CENWS-OD-TS-DMMO

MEMORANDUM FOR: RECORD November 4, 2010

SUBJECT: DETERMINATION REGARDING THE SUITABILITY OF PROPOSED DREDGED MATERIAL FROM BERTH 1 OF THE CHINOOK VENTURES FACILITY, LONGVIEW, WASHINGTON, FOR FLOW-LANE DISPOSAL IN THE COLUMBIA RIVER.

1. Introduction. This memorandum reflects the consensus determination of the Dredged Material Management Program (DMMP) agencies (U.S. Army Corps of Engineers, Environmental Protection Agency, and Washington Departments of Ecology and Natural Resources) regarding the suitability of up to 31,300 cubic yards (cy) of maintenance dredged material from Chinook Ventures Berth 1 in Longview for flow-lane disposal in the Columbia River. See Figure 1 for a vicinity map.

2. Background. Chinook Venture's import/export operations are centered on the existing dock facility, referred to as Berth 1. Prior to Chinook's involvement at the site, Reynolds Metals Company operated Berth 1 and routinely performed maintenance dredging. The last maintenance dredging event occurred in 2000 under USACE Permit No. 97-2-00894. The USACE permit authorized a berth depth of -40 feet Columbia River Datum (CRD) plus an overdredge allowance. Maintenance dredging is necessary at Berth 1 to allow ships continued safe access to its berthing facilities. The proposed dredge depth for Berth 1 is -40 feet CRD, with a 2-foot overdredge allowance (-42 feet CRD total). Berth 1 and its adjacent channel, also referred to as Area A, occupies approximately 14.2 acres and is shown on Figure 2 (Anchor, 2010a). Area B, also shown in Figure 2, is associated with a facility expansion project and may be sampled and characterized at a future date. It is not covered by this suitability determination.

   Concurrent with characterization of maintenance dredged material at Berth 1, the Department of Ecology conducted an investigation into a petroleum coke spill that was alleged to have occurred from the loading facilities associated with Berth 1. One of the areas of investigation was adjacent to the area proposed for maintenance dredging (see Figure 3). Results of that investigation – as they pertain to the suitability of the dredged material for flow-lane disposal – are discussed in section 7 of this suitability determination.

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

Table 1. Project Summary

Project ranking	High (for this dredging cycle only)
Characterized volume	31,300 cy
Maintenance depth	-40 ft. CRD
1st draft SAP received	June 3, 2010
DMMP comments on 1st draft	June 21, 2010
Revised SAP received	August 11, 2010
Revised SAP approved	August 13, 2010
Sampling dates	August 31 - September 2, 2010

Data report received	November 2, 2010
DAIS Tracking number	CHINV-1-A-F-298
USACE Permit Application Number	NWS-2010-1220
Recency Determination (moderate rank = 5 years)	September 2015

4. Project Ranking and Sampling Requirements. The Chinook Ventures facility would normally be ranked "moderate", given the type of facility and its location. However, due to the proximity of Ecology's area of investigation, the proposed dredging area was ranked "high" by the DMMP agencies for this round of characterization. The purpose of this ranking was to increase sampling density to investigate the presence or absence of petroleum coke.

   In high-ranked areas with heterogeneous sediment, the minimum numbers of field samples and dredged material management units (DMMUs) are calculated using the following guidelines (DMMP, 2008a):

   - Maximum volume of sediment represented by each field sample = 4,000 cy
   - Maximum volume of sediment represented by each surface DMMU = 4,000 cy
   - Maximum volume of sediment represented by each subsurface DMMU = 12,000 cy

   Based on these guidelines, the proposed dredging volume of 31,300 cy (19,990 cy of surface material and 11,310 cy of subsurface material) would require a minimum of 8 field samples and 6 DMMUs. The SAP called for 9 field samples and 7 DMMUs.

   Note: The sampling and analysis plan originally included 60,500 cy in 15 DMMUs. Subsequent to approval of the SAP, Chinook Ventures decided to scale back the dredging by eliminating DMMUs 7 through 14. Surface DMMUs 1 through 6 and subsurface DMMU 15 remained.

5. Sampling. Sampling took place from August 31 to September 2, 2010 using a vibracore sampler. Dense sand was encountered and vibracore refusal occurred where the deeper cores were planned in DMMU 15. Recovery was also poor at some locations. Anchor QEA consulted the Dredged Material Management Office regarding these problems. The DMMP agencies agreed with Anchor QEA's proposal to take two additional samples (A15 and A16) from locations in subsurface DMMU 15 where the dredge cut was thinner in order to recover adequate material for z-samples. The agencies also agreed that the core samples taken from DMMU 15, while they did not penetrate to the bottom of the dredging prism, were of adequate length to represent this dredging unit.

   See Figures 4 and 5 for core sampling locations. Table 2 presents this information in tabular form. Table 3 includes compositing information.

6. Chemical Analysis. The approved analysis plan was followed (with minor exceptions) and quality control guidelines specified by the PSEP and DMMP programs were generally met, with only minor quality control deviations (Anchor, 2010b). The data were considered sufficient and acceptable for regulatory decision-making under the DMMP program.

   For this project, the DMMP agencies agreed to use the SEF freshwater guidelines (RSET, 2006), supplemented by the DMMP marine guidelines (DMMP, 2008a) for those chemicals of concern for which freshwater guidelines do not exist. The preliminary chemical results included a single reporting

limit exceedance of a SEF freshwater screening level. Di-n-octylphthalate, while undetected in all DMMUs, had reporting limits exceeding the SL1 of 26 ug/kg. The laboratory re-analyzed these samples to achieve lower reporting limits for di-n-octylphthalate and, upon re-analysis, all samples remained undetected and reporting limits were below the SL1 value. There were no other exceedances of the freshwater or marine screening levels. See Table 4 for the chemistry results.

All seven DMMUs met suitability guidelines, based on chemistry alone, for flow-lane disposal in the Columbia River.

7. Ecology's Petroleum Coke Spill Investigation. Grab samples were collected from 7 sampling stations near the loading facilities associated with Berth 1 (see Figure 3) and tested for metals and PAHs. All sediment samples, including the grab samples from the area of investigation and the cores taken from the DMMUs, were visually screened for petroleum coke, alumina and cement during sampling. Quantitative estimates were also made during the grain-size analysis.

   Results of the chemical analysis can be found in Table 5. There were no screening level exceedances for any of the grab samples. Results of the visual inspection and quantitative analysis are included in Table 6. In half the samples there was no petroleum coke, alumina or cement observed during sampling or grain-size analysis. The other samples had detectable quantities of petroleum coke, but in very small amounts. The one exception was SG-05, which was estimated to contain 2% petroleum coke. The sampling location for SG-05 is directly adjacent to the loading line and approximately 150 feet from the Berth 1 dredging area. The results do provide evidence of spillage. However, the consequences for the dredging area appear to be minimal. There were only minute amounts of petroleum coke found in the dredged material samples. On the basis of the evidence, the DMMP agencies agreed there was little risk posed by the dredging and disposal of the proposed dredged material.

8. Sediment Exposed by Dredging. Sediment exposed by dredging must either meet the State of Washington Sediment Quality Standards (SQS) (Ecology, 1995) or the State's antidegradation standard (DMMP, 2008b). Comparison of the proposed dredged material to SQS normally serves as a first-tier indicator for this purpose. However, in the case of the Chinook Ventures project, there are two arguments against the use of SQS. First, the SQS were developed for marine sediment; the Chinook Ventures site is in freshwater. Second, the total organic carbon (TOC) content ranged from 0.03 to 0.16% for the seven DMMUs. The Department of Ecology does not recommend carbon-normalization when TOC is below 0.5 percent. Therefore, the DMMP agencies agreed to use the freshwater SL1 guidelines for those chemicals for which these guidelines exist and the dry-weight-normalized marine SLs for the other chemicals of concern. As indicated in section 6 of this suitability determination, there were no exceedances of either the freshwater SL1s or the marine SLs. On this basis the agencies concluded that the project is in compliance with the State of Washington anti-degradation policy.

9. Suitability Determination. This memorandum documents the evaluation of the suitability of sediment proposed for dredging from the Chinook Ventures Berth 1 in Longview for flow-lane disposal. The approved sampling and analysis plan was followed (with minor exceptions) and the data gathered were deemed sufficient and acceptable for regulatory decision-making under the DMMP program.

   Based on the results of the previously described testing, the DMMP agencies conclude that all 31,300 cubic yards are suitable for flow-lane disposal in the Columbia River. The material is also likely acceptable for upland disposal but the applicant should contact the local health district or the

Washington Department of Ecology for guidance in this regard, depending on where the material is placed.

The sediment characterization results do not support continued use of the "high" ranking that was used for this dredging cycle. Therefore, the recency determination period of 5 years is based on the normal ranking of "moderate".

10. References.

Anchor, 2010a. *Sampling and Analysis Plan, Chinook Ventures Sediment Characterization, Longview, Washington.* Prepared by Anchor QEA, LLC for Chinook Ventures, Inc. August 2010.

Anchor, 2010b. *Sediment Characterization Report, Chinook Ventures Area A and Surficial Sediments, Longview, Washington.* Prepared by Anchor QEA, LLC on behalf of Chinook Ventures, Inc. November 2010.

DMMP, 2008a. *Dredged Material Evaluation and Disposal Procedures (Users Manual)*. 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.

RSET, 2006. *Northwest Regional Sediment Evaluation Framework, Interim Final.* Northwest Regional Sediment Evaluation Team, September 2006.

10. Agency Signatures.

Concur:

11/4/10 _____
Date — David Fox, P.E. - Seattle District Corps of Engineers

11/4/10 _____
Date — Erika Hoffman - Environmental Protection Agency

11/04/2010 _____
Date — Laura Inouye, Ph.D. - Washington Department of Ecology

11/04/2010 _____
Date — Dave Vagt - Washington Department of Natural Resources

Copies furnished:

DMMP signatories
Danette Guy, Corps Regulatory
James Keithly, Anchor QEA
Rebecca Desrosiers Gardner, Anchor QEA
Dan Guy, NMFS
Jeremy Buck, USFWS

K:\Jobs\100354 Chinook Ventures\100354-01\100354401-RP-008.dwg FIG 1 SCR

Oct 11, 2010 8:34am cdavidson

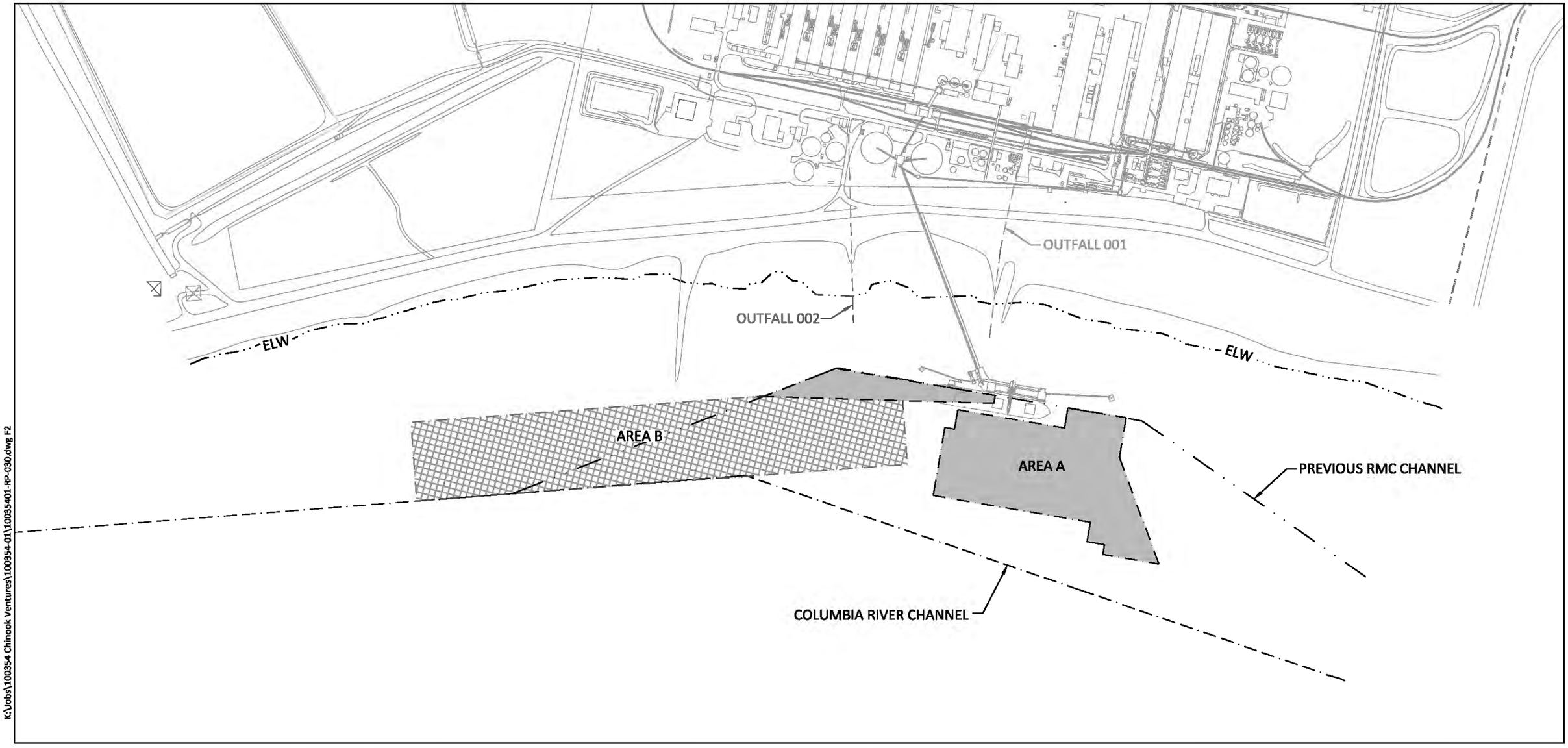
SOURCE: Aerial Image From Google Earth Pro 2009

0 6000

Scale in Feet

Figure 1
Site Vicinity Map
Sediment Characterization Report
Chinook Ventures

ANCHOR QEA



K:\Jobs\100354 Chinook Ventures\100354-01\100354010\100354010-RP-030.dwg F2

Nov 03, 2010 8:12am dholmer

SOURCE: Drawing prepared from multibeam bathymetric survey performed by TerraSond, Ltd. on April 29 and 30, 2010.
HORIZONTAL DATUM: Washington State Plane South, NAD83(91), US Survey Feet.
VERTICAL DATUM: Columbia River Datum (CRD) based on published tidal datums for NOAA Tide Station 944-0422 (1983-2001 epoch).
NOTE: Elevation 0.00 feet CRD is accepted as Extreme Low Water and the line between Tide Lands and Bed Lands.

LEGEND:

ELW Extreme Low Water

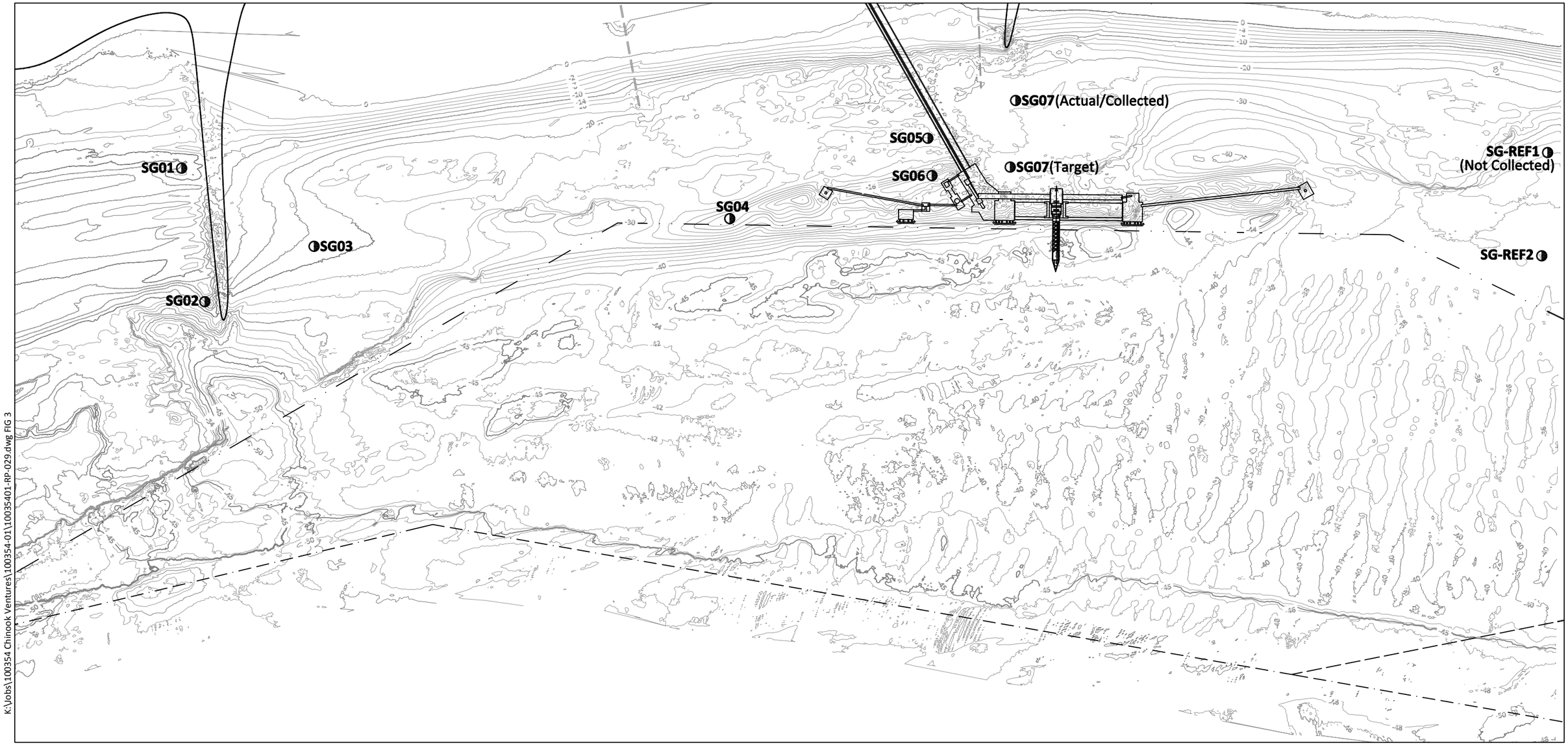
Area A: Current Dredge Area

Area B: Potential Future Dredging

0 500
Scale in Feet

ANCHOR QEA

Figure 2
Original SAP Study Areas
Sediment Characterization Report
Chinook Ventures



K:\Jobs\100354 Chinook Ventures\100354-01\10035401-RP-029.dwg FIG 3

Oct 11, 2010 9:40am cdavidson

SOURCE: Drawing prepared from multibeam bathymetric survey performed by TerraSond, Ltd. on April 29 and 30, 2010.
HORIZONTAL DATUM: Washington State Plane South, NAD83(91), US Survey Feet.
VERTICAL DATUM: Columbia River Datum (CRD) based on published tidal datums for NOAA Tide Station 944-0422 (1983-2001 epoch).
NOTE: Elevation 0.00 feet CRD is accepted as Extreme Low Water and the line between Tide Lands and Bed Lands.

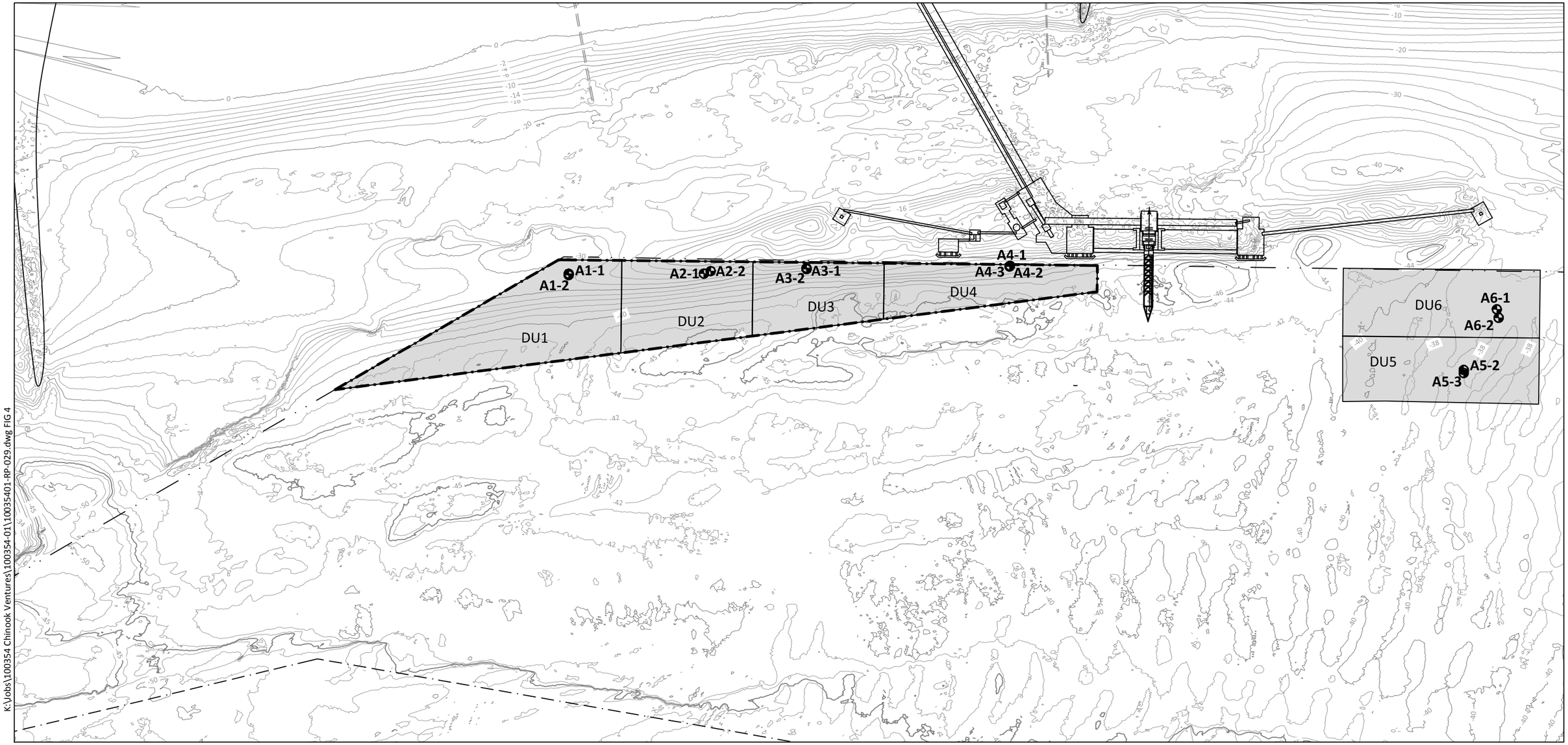
LEGEND:

SG01 Grab Sample Location and Number

0 200
Scale in Feet

ANCHOR QEA

Figure 3
Surface Sediment Grab Sample Locations
Sediment Characterization Report
Chinook Ventures



K:\Jobs\100354 Chinook Ventures\100354-01\100354010035401-RP-029.dwg FIG 4

Nov 01, 2010 2:29pm cdavidson

SOURCE: Drawing prepared from multibeam bathymetric survey performed by TerraSond, Ltd. on April 29 and 30, 2010.
HORIZONTAL DATUM: Washington State Plane South, NAD83(91), US Survey Feet.
VERTICAL DATUM: Columbia River Datum (CRD) based on published tidal datums for NOAA Tide Station 944-0422 (1983-2001 epoch).
NOTE: Elevation 0.00 feet CRD is accepted as Extreme Low Water and the line between Tide Lands and Bed Lands.

LEGEND:

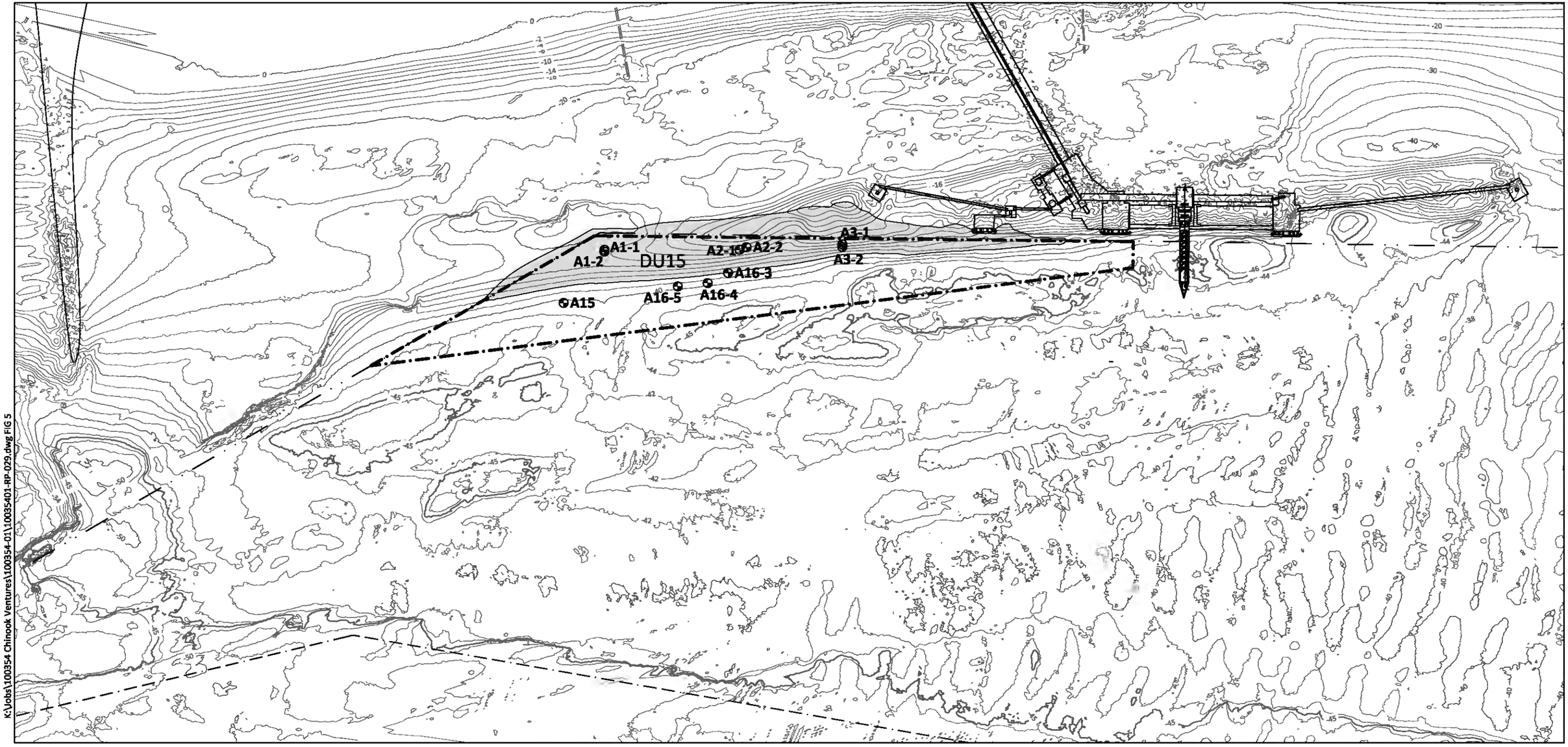
A1 Core Location and Number

Surface Dredge Unit Boundary and Designation

0 150
Scale in Feet

ANCHOR QEA

Figure 4
Area A Surface DU Core Locations
Sediment Characterization Report
Chinook Ventures



K:\Jobs\100354 Chinook Ventures\100354-01\10035401-RP-029.dwg FIG 5

Nov 11, 2010 2:12pm dholmer

SOURCE: Drawing prepared from multibeam bathymetric survey performed by TerraSond, Ltd. on April 29 and 30, 2010.
HORIZONTAL DATUM: Washington State Plane South, NAD83(91), US Survey Feet.
VERTICAL DATUM: Columbia River Datum (CRD) based on published tidal datums for NOAA Tide Station 944-0422 (1983-2001 epoch).
NOTE: Elevation 0.00 feet CRD is accepted as Extreme Low Water and the line between Tide Lands and Bed Lands.

LEGEND:

- ⊕A1 Core Location and Number
- Area A Dredge Footprint
- Subsurface Dredge Unit Boundary and Designation

0 150
Scale in Feet

ANCHOR QEA

Figure 5
Area A Subsurface DU Core Locations
Sediment Characterization Report
Chinook Ventures

Table 2
Core Locations and Mudline Elevations
(adapted from Anchor, 2010b)

Location Name	Observation Date	Latitude	Longitude	Mudline Elevation
A1-1	09/02/2010	46.13649041	123.0047059	-28.4
A1-2	09/02/2010	46.13649041	123.0047059	-28.5
A2-1	09/01/2010	46.13614923	123.0040577	-25.5
A2-2	09/01/2010	46.13614034	123.0040157	-23.9
A3-1	09/01/2010	46.13590807	123.0035461	-29.1
A3-2	09/01/2010	46.13590807	123.0035461	-27.7
A4-1	09/01/2010	46.13540196	123.0025631	-34.2
A4-2	09/01/2010	46.13540196	123.0025631	-34.2
A4-3	09/01/2010	46.13540206	123.002565	-34.4
A5-2	08/31/2010	46.13390869	123.0007672	-38.9
A5-3	08/31/2010	46.13390869	123.0007672	-38.5
A6-1	08/31/2010	46.13402696	123.0003885	-37.5
A6-2	08/31/2010	46.13399421	123.0004103	-37.8
A15	09/02/2010	46.13641708	123.0050943	-40.2
A16-3	09/02/2010	46.13610115	123.0041978	-35.7
A16-4	09/02/2010	46.136119	123.004332	-40.0
A16-5	09/02/2010	46.13618339	123.0044874	-39.5

Notes:

- Mudline elevations are in Columbia River Datum and are corrected for river stage.
- Location Name extention indicates the coring attempt; due to poor recovery not all cores were used

Table 3
Core Recovery, Intervals, and Compositing Scheme
(adapted from Anchor, 2010b)

Dredge Unit	Volume (cy)	Composite Sample ID	Cores Composited	Percent Recovery	Uncorrected Core Interval (feet)	Recovery Corrected Core Interval (feet)	Targeted Sediment Interval (feet)
DU1	3,790	DU1-A-100903	A1-1	33%	0 to 1.3	0 to 3.9	0 to 4.0
			A1-2	55%	0 to 2.2	0 to 4.0	0 to 4.0
DU2	3,120	DU2-A-100902	A2-1	46%	0 to 1.8	0 to 3.9	0 to 4.0
			A2-2	40%	0 to 1.6	0 to 4.0	0 to 4.0
DU3	2,640	DU3-A-100902	A3-1	75%	0 to 3.0	0 to 4.0	0 to 4.0
			A3-2	41%	0 to 1.6	0 to 3.9	0 to 4.0
DU4	2,340	DU4-A-100902	A4-1	63%	0 to 2.5	0 to 4.0	0 to 4.0
			A4-2	56%	0 to 2.2	0 to 4.0	0 to 4.0
			A4-3	60%	0 to 2.4	0 to 4.0	0 to 4.0
DU5	4,050	DU5-A-100901	A5-2	54%	0 to 1.7	0 to 3.1	0 to 3.1
			A5-3	64%	0 to 2.3	0 to 3.6	0 to 3.5
DU6	4,050	DU6-A-100902	A6-1	66%	0 to 2.6	0 to 3.9	0 to 4.5
			A6-2	82%	0 to 3.3	0 to 4.0	0 to 4.2
DU15	11,310	DU15-B-100903	A1-1	33%	1.3 to 3.4	3.9 to 10.3	4.0 to 13.6
			A1-2	55%	2.2 to 5.4	4.0 to 9.8	4.0 to 13.5
			A2-1	46%	1.8 to 4.8	3.9 to 10.4	4.0 to 16.5
			A2-2	40%	1.6 to 3.7	4.0 to 9.3	4.0 to 18.1
			A3-1	75%	3.0 to 4.8	4.0 to 6.4	4.0 to 12.9
			A3-2	41%	1.6 to 3.9	3.9 to 9.5	4.0 to 14.3

Notes:

- Core intervals and targeted sediment intervals do not include z-samples
- Two additional stations not shown here (A15 and A16) were used for z-samples in DU 15

Table 4 - Analytical Results
(from Anchor, 2010b)

Task Location ID Sample ID Sample Date Depth Sample Type	SEF MARINE SL1	SEF MARINE SL2	SEF FRESH SL1	SEF FRESH SL2	Area A Sediment A1 DU1-A-100903 09/03/2010 0 - 4 ft Normal	Area A Sediment A2 DU2-A-100902 09/02/2010 0 - 4 ft Normal	Area A Sediment A3 DU3-A-100902 09/02/2010 0 - 4 ft Normal	Area A Sediment A4 DU4-A-100902 09/02/2010 0 - 4 ft Normal	Area A Sediment A5 DU5-A-100901 09/01/2010 0 - 3.6 ft Normal	Area A Sediment A6 DU6-A-100902 09/02/2010 0 - 4 ft Normal	Area A Sediment DU15/Subsurface DU15-B-100903 09/03/2010 4 - 10.5 ft Normal
Conventional Parameters (mg/kg)											
Ammonia	---	---	---	---	**8.04**	**9.68**	**12.2**	**6.77**	**14.4 J**	**2.97**	**21.7**
Sulfide	---	---	---	---	1.25 U	1.28 U	**1.94**	**1.95**	**1.12**	1.12 U	**1.55**
Conventional Parameters (pct)											
Gravel	---	---	---	---	0.07	0	0	0.01	1.7	3.24	0
Sand (coarse + medium + fine)	---	---	---	---	86.4	79.34	83.2	89.97	96.42	94.67	80.86
Coarse Sand	---	---	---	---	0.03	0	0	0.05	6.6	11.94	0
Medium Sand	---	---	---	---	27.2	15.9	23.4	42.4	85.9	78.4	21.1
Fine Sand	---	---	---	---	59.18	63.43	59.76	47.5	3.9	4.28	59.74
Silt	---	---	---	---	12.24	19.84	15.97	8.83	1.4	1.74	18.83
Clay	---	---	---	---	0.93	0.57	0.51	1.13	0.24	0.12	0
Fines (Silt + Clay)	---	---	---	---	13.17	20.41	16.48	9.96	1.64	1.86	18.83
Total organic carbon	---	---	---	---	**0.155**	**0.101**	**0.0948**	**0.133**	**0.026**	**0.0416**	**0.147**
Total solids	---	---	---	---	**78.3**	**78.4**	**79**	**80.7**	**92.3**	**90.8**	**78.2**
Metals (mg/kg)											
Antimony	150	150	---	---	0.649 UJ	0.653 UJ	0.647 UJ	0.627 UJ	0.552 UJ	0.557 UJ	0.638 UJ
Arsenic	57	93	20	51	**0.707 J**	**0.582 J**	**0.621 J**	**0.671 J**	**0.69 J**	**0.752 J**	**0.759 J**
Cadmium	5.1	6.7	1.1	1.5	0.649 UJ	**0.0719 J**	**0.0712 J**	**0.069 J**	**0.0552 J**	**0.0725 J**	**0.0766 J**
Chromium	260	270	95	100	**3.52 J**	**3.08 J**	**4.5 J**	**3.32 J**	**3.33 J**	**3.93 J**	**4.15 J**
Copper	390	390	80	830	**11.5**	**13.6**	**12.8**	**11.4**	**8.85**	**8.87**	**13.5**
Lead	450	530	340	430	**0.798**	**0.778**	**0.9**	**0.903**	**0.761**	**2.36**	**0.925**
Mercury	0.41	0.59	0.28	0.75	0.0519 U	0.0523 U	0.0518 U	0.0502 U	0.0441 U	0.0446 U	0.051 U
Nickel	---	---	60	70	**5.01 J**	**4.69 J**	**5.49 J**	**5.46 J**	**6.13 J**	**6.17 J**	**5.53 J**
Silver	6.1	6.1	2	2.5	0.649 U	0.653 U	0.647 U	0.627 U	0.552 U	0.557 U	0.638 U
Zinc	410	960	130	400	**15.9**	**19.5**	**19.4**	**16.9**	**17.2**	**19.5**	**17.1**
Aromatic Hydrocarbons (µg/kg)											
Total LPAH (U = 1/2)	5200	5200	6600	9200	**9.1**	6.73 U	**12.0**	**14.7**	2.88 U	**13.2**	**11.8**
Naphthalene	2100	2100	500	1300	6.72 UJ	6.73 UJ	6.61 UJ	6.61 UJ	2.88 UJ	5.87 UJ	6.77 UJ
Acenaphthylene	560	1300	470	640	3.35 U	3.35 U	3.29 U	3.29 U	1.43 U	2.92 U	3.37 U
Acenaphthene	500	500	1100	1300	3.35 U	3.35 U	3.29 U	3.29 U	1.43 U	2.92 U	3.37 U
Fluorene	540	540	1000	3000	3.35 UJ	3.35 UJ	3.29 UJ	3.29 UJ	1.43 UJ	2.92 UJ	3.37 UJ
Phenanthrene	1500	1500	6100	7600	**2.37 J**	3.35 U	**5.34**	**5.9**	1.43 U	**7.37**	**5.03**
Anthracene	960	960	1200	1600	3.35 U	3.35 U	3.29 U	3.29 U	1.43 U	2.92 U	3.37 U
2-Methylnaphthalene	670	670	470	560	6.72 UJ	6.73 UJ	6.61 UJ	3.8 UJ	2.88 UJ	5.87 UJ	6.77 UJ
Total HPAH (U = 1/2)	12000	17000	31000	55000	**24.7**	**21.8**	**50.4**	**32.0**	2.16 U	**33.1**	**103.3**
Fluoranthene	1700	2500	11000	15000	**4.18**	**3.26 J**	**6.9**	**7.13**	1.43 U	**8.71**	**16.6**
Pyrene	2600	3300	8800	16000	**3.64**	**2.88 J**	**5.58**	**6.11**	1.43 U	**7.88**	**15.7**
Benzo(a)anthracene	1300	1600	4300	5800	**2.34 J**	**2.14 J**	**3.95**	**2.87 J**	1.43 U	**3.21**	**9.28**

Table 4 - Analytical Results
(from Anchor, 2010b)

Task Location ID Sample ID Sample Date Depth Sample Type	SEF MARINE SL1	SEF MARINE SL2	SEF FRESH SL1	SEF FRESH SL2	Area A Sediment A1 DU1-A-100903 09/03/2010 0 - 4 ft Normal	Area A Sediment A2 DU2-A-100902 09/02/2010 0 - 4 ft Normal	Area A Sediment A3 DU3-A-100902 09/02/2010 0 - 4 ft Normal	Area A Sediment A4 DU4-A-100902 09/02/2010 0 - 4 ft Normal	Area A Sediment A5 DU5-A-100901 09/01/2010 0 - 3.6 ft Normal	Area A Sediment A6 DU6-A-100902 09/02/2010 0 - 4 ft Normal	Area A Sediment DU15/Subsurface DU15-B-100903 09/03/2010 4 - 10.5 ft Normal
Chrysene	1400	2800	5900	6400	**2.52 J**	**1.77 J**	**7.92**	**3.53**	1.43 U	**2.93**	**10.9**
Benzo(b)fluoranthene	3200	3600	600	4000	**4.21 J**	**4.13 J**	**9.37**	**4.41 J**	2.16 U	**3.36 J**	**15.6**
Benzo(k)fluoranthene	3200	3600	600	4000	5.03 U	5.04 U	**4.48 J**	4.95 U	2.16 U	4.39 U	**6.07**
Benzo(a)pyrene	1600	1600	3300	4800	**4 J**	**3.82 J**	**6.75**	**4.23 J**	2.16 U	**3.75 J**	**14.4**
Indeno(1,2,3-c,d)pyrene	600	690	4100	5300	3.35 U	3.35 U	**2.57 J**	3.29 U	1.43 U	2.92 U	**7.11**
Dibenzo(a,h)anthracene	230	230	800	840	3.35 U	3.35 U	3.29 U	3.29 U	1.43 U	2.92 U	3.37 U
Benzo(g,h,i)perylene	670	720	4000	5200	3.35 U	3.35 U	**2.02 J**	3.29 U	1.43 U	2.92 U	**6.81**
Total PAH (U = 1/2)					**33.8**	**29.4**	**62.3**	**46.7**	2.88 UJ	**46.4**	**115.1**
Chlorinated Hydrocarbons (µg/kg)											
1,4-Dichlorobenzene	110	110	---	---	3.35 U	3.35 U	3.29 U	3.29 U	1.43 U	2.92 U	3.37 U
1,2-Dichlorobenzene	35	50	---	---	3.35 U	3.35 U	3.29 U	3.29 U	1.43 U	2.92 U	3.37 U
1,2,4-Trichlorobenzene	31	51	---	---	4.18 U	4.18 U	4.11 U	4.11 U	1.79 U	3.65 U	4.21 U
Hexachlorobenzene	22	70	---	---	1.01 UJ	**1.9**	1.02 U	0.906 U	0.869 U	0.928 U	1.08 UJ
Phthalates (µg/kg)											
Dimethyl phthalate	71	160	46	440	10.1 U	10.1 U	9.91 U	9.9 U	4.31 U	8.79 U	10.1 U
Diethyl phthalate	200	200	---	---	10.1 U	10.1 U	9.91 U	9.9 U	4.31 U	8.79 U	10.1 U
Di-n-butyl phthalate	1400	1400	---	---	20.1 U	20.2 U	19.8 U	19.8 U	11.5 U	17.6 U	20.3 U
Butylbenzyl phthalate	63	900	260	370	20.1 U	20.2 U	19.8 U	19.8 U	11.6 U	17.6 U	20.3 U
Bis(2-ethylhexyl) phthalate	1300	1900	220	320	33.7 U	33.8 U	33.2 U	33.2 U	19.1 U	29.4 U	34 U
Di-n-octyl phthalate	6200	6200	26	45	16.7 U	16.8 U	16.5 U	16.5 U	14.4 U	14.6 U	16.9 U
Phenols (µg/kg)											
Phenol	420	1200	---	---	20.1 U	20.2 U	19.8 U	19.8 U	8.62 U	17.6 U	20.3 U
2-Methylphenol (o-Cresol)	63	63	---	---	6.72 U	6.73 U	6.61 U	6.61 U	2.88 U	5.87 U	6.77 U
4-Methylphenol and 3-methylphenol (m&p-Cresol)	670	670	---	---	6.72 U	6.73 U	6.61 U	6.61 U	2.88 U	5.87 U	6.77 U
2,4-Dimethylphenol	29	29	---	---	6.72 U	6.73 U	6.61 U	6.61 U	2.88 U	5.87 U	6.77 U
Pentachlorophenol	400	690	---	---	16.8 U	16.8 U	16.5 U	16.5 U	7.19 U	14.7 U	16.9 U
Miscellaneous Extractables (µg/kg)											
Benzyl alcohol	57	73	---	---	6.72 U	6.73 U	6.61 U	6.61 U	2.88 U	5.87 U	6.77 U
Benzoic acid	650	650	---	---	134 U	135 U	132 U	132 U	57.5 U	117 U	135 U
Dibenzofuran	540	540	400	440	3.35 U	3.35 U	3.29 U	3.29 U	1.43 U	2.92 U	3.37 U
Hexachlorobutadiene	11	120	---	---	1.01 UJ	1.07 U	1.02 U	0.906 U	0.869 U	0.928 U	1.08 UJ
N-Nitrosodiphenylamine	28	40	---	---	6.69 U	6.71 U	6.59 U	6.58 U	2.87 U	5.84 U	6.74 U
Pesticides (µg/kg)											
4,4'-DDD (p,p'-DDD)	16	28	---	---	1.01 UJ	1.07 U	1.02 U	0.906 U	0.869 U	0.928 U	1.08 UJ
4,4'-DDE (p,p'-DDE)	9	9.3	---	---	1.01 UJ	1.07 U	1.02 U	0.906 U	0.869 U	0.928 U	1.08 UJ
4,4'-DDT (p,p'-DDT)	12	34	---	---	1.01 UJ	1.07 U	1.02 U	0.906 U	0.869 U	0.928 U	1.08 UJ
Aldrin	9.5	9.5	---	---	1.01 UJ	1.07 U	1.02 U	0.906 U	0.869 U	0.928 U	1.08 UJ
Total Chlordanes (sum of alpha, gamma, and oxy)	2.8	4.5	---	---	1.01 UJ	1.07 U	1.02 U	0.906 U	0.869 U	0.928 U	1.08 UJ

Table 4 - Analytical Results
(from Anchor, 2010b)

Task Location ID Sample ID Sample Date Depth Sample Type	SEF MARINE SL1	SEF MARINE SL2	SEF FRESH SL1	SEF FRESH SL2	Area A Sediment A1 DU1-A-100903 09/03/2010 0 - 4 ft Normal	Area A Sediment A2 DU2-A-100902 09/02/2010 0 - 4 ft Normal	Area A Sediment A3 DU3-A-100902 09/02/2010 0 - 4 ft Normal	Area A Sediment A4 DU4-A-100902 09/02/2010 0 - 4 ft Normal	Area A Sediment A5 DU5-A-100901 09/01/2010 0 - 3.6 ft Normal	Area A Sediment A6 DU6-A-100902 09/02/2010 0 - 4 ft Normal	Area A Sediment DU15/Subsurface DU15-B-100903 09/03/2010 4 - 10.5 ft Normal
alpha-Chlordane (cis-Chlordane)	---	---	---	---	1.01 UJ	1.07 U	1.02 U	0.906 U	0.869 U	0.928 U	1.08 UJ
gamma-Chlordane	---	---	---	---	1.01 UJ	1.07 U	1.02 U	0.906 U	0.869 U	0.928 U	1.08 UJ
Oxychlordane	---	---	---	---	1.01 UJ	1.07 U	1.02 U	0.906 U	0.869 U	0.928 U	1.08 UJ
Dieldrin	1.9	3.5	---	---	1.01 UJ	1.07 U	1.02 U	0.906 U	0.869 U	0.928 U	1.08 UJ
Heptachlor	1.5	2	---	---	1.01 UJ	1.07 U	1.02 U	0.906 U	0.869 U	0.928 U	1.08 UJ
gamma-Hexachlorocyclohexane (Lindane)	---	---	---	---	1.01 UJ	1.07 U	1.02 U	0.906 U	0.869 U	0.928 U	1.08 UJ
cis-Nonachlor	---	---	---	---	1.01 UJ	1.07 U	1.02 U	0.906 U	0.869 U	0.928 U	1.08 UJ
trans-Nonachlor	---	---	---	---	1.01 UJ	1.07 U	1.02 U	0.906 U	0.869 U	0.928 U	1.08 UJ
PCB Aroclors (µg/kg)											
Aroclor 1016	---	---	---	---	6.3 U	6.34 U	6.12 U	6.18 U	5.38 U	5.34 U	6.2 U
Aroclor 1221	---	---	---	---	6.3 U	6.34 U	6.12 U	6.18 U	5.38 U	5.34 U	6.2 U
Aroclor 1232	---	---	---	---	6.3 U	6.34 U	6.12 U	6.18 U	5.38 U	5.34 U	6.2 U
Aroclor 1242	---	---	---	---	6.3 U	6.34 U	6.12 U	6.18 U	5.38 U	5.34 U	6.2 U
Aroclor 1248	---	---	---	---	6.3 U	6.34 U	6.12 U	6.18 U	5.38 U	5.34 U	6.2 U
Aroclor 1254	---	---	---	---	6.3 U	6.34 U	6.12 U	6.18 U	5.38 U	5.34 U	6.2 U
Aroclor 1260	---	---	---	---	6.3 U	6.34 U	6.12 U	6.18 U	5.38 U	5.34 U	6.2 U
Total PCBs (U=0)	130	1000	60	120	6.3 U	6.34 U	6.12 U	6.18 U	5.38 U	5.34 U	6.2 U

Notes:

Bold = Detected result

J = Estimated value

U = Compound analyzed, but not detected above detection limit

UJ = Compound analyzed, but not detected above estimated detection limit

All undetect results are reported at the **reporting limit**

Totals are calculated as the sum of all detected results and half of the **detection limit** of undetected results (U=1/2)

Totals are calculated as the sum of all detected results (U=0). If all results are not detected, the highest reporting limit value is reported as the sum

Total LPAH (Low PAH) are the total of 2-Methylnapthalene, Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, and Anthracene

Total HPAH (High PAH) are the total of Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(x)fluoranthenes, Benzo(a)pyrene, Indeno(1,2,3-c,d)pyrene, Dibenzo(a,h)anthracene, and Benzo(g,h,i)perylene

Gravel = particles larger than 2.0 mm; sand = 2.0 to 0.063 mm; coarse sand = 2.0 to 0.85 mm; medium sand = 0.85 to 0.15 mm; fine sand = 0.15 to 0.063 mm; silt = 0.063 to 0.0039 mm; clay = finer than 0.0039 mm

Table 5
Surface Sediment Grab Sample Analytical Results
(from Anchor, 2010b)

Task Location ID Sample ID Sample Date Depth Sample Type	SEF MARINE SL1	SEF MARINE SL2	SEF FRESH SL1	SEF FRESH SL2	Area A Sediment SG01 SG01-100830 08/30/2010 0 - 10 cm Normal	Area A Sediment SG01 SG51-100830 08/30/2010 0 - 10 cm Field Duplicate	Area A Sediment SG02 SG02-100830 08/30/2010 0 - 10 cm Normal	Area A Sediment SG03 SG03-100830 08/30/2010 0 - 10 cm Normal	Area A Sediment SG04 SG04-100830 08/30/2010 0 - 10 cm Normal	Area A Sediment SG05 SG05-100830 08/30/2010 0 - 10 cm Normal	Area A Sediment SG06 SG06-100830 08/30/2010 0 - 10 cm Normal	Area A Sediment SG07 SG07-100830 08/30/2010 0 - 10 cm Normal
Conventional Parameters (pct)												
Gravel	---	---	---	---	0.2	0.1	0.1	0.1	0.1	1.7	0.1	0.0
Sand (coarse + medium + fine)	---	---	---	---	87.1	87.3	56.8	91.9	85.8	81.3	70.0	17.8
Coarse Sand	---	---	---	---	0.1	0.1	0.0	0.0	0.1	0.4	0.0	1.1
Medium Sand	---	---	---	---	17.9	19.0	17.3	36.4	22.3	23.7	7.4	7.5
Fine Sand	---	---	---	---	69.2	68.2	39.5	55.5	63.5	57.1	62.6	9.2
Silt	---	---	---	---	12.3	11.4	42.8	7.6	12.8	14.8	27.6	44.0
Clay	---	---	---	---	0.0	1.0	0.1	0.1	1.0	1.1	2.1	19.9
Fines (Silt + Clay)	---	---	---	---	12.33	12.37	42.92	7.75	13.83	15.84	29.69	63.92
Total organic carbon	---	---	---	---	**0.0941**	**0.128**	**0.128**	**0.123**	**0.156**	**0.181**	**0.255**	**5.44**
Total solids	---	---	---	---	**76.2**	**76.4**	**76.4**	**76.1**	**75.2**	**75.8**	**71.6**	**46.3**
Metals (mg/kg)												
Antimony	150	150	---	---	**0.101 J**	**0.209 J**	**0.18 J**	**0.0793 J**	0.683 U	**0.291 J**	**0.0921 J**	**0.393 J**
Arsenic	57	93	20	51	**0.908 J**	**0.85 J**	**0.76 J**	**0.767 J**	**0.799 J**	**0.948 J**	**0.892 J**	**8.49**
Cadmium	5.1	6.7	1.1	1.5	**0.114 J**	**0.0877 J**	**0.0933 J**	**0.0793 J**	**0.0751 J**	**0.108 J**	**0.12 J**	**0.525 J**
Chromium	260	270	95	100	**4.61 J**	**6.19 J**	**5.21 J**	**6.52 J**	**4.8 J**	**5.44 J**	**5.12 J**	**24.5 J**
Copper	390	390	80	830	**11.9**	**12.4**	**11.2**	**11.8**	**12.3**	**14.6**	**18.6**	**33.2**
Lead	450	530	340	430	**1.11**	**1.06**	**1.05**	**1.04**	**1.02**	**1.08**	**1.29**	**7.9**
Mercury	0.41	0.59	0.28	0.75	0.0538 U	0.054 U	0.0533 U	0.0529 U	0.0546 U	0.0542 U	0.0567 U	0.0874 U
Nickel	---	---	60	70	**6.29 J**	**7.68 J**	**6.8 J**	**8.02 J**	**6.32 J**	**6.66 J**	**6.28 J**	**25.3 J**
Silver	6.1	6.1	2	2.5	0.672 U	0.675 U	0.666 U	0.661 U	0.683 U	0.677 U	0.708 U	1.09 U
Zinc	410	960	130	400	**17.9**	**17.8**	**18.7**	**19.5**	**23.7**	**23.4**	**22.6**	**65.7**
Aromatic Hydrocarbons (µg/kg)												
Total LPAH (U = 1/2)	5200	5200	6600	9200	**97.9**	**123.6**	**4.8**	**23.6**	**6.9**	**27.8**	**17.1**	5.62 U
Naphthalene	2100	2100	500	1300	**2.73 J**	**2.42 J**	3.38 UJ	3.49 UJ	3.49 UJ	8.74 UJ	3.7 UJ	5.6 UJ
Acenaphthylene	560	1300	470	640	1.64 U	1.62 U	1.69 U	1.74 U	1.74 U	4.37 U	1.85 U	2.8 U
Acenaphthene	500	500	1100	1300	**15.4**	**16.9**	1.69 U	**3.95**	1.74 U	4.37 U	**1.88**	2.8 U
Fluorene	540	540	1000	3000	**4.7 J**	**6.28 J**	1.69 UJ	**2.83 J**	1.74 UJ	4.37 UJ	**1.75 J**	2.8 UJ
Phenanthrene	1500	1500	6100	7600	**57.1**	**75.3**	**1.42 J**	**12.5**	**2.46**	**14.6**	**9.46**	2.8 U
Anthracene	960	960	1200	1600	**16.7**	**21.5**	1.69 U	**2.12**	**1.4 J**	**3.28 J**	**1.74 J**	2.8 U
2-Methylnaphthalene	670	670	470	560	3.29 UJ	3.25 UJ	3.4 UJ	3.5 UJ	3.5 UJ	**4.44 J**	3.71 UJ	5.62 UJ
Total HPAH (U = 1/2)	12000	17000	31000	55000	**869.2**	**1127.3**	**12.9**	**60.9**	**49.6**	**138.4**	**76.2**	28 U
Fluoranthene	1700	2500	11000	15000	**134**	**176 J**	**2.5**	**13**	**16.2**	**31**	**21.7**	2.8 U
Pyrene	2600	3300	8800	16000	**133**	**165 J**	**2.24**	**10.8**	**12.9**	**28**	**19.4**	2.8 U
Benzo(a)anthracene	1300	1600	4300	5800	**81.2**	**111**	**1.4 J**	**5.04**	**4.81**	**13.9**	**6.18**	2.8 U
Chrysene	1400	2800	5900	6400	**89.9**	**127**	**1.45 J**	**4.57**	**6.72**	**14.6**	**6.96**	2.8 U
Benzo(b)fluoranthene	3200	3600	600	4000	**110**	**150 J**	**1.62 J**	**6.12**	**3.04**	**13.1**	**7.45**	4.21 U

Table 5
Surface Sediment Grab Sample Analytical Results
(from Anchor, 2010b)

Task Location ID Sample ID Sample Date Depth Sample Type	SEF MARINE SL1	SEF MARINE SL2	SEF FRESH SL1	SEF FRESH SL2	Area A Sediment SG01 SG01-100830 08/30/2010 0 - 10 cm Normal	Area A Sediment SG01 SG51-100830 08/30/2010 0 - 10 cm Field Duplicate	Area A Sediment SG02 SG02-100830 08/30/2010 0 - 10 cm Normal	Area A Sediment SG03 SG03-100830 08/30/2010 0 - 10 cm Normal	Area A Sediment SG04 SG04-100830 08/30/2010 0 - 10 cm Normal	Area A Sediment SG05 SG05-100830 08/30/2010 0 - 10 cm Normal	Area A Sediment SG06 SG06-100830 08/30/2010 0 - 10 cm Normal	Area A Sediment SG07 SG07-100830 08/30/2010 0 - 10 cm Normal
Benzo(k)fluoranthene	3200	3600	600	4000	**41.5**	**50.4**	2.54 U	**2.02 J**	2.62 U	**3.8 J**	**2.48 J**	4.21 U
Benzo(a)pyrene	1600	1600	3300	4800	**98.7 J**	**128 J**	2.54 UJ	**5.38 J**	**2.09 J**	**13.1 J**	**4.54 J**	4.21 UJ
Indeno(1,2,3-c,d)pyrene	600	690	4100	5300	**81.3**	**104**	**0.983 J**	**6.3**	**1.35 J**	**6.66**	**3.21**	28 U
Dibenzo(a,h)anthracene	230	230	800	840	**17.6**	**23**	1.69 U	**1.27 J**	1.74 U	**4.22 J**	**0.984 J**	28 U
Benzo(g,h,i)perylene	670	720	4000	5200	**82**	**92.9**	**1.06 J**	**6.44**	**1.42 J**	**10 J**	**3.33**	28 U
Total PAH (U = 1/2)	---	---	---	---	**967.1**	**1250.9**	**17.8**	**84.5**	**56.5**	**166.2**	**93.4**	28 U

Notes:

Bold = Detected result

J = Estimated value

U = Compound analyzed, but not detected above detection limit

UJ = Compound analyzed, but not detected above estimated detection limit

All undetect results are reported at the **reporting limit**

Totals are calculated as the sum of all detected results and half of the **detection limit** of undetected results (U=1/2)

Totals are calculated as the sum of all detected results (U=0). If all results are not detected, the highest reporting limit value is reported as the sum

Total LPAH (Low PAH) are the total of 2-Methylnapthalene, Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, and Anthracene

Total HPAH (High PAH) are the total of Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(x)fluoranthenes, Benzo(a)pyrene, Indeno(1,2,3-c,d)pyrene, Dibenzo(a,h)anthracene, and Benzo(g,h,i)perylene

Gravel = particles larger than 2.0 mm; sand = 2.0 to 0.063 mm; coarse sand = 2.0 to 0.85 mm; medium sand = 0.85 to 0.15 mm; fine sand = 0.15 to 0.063 mm; silt = 0.063 to 0.0039 mm; clay = finer than 0.0039 mm

Table 6
Petroleum Coke Observations in Grab and Core Samples
(from Anchor, 2010b)

Sample ID	Field or Core Processing Observation	Laboratory Observation	Laboratory Approximate Quantity
Grab Sample Observations			
SG01-100830	None Observed	Possible petroleum coke in +20 fraction	0.09% of total sample
SG51-100830 (field duplicate of SG01)	None Observed	Petroleum coke observed in +10 and possible petroleum coke in +20 fraction	0.18% of total sample
SG02-100830	None Observed	None Observed	NA
SG03-100830	None Observed	None Observed	NA
SG04-100830	None Observed	None Observed	NA
SG05-100830	Petroleum Coke Observed; <5% by volume	Petroleum coke observed in +4 fraction; +10 and +20 fractions are predominantly petroleum coke	2.0% of total sample
SG06-100830	None Observed	None Observed	NA
SG07-100830	None Observed	None Observed	NA
Core Observations			
DU1-A-100903	None Observed	1 to 2 spheres of petroleum coke in +20 fraction	0.03% of total sample
DU2-A-100902	None Observed	None Observed	NA
DU3-A-100902	None Observed	Possible petroleum coke in +20 fraction	1 grain, 0.01 grams, 0% of total sample
DU4-A-100902	None Observed	Petroleum coke (2 pieces) in +20 fraction	2 grains, 0.05% of total sample
DU5-A-100901	None Observed	Possible petroleum coke in +20 fraction	Not quantified
DU6-A-100902	None Observed	None Observed	NA
DU15/Subsurface	None Observed	None Observed	NA

Note:
NA = Not applicable