate transects.
 Vertical extent core intervals B and deeper are 30 cm in length; PDI shoaling cores identified the intervals alphabetically (i.e., B, C, or D depending on the number of shoaling intervals).

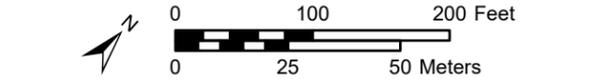
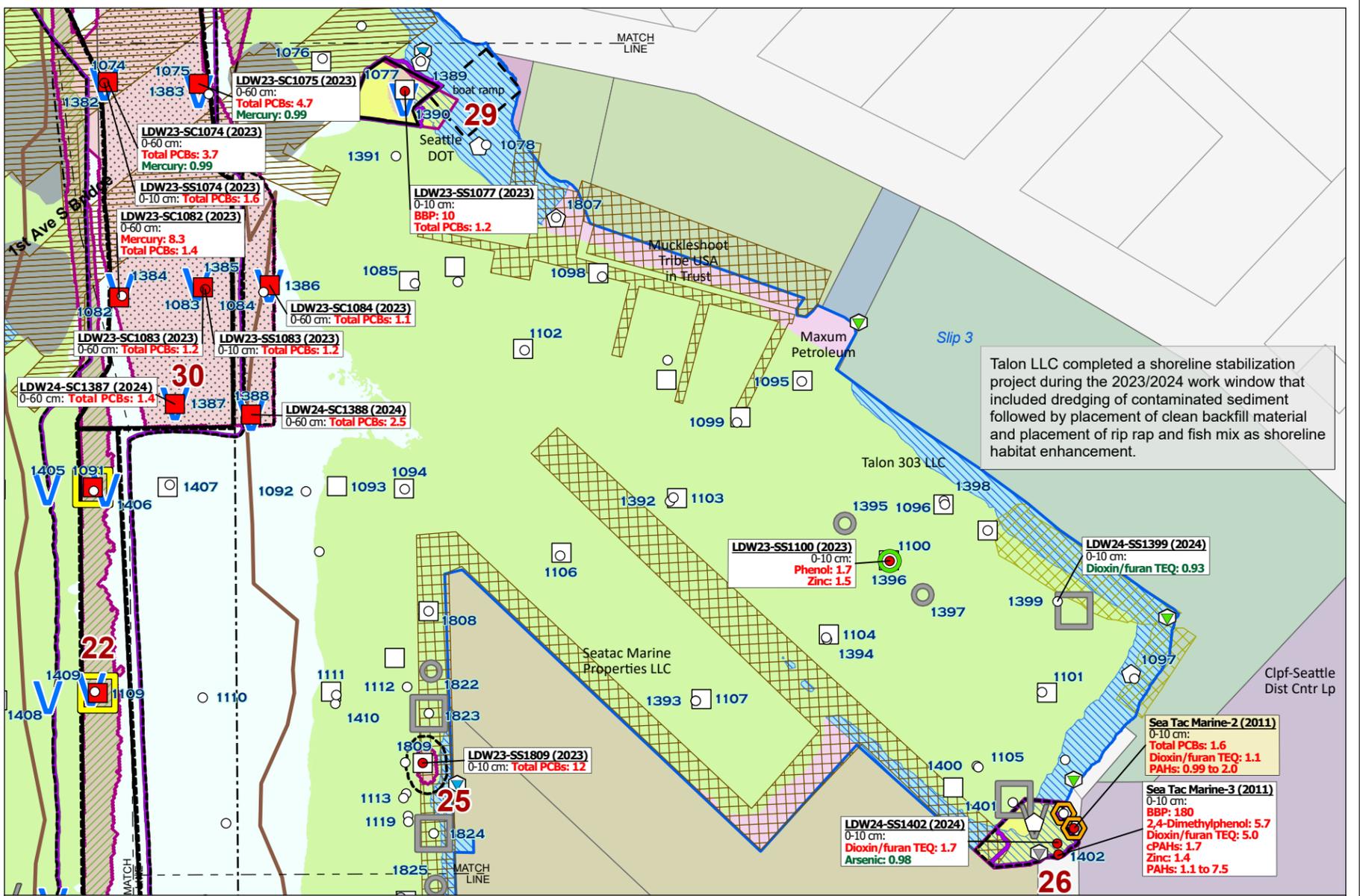


Figure D1-1d. RAA Boundaries, RAL Exceedance Areas, RAL Exceedance Locations, and Vertical Extent Data, RM 2.0 to RM 2.25 West

APPENDIX D - RAA DEVELOPMENT AND DREDGE PRISM DESIGN
 30% REMEDIAL DESIGN BASIS OF DESIGN
 REPORT FOR THE LDW MIDDLE REACH
 OCTOBER 27, 2025



Talon LLC completed a shoreline stabilization project during the 2023/2024 work window that included dredging of contaminated sediment followed by placement of clean backfill material and placement of rip rap and fish mix as shoreline habitat enhancement.

Area 30 S - FNC and Sideslopes								Area 29		Area 26 - Slip 3	
Location	1382	1383	1384	1385	1386	1387	1388	Location	1390	Location	1402
Mudline	-27.3	-28.5	-23.3	-28.5	-21.0	-28.1	-24.4	Location	-8.6	Location	-3.3
Core Target	-31 ft	-31 ft	-31 ft	-31 ft	10 ft	-31 ft	10 ft	Core Target	10 ft	Core Target	7.5 ft
Older Loc.	1074	1075	1082	1083	1084	-	-	Older Loc.	1077	Older Loc.	-
-20 to -21 ft					0-60 A			-8 to -9 ft	0-60 A	-3 to -4 ft	0-45 A
-21 to -22 ft								-9 to -10 ft		-4 to -5 ft	B
-22 to -23 ft								-10 to -11 ft		-5 to -6 ft	C
-23 to -24 ft			0-60 A					-11 to -12 ft		-6 to -7 ft	D
-24 to -25 ft								-12 to -13 ft	geo D	-7 to -8 ft	E
-25 to -26 ft								-13 to -14 ft		-8 to -9 ft	ref.
-26 to -27 ft								-14 to -15 ft		-9 to -10 ft	
-27 to -28 ft								-15 to -16 ft			
-28 to -29 ft	0-60 A							-16 to -17 ft			
-29 to -30 ft		0-60 A		0-60 A				-17 to -18 ft			
-30 to -31 ft								-18 to -19 ft			
-31 to -32 ft								-19 to -20 ft			
-32 to -33 ft											
-33 to -34 ft											
-34 to -35 ft											
-35 to -36 ft											
-36 to -37 ft											
-37 to -38 ft											

Surface (0-10 cm) sampling location

- Exceeds RAL
- Does not exceed RAL

Intertidal (0-45 cm) core location

- Does not exceed RAL

Subtidal (0-60 cm) core location

- Exceeds RAL
- Does not exceed RAL

Other sampling locations

- ∇ Vertical extent (non-RAL interval)
- Surface (0-10 cm), archive
- Subtidal (0-60 cm) archive
- ∇ Vertical extent (non-RAL interval) archive
- Surface (0-10 cm) bioassay passed
- Shoaling core
- Core without appropriate RAL interval
- Sample above MHHW not included in the interpolation dataset

- 30% RD RAA daylight boundary^a
- 30% RD RAA placement area
- 30% RD RAA toe of cut
- 1 RAL exceedance area boundary
- Combined surface and subsurface sediment PCB indicator kriging RAL exceedance area
- Additional Thiessen polygon RAL exceedance area for other COCs

Legend for Vertical Extent Cores

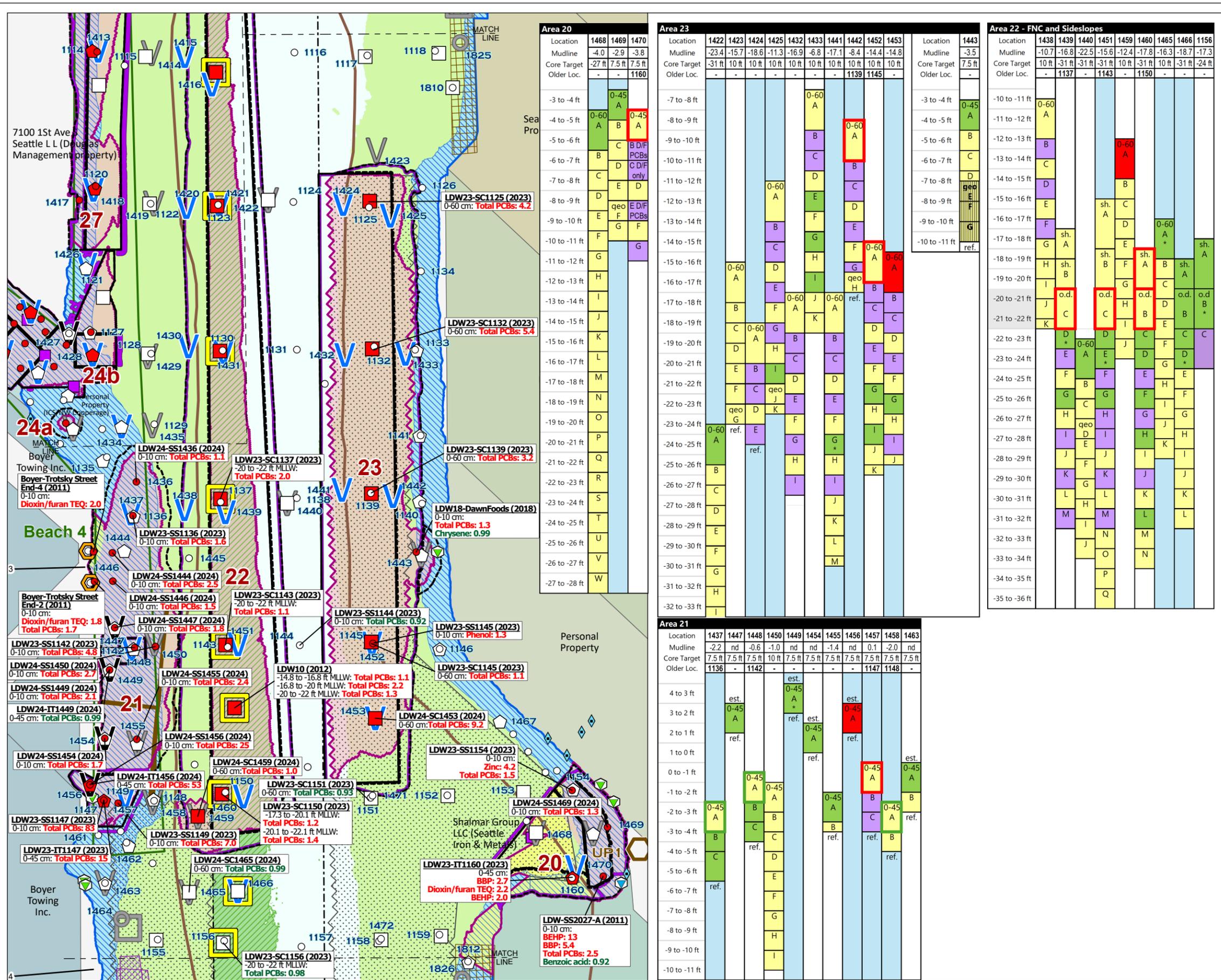
Area	Loc No.	Interval	Notes
-5.6			actual mudline elevation (ft MLLW)
0-60			RAL interval(s); red if > RAL, green if < RAL (PCBs unless noted)
0-60			bold outline: RAL interval(s) of non-Phase II core collected within 30 ft; red if > RAL, green if < RAL (PCBs unless noted)
B			sample below RAL interval (purple if > surface sediment RAL; green if < surface sediment RAL)
D			light yellow indicates samples that were not analyzed
E			hashing indicates native material
F			asterisk indicates PCB EF ≥ 0.9 and ≤ 1.0

Abbreviations: ref. indicates refusal at or above target depth, sh. indicates shoaling material, o.d. indicates over dredge, est. indicates estimated mudline, and geo indicates geological break.

Light grey shading indicates FNC authorized depth.

Alternating light blue and white backgrounds indicate transects.

Vertical extent core intervals B and deeper are 30 cm in length. PDI shoaling cores identified the intervals alphabetically (i.e., B, C, or D depending on the number of shoaling intervals).



Surface (0-10 cm) sampling location

- Exceeds RAL
- Does not exceed RAL

Intertidal (0-45 cm) core location

- Exceeds RAL
- Does not exceed RAL

Subtidal (0-60 cm) core location

- Exceeds RAL
- Does not exceed RAL

Other sampling locations

- ∇ Vertical extent (non-RAL interval)
- Surface (0-10 cm), archive
- Subtidal (0-60 cm) archive
- ∇ Vertical extent (non-RAL interval) archive
- ∇ Vertical extent (non-RAL interval) not collected because of core refusal
- Shoaling core
- Core without appropriate RAL interval
- Sample above MHHW not included in the interpolation dataset
- Upland soil sample

30% RD RAA boundaries

- 30% RD RAA daylight boundary^a
- 30% RD RAA placement area
- 30% RD RAA toe of cut

Combined surface and subsurface sediment PCB indicator kriging RAL exceedance area

- Additional Thiessen polygon RAL exceedance area for other COCs

Legend for Vertical Extent Cores

- actual mudline elevation (ft MLLW)
- RAL interval(s); red if > RAL, green if < RAL (PCBs unless noted)
- bold outline: RAL interval(s) of non-Phase II core collected within 30 ft; red if > RAL, green if < RAL (PCBs unless noted)
- sample below RAL interval (purple if > surface sediment RAL; green if < surface sediment RAL)
- light yellow indicates samples that were not analyzed
- hatching indicates native material
- asterisk indicates PCB EF >0.9 and ≤1.0

Abbreviations: ref. indicates refusal at or above target depth; sh. indicates shoaling material; o.d. indicates overdrill; est. indicates estimated mudline, and geo indicates geological break.

Light grey shading indicates FNC authorized depth.

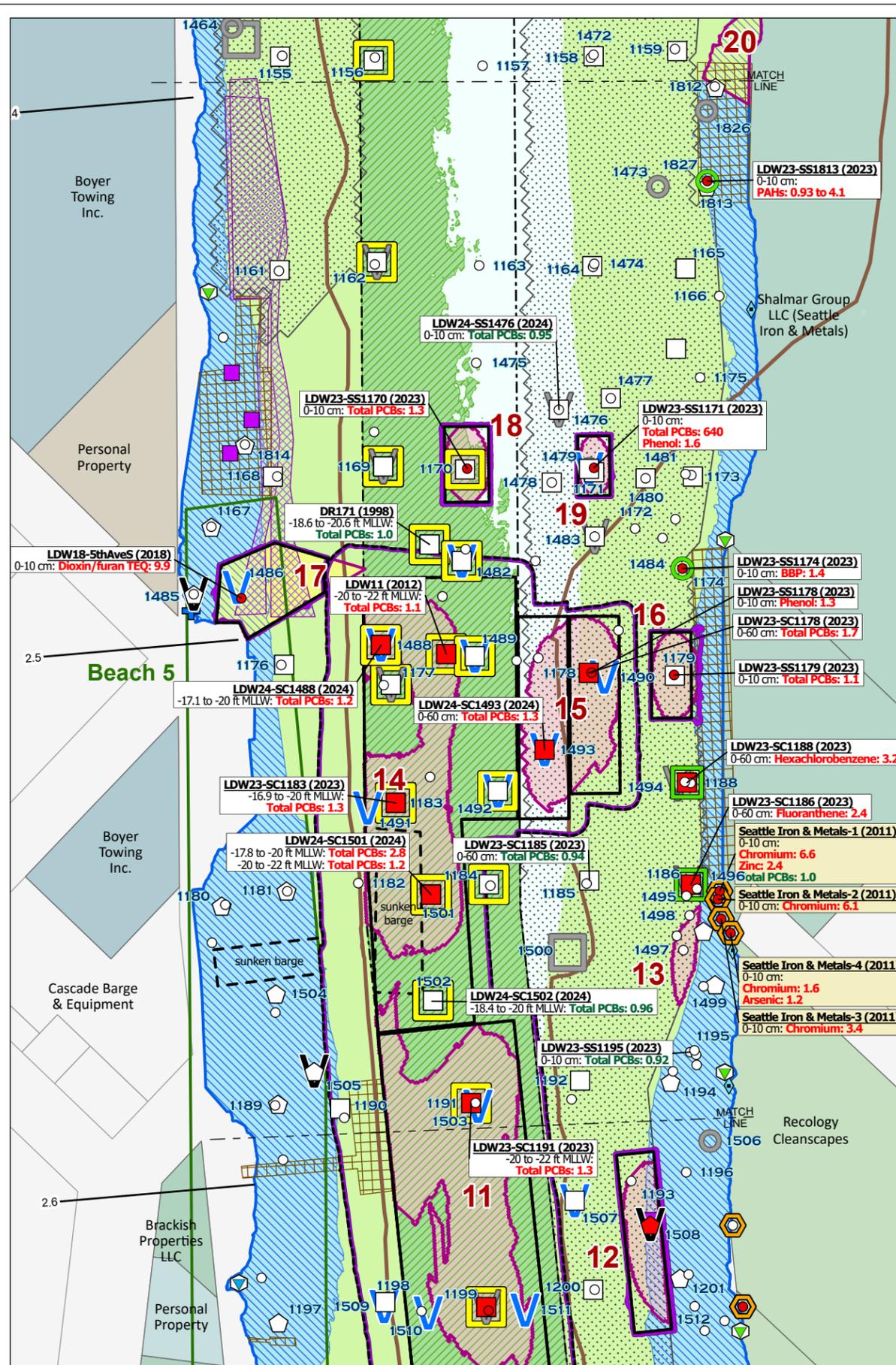
Alternating light blue and white backgrounds indicate transects.

Vertical extent core intervals B and deeper are 30 cm in length; PDI shoaling cores identified the intervals alphabetically (i.e., B, C, or D depending on the number of shoaling intervals).

Figure D1-1f. RAA Boundaries, RAL Exceedance Areas, RAL Exceedance Locations, and Vertical Extent Data, RM 2.2 to RM 2.4

APPENDIX D - RAA DEVELOPMENT AND DREDGE PRISM DESIGN
30% REMEDIAL DESIGN BASIS OF DESIGN
REPORT FOR THE LDW MIDDLE REACH
OCTOBER 27, 2025

Prepared by craigh, 10/27/2025; W:\Projects\Duwamish ACCGIS\GIS\Maps and Analyses\Design\30 percent\30 Percent Design.aprx [Fig D1-1 7652 Phase II design data series - landscape



Area 17	
Location	1485 1486
Mudline	nd -1.1
Core Target	7.5 ft 7.5 ft
Older Loc.	-
4 to 3 ft	0-45 A
3 to 2 ft	ref.
2 to 1 ft	
1 to 0 ft	
0 to -1 ft	
-1 to -2 ft	0-45 A
-2 to -3 ft	B
-3 to -4 ft	C
-4 to -5 ft	D
-5 to -6 ft	ref.

RM 2.5 E	
Location	1494 1495
Mudline	-9.1 -6.6
Core Target	-25 ft 10 ft
Older Loc.	1188 1186
-6 to -7 ft	0-60 A tox
-7 to -8 ft	B
-8 to -9 ft	C
-9 to -10 ft	0-60 A tox
-10 to -11 ft	D
-11 to -12 ft	B
-12 to -13 ft	C
-13 to -14 ft	D
-14 to -15 ft	E
-15 to -16 ft	F
-16 to -17 ft	G
-17 to -18 ft	H
-18 to -19 ft	I
	ref.

Note: dark green shading indicates subsurface bioassay passed

Areas 18 & 14 - FNC						
Location	1162	1169	1170	1177	1183	1184
Mudline	-18.4	-15.5	-19.8	-13.8	-10.7	-19.1
Core Target	-24 ft	-24 ft	-24 ft	-24 ft	-24 ft	-24 ft
-10 to -11 ft				sh. A		
-11 to -12 ft				sh. A		
-12 to -13 ft				sh. A		
-13 to -14 ft				sh. B		
-14 to -15 ft				sh. A		
-15 to -16 ft		sh. A				
-16 to -17 ft		sh. A				
-17 to -18 ft		sh. B		sh. B		
-18 to -19 ft	sh. A	sh. B		sh. B		sh. o.d.
-19 to -20 ft	o.d.	o.d.	sh. o.d.	o.d.	o.d.	
-20 to -21 ft	o.d.	o.d.	sh. o.d.	o.d.	o.d.	
-21 to -22 ft	B	C	A	C	D	A
-22 to -23 ft	C	D	B	D	E	B
-23 to -24 ft						

Area 19	Areas 14 & 15 - FNC & Sideslopes										Area 11			
	1476	1479	1483	1482	1488	1489	1490	1491	1492	1493	1501	1502	1505	1503
Mudline	-19.6	-19.0	-17.3	-18.9	-14.1	-18.8	-16.8	-9.7	-19.4	-18.8	-15.6	-16.8	-3.0	-17.9
Core Target	10 ft	10 ft	10 ft	-31 ft	-31 ft	-31 ft	10 ft	10 ft	-31 ft	10 ft	-24 ft	-24 ft	7.5 ft	-31 ft
Older Loc.	-	1171	-	-	-	LDW11	1178	-	-	-	-	-	-	1191
-3 to -4 ft														0-45 A
break														ref.
-8 to -9 ft														
-9 to -10 ft									0-60 A					
-10 to -11 ft									B					
-11 to -12 ft									C					
-12 to -13 ft									D					
-13 to -14 ft									E					
-14 to -15 ft									F					
-15 to -16 ft									G					
-16 to -17 ft									H					
-17 to -18 ft									I					
-18 to -19 ft									J					
-19 to -20 ft	0-60 A	0-60 A	0-60 A	sh. A	sh. A	sh. A	sh. A	sh. A	sh. A	sh. A	sh. A	sh. A	sh. A	sh. A
-20 to -21 ft	0-60 A	0-60 A	0-60 A	sh. A	sh. A	sh. A	sh. A	sh. A	sh. A	sh. A	sh. A	sh. A	sh. A	sh. A
-21 to -22 ft	B	B	B	B	B	B	B	B	B	B	B	B	B	B
-22 to -23 ft	C	C	C	C	C	C	C	C	C	C	C	C	C	C
-23 to -24 ft	D	D	D	D	D	D	D	D	D	D	D	D	D	D
-24 to -25 ft	E	E	E	E	E	E	E	E	E	E	E	E	E	E
-25 to -26 ft	F	F	F	F	F	F	F	F	F	F	F	F	F	F
-26 to -27 ft	G	G	G	G	G	G	G	G	G	G	G	G	G	G
-27 to -28 ft	H	H	H	H	H	H	H	H	H	H	H	H	H	H
-28 to -29 ft	I	I	I	I	I	I	I	I	I	I	I	I	I	I
-29 to -30 ft	J	J	J	J	J	J	J	J	J	J	J	J	J	J
-30 to -31 ft	K	K	K	K	K	K	K	K	K	K	K	K	K	K
-31 to -32 ft	L	L	L	L	L	L	L	L	L	L	L	L	L	L
-32 to -33 ft	M	M	M	M	M	M	M	M	M	M	M	M	M	M

Surface (0-10 cm) sampling location

- Exceeds RAL
- Does not exceed RAL

Intertidal (0-45 cm) core location

- Exceeds RAL
- Does not exceed RAL

Subtidal (0-60 cm) core location

- Exceeds RAL
- Does not exceed RAL

Other sampling locations

- ∇ Vertical extent (non-RAL interval)
- Surface (0-10 cm), archive
- Subtidal (0-60 cm) archive
- ∇ Vertical extent (non-RAL interval) archive
- ∇ Vertical extent (non-RAL interval) not collected because of core refusal
- Surface (0-10 cm) bioassay passed
- Subtidal (0-60 cm) bioassay passed
- Shoaling core
- Core without appropriate RAL interval
- Sample above MHHW not included in the interpolation dataset
- Upland soil sample
- 30% RD RAA daylight boundary^a
- 30% RD RAA placement area
- 30% RD RAA toe of cut
- 1 RAL exceedance area boundary
- Combined surface and subsurface sediment PCB indicator kriging RAL exceedance area
- Additional Thiessen polygon RAL exceedance area for other

Legend for Vertical Extent Cores

- Area No. - actual mudline elevation (ft MLLW)
- Core Interval - RAL interval(s); red if > RAL, green if < RAL (PCBs unless noted)
- 0-60 - bold outline: RAL interval(s) of non-Phase II core collected within 30 ft; red if > RAL, green if < RAL (PCBs unless noted)
- B - sample below RAL interval (purple if > surface sediment RAL; green if < surface sediment RAL)
- C - light yellow indicates samples that were not analyzed
- D - hashing indicates native material
- E - asterisk indicates PCB EF ≥0.9 and ≤1.0

Abbreviations: ref. indicates refusal at or above target depth; sh. indicates shoaling material; o.d. indicates overdrudge; est. indicates estimated mudline; and geo indicates geological break.

Light grey shading indicates FNC authorized depth.

Alternating light blue and white backgrounds indicate transects.

Vertical extent core intervals B and deeper are 30 cm in length. PDI shoaling cores identified the intervals alphabetically (i.e., B, C, or D depending on the number of shoaling intervals).

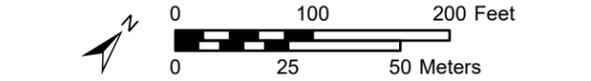
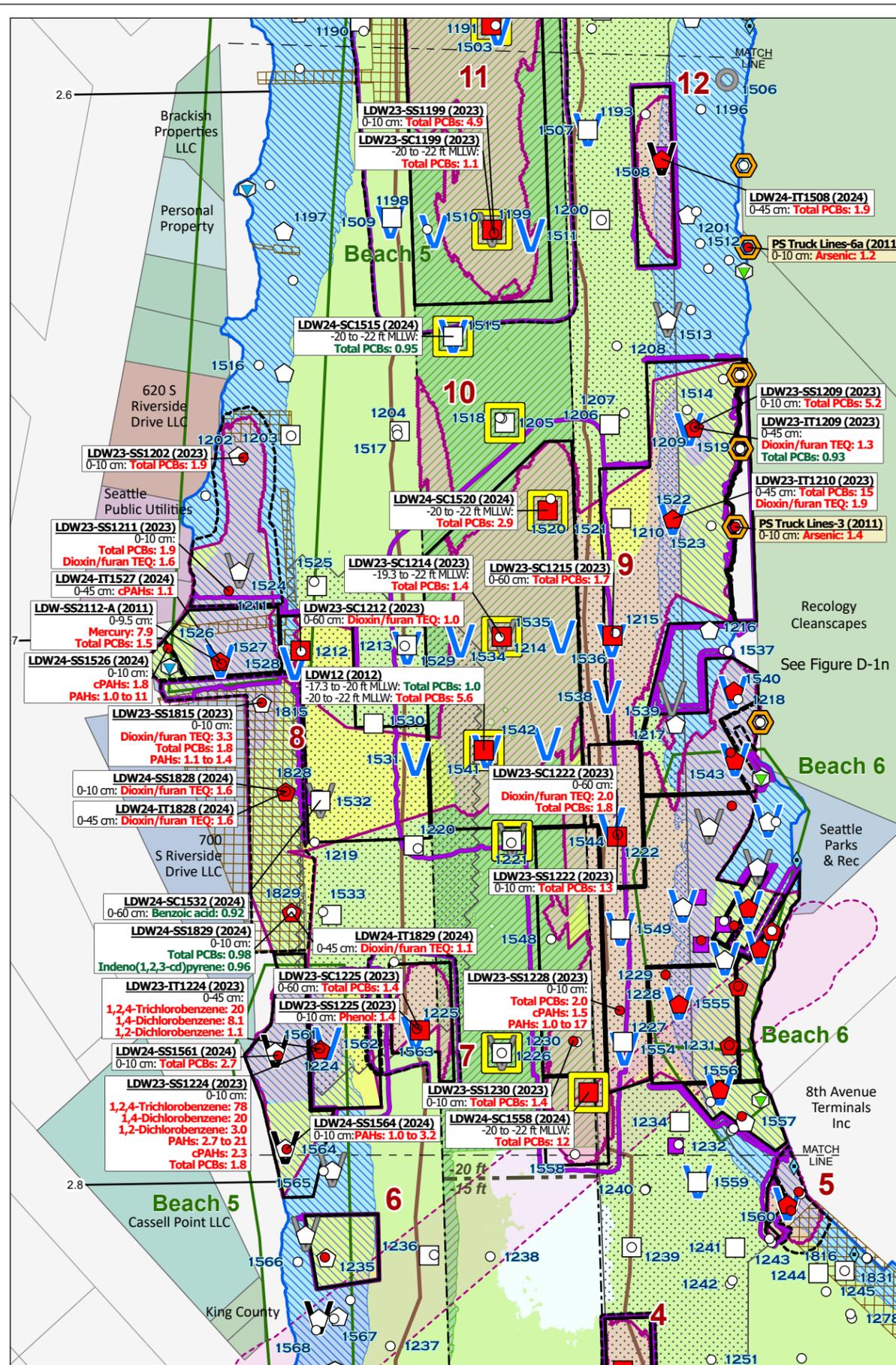


Figure D1-1g. RAA Boundaries, RAL Exceedance Areas, RAL Exceedance Locations, and Vertical Extent Data, RM 2.4 to RM 2.6

APPENDIX D - RAA DEVELOPMENT AND DREDGE PRISM DESIGN
30% REMEDIAL DESIGN BASIS OF DESIGN
REPORT FOR THE LDW MIDDLE REACH
OCTOBER 27, 2025



Area 11 - FNC and Sideslopes						
Location	1507	1509	1510	1199	1511	1515
Mudline	-16.5	-12.4	-16.7	-18.9	-20.0	-17.9
Core Target	10 ft	10 ft	-31 ft	-24 ft	-31 ft	-31 ft
Older Loc.	-	1198	-	-	-	-
-12 to -13 ft						
-13 to -14 ft		A				
-14 to -15 ft		B				
-15 to -16 ft		C				
-16 to -17 ft	0-60	D	sh. A			
-17 to -18 ft	0-60	E			sh. A	
-18 to -19 ft	B	F	sh. B	sh. A		
-19 to -20 ft	C	G				
-20 to -21 ft	D	H	o.d.	o.d.	o.d.	
-21 to -22 ft	E	I	C	A	B	
-22 to -23 ft	F	J	E	C	D	
-23 to -24 ft	G	K	F	D	E	
-24 to -25 ft	geo	H	G	E	F	
-25 to -26 ft	H	I	H	F	G	
-26 to -27 ft	I	J	I	G	H	
-27 to -28 ft	J	K	J	H	geo I	
-28 to -29 ft			K	I	J	
-29 to -30 ft			geo L	J	K	
-30 to -31 ft			geo M	K	L	
-31 to -32 ft			geo N	L	M	
-32 to -33 ft			geo O	M	P	
-33 to -34 ft			geo P			
-34 to -35 ft						

Area 8 - Intertidal						
Location	1524	1527	1528	1561	1562	1564
Mudline	0.5	-2.3	-3.3	nd	-2.6	nd
Core Target	7.5 ft	7.5 ft	-29 ft	7.5 ft	7.5 ft	7.5 ft
Older Loc.	-	-	1212	-	-	-
3 to 2 ft				est. A	est. A	
2 to 1 ft				ref.	ref.	
1 to 0 ft						
0 to -1 ft	0-45	A				
-1 to -2 ft	B					
-2 to -3 ft	C					
-3 to -4 ft	D	0.45 A only cPAHs	0-45 A			
-4 to -5 ft	geo E	F	C	B		
-5 to -6 ft	F	G	D	C		
-6 to -7 ft	G	H	E	D		
-7 to -8 ft	H	I	F	E		
-8 to -9 ft	I	J	G	F		
-9 to -10 ft	J	K	H	G		
-10 to -11 ft						
-11 to -12 ft						
-12 to -13 ft						
-13 to -14 ft						
-14 to -15 ft						
-15 to -16 ft						
-16 to -17 ft						
-17 to -18 ft						
-18 to -19 ft						
-19 to -20 ft						
-20 to -21 ft						
-21 to -22 ft						
-22 to -23 ft						
-23 to -24 ft						
-24 to -25 ft						
-25 to -26 ft						
-26 to -27 ft						
-27 to -28 ft						
-28 to -29 ft						
-29 to -30 ft						
-30 to -31 ft						
-31 to -32 ft						
-32 to -33 ft						
-33 to -34 ft						
-34 to -35 ft						

Areas 7 & 8 Subtidal						
Location	1563	1532				
Mudline	-12.1	-5.5				
Core Target	10 ft	-29 ft				
Older Loc.	1225	-				
-5 to -6 ft						
-6 to -7 ft		0-60 A				
-7 to -8 ft		B				
-8 to -9 ft		C				
-9 to -10 ft		D				
-10 to -11 ft		E				
-11 to -12 ft		F				
-12 to -13 ft	0-60 A	G				
-13 to -14 ft		H				
-14 to -15 ft		I				
-15 to -16 ft		J				
-16 to -17 ft		K				
-17 to -18 ft		L				
-18 to -19 ft		M				
-19 to -20 ft		N				
-20 to -21 ft		O				
-21 to -22 ft		P				
-22 to -23 ft		Q				
-23 to -24 ft		ref.				

Areas 12 & 9 N - Intertidal						
Location	1508	1513	1519	1522		
Mudline	-3.3	-1.1	-0.1	-1.5		
Core Target	7.5 ft	7.5 ft	7.5 ft	7.5 ft		
Older Loc.	-	-	1209	1210		
0 to -1 ft			0-45 A			
-1 to -2 ft			B	0-45 A		
-2 to -3 ft			C	B		
-3 to -4 ft			D	C		
-4 to -5 ft	0-45 A		E	D		
-5 to -6 ft	ref.		F	E		
-6 to -7 ft			G	F		
-7 to -8 ft			H	G		
-8 to -9 ft			I	H		
-9 to -10 ft			J	I		
-10 to -11 ft			K	J		

Area 9 S - Subtidal						
Location	1538	1544	1549	1554	1558	
Mudline	-14.6	-14.6	-14.0	-14.2	-18.1	
Core Target	10 ft	10 ft	10 ft	10 ft	-24 ft	
Older Loc.	-	1222	-	1227	-	
-14 to -15 ft	0-60 A	0-60 A	0-60 A	0-60 A		
-15 to -16 ft	B	B	B	B		
-16 to -17 ft	C	C	C	C		
-17 to -18 ft	D	D	D	D	sh. A	
-18 to -19 ft	E	E	E	E	ref.	
-19 to -20 ft	F	F	F	F	o.d.	
-20 to -21 ft	G	G	G	G	B	
-21 to -22 ft	H	H	H	H	C	
-22 to -23 ft	I	I	I	I		
-23 to -24 ft	J	J	J	J		
-24 to -25 ft	K	K	K	K		
-25 to -26 ft						
-26 to -27 ft						

Areas 8 & 9 - Subtidal FNC & Sideslopes												
Location	1205	1520	1529	1534	1214	1535	1536	1531	1541	1542	1221	1226
Mudline	-19.3	-19.0	-14.7	-18.5	-19.3	-19.5	-12.1	-15.7	-19.0	-19.4	-18.8	-18.7
Core Target	-24 ft	-24 ft	10 ft	-31 ft	-24 ft	-31 ft	10 ft	10 ft	-31 ft	-31 ft	-24 ft	-24 ft
Older Loc.	-	-	1213	-	-	-	1215	-	LDW12	-	-	-
-12 to -13 ft												
-13 to -14 ft												
-14 to -15 ft												
-15 to -16 ft												
-16 to -17 ft												
-17 to -18 ft												
-18 to -19 ft												
-19 to -20 ft	sh. o.d.	sh. A	E	sh. A	sh. o.d.	sh. o.d.	H	D	sh. A	sh. o.d.	sh. A	sh. A
-20 to -21 ft	A	B	F	B	A	A	I	E	B	A	B	B
-21 to -22 ft	B	C	G	C	B	B	J	F	C	B	C	C
-22 to -23 ft	C	D	H	D	C			G	D	C		
-23 to -24 ft	D	E	I	E	D			H	E	D		
-24 to -25 ft	E	F	J	F	E			I	F	E		
-25 to -26 ft	F	G	K	G	F			J	G	F		
-26 to -27 ft	G	H	L	H	G			K	H	G		
-27 to -28 ft	H	I	M	I	H			L	I	H		
-28 to -29 ft	I	J		J	I			M	J	I		
-29 to -30 ft	J	K		K	J			N	K	J		
-30 to -31 ft	K	L		L	K				L	K		
-31 to -32 ft	L	M		M	L				M	L		
-32 to -33 ft												
-33 to -34 ft												

Surface (0-10 cm) sampling location

- Exceeds RAL
- Does not exceed RAL

Intertidal (0-45 cm) core location

- Exceeds RAL
- Does not exceed RAL

Subtidal (0-60 cm) core location

- Exceeds RAL
- Does not exceed RAL

Other sampling locations

- ∇ Vertical extent (non-RAL interval)
- Surface (0-10 cm), archive
- ∇ Vertical extent (non-RAL interval) archive
- ∇ Vertical extent (non-RAL interval) not collected because of core refusal
- Shoaling core
- Core without appropriate RAL interval
- Sample above MHHW not included in the interpolation dataset
- Upland soil sample
- 30% RD RAA daylight boundary^a
- 30% RD RAA placement area
- 30% RD RAA toe of cut
- 1 RAL exceedance area boundary
- Combined surface and subsurface sediment PCB indicator kriging RAL exceedance area
- Additional Thiessen polygon RAL exceedance area for other COCs
- Utility corridor
- Federal Navigation Channel authorized depth boundary

Legend for Vertical Extent Cores

- Area No. 156
- 5.6 actual mudline elevation (ft MLLW)
- 0-60 RAL interval(s); red if > RAL, green if < RAL (PCBs unless noted)
- bold outline: RAL interval(s) of non-Phase II core collected within 30 ft; red if > RAL, green if < RAL (PCBs unless noted)
- sample below RAL interval (purple if > surface sediment RAL)
- green if < surface sediment RAL
- light yellow indicates samples that were not analyzed
- hashing indicates native material
- asterisk indicates PCB EF ≥ 0.9 and ≤ 1.0

Abbreviations: ref. indicates refusal at or above target depth; sh. indicates shoaling material; o.d. indicates overdrift; est. indicates estimated mudline; and geo indicates geological break.

Light grey shading indicates FNC authorized depth.

Alternating light blue and white backgrounds indicate transects.

Vertical extent core intervals B and deeper are 30 cm in length; PDI shoaling cores identified the intervals alphabetically (i.e., B, C, or D depending on the number of shoaling intervals).

Figure D1-1h. RAA Boundaries, RAL Exceedance Areas, RAL Exceedance Locations, and Vertical Extent Data, RM 2.6 to RM 2.8

APPENDIX D - RAA DEVELOPMENT AND DREDGE PRISM DESIGN
30% REMEDIAL DESIGN BASIS OF DESIGN
REPORT FOR THE LDW MIDDLE REACH
OCTOBER 27, 2025

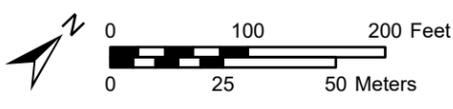
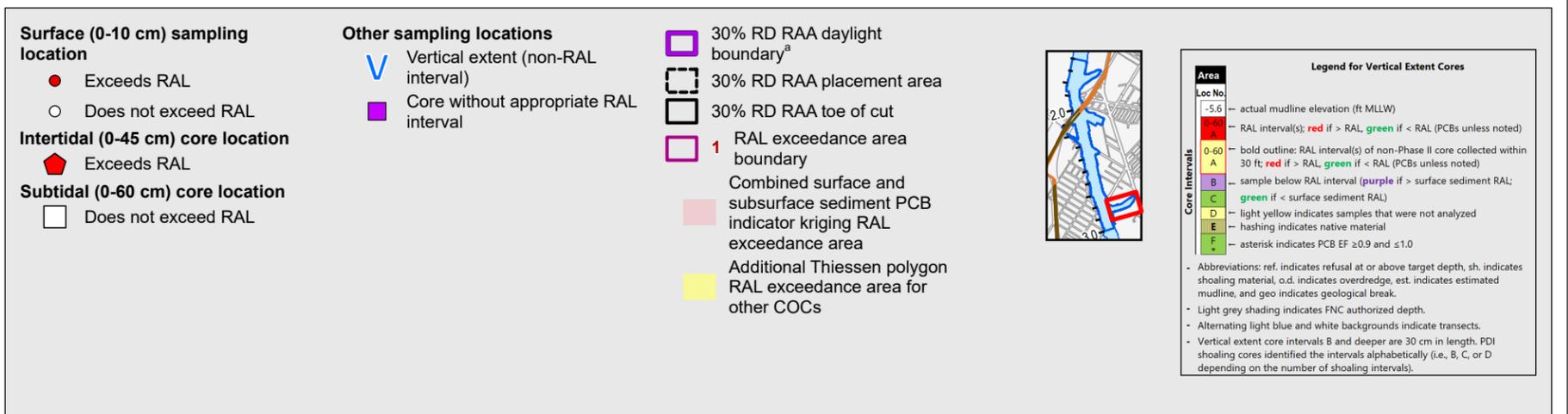
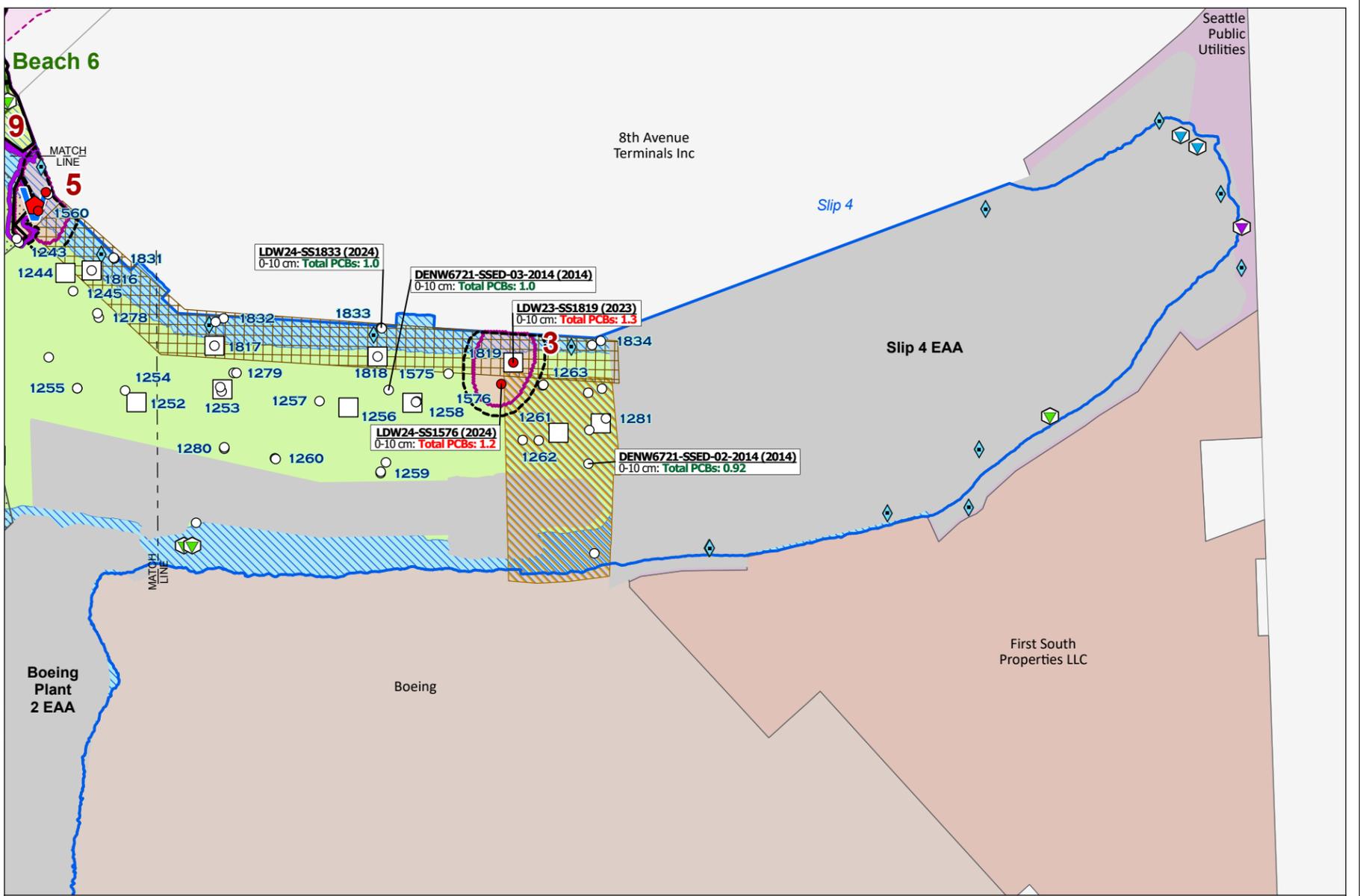
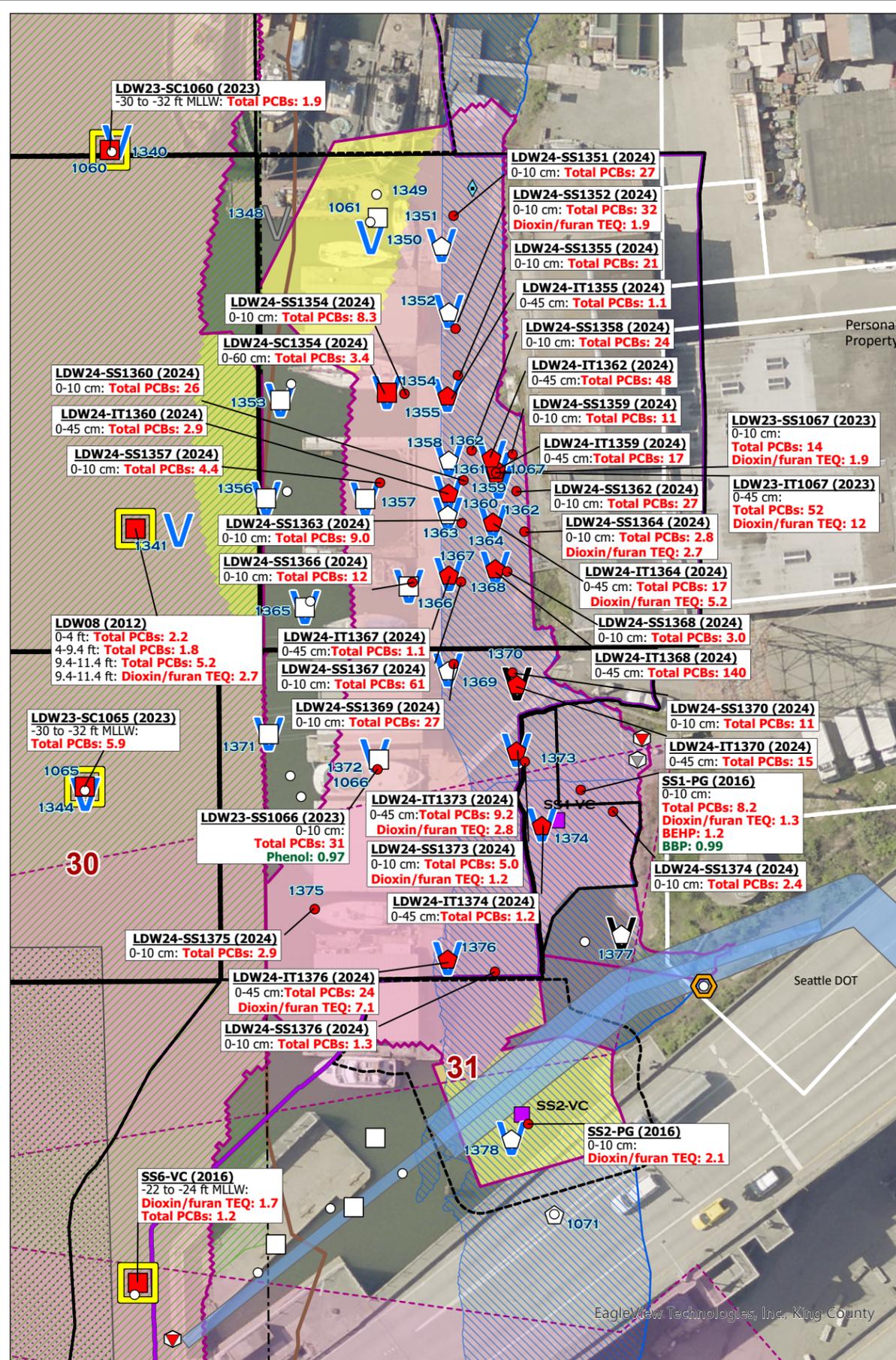


Figure D1-1j. RAA Boundaries, RAL Exceedance Areas, RAL Exceedance Locations, and Vertical Extent Data, Slip 4
 APPENDIX D - RAA DEVELOPMENT AND DREDGE PRISM DESIGN
 30% REMEDIAL DESIGN BASIS OF DESIGN
 REPORT FOR THE LDW MIDDLE REACH OCTOBER 27, 2025

Prepared by crnigh, 10/27/2025; W:\Projects\Duwamish_AOC\GIS\Maps and Analyses\Design\30 Percent Design.aprx\Fig D1-1 17652 Phase II design data series - portrait



Area 30 - Sideslopes				Areas 30 & 31 - Subtidal											
Location	1340	1341	1344	Location	1350	1353	1354	1356	1357	1365	1366	1371	1372		
Mudline	-20.5	-16.4	-22.5	Mudline	-9.1	-12.0	-7.7	-12.7	-8.9	-11.0	-5.6	-11.6	-8.0		
Core Target	-41 ft	-41 ft	-41 ft	Core Target	15 ft	20 ft	15 ft								
Older Loc.	1060	LDW08	1065	Older Loc.	1061	-	-	-	-	-	-	-	1066		

Area 31 - Intertidal																			
Location	1351	1352	1355	1358	1359	1360	1362	1361	1363	1364	1367	1368	1369	1370	1373	1374	1376	1377	1378
Mudline	-4.0	-4.0	-3.9	-4.1	nd	-4.6	nd	nd	-3.9	nd	-3.9	nd	-3.4	nd	-2.3	-0.6	-3.0	nd	-0.6
Core Target	7.5 ft																		
Older Loc.	-	-	-	-	-	-	-	1067	-	-	-	-	-	-	-	-	-	-	-

Surface (0-10 cm) sampling location

- Exceeds RAL
- Does not exceed RAL

Intertidal (0-45 cm) core location

- ◆ Exceeds RAL
- ◇ Does not exceed RAL

Subtidal (0-60 cm) core location

- Exceeds RAL
- Does not exceed RAL

Other sampling locations

- ∇ Vertical extent (non-RAL interval)
- ∇ Vertical extent (non-RAL interval) archive
- ∇ Vertical extent (non-RAL interval) not collected because of core refusal
- Shoaling core
- Core without appropriate RAL interval
- Sample above MHHW not included in the interpolation dataset
- 30% RD RAA daylight boundary^a
- 30% RD RAA placement area
- 30% RD RAA toe of cut
- 1 RAL exceedance area boundary
- Combined surface and subsurface sediment PCB indicator kriging RAL exceedance area
- Additional Thiessen polygon RAL exceedance area for other COCs
- Georgetown WWTS diffuser pipe
- Utility corridor

Legend for Vertical Extent Cores

- Area: -5.6 actual mudline elevation (ft MLLW)
- Core intervals: RAL interval(s); red if > RAL, green if < RAL (PCBs unless noted)
- bold outline: RAL interval(s) of non-Phase II core collected within 30 ft; red if > RAL, green if < RAL (PCBs unless noted)
- B: sample below RAL interval (purple if > surface sediment RAL; green if < surface sediment RAL)
- D: light yellow indicates samples that were not analyzed
- E: hashing indicates native material
- F: asterisk indicates PCB EF ≥ 0.9 and ≤ 1.0

Abbreviations: ref. indicates refusal at or above target depth, sh. indicates shoaling material, o.d. indicates overredge, est. indicates estimated mudline, and geo indicates geological break.

Light grey shading indicates FNC authorized depth.

Alternating light blue and white backgrounds indicate transects.

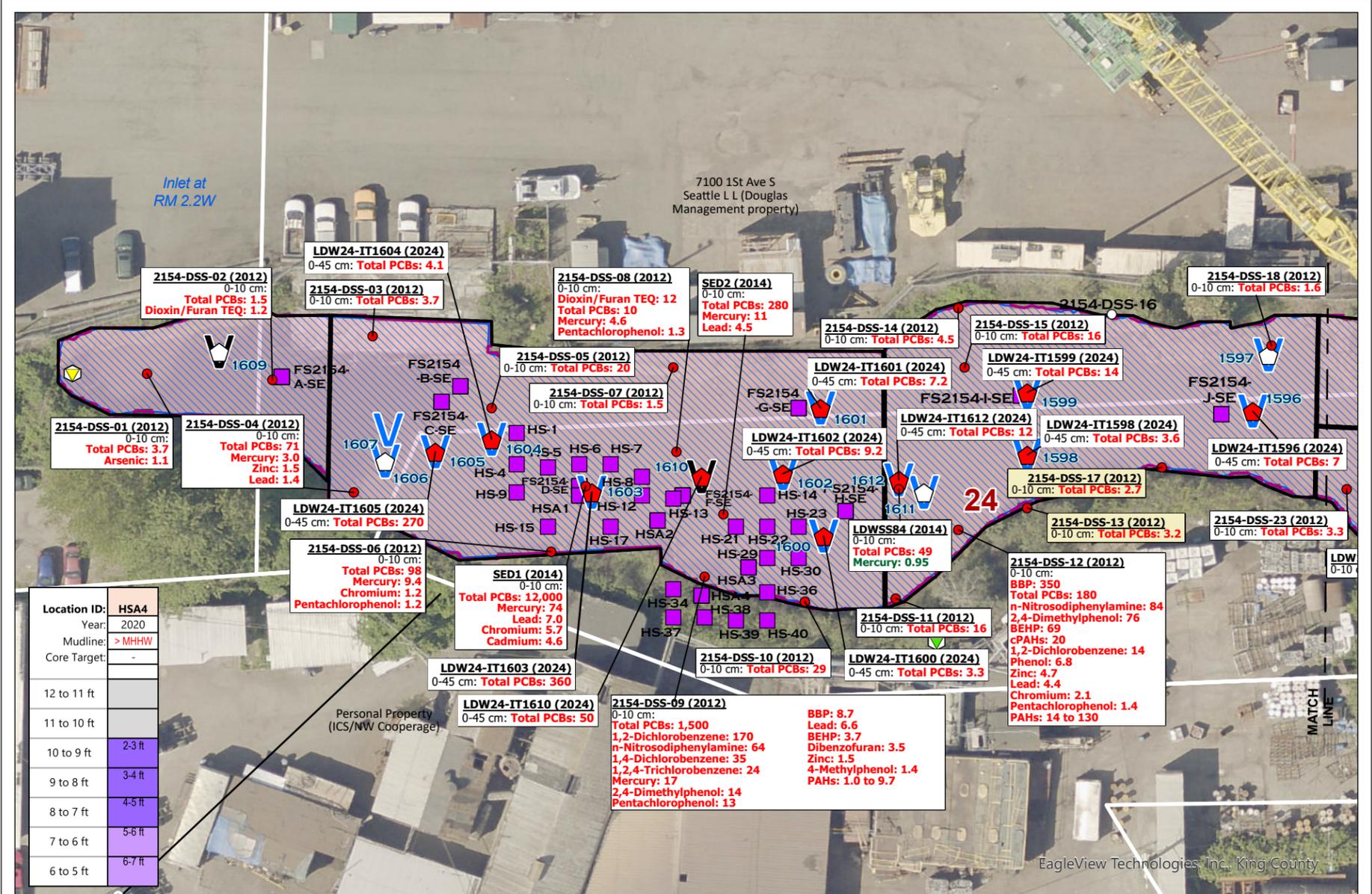
Vertical extent core intervals B and deeper are 30 cm in length. PDI shoaling cores identified the intervals alphabetically (i.e., B, C, or D depending on the number of shoaling intervals).



Figure D1-1k. RAA Boundaries, RAL Exceedance Areas, RAL Exceedance Locations, and Vertical Extent Data, Duwamish Marine Center

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Note: Location 1373 intervals C, D, and E were unable to be analyzed because they were majority gravel.



Area 24 - Inner Inlet

Location	1609	FS2154-A-SE	1606	1607	FS2154-C-SE	FS2154-B-SE	1605	1603	HSA1	FS2154-D-SE	1604	1610	HSA2	FS2154-F-SE	1602	HSA3	1600	FS2154-H-SE	FS2154-G-SE	1601	1612	1611	1598	FS2154-I-SE	1599	1596	FS2154-J-SE	1597		
Mudline	5.6	4.0	4.3	4.1	4.2	5.2	4.3	4.0	est. +5	3.7	4.1	3.7	est. 6	2.9	3.4	est. 7	3.1	2.4	5.9	5.6	3.3	6.4	6.0	1.7	2.5	1.9	2.5	4.4		
Core Target	-3 ft	-	-3 ft	-3 ft	-	-	-3 ft	-3 ft	-	-	-3 ft	-3 ft	-	-	-3 ft	-	-5 ft	-	-	-5 ft	-3 ft	-3 ft	-5 ft	-	-5 ft	-5 ft	-	-5 ft		
7 to 6 ft																														
6 to 5 ft		0-45 A																												
5 to 4 ft		ref.	0-45 A	0-45 A		0.5-1.7ft	0-45 A	0-45 A	1-2 ft		0-45 A																			
4 to 3 ft			B	B			B	B Hg, PCBs	2-3 ft		0-45 A	0-45 A	2-3 ft				0-45 A													
3 to 2 ft		0.9-1.6ft	C	C	2-2.5 ft	2.8-3.8ft	C	C Hg, PCBs	3-4 ft	1.5-2.7ft	B	ref.					0-45 A													
2 to 1 ft			D	D	2.5-4 ft	4-4.8 ft	D	D	4-5 ft	2.9-4.6ft	ref.						B													
1 to 0 ft		3.3-4.5ft	E	E	4-4.8 ft	5-6 ft	E	ref.									C													
0 to -1 ft		4.6-5.5ft	F	F	6.1-7.1ft		F			4.7-5.8ft							D													
-1 to -2 ft		5.8-6.8ft	G	G			G			5.8-7.6ft							E													
-2 to -3 ft		6.8-7.6ft	ref.	ref.			H										ref.													
-3 to -4 ft																														
-4 to -5 ft																														
-5 to -6 ft																														
-6 to -7 ft																														
-7 to -8 ft																														
-8 to -9 ft																														

Surface (0-10 cm) sampling location

- Exceeds RAL
- Does not exceed RAL

Intertidal (0-45 cm) core location

- Exceeds RAL
- Does not exceed RAL

Subtidal (0-60 cm) core location

- Exceeds RAL
- Does not exceed RAL

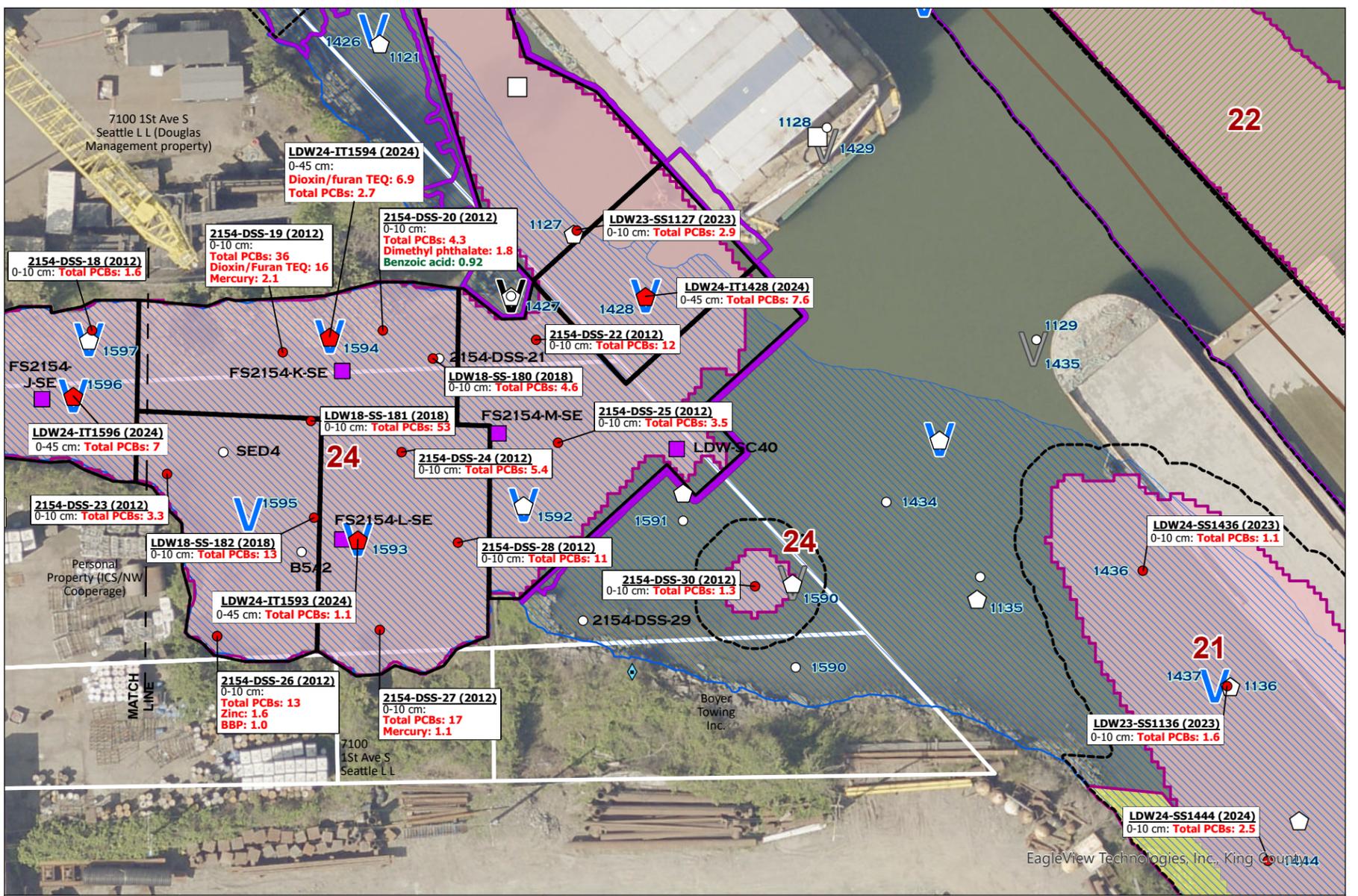
Other sampling locations

- ∇ Vertical extent (non-RAL interval)
- ∇ Vertical extent (non-RAL interval) not collected because of core refusal
- Core without appropriate RAL interval
- 30% RD RAA placement area
- 30% RD RAA toe of cut
- 1 RAL exceedance area boundary
- Combined surface and subsurface sediment PCB indicator kriging RAL exceedance area
- Additional Thiessen polygon RAL exceedance area for other COCs

Legend for Vertical Extent Cores

Area	Loc No.	Description
3.5		actual mudline elevation (ft MLLW)
0-60 A		RAL interval(s); red if > RAL, green if < RAL (PCBs unless noted)
B		sample below RAL interval (green if > surface sediment RAL); asterisk indicates PCB EF ≥ 0.9 and ≤ 1.0
C		sample below RAL interval (light purple if maximum EF < 10 relative to surface sediment RAL) (for PCBs unless noted)
D		sample below RAL interval (purple if maximum EF ≥ 10 relative to surface sediment RAL) (for PCBs unless noted)
E		sample below RAL interval (dark purple if maximum EF ≥ 100 relative to surface sediment RAL) (for PCBs unless noted)
F		light yellow indicates samples that were not analyzed

- Abbreviations: ref. indicates refusal at or above target depth, sh. indicates shoaling material, o.d. indicates overredge, est. indicates estimated mudline, and geo indicates geological break.
 - Alternating light blue and white backgrounds indicate transects.
 - PDI vertical extent core intervals B and deeper are 30 cm in length.



Area 24 - Outer Inlet

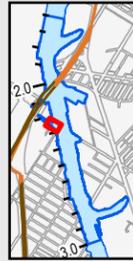
Location	1595	1593	FS2154-L-SE	FS2154-K-SE	1594	1592	FS2154-M-SE	1427	1590	LDW-SC40	1428	1434
Mudline	3.0	1.9	2.6	-0.6	0.6	0.7	-1.7	nd	3.8	-0.8	-2.9	-2.4
Core Target	-5 ft	-6 ft	-	-	-6 ft	-5 ft	-	7.5 ft	-5 ft	-	7.5 ft	7.5 ft
			Transect 6			Transect 7						
6 to 5 ft								0-45 A				
5 to 4 ft								ref.				
4 to 3 ft									0-45 A			
3 to 2 ft	0-45 A								B			
2 to 1 ft	B	0-45 A	1.4-2.5 ft						C			
1 to 0 ft	geo C	B			0-45 A D/F, PCBs				D			
0 to -1 ft	D	C	2.8-4.3 ft		B			ref.	ref.			
-1 to -2 ft	E	D				0-1.2 ft			0-1.3 ft			
-2 to -3 ft	F	ref.	4.3-5.9 ft	1.5-2.8	C	ref.	1.2-2.2 ft		1.3-2 ft			
-3 to -4 ft	ref.				D		2.2-3.4 ft		2-4 ft	0-45 A		0-45 A
-4 to -5 ft					E					B		B
-5 to -6 ft					ref.							ref.
-6 to -7 ft										C Hg, PCBs		
-7 to -8 ft										D		
-8 to -9 ft										E		
-9 to -10 ft										F		
-10 to -11 ft										geo G		

Surface (0-10 cm) sampling location

- Exceeds RAL
- Does not exceed RAL
- Intertidal (0-45 cm) core location**
- Exceeds RAL
- Does not exceed RAL
- Subtidal (0-60 cm) core location**
- Exceeds RAL
- Does not exceed RAL
- 30% RD RAA daylight boundary^a
- 30% RD RAA placement area
- 30% RD RAA toe of cut

Other sampling locations

- ∇ Vertical extent (non-RAL interval)
- ∇ Vertical extent (non-RAL interval) archive
- ∇ Vertical extent (non-RAL interval) not collected because of core refusal
- Core without appropriate RAL interval
- 1 RAL exceedance area boundary
- Combined surface and subsurface sediment PCB indicator kriging RAL exceedance area
- Additional Thiessen polygon RAL exceedance area for other COCs



Legend for Vertical Extent Cores

- | Area | Loc No. | Description |
|--------|---------|--|
| 3.5 | | actual mudline elevation (ft MLLW) |
| 0-60 A | | RAL interval(s); red if > RAL, green if < RAL (PCBs unless noted) |
| B | | sample below RAL interval (green if > surface sediment RAL); asterisk indicates PCB EF ≥ 0.9 and ≤ 1.0 |
| C | | sample below RAL interval (light purple if maximum EF < 10 relative to surface sediment RAL) (for PCBs unless noted) |
| D | | sample below RAL interval (purple if maximum EF ≥ 10 relative to surface sediment RAL) (for PCBs unless noted) |
| E | | sample below RAL interval (dark purple if maximum EF ≥ 100 relative to surface sediment RAL) (for PCBs unless noted) |
| F | | light yellow indicates samples that were not analyzed |
- Abbreviations: ref. indicates refusal at or above target depth, sh. indicates shoaling material, o.d. indicates overredge, est. indicates estimated mudline, and geo indicates geological break.
 - Alternating light blue and white backgrounds indicate transects.
 - PDI vertical extent core intervals B and deeper are 30 cm in length.

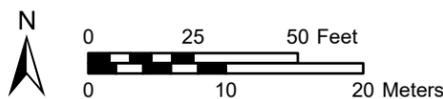
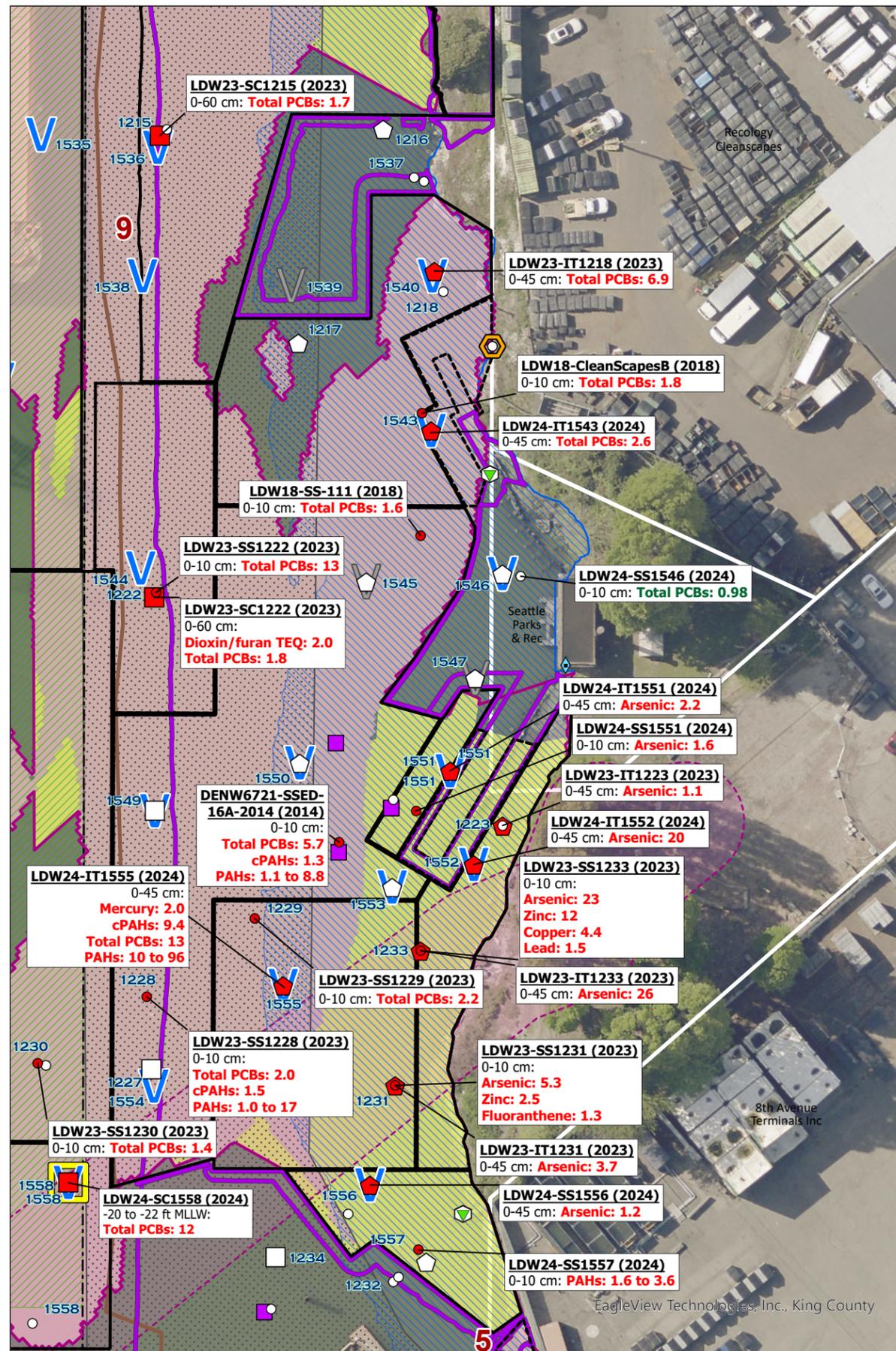


Figure D1-1m. RAA Boundaries, RAL Exceedance Areas, RAL Exceedance Locations, and Vertical Extent Data, RM 2.2W Outer Inlet



Area 9 - Subtidal FNC & Sideslopes						Area 9 S - Intertidal														
Location	1535	1536	1538	1544	1549	1554	Location	1539	1540	1543	1545	1546	1547	1550	1551	1553	1552	1555	1556	
Mudline	-19.5	-12.1	-14.6	-14.6	-14.0	-14.2	Mudline	-3.7	1.7	-0.1	-3.9	-0.5	0.5	-3.1	2.5	3.8	6.2	-1.5	-1.7	
Core Target	-31 ft	10 ft	10 ft	10 ft	10 ft	10 ft	Core Target	7.5 ft	7.5 ft	7.5 ft	7.5 ft	15 ft	15 ft	7.5 ft	7.5 ft	7.5 ft	7.5 ft	7.5 ft	7.5 ft	
Older Loc.	-	1215	-	1222	-	1227	Older Loc.	1217	1218	-	-	-	-	-	-	-	-	-	-	-
-12 to -13 ft		0-60 A					6 to 5 ft										0-45 A As only			
-13 to -14 ft							5 to 4 ft										B As only			
-14 to -15 ft			0-60 A	0-60 A	0-60 A	0-60 A	4 to 3 ft										0-45 A			
-15 to -16 ft							3 to 2 ft										B	geo D		
-16 to -17 ft							2 to 1 ft										0-45 A As only			
-17 to -18 ft							1 to 0 ft			0-45 A							geo C	ref.		
-18 to -19 ft							0 to -1 ft										B			
-19 to -20 ft							-1 to -2 ft										geo D			
-20 to -21 ft							-2 to -3 ft										ref.			
-21 to -22 ft							-3 to -4 ft										0-45 Hg, PAHs, PCBs B	0-45 A As only B PAHs, As, PCBs C*		
-22 to -23 ft							-4 to -5 ft										ref.			
-23 to -24 ft							-5 to -6 ft													
-24 to -25 ft							-6 to -7 ft													
-25 to -26 ft							-7 to -8 ft													
-26 to -27 ft							-8 to -9 ft													
-27 to -28 ft							-9 to -10 ft													
-28 to -29 ft							-10 to -11 ft													
-29 to -30 ft							-11 to -12 ft													
-30 to -31 ft							-12 to -13 ft													
-31 to -32 ft							-13 to -14 ft													
-32 to -33 ft							-14 to -15 ft													

Surface (0-10 cm) sampling location

- Exceeds RAL
- Does not exceed RAL

Intertidal (0-45 cm) core location

- ◆ Exceeds RAL
- ◇ Does not exceed RAL

Subtidal (0-60 cm) core location

- Exceeds RAL
- Does not exceed RAL

Other sampling locations

- V Vertical extent (non-RAL interval)
- V Vertical extent (non-RAL interval) archive
- Shoaling core
- Core without appropriate RAL interval
- Sample above MHHW not included in the interpolation dataset
- 30% RD RAA daylight boundary^a
- 30% RD RAA placement area
- 30% RD RAA toe of cut
- 1 RAL exceedance area boundary
- Combined surface and subsurface sediment PCB indicator kriging RAL exceedance area
- Additional Thiessen polygon RAL exceedance area for other COCs
- Utility corridor

Legend for Vertical Extent Cores

- Area:
 - Loc No. -5.6: actual mudline elevation (ft MLLW)
 - 0-60 A: RAL interval(s); red if > RAL, green if < RAL (PCBs unless noted)
 - 0-60 A: bold outline: RAL interval(s) of non-Phase II core collected within 30 ft; red if > RAL, green if < RAL (PCBs unless noted)
 - B: sample below RAL interval (purple if > surface sediment RAL; green if < surface sediment RAL)
 - D: light yellow indicates samples that were not analyzed
 - E: hashing indicates native material
 - F: asterisk indicates PCB EF ≥ 0.9 and ≤ 1.0
- Core intervals:
 - ref: indicates refusal at or above target depth, sh. indicates shoaling material, o.d. indicates overredge, est. indicates estimated mudline, and geo indicates geological break.
 - Light grey shading indicates FNC authorized depth.
 - Alternating light blue and white backgrounds indicate transects.
 - Vertical extent core intervals B and deeper are 30 cm in length. PDI shoaling cores identified the intervals alphabetically (i.e., B, C, or D depending on the number of shoaling intervals).

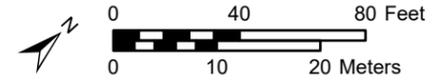
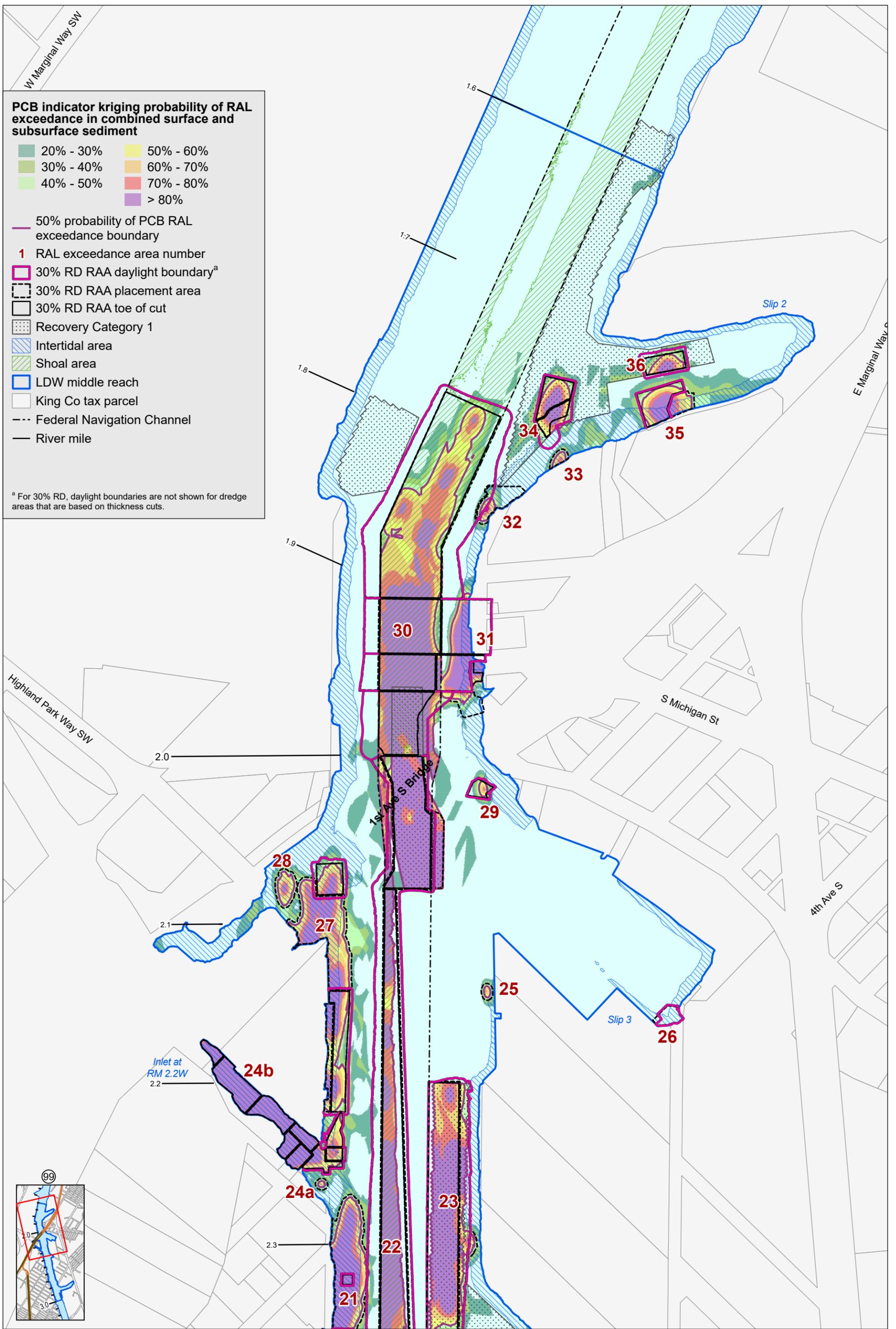


Figure D1-1n. RAA Boundaries, RAL Exceedance Areas, RAL Exceedance Locations, and Vertical Extent Data, Gateway Park

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PCB indicator kriging probability of RAL exceedance in combined surface and subsurface sediment

20% - 30%	50% - 60%
30% - 40%	60% - 70%
40% - 50%	70% - 80%
	> 80%

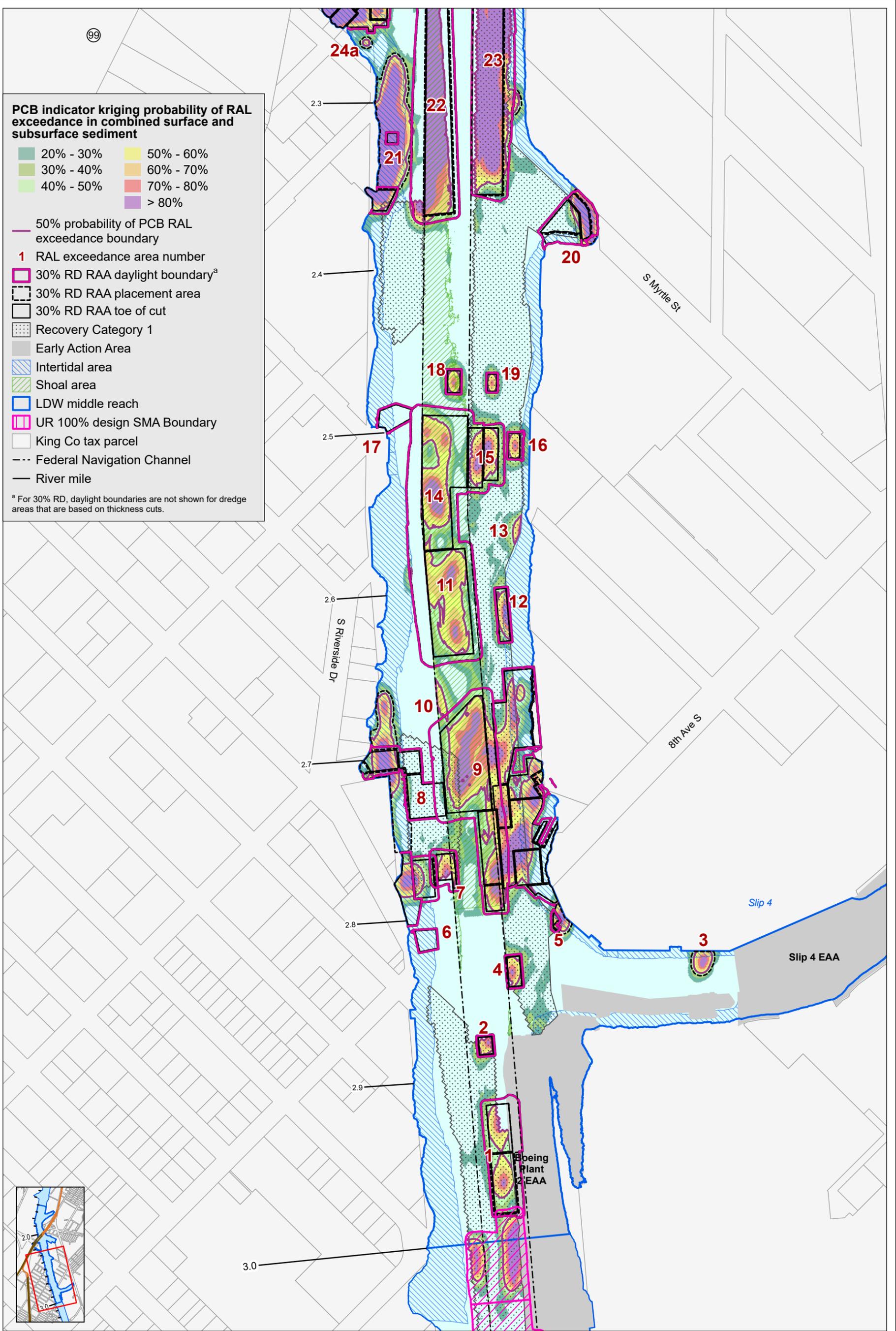
- 50% probability of PCB RAL exceedance boundary
- 1 RAL exceedance area number
- 30% RD RAA daylight boundary^a
- 30% RD RAA placement area
- 30% RD RAA toe of cut
- ▨ Recovery Category 1
- ▨ Intertidal area
- ▨ Shoal area
- ▨ LDW middle reach
- ▨ King Co tax parcel
- Federal Navigation Channel
- River mile

^a For 30% RD, daylight boundaries are not shown for dredge areas that are based on thickness cuts.

Prepared by craigh, 10/27/2025; W:\Projects\Duwamish_AOC\GIS\Maps and Analyses\Design\30 percent\30 Percent Design.aprx Fig D1-2 7216 Combined Phil IK wRAAs



Figure D1-2a. Total PCB Combined Surface and Subsurface Sediment Indicator Kriging Interpolation with RAA Boundaries, RM 1.6 to RM 2.3
 APPENDIX D - RAA DEVELOPMENT AND DREDGE PRISM DESIGN
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PCB indicator kriging probability of RAL exceedance in combined surface and subsurface sediment

20% - 30%	50% - 60%
30% - 40%	60% - 70%
40% - 50%	70% - 80%
	> 80%

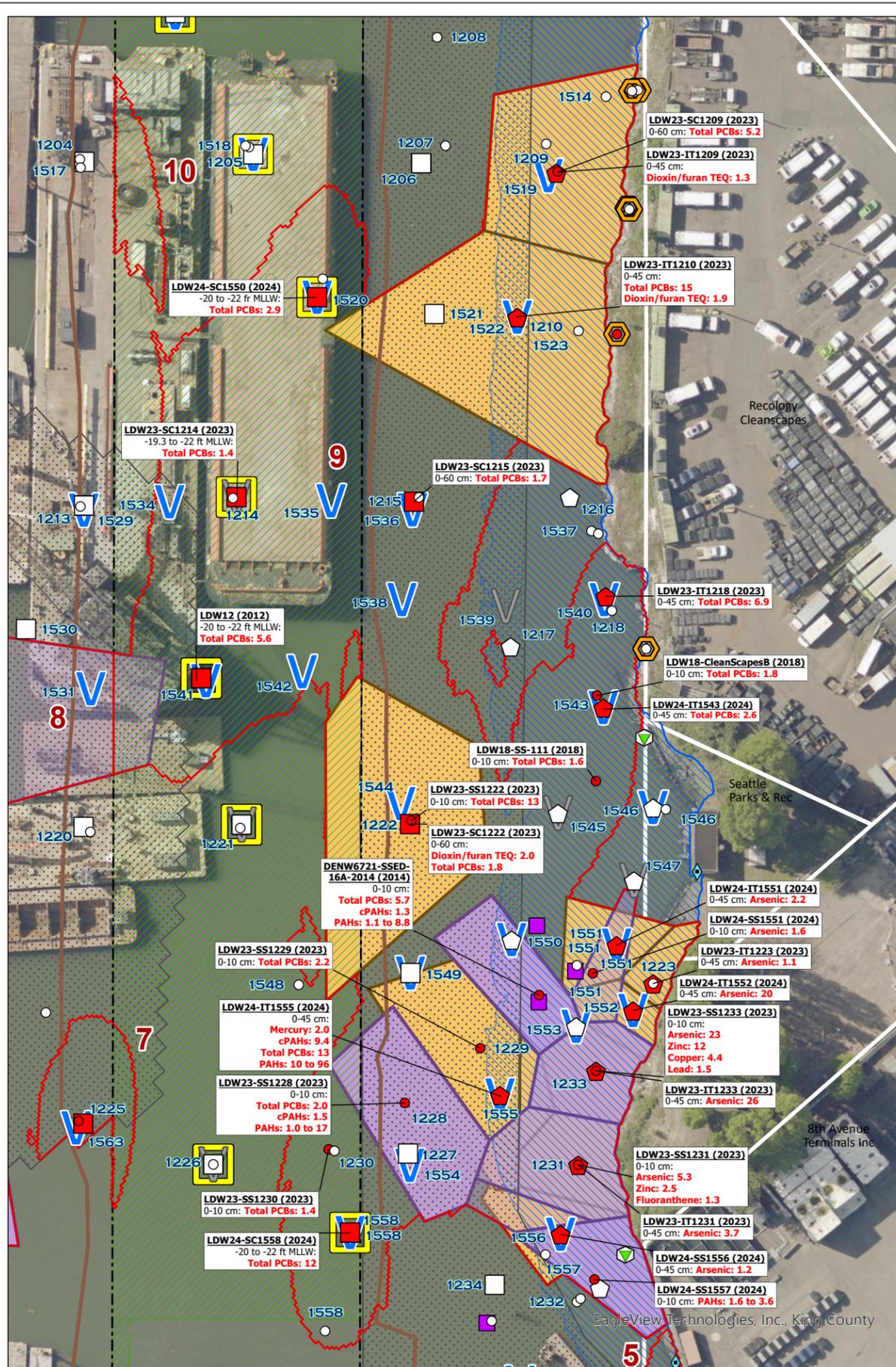
- 50% probability of PCB RAL exceedance boundary
- 1** RAL exceedance area number
- 30% RD RAA daylight boundary^a
- 30% RD RAA placement area
- 30% RD RAA toe of cut
- ▨ Recovery Category 1
- ▨ Early Action Area
- ▨ Intertidal area
- ▨ Shoal area
- ▨ LDW middle reach
- ▨ UR 100% design SMA Boundary
- King Co tax parcel
- Federal Navigation Channel
- River mile

^a For 30% RD, daylight boundaries are not shown for dredge areas that are based on thickness cuts.

Prepared by craigh, 10/27/2025: W:\Projects\Duwamish_AOC\GIS\Maps and Analyses\Design\30 Percent Design.aprx Fig D1-2 7216 Combined Phil IK wRAAs



Figure D1-2b. Total PCB Combined Surface and Subsurface Sediment Indicator Kriging Interpolation with RAA Boundaries, RM 2.3 to RM 3.0
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Area 9 Subtidal S - FNC & Sidesloptes

Location	1520	1529	1534	1214	1535	1536	1531	1541	1542
Mudline	-19.0	-14.7	-18.5	-19.3	-19.5	-12.1	-15.7	-19.0	-19.4
Older Loc.	-	1213	-	-	-	1215	-	LDW12	-
-12 to -13 ft						0-60 A			
-13 to -14 ft						B			
-14 to -15 ft						C			
-15 to -16 ft						D		0-60 A	
-16 to -17 ft						E		B	
-17 to -18 ft						F		C	
-18 to -19 ft						G		D	
-19 to -20 ft	sh. A	E	sh. A	sh. o.d.	sh. o.d.	H		sh. A	sh. o.d.
-20 to -21 ft	o.d.	F	o.d.	o.d.	o.d.	I		o.d.	o.d.
-21 to -22 ft	B	G	B	A	A	J		B	A
-22 to -23 ft	C	H	C	B	B	K		C	B
-23 to -24 ft		I	D	C	C	L		D	C
-24 to -25 ft		J	E	D	D	M		E	D
-25 to -26 ft		K	F	E	E	N		F	E
-26 to -27 ft			geo G	F	F			G	F
-27 to -28 ft			H	G	G			H	G/D/F, PCBs
-28 to -29 ft			I	H	H			I	H
-29 to -30 ft			J	I	I			J	I
-30 to -31 ft			K	geo J	geo J			K	J
-31 to -32 ft			L	K	K			L	K/D/F only
-32 to -33 ft			M	L	L			M	L
-33 to -34 ft								N	M

Area 9 Subtidal N - FNC & Sidesloptes

Location	1538	1221	1544	1549	1554	1558
Mudline	-14.6	-18.8	-14.6	-14.0	-14.2	-18.1
Older Loc.	-	-	1222	-	1227	-
-14 to -15 ft					0-60 A	0-60 A
-15 to -16 ft			0-60 A		B	B
-16 to -17 ft			B		C	C
-17 to -18 ft			C		D	*
-18 to -19 ft			D		geo D	sh. A
-19 to -20 ft			E		E	o.d.
-20 to -21 ft			F		F	
-21 to -22 ft			G		G	
-22 to -23 ft			H		H	
-23 to -24 ft			I		I	
-24 to -25 ft			J		J	
-25 to -26 ft			K		K	
-26 to -27 ft						

Area 9 Intertidal North

Location	1519	1522	1539	1540	1543	1545	1546	1547	1550
Mudline	-0.1	-1.5	-3.7	1.7	-0.1	-3.9	-0.5	0.5	-3.1
Older Loc.	1209	1210	1217	1218	-	-	-	-	-
2 to 1 ft				0-45 A					
1 to 0 ft				B	0-45 A				
0 to -1 ft	0-45 A			geo C	B			0-45 A	
-1 to -2 ft	B	0-45 A		D	C			B	
-2 to -3 ft	C			ref.	C			C	
-3 to -4 ft				0-45 A	D			D	0-45 A
-4 to -5 ft	ref.	C		E	*	0-45 A		E	B
-5 to -6 ft		ref.		F	B			F	C
-6 to -7 ft				G	C			G	D
-7 to -8 ft				H	D			H	geo E
-8 to -9 ft				I	E			I	F
-9 to -10 ft				geo G	F			geo G	G
-10 to -11 ft				H	G			H	
-11 to -12 ft				I	H			I	
-12 to -13 ft					I				
-13 to -14 ft									

Area 9 Intertidal South

Location	1551	1553	1552	1555	1556
Mudline	2.5	3.8	6.2	-1.5	-1.7
Older Loc.	-	-	-	-	-
6 to 5 ft			0-45 A As only		
5 to 4 ft			B As only		
4 to 3 ft			A C		
3 to 2 ft	0-45 A As only	B	geo D		
2 to 1 ft	B	geo C	ref.		
1 to 0 ft	C	D			
0 to -1 ft	D	ref.			
-1 to -2 ft					
-2 to -3 ft			0-45 Hg, PAHs, PCBs		0-45 A As only
-3 to -4 ft			B		B PAHs, As, PCBs
-4 to -5 ft			ref.		C*
-5 to -6 ft					geo D As only
-6 to -7 ft					E As only
					ref.

Surface (0-10 cm) sampling location

- Exceeds RAL
- Does not exceed RAL

Intertidal (0-45 cm) core location

- ◆ Exceeds RAL
- ◇ Does not exceed RAL

Subtidal (0-60 cm) core location

- Exceeds RAL
- Does not exceed RAL

Other sampling locations

- V Vertical extent (non-RAL interval)
- ∇ Vertical extent (non-RAL interval) archive
- Shoaling core
- Core without appropriate RAL interval
- Sample above MHHW not included in the interpolation dataset
- 1 RAL exceedance area boundary
- Surface Thiessen polygon RAL exceedance area
- Subsurface Thiessen polygon RAL exceedance area

Legend for Vertical Extent Cores

Area	Loc No.	Description
-5.6	-	actual mudline elevation (ft MLLW)
0-60	A	RAL interval(s); red if > RAL, green if < RAL (PCBs unless noted)
0-60	A	bold outline: RAL interval(s) of non-Phase II core collected within 30 ft; red if > RAL, green if < RAL (PCBs unless noted)
B		sample below RAL interval (purple if > surface sediment RAL; green if < surface sediment RAL)
D		light yellow indicates samples that were not analyzed
E		hashing indicates native material
F		asterisk indicates PCB EF ≥ 0.9 and ≤ 1.0

Abbreviations: ref. indicates refusal at or above target depth, sh. indicates shoaling material, o.d. indicates overredge, est. indicates estimated mudline, and geo indicates geological break.

Light grey shading indicates FNC authorized depth.

Alternating light blue and white backgrounds indicate transects.

Vertical extent core intervals B and deeper are 30 cm in length. PDI shoaling cores identified the intervals alphabetically (i.e., B, C, or D depending on the number of shoaling intervals).

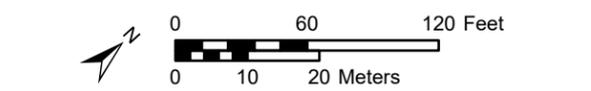


Figure D1-3b. Thiessen Polygons at RAL Exceedance Area 9

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