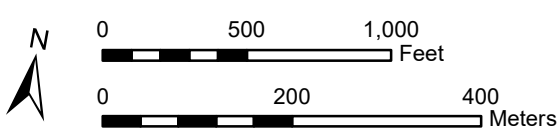


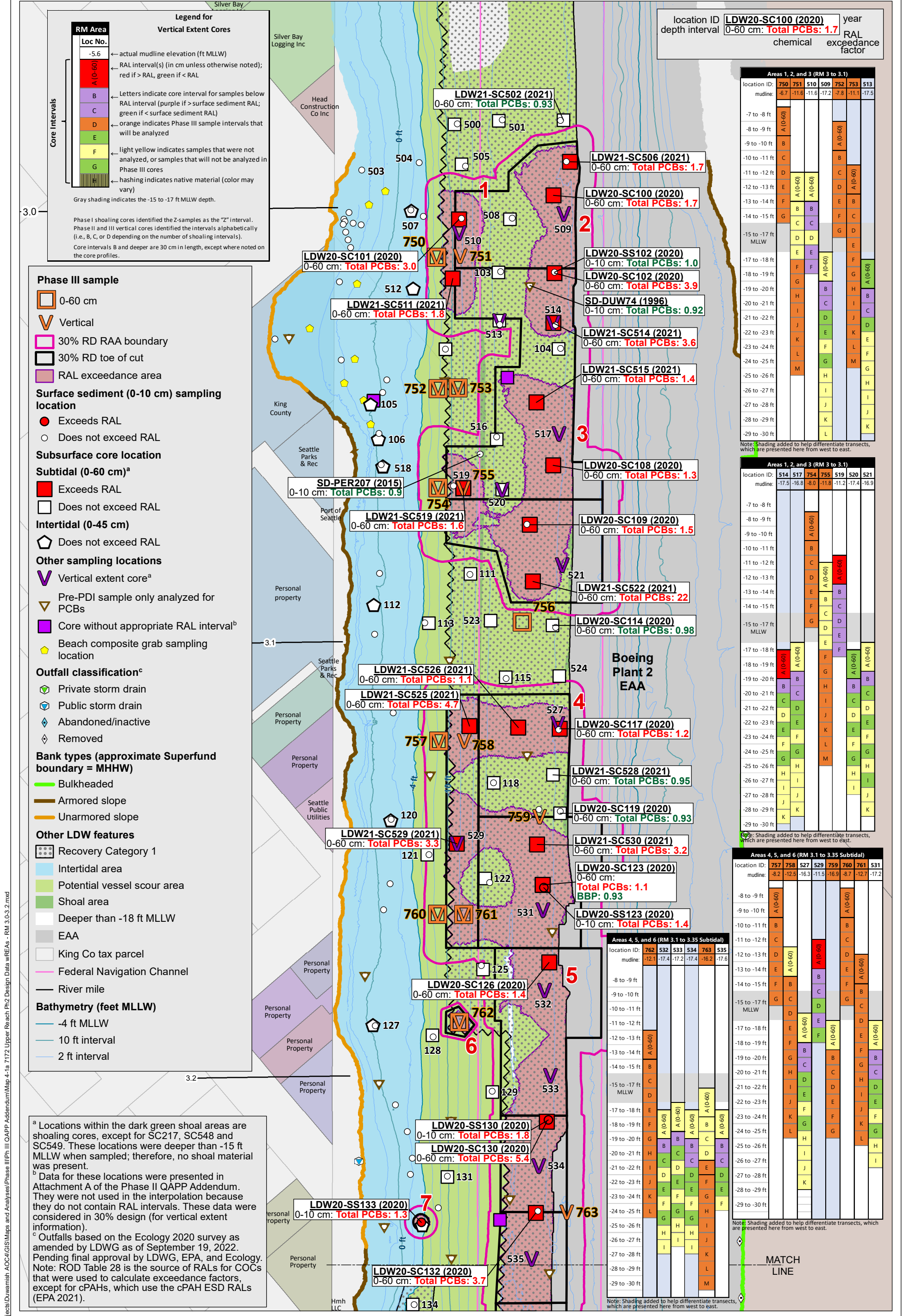
- Early Action Area
- Boeing South Storm Drain removal area
- ENR/AC Pilot plot
- Recovery Category 1
- Intertidal area^a
- Shoaled subtidal area in navigation channel
- Subtidal area outside of shoaled area
- Area not covered by bathymetric survey
- Bridge
- Dock/pier/marina
- LDW Superfund Site
- King Co tax parcel
- Federal Navigation Channel
- River mile

^a The blue intertidal area between the shoreward limit of the 2020 bathymetric survey and the shoreline is inferred.
 Note: The federally regulated channel depth in the upper reach is -15 ft MLLW.



Map 1-1. Upper reach of the Lower Duwamish Waterway
 QAPP ADDENDUM FOR THE LDW UPPER REACH: PRE-DESIGN INVESTIGATION PHASE III NOVEMBER 22, 2022

Prepared by craigh_11/28/22: W:\Projects\Duwamish AOC\GIS\Maps and Analysis\Phase III\Ph III QAPP Addendum\Map 1-1 7056 Upper Reach.mxd



location ID **LDW20-SC100 (2020)** year
 depth interval 0-60 cm: **Total PCBs: 1.7** RAL
 chemical exceedance factor

Areas 1, 2, and 3 (RM 3 to 3.1)

location ID:	750	751	510	509	752	753	513
mudline:	-6.7	-11.6	-11.6	-17.2	-7.8	-11.1	-17.5
-7 to -8 ft	A (0-60)						
-8 to -9 ft	B						
-9 to -10 ft	C						
-10 to -11 ft	D						
-11 to -12 ft	E	A (0-60)	A (0-60)				
-12 to -13 ft	F	B	B				
-13 to -14 ft	G	C	C				
-14 to -15 ft	H	D	D				
-15 to -17 ft MLLW	I	E	E				
-17 to -18 ft	J	F	F	A (0-60)			
-18 to -19 ft	K	G	G				
-19 to -20 ft	L	H	H				
-20 to -21 ft	M	I	I				
-21 to -22 ft		J	J				
-22 to -23 ft		K	K				
-23 to -24 ft		L	L				
-24 to -25 ft		M	M				
-25 to -26 ft							
-26 to -27 ft							
-27 to -28 ft							
-28 to -29 ft							
-29 to -30 ft							

Areas 1, 2, and 3 (RM 3 to 3.1)

location ID:	514	517	754	755	519	520	521
mudline:	-17.5	-16.8	-8.0	-11.8	-11.2	-17.4	-16.9
-7 to -8 ft							
-8 to -9 ft							
-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 -17 ft MLLW							
-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							

Areas 4, 5, and 6 (RM 3.1 to 3.35 Subtidal)

location ID:	757	758	527	529	759	760	761	531
mudline:	-8.2	-12.5	-16.3	-11.5	-16.9	-8.7	-12.7	-17.2
-8 to -9 ft								
-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 -17 ft MLLW								
-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								

Legend for Vertical Extent Cores

RM Area

Loc No.	Actual mudline elevation (ft MLLW)
A (0-60)	-5.6

← actual mudline elevation (ft MLLW)
 ← RAL interval(s) (in cm unless otherwise noted); red if > RAL, green if < RAL

Core Intervals

- Letters indicate core interval for samples below RAL interval (purple if > surface sediment RAL; green if < surface sediment RAL)
- orange indicates Phase III sample intervals that will be analyzed
- light yellow indicates samples that were not analyzed, or samples that will not be analyzed in Phase III cores
- hashing indicates native material (color may vary)
- Gray shading indicates the -15 to -17 ft MLLW depth.

Phase I shoaling cores identified the Z-samples as the "Z" interval. Phase II and III vertical cores identified the intervals alphabetically (i.e., A, B, C, or D depending on the number of shoaling intervals). Core intervals B and deeper are 30 cm in length, except where noted on the core profiles.

Phase III sample

- 0-60 cm
- Vertical
- 30% RD RAA boundary
- 30% RD toe of cut
- RAL exceedance area

Surface sediment (0-10 cm) sampling location

- Exceeds RAL
- Does not exceed RAL

Subsurface core location

Subtidal (0-60 cm)^a

- Exceeds RAL
- Does not exceed RAL

Intertidal (0-45 cm)

- Does not exceed RAL

Other sampling locations

- Vertical extent core^a
- Pre-PDI sample only analyzed for PCBs
- Core without appropriate RAL interval^b
- Beach composite grab sampling location

Outfall classification^c

- Private storm drain
- Public storm drain
- Abandoned/inactive
- Removed

Bank types (approximate Superfund boundary = MHHW)

- Bulkheaded
- Armored slope
- Unarmored slope

Other LDW features

- Recovery Category 1
- Intertidal area
- Potential vessel scour area
- Shoal area
- Deeper than -18 ft MLLW
- EAA
- King Co tax parcel
- Federal Navigation Channel
- River mile

Bathymetry (feet MLLW)

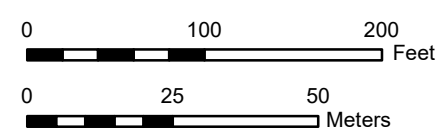
- 4 ft MLLW
- 10 ft interval
- 2 ft interval

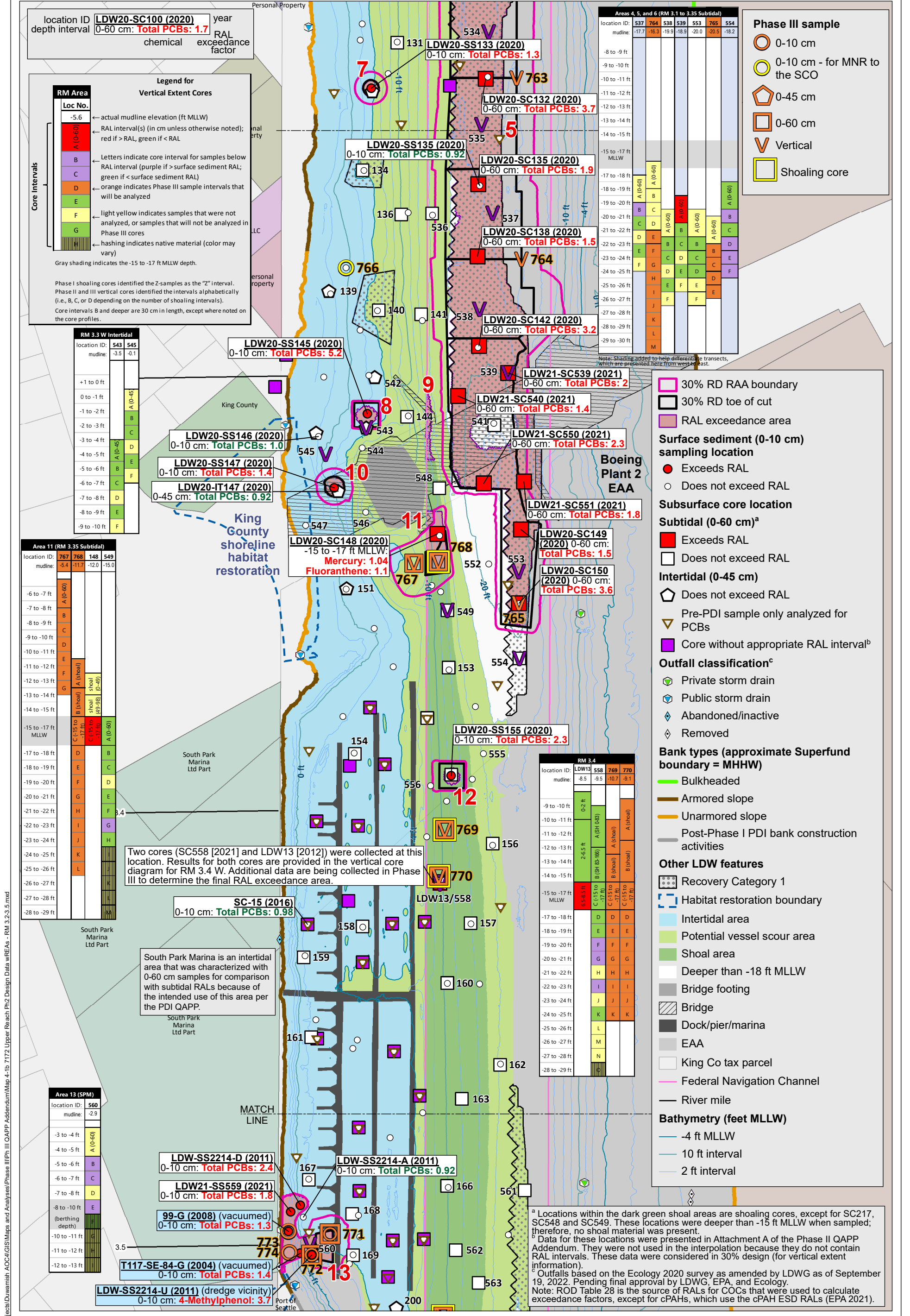
^a Locations within the dark green shoal areas are shoaling cores, except for SC217, SC548 and SC549. These locations were deeper than -15 ft MLLW when sampled; therefore, no shoal material was present.

^b Data for these locations were presented in Attachment A of the Phase II QAPP Addendum. They were not used in the interpolation because they do not contain RAL intervals. These data were considered in 30% design (for vertical extent information).

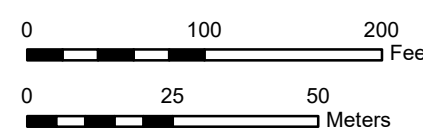
^c Outfalls based on the Ecology 2020 survey as amended by LDWG as of September 19, 2022. Pending final approval by LDWG, EPA, and Ecology. Note: ROD Table 28 is the source of RALs for COCs that were used to calculate exceedance factors, except for cPAHs, which use the cPAH ESD RALs (EPA 2021).

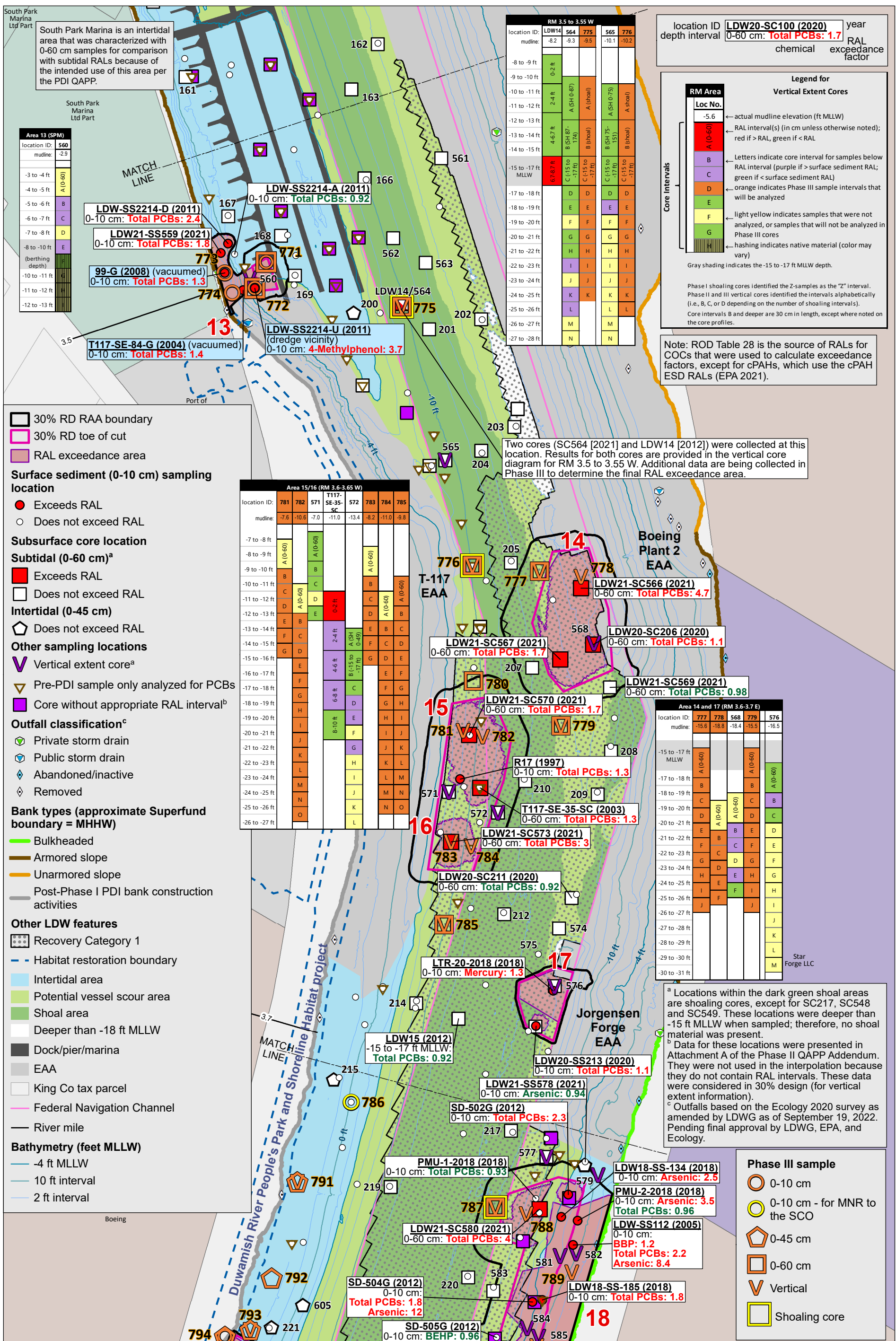
Prepared by craigh. 11/22/22: W:\Projects\Duwamish AOC\GIS\Maps and Analysis\Phase III\Ph III QAPP Addendum\Map 4-1a 7172 Upper Reach PDI Design Data wREAs - RM 3.0-3.2.mxd





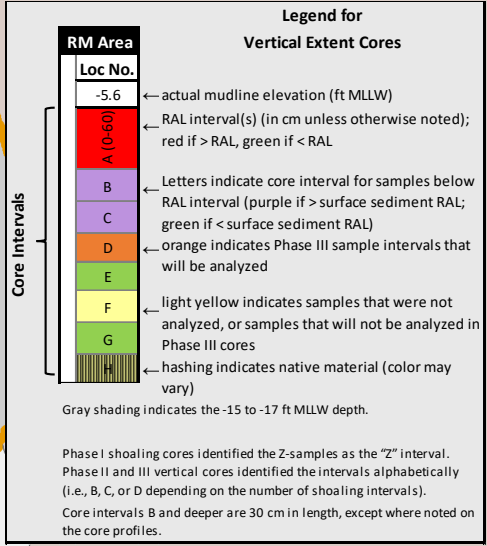
Prepared by craigh. 11/22/22. W:\Projects\Duwamish AOC\GIS\Maps and Analyses\Phase III\Ph III QAPP Addendum\Map 4-1b 7172 Upper Reach Ph3 Design Data wRAAs - RM 3.2-3.5.mxd





South Park Marina is an intertidal area that was characterized with 0-60 cm samples for comparison with subtidal RALs because of the intended use of this area per the PDI QAPP.

location ID **LDW20-SC100 (2020)** year
 depth interval 0-60 cm: **Total PCBs: 1.7** RAL
 chemical exceedance factor



Note: ROD Table 28 is the source of RALs for COCs that were used to calculate exceedance factors, except for cPAHs, which use the cPAH ESD RALs (EPA 2021).

Two cores (SC564 [2021] and LDW14 [2012]) were collected at this location. Results for both cores are provided in the vertical core diagram for RM 3.5 to 3.55 W. Additional data are being collected in Phase III to determine the final RAL exceedance area.

Area 13 (SPM)

location ID:	560
mudline:	-2.9
-3 to -4 ft	A (0-60)
-4 to -5 ft	B
-5 to -6 ft	C
-6 to -7 ft	D
-7 to -8 ft	E
(berthing depth)	
-10 to -11 ft	
-11 to -12 ft	
-12 to -13 ft	

RM 3.5 to 3.55 W

location ID:	LDW14	564	775	565	776
mudline:	-8.2	-9.3	-9.5	-10.1	-10.2
-8 to -9 ft					
-9 to -10 ft	0-2 ft				
-10 to -11 ft	2-4 ft	A (SH 0-87)	A (shoal)	A (SH 0-75)	A (shoal)
-11 to -12 ft					
-12 to -13 ft					
-13 to -14 ft	4-6.7 ft	B (SH 87-174)	B (shoal)	B (SH 75-151)	B (shoal)
-14 to -15 ft					
-15 to -17 ft MLLW	6.7-8.7 ft	C (15 to -17 ft)	C (15 to -17 ft)	C (15 to -17 ft)	C (15 to -17 ft)
-17 to -18 ft					
-18 to -19 ft		D	D	D	D
-19 to -20 ft		E	E	E	E
-20 to -21 ft		F	F	F	F
-21 to -22 ft		G	G	G	G
-22 to -23 ft		H	H	H	H
-23 to -24 ft		I	I	I	I
-24 to -25 ft		J	J	J	J
-25 to -26 ft		K	K	K	K
-26 to -27 ft		L	L	L	L
-27 to -28 ft		M	M	M	M
		N	N	N	N

Area 15/16 (RM 3.6-3.65 W)

location ID:	781	782	571	T117-SE-35-SC	572	783	784	785
mudline:	-7.6	-10.6	-7.0	-11.0	-13.4	-8.2	-11.0	-9.8
-7 to -8 ft			A (0-60)					
-8 to -9 ft			B					
-9 to -10 ft			C					
-10 to -11 ft			D					
-11 to -12 ft			E					
-12 to -13 ft			F					
-13 to -14 ft			G					
-14 to -15 ft			H					
-15 to -16 ft			I					
-16 to -17 ft			J					
-17 to -18 ft			K					
-18 to -19 ft			L					
-19 to -20 ft			M					
-20 to -21 ft			N					
-21 to -22 ft			O					
-22 to -23 ft			P					
-23 to -24 ft			Q					
-24 to -25 ft			R					
-25 to -26 ft			S					
-26 to -27 ft			T					

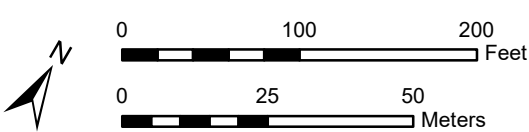
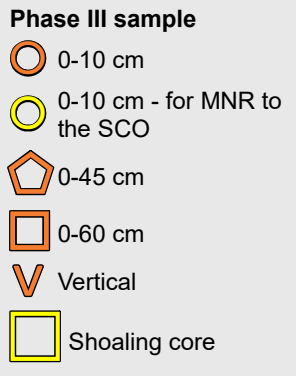
Area 14 and 17 (RM 3.6-3.7 E)

location ID:	777	778	568	779	576
mudline:	-15.6	-18.8	-18.4	-15.5	-16.5
-15 to -17 ft MLLW					
-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					

^a Locations within the dark green shoal areas are shoaling cores, except for SC217, SC548 and SC549. These locations were deeper than -15 ft MLLW when sampled; therefore, no shoal material was present.

^b Data for these locations were presented in Attachment A of the Phase II QAPP Addendum. They were not used in the interpolation because they do not contain RAL intervals. These data were considered in 30% design (for vertical extent information).

^c Outfalls based on the Ecology 2020 survey as amended by LDWG as of September 19, 2022. Pending final approval by LDWG, EPA, and Ecology.



Area 18 Subtidal (RM 3.7-3.85 E)						
location ID:	787	788	577	587	591	596
mudline:	-13.9	-11.5	-11.3	-9.5	-6.0	-8.0
-6 to -7 ft					A (0-60)	
-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					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						
-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						

Area 19/20 (RM 3.8 W)						
location ID:	791	793	795	608	609	799
mudline:	5.4	5.8	6.9	6.5	-3.2	5.3
+7 to +6 ft						
+6 to +5 ft						
+5 to +4 ft						
+4 to +3 ft						
+3 to +2 ft						
+2 to +1 ft						
0 to -1 ft						
-1 to -2 ft						
-2 to -3 ft						
-3 to -4 ft						
-4 to -5 ft						
-5 to -6 ft						
-6 to -7 ft						
-7 to -8 ft						
-8 to -9 ft						

Area 18 Intertidal (RM 3.7-3.85 E)													
location ID:	579	581	582	789	584	585	790	588	592	593	597	598	604
mudline:	-0.7	-2.8	-0.2	0.5	-3.8	-1.8	-0.4	0.6	-2.0	-1.0	-0.2	3.2	6.3
+6 to +5 ft													
+5 to +4 ft													
+4 to +3 ft													
+3 to +2 ft													
+2 to +1 ft													
+1 to 0 ft													
0 to -1 ft													
-1 to -2 ft													
-2 to -3 ft													
-3 to -4 ft													
-4 to -5 ft													
-5 to -6 ft													
-6 to -7 ft													
-7 to -8 ft													
-8 to -9 ft													
-9 to -10 ft													
-10 to -11 ft													
-11 to -12 ft													

Note: Shading added to help differentiate transects, which are presented here from west to east.

^a Locations within the dark green shoal areas are shoaling cores, except for SC217, SC548 and SC549. These locations were deeper than -15 ft MLLW when sampled; therefore, no shoal material was present.

^b Data for these locations were presented in Attachment A of the Phase II QAPP Addendum. They were not used in the interpolation because they do not contain RAL intervals. These data were considered in 30% design (for vertical extent information).

^c Outfalls based on the Ecology 2020 survey as amended by LDWG as of September 19, 2022. Pending final approval by LDWG, EPA, and Ecology.

Note: ROD Table 28 is the source of RALs for COCs that were used to calculate exceedance factors, except for cPAHs, which use the cPAH ESD RALs (EPA 2021).

Two cores (SC629 [2021] and LDW17 [2012]) were collected at this location. Results for both cores are provided in the vertical core diagram for RM 3.9 subtidal. Additional data are being collected in Phase III to determine the final RAL exceedance area.

30% RD RAA boundary
 30% RD toe of cut
 RAL exceedance area

Surface sediment (0-10 cm) sampling location
 Exceeds RAL
 Does not exceed RAL

Subsurface core location
 Subtidal (0-60 cm)^a
 Exceeds RAL
 Does not exceed RAL

Intertidal (0-45 cm)
 Exceeds RAL
 Does not exceed RAL

Other sampling locations
 Vertical extent core^a
 Vertical archive
 Pre-PDI sample only analyzed for PCBs
 Core without appropriate RAL interval^b

Outfall classification^c
 EOF/storm drain
 Private storm drain
 Abandoned/inactive
 Removed

Bank types (approximate Superfund boundary = MHHW)
 Bulkheaded
 Unarmored slope
 Post-Phase I PDI bank construction activities

Other LDW features
 Recovery Category 1
 Habitat restoration boundary
 Intertidal area
 Potential vessel scour area
 Shoal area
 EAA
 ENR/AC Pilot plot

King Co tax parcel
 Federal Navigation Channel
 River mile
Bathymetry (feet MLLW)
 -4 ft MLLW
 10 ft interval
 2 ft interval

Phase III sample

- 0-10 cm - for MNR to the SCO
- 0-45 cm
- 0-60 cm
- Vertical
- Shoaling core

R23 (1997)
 0-10 cm:
 Benzo(a)anthracene: 1.0
 Total benzofluoranthenes: 1.1
 BBP: 1.2
 cPAHs: 1.2
 Benzo(a)pyrene: 1.3
 Chrysene: 1.4
 Total HPAHs: 1.6
 Fluoranthene: 2.0
 Phenanthrene: 2.0
 Indeno(1,2,3-cd)pyrene: 2.8
 Benzo(g,h,i)perylene: 2.9
 Dibenzo(a,h)anthracene: 3
 Total PCBs: 4.3

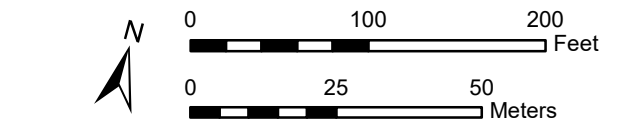
R22 (1997)
 0-10 cm:
 Total PCBs: 1.1
 Phenanthrene: 1.1
 Fluoranthene: 1.3
 Arsenic: 1.4
 Dibenzo(a,h)anthracene: 1.5
 Benzo(g,h,i)perylene: 1.6
 Indeno(1,2,3-cd)pyrene: 1.6
 Chrysene: 0.91
 Total HPAHs: 0.94

Area 21 (RM 3.8)	
location ID:	800
mudline:	-8.8
-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	
-16 to -17 ft	

Legend for Vertical Extent Cores

RM Area
 Loc No.
 -5.6
 actual mudline elevation (ft MLLW)
 RAL interval(s) (in cm unless otherwise noted); red if >RAL, green if <RAL
 Letters indicate core interval for samples below RAL interval (purple if > surface sediment RAL; green if < surface sediment RAL)
 orange indicates Phase III sample intervals that will be analyzed
 light yellow indicates samples that were not analyzed, or samples that will not be analyzed in Phase III cores
 hatching indicates native material (color may vary)
 Gray shading indicates the -15 to -17 ft MLLW depth.

Phase I shoaling cores identified the Z-samples as the "Z" interval. Phase II and III vertical cores identified the intervals alphabetically (i.e., B, C, or D depending on the number of shoaling intervals). Core intervals B and deeper are 30 cm in length, except where noted on the core profiles.



Map 4-1d. Design dataset with RAL exceedance areas, 30% design RAA boundaries, and proposed Phase III PDI sample locations, RM 3.7 to RM 3.85

QAPP ADDENDUM FOR THE LDW UPPER REACH: PRE-DESIGN INVESTIGATION PHASE III NOVEMBER 22, 2022

Two cores (SC629 [2021] and LDW17 [2012]) were collected at this location. Results for both cores are provided in the vertical core diagram for RM 3.9 subtidal. Additional data are being collected in Phase III to determine the final RAL exceedance area.

Legend for Vertical Extent Cores

RM Area	Loc No.
-5.6	← actual mudline elevation (ft MLLW)
A (0-60)	← RAL interval(s) (in cm unless otherwise noted); red if > RAL, green if < RAL
B	← Letters indicate core interval for samples below RAL interval (purple if > surface sediment RAL; green if < surface sediment RAL)
C	← orange indicates Phase III sample intervals that will be analyzed
D	← light yellow indicates samples that were not analyzed, or samples that will not be analyzed in Phase III cores
E	← hashing indicates native material (color may vary)
F	← Gray shading indicates the -15 to -17 ft MLLW depth.
G	

Phase I shoaling cores identified the Z-samples as the "Z" interval. Phase II and III vertical cores identified the intervals alphabetically (i.e., B, C, or D depending on the number of shoaling intervals). Core intervals B and deeper are 30 cm in length, except where noted on the core profiles.

RM 3.9 Subtidal

location ID:	LDW17	629	802
mudline:	-12.2	-13.5	-12.4
0 to -1 ft			
-1 to -2 ft			
-2 to -3 ft			
-3 to -4 ft			
-4 to -5 ft			
-5 to -6 ft			
-6 to -7 ft			
-7 to -8 ft			
-8 to -9 ft			
-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			
-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			

Area 23

location ID:	806
mudline:	4.3
+5 to +4 ft	
+4 to +3 ft	
+3 to +2 ft	
+2 to +1 ft	
+1 to 0 ft	
0 to -1 ft	
-1 to -2 ft	

^a Locations within the dark green shoal areas are shoaling cores, except for SC217, SC548 and SC549. These locations were deeper than -15 ft MLLW when sampled; therefore, no shoal material was present.

^b Data for these locations were presented in Attachment A of the Phase II QAPP Addendum. They were not used in the interpolation because they do not contain RAL intervals. These data were considered in 30% design (for vertical extent information).

^c Outfalls based on the Ecology 2020 survey as amended by LDWG as of September 19, 2022. Pending final approval by LDWG, EPA, and Ecology. Note: ROD Table 28 is the source of RALs for COCs that were used to calculate exceedance factors, except for cPAHs, which use the cPAH ESD RALs (EPA 2021).

Phase III sample

- 0-10 cm
- ◐ 0-45 cm
- ◑ 0-60 cm
- ∇ Vertical
- ◻ Shoaling core

RM 3.95 W

location ID:	637
mudline:	0.2
0 to -1 ft	
-1 to -2 ft	
-2 to -3 ft	
-3 to -4 ft	
-4 to -5 ft	
-5 to -6 ft	

RM 3.85 Subtidal

location ID:	630	634	640
mudline:	-8.5	-8.5	-4.9
-5 to -6 ft			
-6 to -7 ft			
-7 to -8 ft			
-8 to -9 ft			
-9 to -10 ft			
-10 to -11 ft			
-11 to -12 ft			
-12 to -13 ft			
-13 to -14 ft			
-14 to -15 ft			

Area 24/25 and Area 26

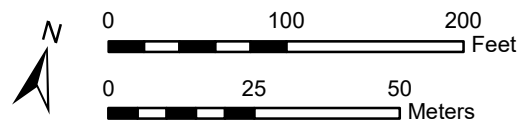
location ID:	808	632	809	635	644	810
mudline:	0.3	3.1	3.2	0.9	-0.4	2.5
+3 to +2 ft						
+2 to +1 ft						
+1 to 0 ft						
0 to -1 ft						
-1 to -2 ft						
-2 to -3 ft						
-3 to -4 ft						
-4 to -5 ft						
-5 to -6 ft						
-6 to -7 ft						

Area 22 (RM 3.9 E)

location ID:	804	621	622
mudline:	-8.3	-1.4	0.6
0 to -1 ft			
-1 to -2 ft			
-2 to -3 ft			
-3 to -4 ft			
-4 to -5 ft			
-5 to -6 ft			
-6 to -7 ft			
-7 to -8 ft			
-8 to -9 ft			
-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			
-16 to -17 ft			

Legend

- ◻ 30% RD RAA boundary
- ◻ 30% RD toe of cut
- ◻ RAL exceedance area
- Surface sediment (0-10 cm) sampling location**
- Exceeds RAL
- Does not exceed RAL
- Subsurface core location**
- Subtidal (0-60 cm)^a**
- ◻ Exceeds RAL
- ◻ Does not exceed RAL
- Intertidal (0-45 cm)**
- ◻ Exceeds RAL
- ◻ Does not exceed RAL
- Other sampling locations**
- ∇ Vertical extent core^a
- ∇ Vertical archive
- ∇ Pre-PDI sample only analyzed for PCBs
- ◻ Core without appropriate RAL interval^b
- Outfall classification^c**
- ◻ Private storm drain
- ◻ Stream, channel, or ditch
- ◻ Abandoned/inactive
- ◻ Removed
- ◻ Pipe of unresolved origin and/or use
- Bank types (approximate Superfund boundary = MHHW)**
- ◻ Bulkheaded
- ◻ Armored slope
- ◻ Unarmored slope
- ◻ Post-Phase I PDI bank construction activities
- Other LDW features**
- ◻ Recovery Category 1
- ◻ King Co tax parcel
- ◻ Habitat restoration boundary
- ◻ Federal Navigation Channel
- ◻ Intertidal area
- ◻ Potential vessel scour area
- ◻ Shoal area
- ◻ Dock/pier/marina
- ◻ ENR/AC Pilot plot
- Bathymetry (feet MLLW)**
- ◻ -4 ft MLLW
- ◻ 10 ft interval
- ◻ 2 ft interval



Map 4-1e. Design dataset with RAL exceedance areas, 30% design RAA boundaries, and proposed Phase III PDI sample locations, RM 3.85 to RM 4.05

QAPP ADDENDUM FOR THE LDW UPPER REACH: PRE-DESIGN INVESTIGATION PHASE III NOVEMBER 22, 2022

^a Data for these locations were presented in Attachment A of the Phase II QAPP Addendum. They were not used in the interpolation because they do not contain RAL intervals. These data were considered in 30% design (for vertical extent information).
^b Outfalls based on the Ecology 2020 survey as amended by LDWG as of September 19, 2022. Pending final approval by LDWG, EPA, and Ecology.

Mellon Trust Of Wa-Desimone (Duwamish Yacht Club)
 Duwamish Yacht Club is an intertidal area that was characterized with 0-60 cm samples for comparison with subtidal RALs because of the intended use of this area per the PDI QAPP.

location ID **LDW20-SC100 (2020)** year
 depth interval 0-60 cm: **Total PCBs: 1.7** chemical RAL exceedance factor

LDW20-SS300 (2020)
 0-10 cm: **Total PCBs: 1.1**

LDW20-SS301 (2020)
 0-10 cm: **Dioxin/furan TEQ: 1.4**
Total PCBs: 0.92

LDW20-IT272 (2020)
 0-45 cm: **Mercury: 0.91**

LDW20-SS304 (2020)
 0-10 cm: **Mercury: 1.2**
Total PCBs: 1.7
Dioxin/furan TEQ: 0.9

LDW20-IT302 (2020)
 0-45 cm: **Dioxin/furan TEQ: 13**

LDW20-SS302 (2020)
 0-10 cm: **Dioxin/furan TEQ: 1.6**

LDW20-IT304 (2020)
 0-45 cm: **Total PCBs: 1.7**

LDW21-IT652 (2021)
 0-45 cm: **Total PCBs: 3.2**
Dioxin/furan TEQ: 0.99

LDW20-IT303 (2020)
 0-45 cm: **Dioxin/furan TEQ: 1.4**
Total PCBs: 2.2

LDW18-SS-142 (2018)
 0-10 cm: **Total PCBs: 3.8**

LDW20-IT306 (2020)
 0-45 cm: **Total PCBs: 2.3**

LDW20-IT307 (2020)
 0-45 cm: **Total PCBs: 1.1**

LDW20-SS308 (2020)
 0-10 cm: **Phenol: 1.1**

LDW21-IT658 (2021)
 0-45 cm: **Total PCBs: 0.91**

LDW20-IT309 (2020)
 0-45 cm: **Total PCBs: 3.2**

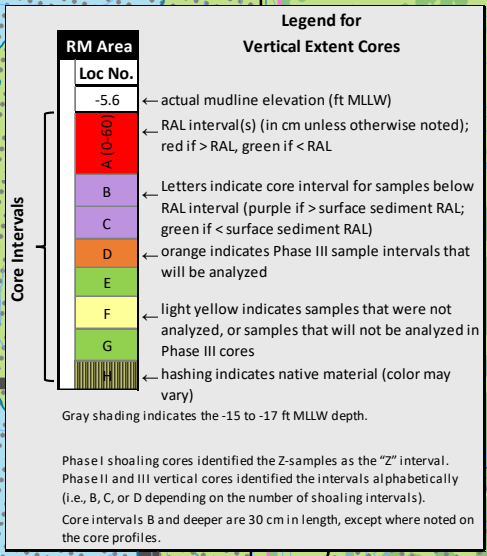
LDW21-IT662 (2021)
 0-45 cm: **Total PCBs: 1.3**
Dioxin/furan TEQ: 1.2

LDW20-IT312 (2020)
 0-45 cm: **Total PCBs: 1.1**
Dioxin/furan TEQ: 0.98

LDW20-SS313 (2020)
 0-10 cm: **Total PCBs: 4.3**

LDW20-IT316 (2020)
 0-45 cm: **Total PCBs: 1.1**
RP-11 (2011)
 0-10 cm: **Total PCBs: 1.8**

- 30% RD RAA boundary
- 30% RD toe of cut
- RAL exceedance area
- Surface sediment (0-10 cm) sampling location**
- Exceeds RAL
- Does not exceed RAL
- Subsurface core location**
- Subtidal (0-60 cm)**
- Does not exceed RAL
- Intertidal (0-45 cm)**
- Exceeds RAL
- Does not exceed RAL
- Other sampling locations**
- Vertical extent core
- Pre-PDI sample only analyzed for PCBs
- Core without appropriate RAL interval^a
- Outfall classification^b**
- Private storm drain
- Public storm drain
- Abandoned/inactive
- Bank types (approximate Superfund boundary = MHHW)**
- Bulkheaded
- Armored slope
- Unarmored slope
- Other LDW features**
- Recovery Category 1
- Intertidal area
- Potential vessel scour area
- Shoal area
- Dock/pier/marina

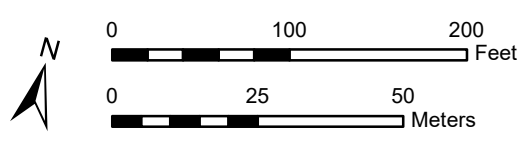


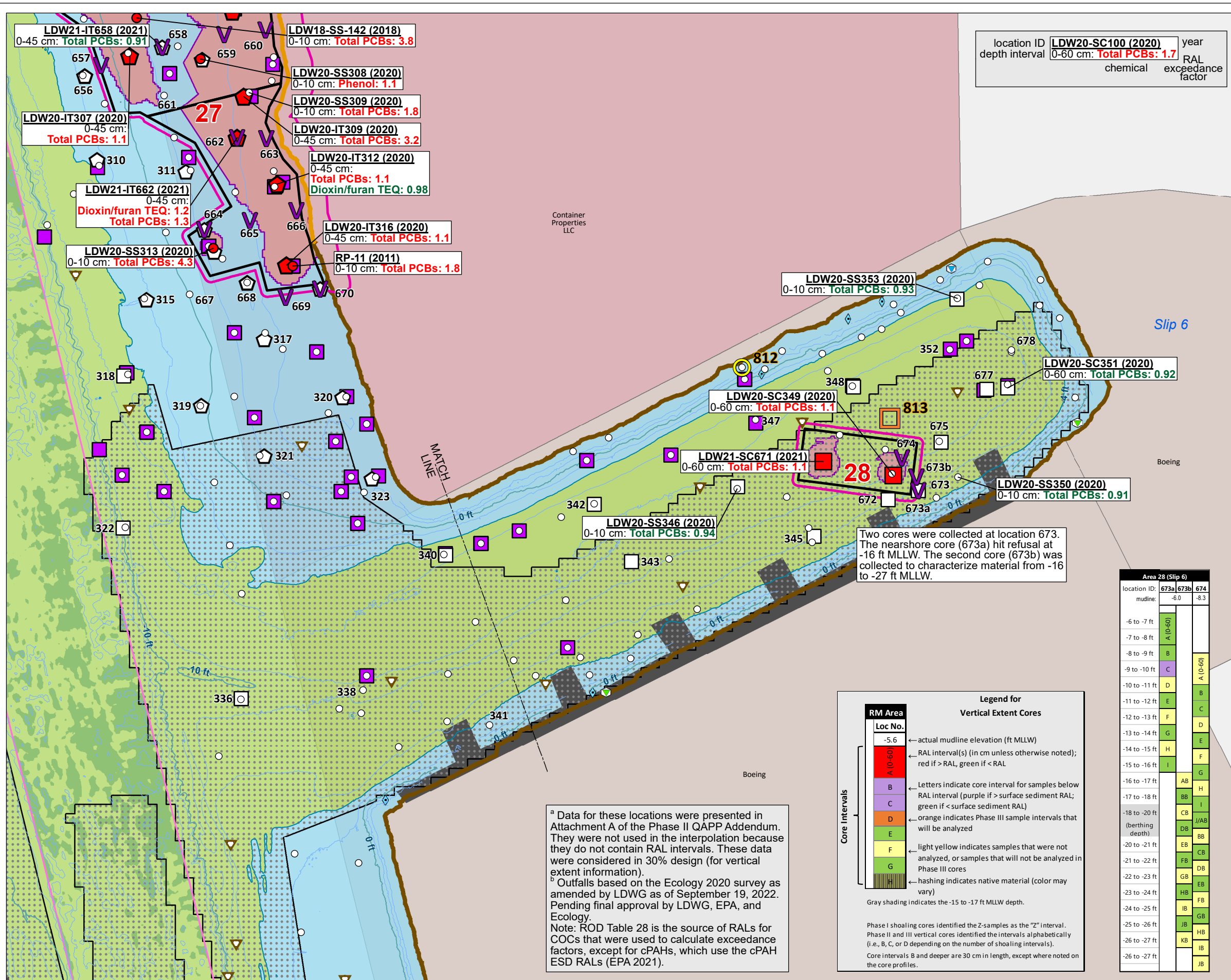
Area 27 (RM 4.1 E Intertidal)

location ID:	648	649	650	652	653	654	655	657	658	659	660	662	663	664	665	666	669	670
mudline:	-0.3	5.1	7.2	0.9	3.3	4.1	6.2	-1.0	2.9	4.4	5.8	4.3	5.3	2.1	3.3	6.9	5.0	7.5
+7 to +6 ft				A (0-45)														
+6 to +5 ft				A (0-45)														
+5 to +4 ft				A (0-45)														
+4 to +3 ft				A (0-45)														
+3 to +2 ft				A (0-45)														
+2 to +1 ft				A (0-45)														
+1 to 0 ft				A (0-45)														
0 to -1 ft				A (0-45)														
-1 to -2 ft				A (0-45)														
-2 to -3 ft				A (0-45)														
-3 to -4 ft				A (0-45)														
-4 to -5 ft				A (0-45)														
-5 to -6 ft				A (0-45)														
-6 to -7 ft				A (0-45)														
-7 to -8 ft				A (0-45)														

Note: Shading added to help differentiate transects, which are presented here from west to east.

Note: ROD Table 28 is the source of RALs for COCs that were used to calculate exceedance factors, except for cPAHs, which use the cPAH ESD RALs (EPA 2021).





location ID	LDW20-SC100 (2020)	year	
depth interval	0-60 cm: Total PCBs: 1.7	chemical	RAL exceedance factor

Phase III sample

- 0-10 cm - for MNR to the SCO
- 0-60 cm
- 30% RD RAA boundary
- 30% RD toe of cut
- RAL exceedance area

Surface sediment (0-10 cm) sampling location

- Exceeds RAL
- Does not exceed RAL

Subsurface core location

Subtidal (0-60 cm)

- Exceeds RAL
- Does not exceed RAL

Intertidal (0-45 cm)

- Exceeds RAL
- Does not exceed RAL

Other sampling locations

- Vertical extent core
- Pre-PDI sample only analyzed for PCBs
- Core without appropriate RAL interval^a

Outfall classification^b

- Private storm drain
- Public storm drain
- Abandoned/inactive

Bank types (approximate Superfund boundary = MHHW)

- Armored slope
- Unarmored slope

Bathymetry (feet MLLW)

- 4 ft MLLW
- 10 ft interval
- 2 ft interval

Other LDW features

- Recovery Category 1
- Intertidal area
- Potential vessel scour area
- Shoal area
- Dock/pier/marina
- King Co tax parcel
- Federal Navigation Channel

Two cores were collected at location 673. The nearshore core (673a) hit refusal at -16 ft MLLW. The second core (673b) was collected to characterize material from -16 to -27 ft MLLW.

Area 28 (Slip 6)		
location ID:	673a	673b
mudline:	-6.0	-8.3
-6 to -7 ft	A (0-60)	A (0-60)
-7 to -8 ft	B	B
-8 to -9 ft	C	C
-9 to -10 ft	D	D
-10 to -11 ft	E	E
-11 to -12 ft	F	F
-12 to -13 ft	G	G
-13 to -14 ft	H	H
-14 to -15 ft	I	I
-15 to -16 ft		
-16 to -17 ft	AB	BB
-17 to -18 ft	BB	BB
-18 to -20 ft	CB	CB
(berthing depth)	J/AB	BB
-20 to -21 ft	EB	CB
-21 to -22 ft	FB	DB
-22 to -23 ft	GB	EB
-23 to -24 ft	HB	FB
-24 to -25 ft	IB	GB
-25 to -26 ft	JB	HB
-26 to -27 ft	KB	IB
-26 to -27 ft		JB

Legend for Vertical Extent Cores

RM Area	Loc No.	Description
	-5.6	actual mudline elevation (ft MLLW)
	A (0-60)	RAL interval(s) (in cm unless otherwise noted); red if > RAL, green if < RAL
	B	Letters indicate core interval for samples below RAL interval (purple if > surface sediment RAL; green if < surface sediment RAL)
	C	orange indicates Phase III sample intervals that will be analyzed
	D	light yellow indicates samples that were not analyzed, or samples that will not be analyzed in Phase III cores
	E	hashing indicates native material (color may vary)
	F	
	G	

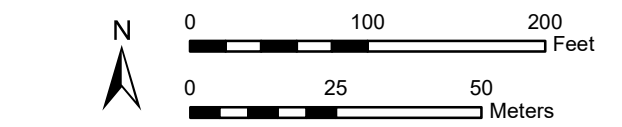
Gray shading indicates the -15 to -17 ft MLLW depth.

Phase I shoaling cores identified the Z-samples as the "Z" interval. Phase II and III vertical cores identified the intervals alphabetically (i.e., B, C, or D depending on the number of shoaling intervals). Core intervals B and deeper are 30 cm in length, except where noted on the core profiles.

^a Data for these locations were presented in Attachment A of the Phase II QAPP Addendum. They were not used in the interpolation because they do not contain RAL intervals. These data were considered in 30% design (for vertical extent information).

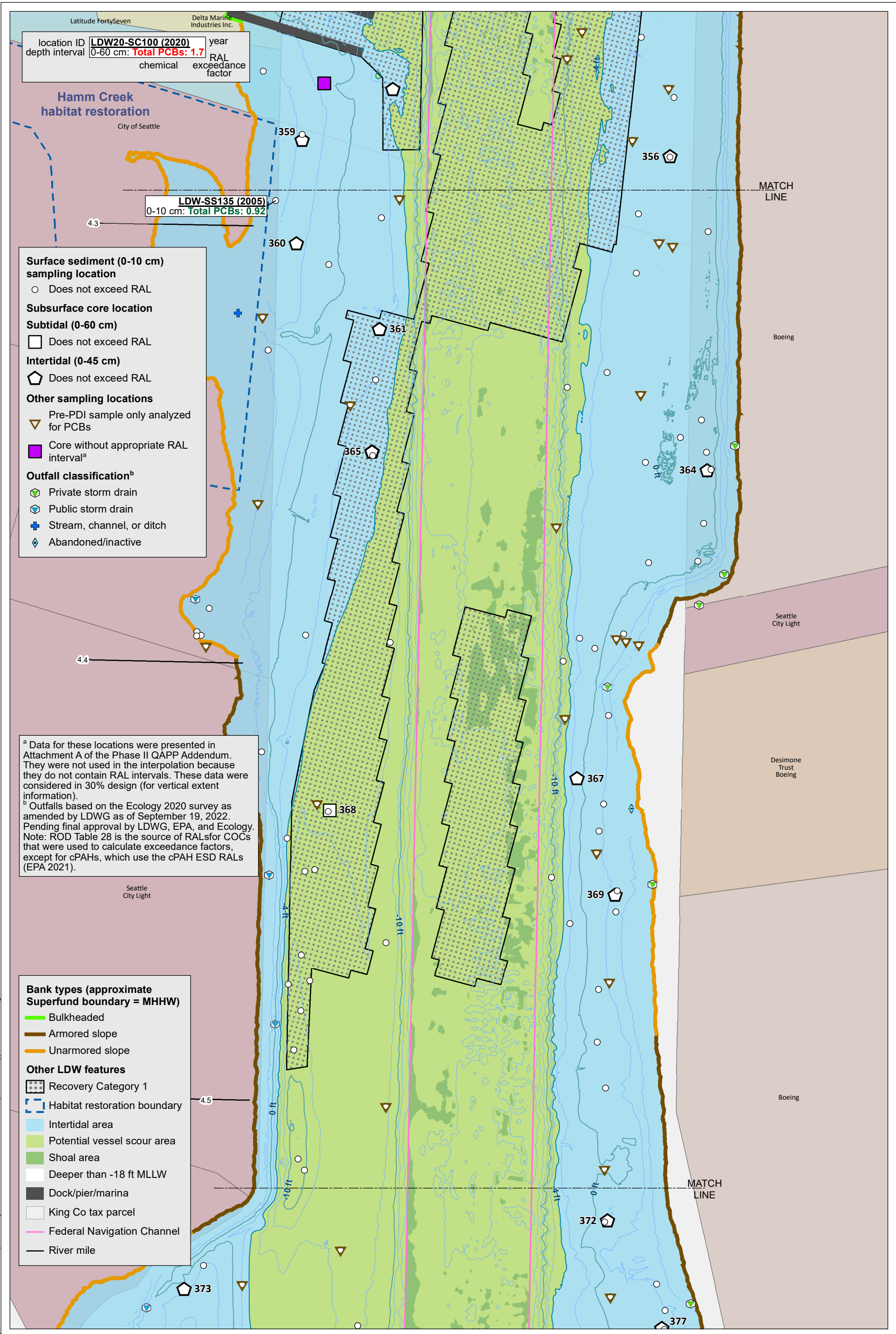
^b Outfalls based on the Ecology 2020 survey as amended by LDWG as of September 19, 2022. Pending final approval by LDWG, EPA, and Ecology.

Note: ROD Table 28 is the source of RALs for COCs that were used to calculate exceedance factors, except for cPAHs, which use the cPAH ESD RALs (EPA 2021).



Map 4-1g. Design dataset with RAL exceedance areas, 30% design RAA boundaries, and proposed Phase III PDI sample locations, Slip 6

QAPP ADDENDUM FOR THE LDW UPPER REACH: PRE-DESIGN INVESTIGATION PHASE III NOVEMBER 22, 2022



location ID **LDW20-SC100 (2020)** year
 depth interval **0-60 cm: Total PCBs: 1.7** RAL
 chemical exceedance factor

LDW-SS135 (2005)
 0-10 cm: Total PCBs: 0.92

- Surface sediment (0-10 cm) sampling location**
- Does not exceed RAL
- Subsurface core location**
- Subtidal (0-60 cm)**
- Does not exceed RAL
- Intertidal (0-45 cm)**
- ⬠ Does not exceed RAL
- Other sampling locations**
- ▽ Pre-PDI sample only analyzed for PCBs
 - Core without appropriate RAL interval^a
- Outfall classification^b**
- ▽ Private storm drain
 - ⬠ Public storm drain
 - ⊕ Stream, channel, or ditch
 - ◇ Abandoned/inactive

^a Data for these locations were presented in Attachment A of the Phase II QAPP Addendum. They were not used in the interpolation because they do not contain RAL intervals. These data were considered in 30% design (for vertical extent information).

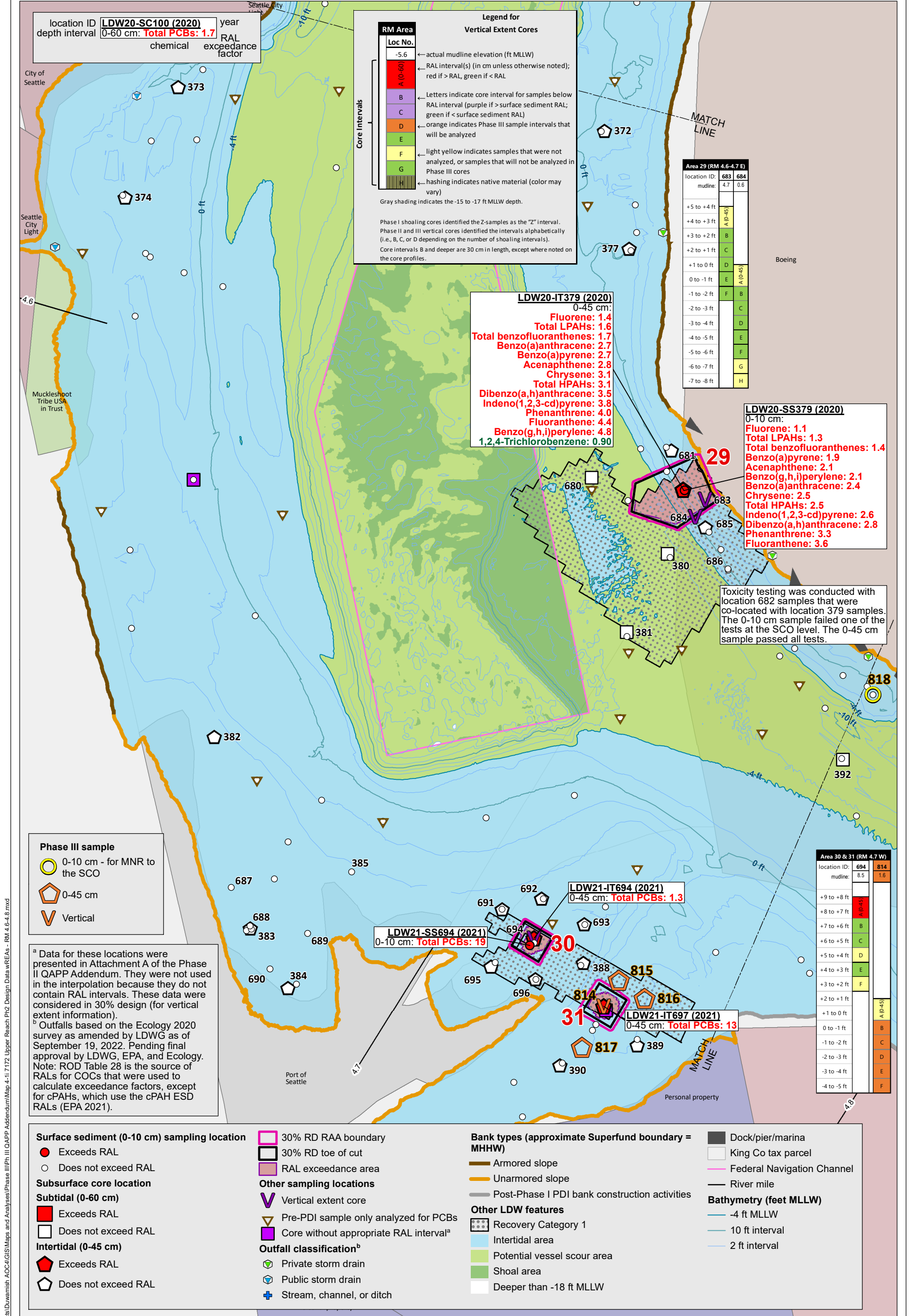
^b Outfalls based on the Ecology 2020 survey as amended by LDWG as of September 19, 2022. Pending final approval by LDWG, EPA, and Ecology. Note: ROD Table 28 is the source of RALs for COCs that were used to calculate exceedance factors, except for cPAHs, which use the cPAH ESD RALs (EPA 2021).

- Bank types (approximate Superfund boundary = MHHW)**
- █ Bulkheaded
 - █ Armored slope
 - █ Unarmored slope
- Other LDW features**
- ▨ Recovery Category 1
 - ▭ Habitat restoration boundary
 - ▭ Intertidal area
 - ▭ Potential vessel scour area
 - ▭ Shoal area
 - ▭ Deeper than -18 ft MLLW
 - ▭ Dock/pier/marina
 - ▭ King Co tax parcel
 - ▭ Federal Navigation Channel
 - ▭ River mile



Map 4-1h. Design dataset with RAL exceedance areas, 30% design RAA boundaries, and proposed Phase III PDI sample locations, RM 4.3 to RM 4.55
 QAPP ADDENDUM FOR THE LDW UPPER REACH: PRE-DESIGN INVESTIGATION PHASE III NOVEMBER 22, 2022

Prepared by craigh.11/22/22: W:\Projects\Duwamish AOC\GIS\Maps and Analyses\Phase III\Ph III QAPP Addendum\Map 4-1h 7172 Upper Reach PDI Design Data wREAs - RM 4.3-4.55.mxd



location ID **LDW20-SC100 (2020)** year
 depth interval **0-60 cm: Total PCBs: 1.7** RAL
 chemical exceedance factor

Legend for Vertical Extent Cores

RM Area	Loc No.
-5.6	← actual mudline elevation (ft MLLW)
A (0-60)	← RAL interval(s) (in cm unless otherwise noted); red if > RAL, green if < RAL
B	← Letters indicate core interval for samples below RAL interval (purple if > surface sediment RAL; green if < surface sediment RAL)
C	← orange indicates Phase III sample intervals that will be analyzed
D	← light yellow indicates samples that were not analyzed, or samples that will not be analyzed in Phase III cores
E	← hashing indicates native material (color may vary)
F	
G	

Gray shading indicates the -15 to -17 ft MLLW depth.

Phase I shoaling cores identified the Z-samples as the "Z" interval. Phase II and III vertical cores identified the intervals alphabetically (i.e., B, C, or D depending on the number of shoaling intervals). Core intervals B and deeper are 30 cm in length, except where noted on the core profiles.

Area 29 (RM 4.6-4.7 E)

location ID:	683	684
mudline:	4.7	0.6
+5 to +4 ft		
+4 to +3 ft	A (0-45)	
+3 to +2 ft	B	
+2 to +1 ft	C	
+1 to 0 ft	D	
0 to -1 ft	E	A (0-45)
-1 to -2 ft	F	B
-2 to -3 ft		C
-3 to -4 ft		D
-4 to -5 ft		E
-5 to -6 ft		F
-6 to -7 ft		G
-7 to -8 ft		H

LDW20-IT379 (2020)
 0-45 cm:
 Fluorene: 1.4
 Total LPAHs: 1.6
 Total benzofluoranthenes: 1.7
 Benzo(a)anthracene: 2.7
 Benzo(a)pyrene: 2.7
 Acenaphthene: 2.8
 Chrysene: 3.1
 Total HPAHs: 3.1
 Dibenzo(a,h)anthracene: 3.5
 Indeno(1,2,3-cd)pyrene: 3.8
 Phenanthrene: 4.0
 Fluoranthene: 4.4
 Benzo(g,h,i)perylene: 4.8
 1,2,4-Trichlorobenzene: 0.90

LDW20-SS379 (2020)
 0-10 cm:
 Fluorene: 1.1
 Total LPAHs: 1.3
 Total benzofluoranthenes: 1.4
 Benzo(a)pyrene: 1.9
 Acenaphthene: 2.1
 Benzo(g,h,i)perylene: 2.1
 Benzo(a)anthracene: 2.4
 Chrysene: 2.5
 Total HPAHs: 2.5
 Indeno(1,2,3-cd)pyrene: 2.6
 Dibenzo(a,h)anthracene: 2.8
 Phenanthrene: 3.3
 Fluoranthene: 3.6

Toxicity testing was conducted with location 682 samples that were co-located with location 379 samples. The 0-10 cm sample failed one of the tests at the SCO level. The 0-45 cm sample passed all tests.

Phase III sample

- 0-10 cm - for MNR to the SCO
- 0-45 cm
- Vertical

^a Data for these locations were presented in Attachment A of the Phase II QAPP Addendum. They were not used in the interpolation because they do not contain RAL intervals. These data were considered in 30% design (for vertical extent information).

^b Outfalls based on the Ecology 2020 survey as amended by LDWG as of September 19, 2022. Pending final approval by LDWG, EPA, and Ecology. Note: ROD Table 28 is the source of RALs for COCs that were used to calculate exceedance factors, except for cPAHs, which use the cPAH ESD RALs (EPA 2021).

Surface sediment (0-10 cm) sampling location

- Exceeds RAL
- Does not exceed RAL

Subsurface core location

Subtidal (0-60 cm)

- Exceeds RAL
- Does not exceed RAL

Intertidal (0-45 cm)

- Exceeds RAL
- Does not exceed RAL

30% RD RAA boundary

- 30% RD toe of cut
- RAL exceedance area

Other sampling locations

- Vertical extent core
- Pre-PDI sample only analyzed for PCBs
- Core without appropriate RAL interval^a

Outfall classification^b

- Private storm drain
- Public storm drain
- Stream, channel, or ditch

Bank types (approximate Superfund boundary = MHHW)

- Armored slope
- Unarmored slope
- Post-Phase I PDI bank construction activities

Other LDW features

- Recovery Category 1
- Intertidal area
- Potential vessel scour area
- Shoal area
- Deeper than -18 ft MLLW

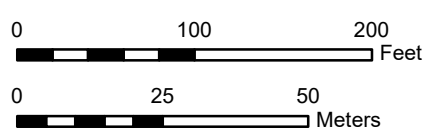
Dock/pier/marina

- King Co tax parcel
- Federal Navigation Channel
- River mile

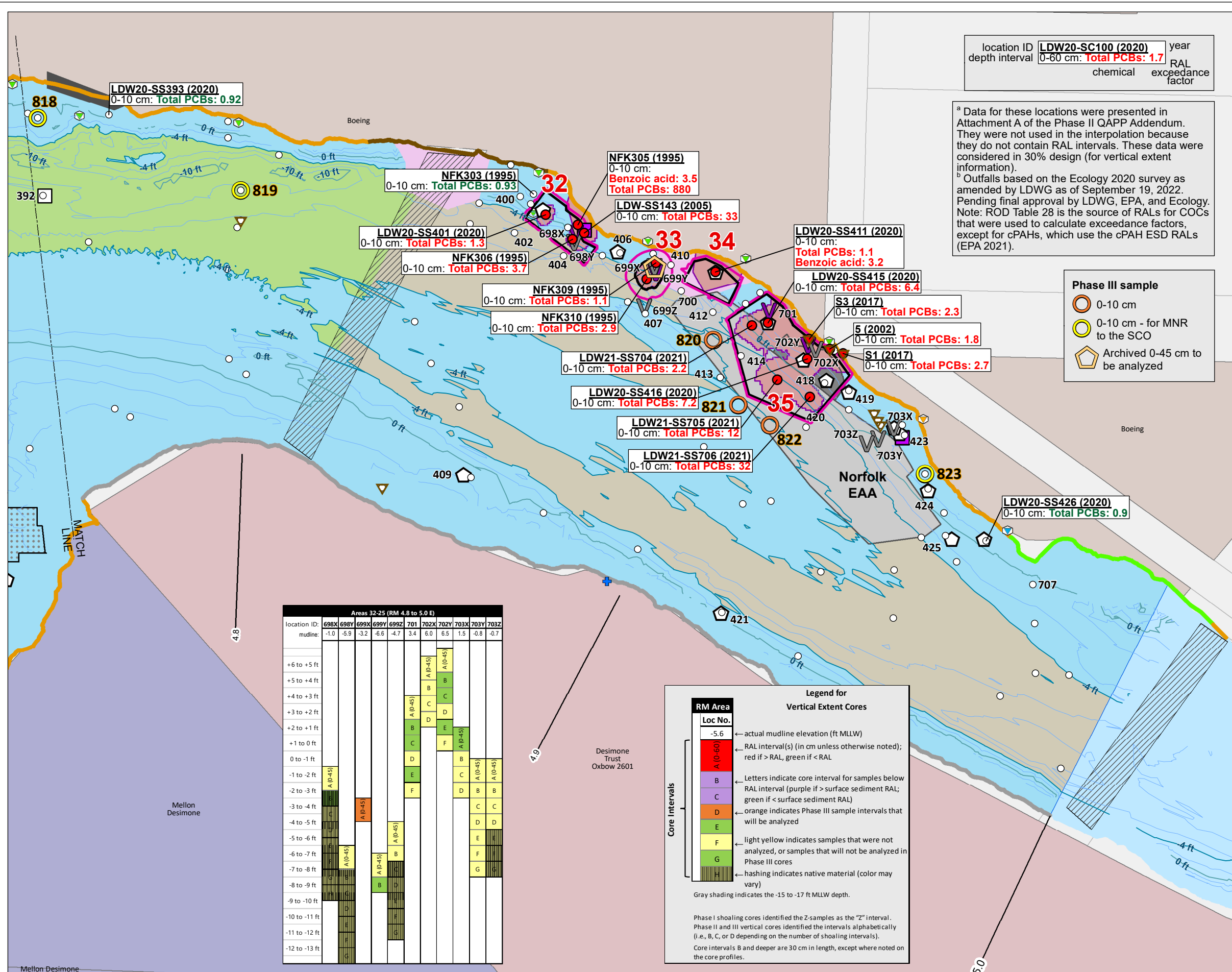
Bathymetry (feet MLLW)

- 4 ft MLLW
- 10 ft interval
- 2 ft interval

Prepared by craigh.11/28/22: W:\Projects\Duwamish AOC\GIS\Maps and Analyses\Phase III\Ph III QAPP Addendum\Map 4-1i\17172 Upper Reach Ph2 Design Data wRAEs - RM 4.6-4.8.mxd



Prepared by craigh, 11/28/22; W:\Projects\Duwamish_AOC4\GIS\Maps and Analyses\Phase III\Ph III QAPP Addendum\Map 4-1j 7172 Upper Reach Ph3 Design Data wREAs -RM 4.8-5.0.mxd

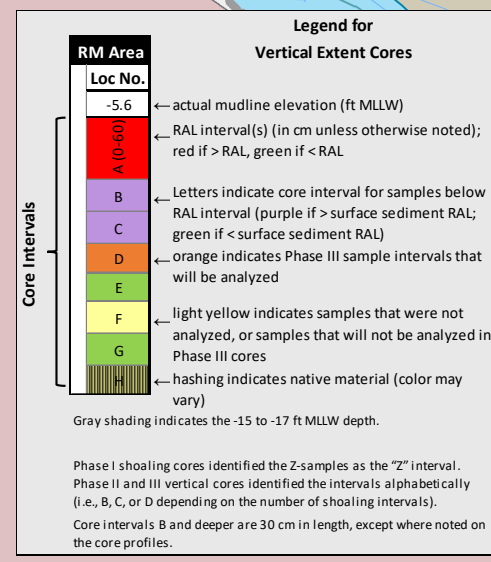


location ID **LDW20-SC100 (2020)** year
 depth interval 0-60 cm: **Total PCBs: 1.7** RAL
 chemical exceedance factor

^a Data for these locations were presented in Attachment A of the Phase II QAPP Addendum. They were not used in the interpolation because they do not contain RAL intervals. These data were considered in 30% design (for vertical extent information).
^b Outfalls based on the Ecology 2020 survey as amended by LDWG as of September 19, 2022. Pending final approval by LDWG, EPA, and Ecology. Note: ROD Table 28 is the source of RALs for COCs that were used to calculate exceedance factors, except for cPAHs, which use the cPAH ESD RALs (EPA 2021).

Phase III sample
 ○ 0-10 cm
 ○ 0-10 cm - for MNR to the SCO
 ○ Archived 0-45 cm to be analyzed

Areas 32-25 (RM 4.8 to 5.0 E)												
location ID:	698X	698Y	699X	699Y	701	702X	702Y	703X	703Y	703Z		
mudline:	-1.0	-5.9	-3.2	-6.6	4.7	3.4	6.0	6.5	1.5	-0.8	-0.7	
+6 to +5 ft												
+5 to +4 ft												
+4 to +3 ft												
+3 to +2 ft												
+2 to +1 ft												
0 to -1 ft												
-1 to -2 ft												
-2 to -3 ft												
-3 to -4 ft												
-4 to -5 ft												
-5 to -6 ft												
-6 to -7 ft												
-7 to -8 ft												
-8 to -9 ft												
-9 to -10 ft												
-10 to -11 ft												
-11 to -12 ft												
-12 to -13 ft												



30% RD RAA boundary
 30% RD toe of cut
 RAL exceedance area

Surface sediment (0-10 cm) sampling location
 ● Exceeds RAL
 ○ Does not exceed RAL

Subsurface core location
Subtidal (0-60 cm)
 □ Does not exceed RAL
Intertidal (0-45 cm)
 □ Does not exceed RAL

Other sampling locations
 V Vertical extent core
 V Vertical archive
 ▽ Pre-PDI sample only analyzed for PCBs
 □ Core without appropriate RAL interval^a

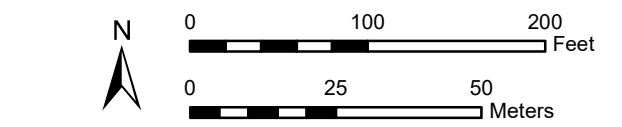
Outfall classification^b
 ◇ CSO/storm drain
 ◇ Private storm drain
 ◇ Public storm drain
 + Stream, channel, or ditch
 ◇ Abandoned/inactive

Bank types (approximate Superfund boundary = MHHW)
 Bulkheaded
 Armored slope
 Unarmored slope
 Post-Phase I PDI bank construction activities

Other LDW features
 Recovery Category 1
 Bridge
 Dock/pier/marina
 Intertidal area
 Potential vessel scour area
 Subtidal with no subsurface RAL
 Area not covered by bathymetric survey

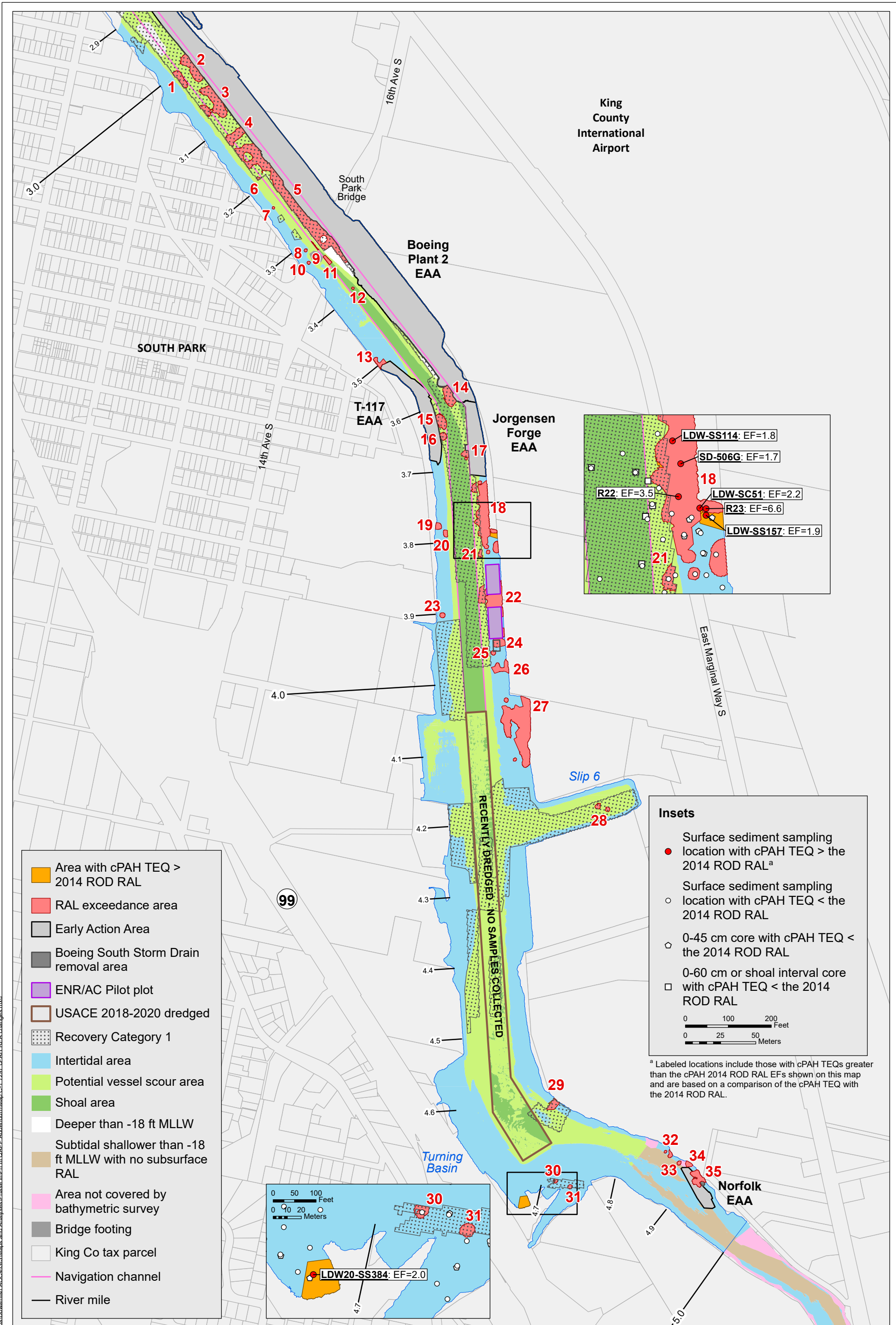
Boeing South Storm Drain removal area
 EAA
 King Co tax parcel
 River mile

Bathymetry (feet MLLW)
 -4 ft MLLW
 10 ft interval
 2 ft interval

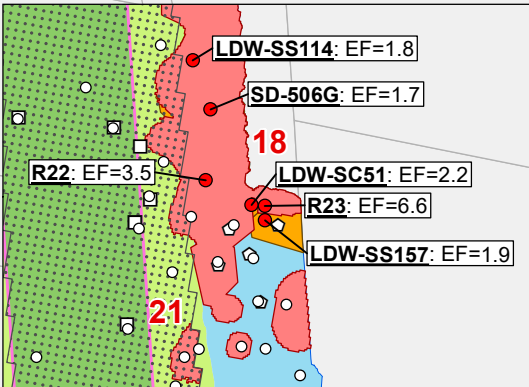


Map 4-1j. Design dataset with RAL exceedance areas, 30% design RAA boundaries, and proposed Phase III PDI sample locations, RM 4.8 to RM 5.0

QAPP ADDENDUM FOR THE LDW UPPER REACH: PRE-DESIGN INVESTIGATION PHASE III NOVEMBER 22, 2022

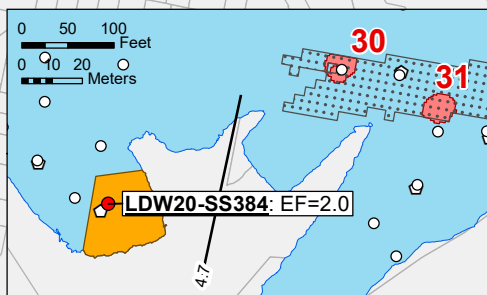


- Area with cPAH TEQ > 2014 ROD RAL
- RAL exceedance area
- Early Action Area
- Boeing South Storm Drain removal area
- ENR/AC Pilot plot
- USACE 2018-2020 dredged
- Recovery Category 1
- Intertidal area
- Potential vessel scour area
- Shoal area
- Deeper than -18 ft MLLW
- Subtidal shallower than -18 ft MLLW with no subsurface RAL
- Area not covered by bathymetric survey
- Bridge footing
- King Co tax parcel
- Navigation channel
- River mile

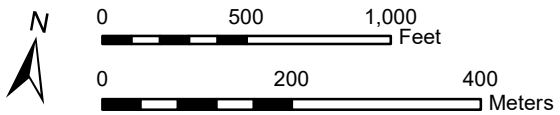


- Insets**
- Surface sediment sampling location with cPAH TEQ > the 2014 ROD RAL^a
 - Surface sediment sampling location with cPAH TEQ < the 2014 ROD RAL
 - 0-45 cm core with cPAH TEQ < the 2014 ROD RAL
 - 0-60 cm or shoal interval core with cPAH TEQ < the 2014 ROD RAL
- 0 100 200 Feet
0 25 50 Meters

^a Labeled locations include those with cPAH TEQs greater than the cPAH 2014 ROD RAL EFs shown on this map and are based on a comparison of the cPAH TEQ with the 2014 ROD RAL.



Lower Duwamish Waterway Group
 Port of Seattle / City of Seattle / King County / The Boeing Company



Map C-1. Additional RAL exceedance areas in the upper reach based on the use of the 2014 ROD RAL for cPAHs

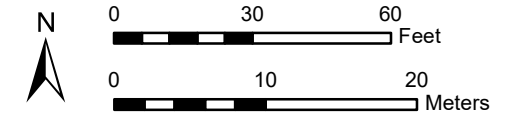
Prepared by: craigh_11/22/22 - W:\Projects\Duwamish_AOC\GIS\Maps_and_Analysis\Phase_III\Ph_III\QAPP_Addendum\Map_C-1_7297_cPAH_REA_changes.mxd



Phase III sample

- 0-10 cm
- 0-45 cm
- Vertical
- Surface sediment sampling location with cPAH TEQ greater than the 2014 ROD RAL^a
- Surface sediment sampling location with cPAH TEQ less than the 2014 ROD RAL
- 0-45 cm core with cPAH TEQ less than the 2014 ROD RAL
- cPAH ROD RAL exceedance area
- RAL exceedance area
- Recovery Category 1
- Intertidal area
- LDW Superfund Boundary
- King Co tax parcel
- Federal Navigation Channel
- River mile

^a Labeled locations include those with cPAH TEQs greater than the cPAH 2014 ROD RAL EFs shown on this map and are based on a comparison of the cPAH TEQ with the 2014 ROD RAL.
 Note: ROD Table 28 is the source of RALs for COCs that were used to calculate exceedance factors, except for cPAHs, which use the cPAH ESD RALs (EPA 2021).



Map C-2. Phase III surface sediment locations to refine cPAH-only ROD RAL exceedance area

QAPP ADDENDUM FOR THE LDW UPPER REACH: PRE-DESIGN INVESTIGATION PHASE III NOVEMBER 22, 2022



Lower Duwamish Waterway Group
 Port of Seattle / City of Seattle / King County / The Boeing Company