

MEMORANDUM FOR: RECORD

July 31, 2013

SUBJECT: DETERMINATION REGARDING THE SUITABILITY OF PROPOSED DREDGED MATERIAL FROM THE DUWAMISH RIVER AT THE SPOKANE STREET BRIDGE, KING COUNTY, WASHINGTON (*Public Notice CENWS-OD-TS-NS-39*) EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT FOR UNCONFINED OPEN-WATER DISPOSAL AT THE ELLIOTT BAY NON-DISPERSIVE DISPOSAL SITE.

1. **Introduction.** This memorandum reflects the consensus determination of the Dredged Material Management Program (DMMP) agencies (U.S. Army Corps of Engineers, Washington State Department of Ecology, Washington State Department of Natural Resources, and the Environmental Protection Agency) regarding the suitability of up to 2,237 cubic yards (cy) of dredged material from the Duwamish River Navigation Channel at the Spokane Street Bridge for open-water disposal at the Elliott Bay non-dispersive site.
2. **Background.** As authorized by Congress in the Rivers and Harbors Acts of 1925 and 1930, the Seattle District, Corps of Engineers (Corps) conducts maintenance dredging of the Seattle Harbor Federal Navigation Project in the Duwamish River, Seattle, WA. The authorized depth of the channel at the Spokane Street Bridge is -30 feet mean lower low water (MLLW), with a 2 foot allowable overdepth (to -32 ft MLLW).

Shoaling within the navigation channel underneath the Spokane Street Bridge was brought to the attention of the Corps of Engineers, Navigation Section in early July, 2013 because the shoaling was impacting the ability of barges to safely and efficiently navigate the waterway.

This portion of the river is located within the West Waterway Operable Unit of the Harbor Island Superfund Site.

3. **Project Summary.** Table 1 includes project summary and tracking information.

Table 1. Project Summary

Project ranking	High
Proposed dredging volume	2,237 cubic yards
Proposed dredging depth	-32 ft (including 2-ft of overdepth)
Sampling dates	October 8 – 19, 2012
Final data report received	May 17, 2013
EIM Study ID	DMMP-DUWSU-B-337-13
Recency Determination (high rank = 2 years)	October, 2014

4. **Project Ranking and Sampling Requirements.** This project was ranked high by the DMMP agencies according to the guidelines set out in the User's Manual for the Duwamish River downstream of station 254+00, the Seattle Waterfront and West Waterway. In a high-ranked area the number of samples and analyses are calculated using the following guidelines (DMMP, 2008a):
- Maximum volume of sediment represented by each field sample = 4,000 cubic yards
 - Maximum volume of sediment represented by each analysis in the upper 4-feet of the dredging prism (surface sediment) = 4,000 cubic yards
 - Maximum volume of sediment represented by each analysis in the subsurface portion of the dredging prism = 12,000 cubic yards

All 2,237 cy of material are represented by one DMMU.

5. **Sampling.** Sampling took place October 8-19th, as part of the Duwamish Subsurface Sediment Investigation, using a Vibracore sampler (see Figure 1). The approved sampling and analysis plan for the Duwamish Subsurface Sediment Investigation (HDR, 2012) was followed. One station that was occupied as part of that sampling program, LDW02, was collected from within the shoaled area near the Spokane Street Bridge. Two cores were taken from the site and composited together. Two depth intervals were analyzed separately, see Table 2 for the compositing scheme.
6. **Chemical Analysis.** The quality control guidelines specified by the DMMP program were generally met. Chemical testing for DMMP standard COCs, TBT and dioxin was conducted by Analytical Resources, Inc. of Tukwila, WA.

Grain size analysis of the surface and subsurface sample showed the material to be sandy gravel, with approximately 60% sand and 40% gravel, with no fines. The total organic carbon content ranged between 0.58 and 0.90%. There were no detected or undetected exceedances of any of the standard DMMP COCs in either the surface or subsurface sample, see Table 3 (DMMP, 2011). Bulk TBT was analyzed because insufficient porewater was available due to the coarse nature of the material. Bulk TBT values were well below the DMMP SL and BT value of 73 µg/kg dry weight. Dioxin was also analyzed in these samples, see Table 4, and quantitated well below the non-dispersive site management objective of 4 ppt TEQ (DMMP, 2010).

7. **Sediment Exposed by Dredging.** The sediment to be exposed by dredging must either meet the State of Washington Sediment Quality Standards (SQS) (Ecology, 1995) or the State's antidegradation standard (DMMP, 2008b). All COCs in the dredged material were below DMMP screening levels, and there was no trend for increasing chemical concentrations with depth, so no additional analysis of z-samples was required for decision-making.

As demonstrated by the results of the above analysis, the sediment to be exposed by dredging is not considered to be degraded relative to the currently exposed sediment surface. On this basis the DMMP agencies conclude that this project is in compliance with the State of Washington anti-degradation policy.

8. **Suitability Determination.** This memorandum documents the evaluation of the suitability of sediment proposed for dredging from the Duwamish River at the Spokane Street Bridge for open-water disposal at the Elliott Bay non-dispersive disposal site. The data gathered were deemed sufficient and acceptable for regulatory decision-making under the DMMP program.

In summary, based on the results of the previously described testing, the DMMP agencies conclude that **all 2,237 cy of material are suitable** for open-water disposal at the Elliott Bay non-dispersive site.

This suitability determination does **not** constitute final agency approval of the project. During the public comment period that follows a public notice, the resource agencies will provide input on the overall project. A final decision will be made after full consideration of agency input, and after an alternatives analysis is done under section 404(b)(1) of the Clean Water Act.

9. **References.**

DMMP, 2011. *Marine Sediment Quality Screening Levels: Adopting RSET Marine SLs for Use in DMMP.* A Clarification Paper prepared by Laura Inouye (Ecology) and David Fox (USACE) for the Dredged Material Management Program, June 2011.

DMMP, 2010. *Dredged Material Management Program New Interim Guidelines for Dioxins.* December 6, 2010.

DMMP, 2008a. *Dredged Material Evaluation and Disposal Procedures (Users Manual).* Prepared by the Seattle District Dredged Material Management Office for the Dredged Material Management Program, July 2008.

DMMP, 2008b. *Quality of Post-Dredge Sediment Surfaces (Updated).* A Clarification Paper Prepared by David Fox (USACE), Erika Hoffman (EPA) and Tom Gries (Ecology) for the Dredged Material Management Program, June 2008.

Ecology, 1995. *Sediment Management Standards – Chapter 173-204 WAC.* Washington State Department of Ecology, December 1995.

HDR, 2012. *Final Sampling and Analysis Plan: Lower Duwamish Waterway, East Waterway, and West Waterway Subsurface Sediment Characterization; Seattle, Washington.* October 4, 2012.

10. Agency Signatures.

The signed document is on file in the Dredged Material Management Office

Concur:

Date Kelsey van der Elst - Seattle District Corps of Engineers

Date Erika Hoffman - Environmental Protection Agency

Date Laura Inouye, Ph.D. - Washington Department of Ecology

Date Celia Barton - Washington Department of Natural Resources

Copies furnished:

DMMP signatories
John Hicks, CENWS-OD-TS-NS

Table 2. Sampling and Compositing.

		LDW02 25.1 to -30	LDW02 30 to -32	Total
Volume (CY):		1,598	639	2,237
Station	LDW02-1	0 - 4.9	4.9 - 6.9	
	LDW02-2	0 - 3.9	3.9 - 5.9	

Notes:

- 1) Depths are in ft below mudline

Table 3. Chemical results compared to DMMP regulatory guidelines.

CHEMICAL	DMMP Guidelines			LDW02 -25.1 to -30 ft MLLW		LDW02 -30 to -32 ft MLLW	
	SL	BT	ML	conc	VQ	conc	VQ
CONVENTIONALS							
Gravel, %				37.2		41.8	
Sand, %				60.1		57.3	
Silt, %				---		---	
Clay, %				---		---	
Fines (Silt + Clay), %				---		---	
Total Solids, %				89.7		92.5	
Volatile Solids, %				1.01		0.55	
Total Organic Carbon, %				0.578		0.905	
Total Sulfides, mg/kg				12.9		5.4	U
Total Ammonia, mg N/kg				0.38		0.12	
METALS (mg/kg dry)							
Antimony	150	---	200	6	UJ	5	UJ
Arsenic	57	507	700	10		5	U
Cadmium	5.1	11.3	14.0	0.2	U	0.2	
Chromium	260	260	---	18.1		15.8	
Copper	390	1,027	1,300	31.1		25.8	
Lead	450	975	1,200	11		2	U
Mercury	0.41	1.5	2.3	0.03		0.03	U
Selenium	---	3	---	0.5	U	0.5	U
Silver	6.1	6.1	8.4	0.3	U	0.3	U
Zinc	410	2,783	3,800	43		30	
ORGANOMETALLIC COMPOUNDS (ug/kg dw)							
Tributyltin (ion)	73	73	---	8.9		5.1	U
PAHs (ug/kg dry)							
Total LPAH	5,200	---	29,000	97.7		7.6	
Naphthalene	2,100	---	2,400	18		4.6	U
Acenaphthylene	560	---	1,300	5.4		2.6	J
Acenaphthene	500	---	2,000	8.1		4.6	U
Fluorene	540	---	3,600	8.2		4.6	U
Phenanthrene	1,500	---	21,000	37		4.6	U
Anthracene	960	---	13,000	21		5	
2-Methylnaphthalene	670	---	1,900	9.4		4.6	U
Total HPAH	12,000	---	69,000	782		157.8	
Fluoranthene	1,700	4,600	30,000	88		5	
Pyrene	2,600	11,980	16,000	190		8.3	J
Benzo(a)anthracene	1,300	---	5,100	56		12	J
Chrysene	1,400	---	21,000	82		25	
Total benzofluoranthenes	3,200	---	9,900	200		63	
Benzo[a]pyrene	1,600	---	3,600	86		28	J
Indeno(1,2,3-c,d)pyrene	600	---	4,400	33		7.3	
Dibenzo(a,h)anthracene	230	---	1,900	12		2.4	J
Benzo(g,h,i)perylene	670	---	3,200	35		6.8	
CHLORINATED BENZENES (ug/kg dry)							
1,2-Dichlorobenzene	35	---	110	19	U	20	U
1,4-Dichlorobenzene	110	---	120	19	U	20	U
1,2,4-Trichlorobenzene	31	---	64	19	U	20	U
Hexachlorobenzene	22	168	230	0.92	U	0.96	U

CHEMICAL	SL	BT	ML	-25.1 to -30 ft MLLW		-30 to -32 ft MLLW	
PHthalate Esters (ug/kg dry)							
Dimethyl phthalate	71	---	1,400	19	U	20	U
Diethyl phthalate	200	---	1,200	47	U	49	U
Di-n-butyl phthalate	1,400	---	5,100	19	U	20	U
Butyl benzyl phthalate	63	---	970	19	U	20	U
Bis(2-ethylhexyl)phthalate	1,300	---	8,300	25	U	24	U
Di-n-octyl phthalate	6,200	---	6,200	19	U	20	U
PHENOLS (ug/kg dry)							
Phenol	420	---	1,200	19	U	20	U
2 Methylphenol	63	---	77	19	U	20	U
4 Methylphenol	670	---	3,600	38	U	39	U
2,4-Dimethylphenol	29	---	210	19	UJ	20	UJ
Pentachlorophenol	400	504	690	190	U	200	U
MISCELLANEOUS EXTRACTABLES (ug/kg dry)							
Benzoic acid	650	---	760	380	U	390	U
Benzyl alcohol	57	---	870	19	U	20	U
Dibenzofuran	540	---	1,700	12		4.6	U
Hexachlorobutadiene	11	---	270	0.92	U	0.96	U
N-Nitrosodiphenylamine	28	---	130	19	U	20	U
PESTICIDES (ug/kg dry)							
Aldrin	10	---	---	0.46	U	0.48	U
Total Chlordane	3	37	---	0.76	UJ	0.79	UJ
Dieldrin	2	---	---	0.46	UJ	0.48	UJ
Heptachlor	2	---	---	0.23	UJ	0.24	UJ
p,p'-DDE	9	---	---	0.92	U	0.96	U
p,p'-DDD	16	---	---	0.92	U	0.96	U
p,p'-DDT	5	---	---	1.6		0.96	U
Total DDT		50	69	1.6		0.96	U
PCBs (ug/kg dry)							
Total PCBs	130	---	3,100	34.7		8.2	U
Total PCBs (mg/kg OC)	---	38	---				
DMMP DETERMINATION							
DMMU volume				2237 cy			
Rank				High			
Mean sample depth				3.9		2.0	
Maximum sampling depth				4.9		2.0	
	SL	BT	ML	LDW02 -25.1 to -30 ft		LDW02 -30 to -32 ft	

J = estimated concentration
 U = undetected
 OC = organic carbon
 SL = screening level
 BT = bioaccumulation trigger
 ML = maximum level

Table 4. Dioxin Results

CHEMICAL	TEF	LDW02 25.1 to -30 ft MLLW				LDW02 -30 to -32 ft MLLW			
		conc	VQ	TEQ (U = 0)	TEQ (U = 1/2 RL)	conc	VQ	TEQ (U = 0)	TEQ (U = 1/2 RL)
DIOXINS/FURANS									
2,3,7,8-TCDD	1	0.441	U	0	0.2205	0.137	U	0	0.0685
1,2,3,7,8-PeCDD	1	0.166	J	0.166	0.166	0.0775	U	0	0.03875
1,2,3,4,7,8-HxCDD	0.1	0.266	U	0	0.0133	0.101	U	0	0.00505
1,2,3,6,7,8-HxCDD	0.1	1.08	U	0	0.054	0.133	U	0	0.00665
1,2,3,7,8,9-HxCDD	0.1	0.582	J	0.0582	0.0582	0.0654	U	0	0.00327
1,2,3,4,6,7,8-HpCDD	0.01	64.8		0.648	0.648	0.51		0.0051	0.0051
OCDD	0.0003	685		0.2055	0.2055	3.47		0.001041	0.001041
2,3,7,8-TCDF	0.1	0.219	U	0	0.01095	0.0598	U	0	0.00299
1,2,3,7,8-PeCDF	0.03	0.182		0.00546	0.00546	0.0567	U	0	0.0008505
2,3,4,7,8-PeCDF	0.3	0.25	U	0	0.0375	0.109	U	0	0.01635
1,2,3,4,7,8-HxCDF	0.1	0.719	J	0.0719	0.0719	0.086	U	0	0.0043
1,2,3,6,7,8-HxCDF	0.1	0.354	U	0	0.0177	0.0801	U	0	0.004005
1,2,3,7,8,9-HxCDF	0.1	0.205	U	0	0.01025	0.0592	U	0	0.00296
2,3,4,6,7,8-HxCDF	0.1	0.158	U	0	0.0079	0.0655	U	0	0.003275
1,2,3,4,6,7,8-HpCDF	0.01	8.04		0.0804	0.0804	0.0916	J	0.000916	0.000916
1,2,3,4,7,8,9-HpCDF	0.01	0.764	J	0.00764	0.00764	0.19	U	0	0.00095
OCDF	0.0003	29		0.0087	0.0087	0.618	U	0	0.000927
TOTAL TEQ				1.252	1.624			0.007	0.165

Figure 1. Site Map

NOTES:

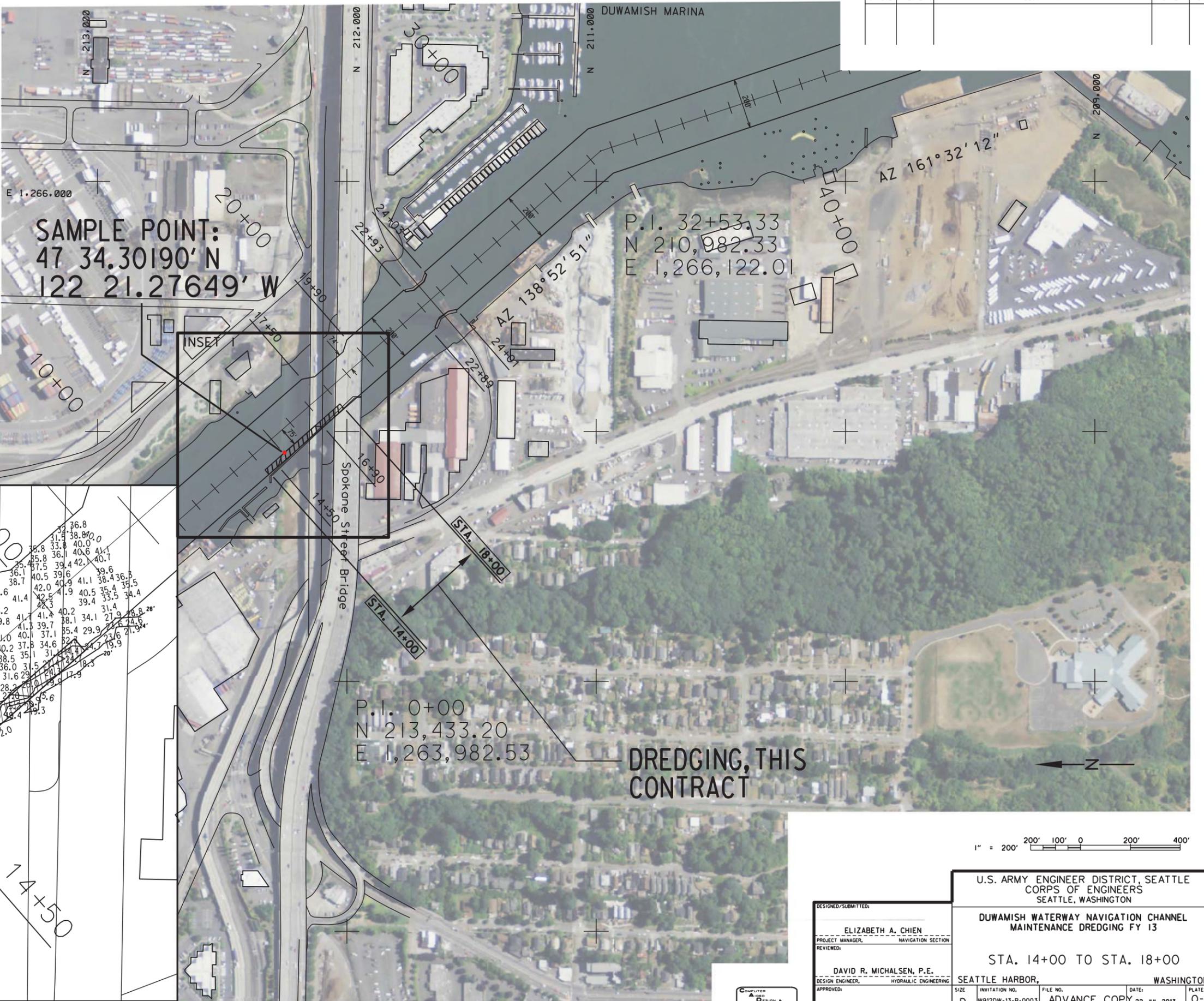
- HORIZONTAL CONTROL BASED ON LAMBERT GRID PROJECTION FOR WASHINGTON NORTH ZONE, NAD 83/91
- BASE MAP PREPARED FROM AERIAL PHOTOGRAPHY FLOWN 26 SEPTEMBER 1996, BY SURVEY BRANCH, SEATTLE DISTRICT, CORPS OF ENGINEERS.
- CHANNEL ALIGNMENT SHOWN IS ALIGNMENT 1998
- AZIMUTH ON CENTERLINE OF CHANNEL ARE LAMBERT AND DIFFER FROM TRUE NORTH AZIMUTH BEARINGS.
- LOCATIONS OF UTILITIES ARE ONLY APPROXIMATE, MUST VERIFY AS NEEDED.
- BASE IMAGERY PREPARED FROM NATURAL COLOR FOUR BAND IMAGERY (NAIP), TAKEN BY UNITED STATES DEPARTMENT OF AGRICULTURE (2011).

LEGEND

AREA TO BE DREDGED TO -30.0' MLLW
+2.0' OVERDEPTH



REVISIONS				
SYMBOL	ZONE	DESCRIPTION	DATE	BY



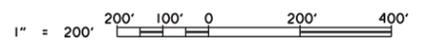
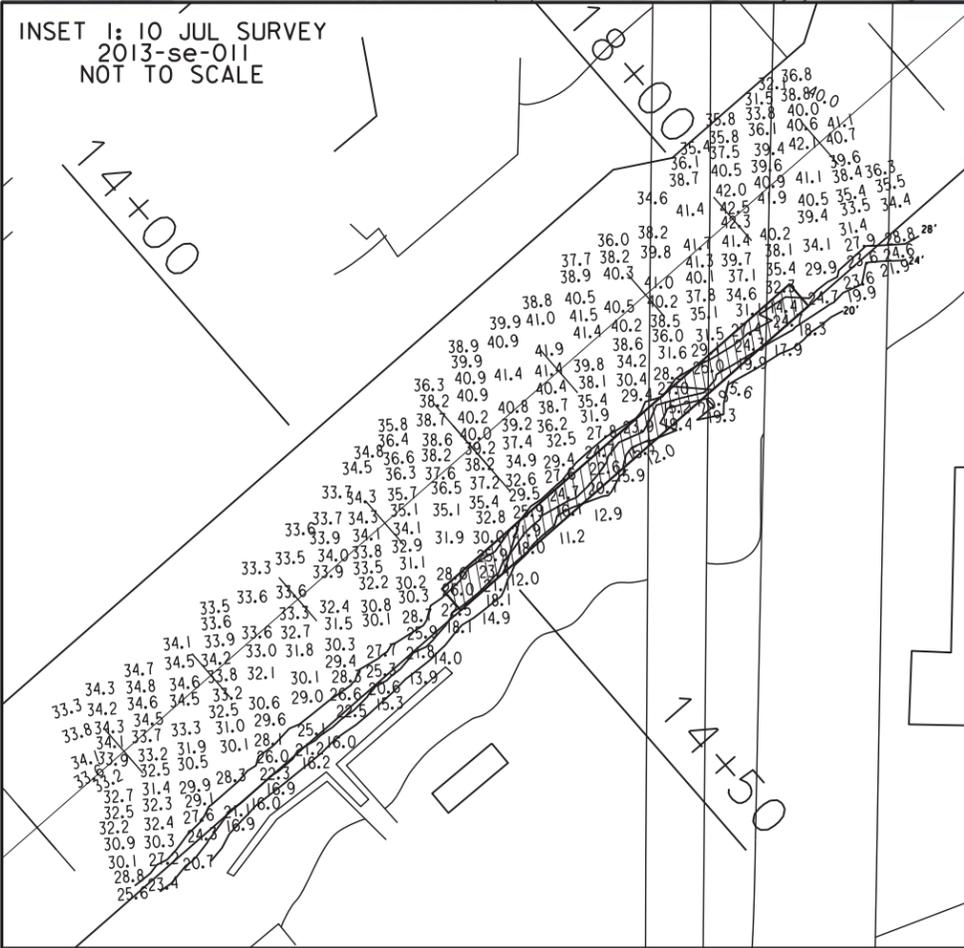
SAMPLE POINT:
47 34.30190' N
122 21.27649' W

P.I. 32+53.33
N 210,982.33
E 1,266,122.01

P.I. 0+00
N 213,433.20
E 1,263,982.53

DREDGING, THIS CONTRACT

INSET 1: 10 JUL SURVEY
2013-se-011
NOT TO SCALE



DESIGNED/SUBMITTED: ELIZABETH A. CHIEN		U.S. ARMY ENGINEER DISTRICT, SEATTLE CORPS OF ENGINEERS SEATTLE, WASHINGTON			
PROJECT MANAGER, NAVIGATION SECTION		DUWAMISH WATERWAY NAVIGATION CHANNEL MAINTENANCE DREDGING FY 13			
REVIEWED: DAVID R. MICHALSEN, P.E.		STA. 14+00 TO STA. 18+00			
DESIGN ENGINEER, HYDRAULIC ENGINEERING		SEATTLE HARBOR, WASHINGTON			
APPROVED:	SIZE: D	INVITATION NO. W912DW-13-B-0003	FILE NO. ADVANCE COPY	DATE: 22 JUL 2013	PLATE: 0-1
JOHN A. HICKS	DSCL: PELL	CHK: HICKS	SHEET: 1 OF 1		
CHIEF, NAVIGATION SECTION					

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