TECHNICAL MEMORANDUM

LANDAU ASSOCIATES
ENVIRONMENTAL | GEOTECHNICAL | NATURAL RESOURCES

TO: David South, Washington State Department of Ecology

FROM: Lawrence Beard, P.E., L.H.G.

DATE: July 21, 2011

RE: RIVERSIDE BUSINESS PARK
FILL THICKNESS EVALUATION
EVERETT, WASHINGTON

This technical memorandum presents the results of an evaluation of the thickness of existing and planned clean fill material at the Port of Everett (Port) Riverside Business Park property (the Property). The purpose of this evaluation was to determine the extent to which clean fill and existing pavement and structures provide adequate protection against direct human contact with soil that may be affected by arsenic contamination associated with slag or affected fill from the ASARCO Everett Smelter site (Smelter Site). It is expected that any arsenic originating from direct ASARCO emissions is overlain by approximately 4 to 8 ft of fill soil placed on the Property in the early 1900's.

BACKGROUND

The Property is located adjacent to the Snohomish River in Everett, Washington, as shown on Figure 1. It consists of approximately 75 acres owned by the Port, 5 acres at the north end on the property that is owned by the Cymbaluk's. The Port-owned property includes a 40-acre parcel immediately south of the access road an access trail along the shoreline bordering the Cymbaluk property, the inter model yard to the south of the 40-acre parcel, and the dredge spoils storage area at the south end of the Property. The Cymbaluk property, the shoreline trail, and the stormwater pond area to the north of the Cymbaluk property are collectively referred to as the North Area, as shown on Figure 2.

Historical operations associated with the former Weyerhaeuser East Site resulted in environmental impacts to Property soil and groundwater that were addressed by an environmental cleanup conducted by Weyerhaeuser under a consent decree with the Washington State Department of Ecology (Ecology). The cleanup included the removal of contaminated soil above the cleanup levels established for the Property which were based on MTCA industrial cleanup levels, and containment of residual contamination above the unrestricted cleanup levels on the Property. The property zoning designation is M-2, Heavy Industrial. Within the shoreline management zone the designation is Urban Industrial. A restrictive covenant has been placed on the Property under the consent decree to ensure that future development activities do not compromise the containment element of the cleanup action and that residential development will not occur on the site. In addition to residual contamination associated with

former Weyerhaeuser operations, elevated arsenic concentrations in soil that appear to be related to slag or affected fill associated with the former Smelter Site have been detected in shallow soil on the Property associated with the operational surface during Weyerhaeuser operations.

Ecology has established performance standards for remediation of arsenic-contaminated soil in the upland (residential) area of the former Smelter Site that identifies arsenic remediation levels based on the depth of the arsenic-affected soil below ground surface. The upland area performance standards identify remediation levels of 60 milligrams per kilogram (mg/kg) average concentration and 150 mg/kg maximum concentration for affected soil between 1 ft and 2 ft below ground surface (BGS), and an average concentration of 150 mg/kg and maximum concentration of 500 mg/kg for affected soil located greater than 2 ft BGS. Containment of these concentrations beneath pavement or permanent structures is also considered adequately protective for the former Smelter Site upland area.

The upland area performance standards were established for unrestricted site use and, as such, are very conservative for application to the Property because the restrictive covenant does not allow residential development and planned future site use is commercial/industrial. As a result, the use of the upland area remediation levels for soil deeper than 2 ft (150 mg/kg average and 500 mg/kg maximum) are considered appropriate screening levels for all soil on the Property that is deeper than 1 ft BGS or covered by pavement or buildings. An arsenic screening level of 88 mg/kg, the Model Toxics Control Act (MTCA) industrial soil cleanup level for arsenic based on direct contact, is considered appropriate for soil in the upper foot of soil because of the restrictive covenant and planned future site use.

ARSENIC CONCENTRATIONS IN SOIL

Arsenic soil quality data for the former Smelter Site Lowlands Area, including the Property, was recently presented in *The Everett Smelter Site - Conditions and Data Gaps Report* (SAIC 2010) that was prepared for Ecology. Figure 9 from that report (Attachment 1) presents maximum arsenic concentrations in soil for environmental explorations conducted in the Lowlands Area. As indicated on the figure, only two locations (HP-46 and TP-30) exhibited arsenic concentrations that exceeded the screening level maximum concentration (500 mg/kg) for soil identified above. HP-46 is located in an area currently under a number of feet of clean fill and asphalt, as discussed below. TP-30 is located in the current solid waste intermodal yard at 2 ft BGS. The figure also illustrates that arsenic concentrations in soil are generally below the MTCA industrial soil cleanup level based on direct contact (88 mg/kg) south of the Riverside Business Park access road.

PREVIOUS AND PLANNED PLACEMENT OF CLEAN FILL MATERIAL

Following the Weyerhaeuser cleanup action, clean fill material has been placed on the property and additional clean fill material is planned to be imported to the property in the near future to raise grades to support redevelopment. Five known events have occurred where clean fill material was placed at the Property since Weyerhaeuser operations ceased at the Property:

- In 1991, the Weyerhaeuser Company imported approximately 100,000 cubic yards (cy) of fill material and placed the material in the 40-acre central portion of the Property, south of the current access road. Analytical results for the fill material (Attachment 2) indicate that fill material is below the MTCA Method A soil cleanup levels for unrestricted site uses.
- In 2001, the Port imported approximately 80,000 to 100,000 cy of fill material consisting of sediment removed from the Snohomish River upper settling basin. This fill material was also placed in the central portion of the Property, south of the current access road. Although analytical results are not available for this dredging event, the material is anticipated to have similar sediment quality as discussed below for the 2009 settling basin fill.
- In 2002, the Port imported fill material consisting of excavated soil from the city of Everett Grand Avenue sewer project, amended with soil from the 2001 upper settling basin fill, and placed the fill in the portion of the North Area currently owned by the Cymbaluks to raise site grades in this area, as shown on Attachment 3).
- In 2009, the Cymbaluks imported fill material from an unknown source and placed the fill material over their portion of the North Area to achieve the planned grades for their planned development. The portion of the Cymbaluk property not covered by buildings was paved with asphalt following site grading (Attachment 4).
- In 2009, the Port imported approximately 2,000 cy (approximately a 1 ft thick layer) of fill material consisting of sediment from the Snohomish River upper settling basin amended with organic material to create top soil. The fill was used in the North Area for a shoreline trail and slope stabilization to the east of the Cymbaluk property. Analytical results for the fill material (Attachment 5) indicate that fill material is below the MTCA Method A soil cleanup levels for unrestricted site use. For bank stabilization purposes, a portion of the shoreline near the trail project was armored with an approximate 1-ft thick layer of quarry spalls, amended with several inches of sandy gravel.

Future placement of clean fill material on the Port-owned 40-acre parcel is planned as part of the Property redevelopment. As part of the redevelopment, the Port plans to raise the Property grades above the Federal Emergency Management Agency (FEMA) 100-year flood plain elevation. The estimated 100-year flood plain elevations for various portions of the Property range from 12.0 to 12.4 ft NAVD88, as shown on a figure developed by Reid Middleton for the Port of Everett in 2011 (Attachment 6). The Port plans on raising Property grades a minimum of 0.5 ft above the FEMA 100-year flood plain elevation within the 40-acre parcel this year, so it was assumed for this evaluation that this would be the minimum elevation achieved throughout this portion of the Property. The Property is relatively flat and the Port plans on doing substantial additional filling in the future to create sufficient grades for

stormwater drainage. Much of the Property will ultimately be raised significantly above the 100-year flood plain elevation.

FILL MATERIAL THICKNESS ESTIMATION

The thickness of clean fill material placed on the Property since wood products manufacturing ceased at the Property was estimated by comparing pre-fill surface elevations to the current ground surface elevations, or to the planned ground surface elevations following filling to exceed the FEMA 100-year flood plain elevation, whichever is greater. The fill thickness estimates were developed for the 40-acre parcel and the Cymbaluk property. The intermodal area has not received appreciable fill since Weyerhaeuser completed its cleanup, although a large portion of the area is asphalt paved. The dredge spoils storage area has been filled and emptied of river sediment from the Snohomish River upper settling basin numerous times since the completion of the Weyerhaeuser cleanup and soil quality in this area is not of concern.

Pre-Fill Surface Elevations

Pre-fill surface elevations for the Port-owned portion of the Property were determined based on ground surface elevations measured for 32 historical explorations that were conducted by Weyerhaeuser for environmental characterization. Although many more explorations have been conducted at the Property, the ground surface elevation was not documented for most explorations. The location of the explorations where historical ground surface elevations are available is shown on Figure 3. Ground surface elevations for these locations were recorded in 1989, 1990, 1992, and 1994, and were based on NVGD29 datum. The ground surface elevations and dates for each exploration are summarized in Table 1.

Pre-fill surface elevations for the portion of the North Area owned by the Cymbaluks were estimated using existing topographic contours presented on a 2002 grading plan for that portion of the Property (Attachment 3). As shown on this grading plan, the ground surface elevation in this portion of the Property was generally 8 to 10 ft NGVD29. Attachment 3 also shows that the planned filling by the Port in 2002 was intended to raise grades in this portion of the property by 1 to 2 ft.

Planned and/or Current Ground Surface Elevation (Top of Fill Material)

The 2011 topographic survey prepared by Reid Middleton to evaluate Property grades relative to the FEMA 100-year flood plain elevations (Attachment 6) was used to estimate existing ground surface elevations, and the ground surface elevations that will be achieved to address the FEMA flood plain elevations, within the portion of the Property south of the access road. The estimated current elevation

and the estimated elevation that will be achieved to address the FEMA 100-year flood plain elevation were estimated for each of the 32 exploration locations. The existing ground surface elevations were estimated using the elevation contours on Attachment 6. The required ground surface elevations to address the FEMA 100-year floodplain elevations were estimated at each of the explorations by adding 0.5 ft to the nearest 100-year flood elevation on Attachment 6. If the current ground surface elevation was higher than the estimated 100-year flood elevation plus 0.5 ft, the current ground surface elevation was used to estimate the thickness of clean fill. Otherwise, the required elevation to raise grades 0.5 ft above the 100-year floodplain elevation was used.

The estimated ground surface elevations based on this evaluation are presented in Table 1. As noted in Table 1, the estimated current ground surface elevation is above the FEMA 100-year flood elevation plus 0.5 ft at all but one location (TP-105), so the estimated clean fill thickness is largely based on current conditions and not dependant on future planned filling.

A 2008 figure prepared by David Evans and Associates showing developed conditions for the Cymbaluk's portion of the North Area (Attachment 4) was used to estimate the existing ground surface elevations for this portion of the Property. Based on the rim elevations for stormwater catch basins and the finish floor elevation for t he building, current elevations in this area range from about 13.5 ft to more than 17 ft NAVD88.

Estimation of Clean Fill Thickness

The estimated thickness of clean fill material that overlies, or will soon overly, the historical ground surface that may be impacted by arsenic was estimated by subtracting pre-fill ground surface elevations from the current or planned ground surface elevation at each of the 32 exploration locations. However, because the pre-fill ground surface elevations and the planned ground surface elevations reference different datums, a conversion was necessary prior to calculating the thickness. All pre-fill elevations referencing NGVD29 were converted to NAVD88 by adding 3.58 ft. The results of the calculations are presented in Table 2.

As shown in Table 1, the clean fill material thickness ranges from 0 ft to 2.8 ft with an average thickness of about 1.5 ft. With the exception of one location (TP-106), all the locations where the fill thickness was less than 1 ft were near the Snohomish River shoreline. As shown on Attachment 6, the ground surface is significantly higher along most of the shoreline, which is likely the reason significant filling has not occurred in this area. Additionally, the ground surface slopes steeply toward the river, which may affect the accuracy of the estimates of the current elevation at near-shore explorations. It should also be noted that, based on Attachment 1, arsenic concentrations in soil along the shoreline and in

the vicinity of the TP-106 are all below the MTCA industrial soil cleanup level for arsenic based on direct contact.

The estimated thickness of the fill material that overlays the historical environmentally impacted soil in the North Area was estimated for the Cymbaluk property by comparing 2002 ground surface elevations (Attachment 3) to the finish elevations following development by the Cymbaluks (Attachment 4), relying on comparison of the existing catch basin rim elevations to the original 2002 ground surface. Similar to ground surface elevations for previous explorations, the pre-2002 ground surface elevations were converted from NGVD29 to NAVD88 for the fill thickness estimates. The results of the calculations are presented in Table 2. As shown in Table 2, the clean fill material thickness ranges from about 0.4 ft to 3.7 ft. Additionally, almost the entire area is now covered by either buildings or asphalt and concrete pavement.

The fill thickness for the shoreline trail area to the east of the Cymbaluk property was estimated based on the construction drawings for the trail and conversations with Port personnel. Clean fill cover was determined to be a minimum of 1 ft thick in landscape areas and consisted of the 10-ft wide asphalt-paved pathway over the remainder of the shoreline area. Clean fill thickness to the north of the Cymbaluk property was not determined, although the area largely consists of a stormwater detention pond system that contains a low-permeability liner a paved turnaround area.

CONCLUSIONS

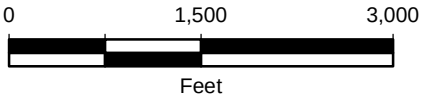
Based on the results of this evaluation, the Property is generally covered by more than 1 ft of clean fill that was placed over the historic ground surface that may contain soil affected by slag or affected fill from the former Smelter Site. Clean fill thicknesses of less than 1 ft are largely limited to the shoreline area and the intermodal area, and available analytical results indicate that arsenic concentrations in soil in areas with less than 1 ft of clean soil cover or asphalt pavement are below the MTCA industrial soil cleanup level based on direct contact. Based on the presence of more than 1 ft of clean fill over most of the Property, the low concentrations of arsenic in those areas that do not have at least 1 ft of clean soil cover, and the restrictive covenant that precludes residential development on the Property, the Property is adequately protective of human health against contact with arsenic-affected soil, with the possible exception of limited areas along the shoreline and in the intermodal area. The clean fill cover soil is also protective of human health against contact with residual contamination associated with the Weyerhaeuser East Site.

USE OF THIS DOCUMENT

This document has been prepared for the exclusive use of the Port of Everett for specific application to the Riverside Business Park. No other party is entitled to rely on the information, conclusions, and recommendations included in this document without the express written consent of the Port and Landau Associates. Further, the reuse of information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by the Port and Landau Associates, shall be at the user's sole risk. Landau Associates warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either express or implied.

REFERENCES

SAIC. 2010. *Draft Site Conditions and Data Gap Report, Everett Smelter Site – Lowland Area, Everett, Washington.* Prepared for Washington State Department of Ecology. September 29.



Data Source: ESRI 2008

Y:\Projects\147032\MapDocs\Fig1.mxd 7/5/2011

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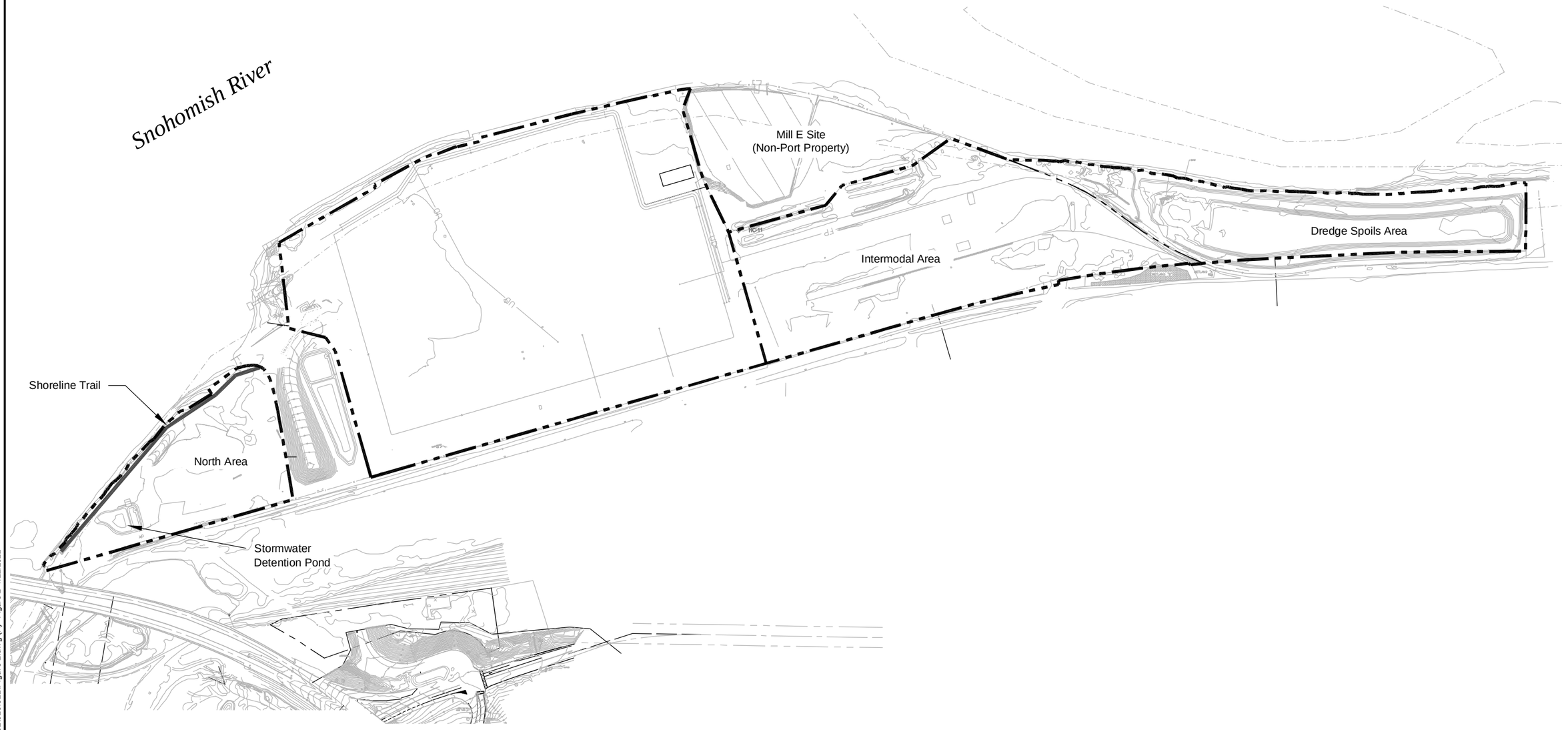
Riverside Business Park Fill Thickness Evaluation Everett, Washington	**Vicinity Map**	Figure 1



N

0 400 800

Scale in Feet

Base map source: Reid Middleton 2001

LANDAU ASSOCIATES

Riverside Business Park Fill Thickness Evaluation Everett, Washington	**Site Plan**	Figure **2**

Riverside Business Park | V:\147\032\010.011\Figure 2.dwg (A) "Figure 2" 7/21/2011

Legend

MW-102	Approximate Exploration Location and Label
2.42	Estimated Clean Fill Thickness (ft)

Base map source: Reid Middleton 2001

LANDAU ASSOCIATES

Riverside Business Park Fill Thickness Evaluation Everett, Washington	**Clean Fill Thickness**	Figure 3

Riverside Business Park | V:\1477032\010.011\Figure 3.dwg (A) "Figure 3" 7/15/2011

TABLE 1
CLEAN FILL THICKNESS EVALUATION
RIVERSIDE BUSINESS PARK

Boring	Estimate Ground Surface Elevation Prior to Fill Material (ft)	Estimate Ground Surface Elevation Prior to Fill Material (ft)	Estimated Current Ground Surface Elevation (ft)	LOT #	FEMA Base Flood Elevation (ft)	FEMA + 0.5	MAX (Current or FEMA+.5)	Current or Planned Fill Thickness (ft)
	NVGD29	*NAVD88*	*NAVD88*		*NAVD88*	*NAVD88*	*NAVD88*	
HC-4	7.63	11.21	13	3	12.4	12.9	13	1.79
HC-5	6.68	10.26	13	3	12.4	12.9	13	2.74
HC-6	7.83	11.41	13	3	12.4	12.9	13	1.59
HC-10	7.82	11.40	11	3	12.4	12.9	12.9	1.5
HC-10D	8.07	11.65		3	12.4	12.9	12.9	1.25
HC-11	6.58	10.16	13	6	12.4	12.9	13	2.84
HC-11D	6.63	10.21	13	6	12.4	12.9	13	2.79
HC-17	7.40	10.98	13	6	12.4	12.9	13	2.02
HC-18	7.97	11.55	8	3	12.4	12.9	12.9	1.35
HC-19	8.17	11.75	11.5	3	12.4	12.9	12.9	1.15
HC-20	7.84	11.42	12	3	12.4	12.9	12.9	1.48
MW-100D	9.60	13.18	14	3	12.4	12.9	14	0.82
MW-100S	9.70	13.28	14	3	12.4	12.9	14	0.72
MW-101S	9.00	12.58	13	3	12.4	12.9	13	0.42
MW-102S	9.00	12.58	15	2	12.1	12.6	15	2.42
MW-103D	11.00	14.58	15	2	12.1	12.6	15	0.42
MW-103S	11.00	14.58	15	2	12.1	12.6	15	0.42
MW-104S	12.00	15.58	14	2	12.1	12.6	14	0
MW-105D	9.70	13.28	13	2	12.1	12.6	13	0
MW-105S	9.40	12.98	13	2	12.1	12.6	13	0.02
MW-107S(2)	7.90	11.48	13	4	12	12.5	13	1.52
MW-108S	8.40	11.98	13	4	12	12.5	13	1.02
TP-102	7.10	10.68	20	4	12	12.5	20	9.32
TP-103	10.90	14.48	16	2	12.1	12.6	16	1.52
TP-104	10.20	13.78	14	2	12.1	12.6	14	0.22
TP-105	8.20	11.78	12	2	12.1	12.6	12.6	0.82
TP-106	9.80	13.38	13	2	12.1	12.6	13	0
TP-108	7.50	11.08	13	2	12.1	12.6	13	1.92
TP-109	11.40	14.98	14	2	12.1	12.6	14	0
TP-207	7.10	10.68	13	4	12	12.5	13	2.32
TP-208	7.30	10.88	13	5	12.4	12.9	13	2.12
							Average Cover Thickness =>	**1.5**

Date of previous ground surface elevations are as follows: **HC-4 through HC-20 = June 1989**
MW-100D through MW-108S = Dec 1992, except MW-107S(2) = 1994
TP-102 through TP-208 = June 1990

TABLE 2
CLEAN FILL ESTIMATE FOR
CYMBALUK PROPERTY

Catch Basin (Attachment 6)	Previous Ground Surface Elevation - 2002 (ft)	Estimate Ground Surface Elevation Prior to Fill Material (ft)	Current Ground Surface Elevation (ft)	Estimated Clean Fill Thickness (ft)
	NVGD29	NAVD88	NAVD88	
CB-2	9.00	12.58	14.18	1.60
CB-3	8.00	11.58	15.24	3.66
CB-4	8.00	11.58	15.09	3.51
CB-7	10.00	13.58	14.85	1.27
CB-8	11.00	14.58	14.95	0.37
CB-9	10.00	13.58	15.24	1.66
CB-10	10.00	13.58	15.46	1.88
			Average	**2.0**

ATTACHMENT 1

Figure 9 Maximum Arsenic Concentrations in Soil (SAIC 2010)

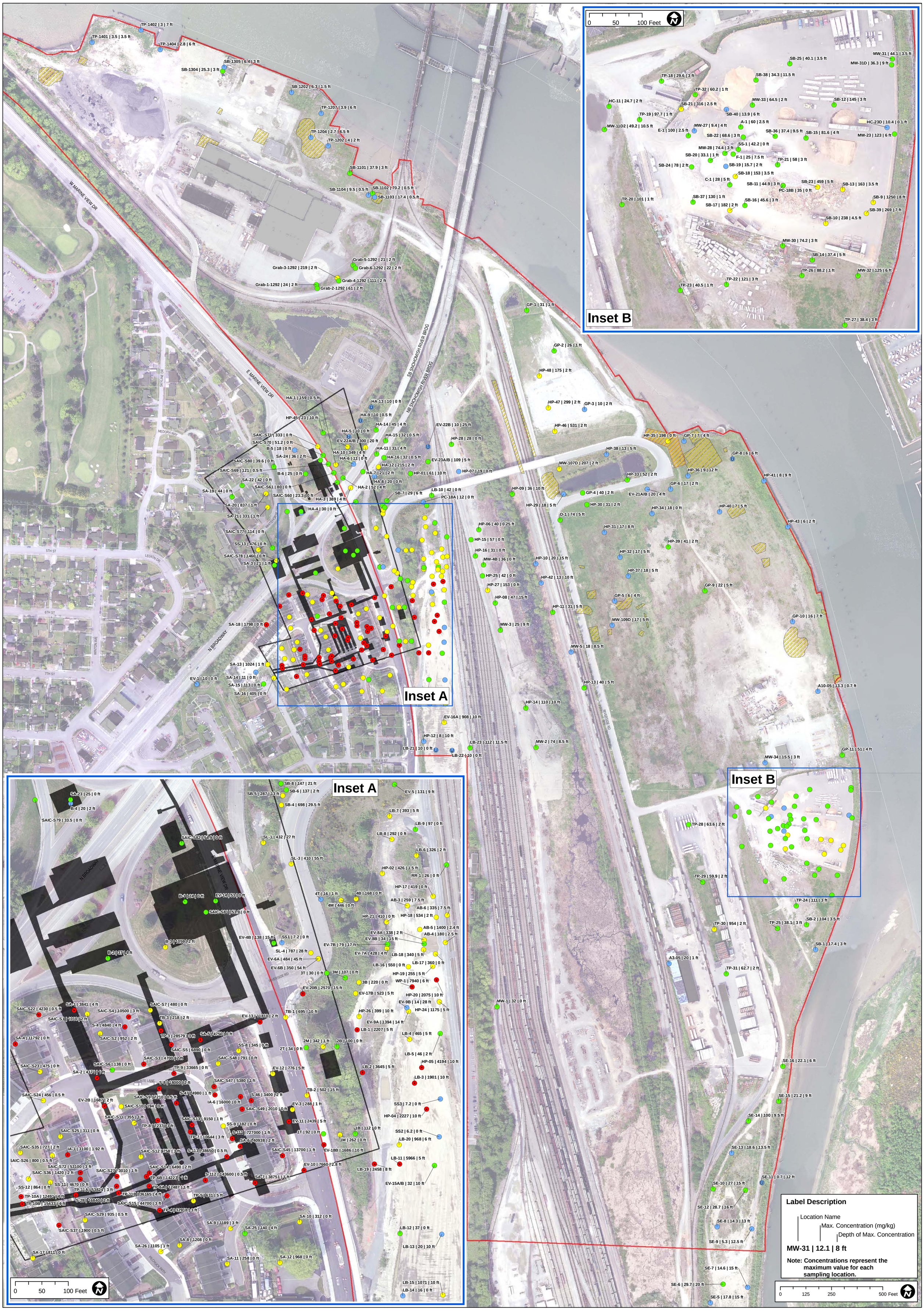


Figure 9. Maximum Arsenic Concentrations in Soil

SAIC From Science to Solutions

Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet
Prepared By: apw
File: Figure_09-MaximumArsenic-D.mxd
Illustrative purposes only.

DEPARTMENT OF ECOLOGY State of Washington

ATTACHMENT 2

Weyerhaeuser 1991 Fill Analytical Data

NORTH CREEK ANALYTICAL
18939 120th Avenue N.E., Suite 101 • Bothell, WA 98011-2558
Phone (206) 481-9200 • FAX (206) 485-2992

SEACOR	Client Project ID:	Ames Const.	Sampled:	Oct 18, 19
5330 112th Avenue N.E., #104	Sample Descript:	Soil SP-1 @2.0'	Received:	Oct 18, 19
Bellevue, WA 98004	Analysis Method:	EPA 5030/8010	Analyzed:	Oct 24, 19
Attention: George Ehlers	Lab Number:	110-0754	Reported:	Oct 28, 19

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/kg (ppb)	Sample Results µg/kg (ppb)
Bromodichloromethane	20	N.D.
Bromoform	20	N.D.
Bromomethane	20	N.D.
Carbon tetrachloride	20	N.D.
Chlorobenzene	20	N.D.
Chloroethane	100	N.D.
2-Chloroethylvinyl ether	20	N.D.
Chloroform	20	N.D.
Chloromethane	20	N.D.
Dibromochloromethane	20	N.D.
1,2-Dichlorobenzene	40	N.D.
1,3-Dichlorobenzene	40	N.D.
1,4-Dichlorobenzene	40	N.D.
1,1-Dichloroethane	20	N.D.
1,2-Dichloroethane	20	N.D.
1,1-Dichloroethene	20	N.D.
Total 1,2-Dichloroethene	20	N.D.
1,2-Dichloropropane	20	N.D.
cis-1,3-Dichloropropene	20	N.D.
trans-1,3-Dichloropropene	20	N.D.
Methylene chloride	100	N.D.
1,1,2,2-Tetrachloroethane	20	N.D.
Tetrachloroethene	20	N.D.
1,1,1-Trichloroethane	20	N.D.
1,1,2-Trichloroethane	20	N.D.
Trichloroethene	20	N.D.
Trichlorofluoromethane	20	N.D.
Vinyl chloride	40	N.D.

Surrogate Recovery, %: 88
Analytes reported as N.D. were not present above the stated limit of detection.

NORTH CREEK ANALYTICAL

NORTH CREEK ANALYTICAL
18939 120th Avenue N.E., Suite 101 • Bothell, WA 98011-2668
Phone (206) 481-6200 • FAX (206) 485-2992

SEACOR	Client Project ID:	Ames Const.	Sampled:	Oct 16, 199
330 112th Avenue N.E., #104	Sample Descript:	Soil SP-2 @3.0'	Received:	Oct 18, 199
Bellevue, WA 98004	Analysis Method:	EPA 5030/8010	Analyzed:	Oct 24, 199
Attention: George Ehlers	Lab Number:	110-0755	Reported:	Oct 28, 199

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/kg (ppb)	Sample Results µg/kg (ppb)
Bromodichloromethane	20	N.D.
Bromoform	20	N.D.
Bromomethane	20	N.D.
Carbon tetrachloride	20	N.D.
Chlorobenzene	20	N.D.
Chloroethane	100	N.D.
2-Chloroethylvinyl ether	20	N.D.
Chloroform	20	N.D.
Chloromethane	20	N.D.
Dibromochloromethane	20	N.D.
1,2-Dichlorobenzene	40	N.D.
1,3-Dichlorobenzene	40	N.D.
1,4-Dichlorobenzene	40	N.D.
1,1-Dichloroethane	20	N.D.
1,2-Dichloroethane	20	N.D.
1,1-Dichloroethene	20	N.D.
Total 1,2-Dichloroethene	20	N.D.
1,2-Dichloropropane	20	N.D.
cis-1,3-Dichloropropene	20	N.D.
trans-1,3-Dichloropropene	20	N.D.
Methylene chloride	100	N.D.
1,1,2,2-Tetrachloroethane	20	N.D.
Tetrachloroethene	20	N.D.
1,1,1-Trichloroethane	20	N.D.
1,1,2-Trichloroethane	20	N.D.
Trichloroethene	20	N.D.
Trichlorofluoromethane	20	N.D.
Vinyl chloride	40	N.D.

Surrogate Recovery, %: 82
Analytes reported as N.D. were not present above the stated limit of detection.

NORTH CREEK ANALYTICAL

NORTH CREEK ANALYTICAL

18939 120th Avenue N.E., Suite 101 • Bothell, WA 98011-2988
Phone (206) 481-9200 • FAX (206) 485-2992

SEACOR	Client Project ID:	Ames Const.		
330 112th Avenue N.E., #104	Sample Descript:	Method Blank		
Bellevue, WA 98004	Analysis Method:	EPA 5030/8010	Analyzed:	Oct 24, 1991
Attention: George Ehlers	Lab Number:	BLK102491	Reported:	Oct 28, 1991

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/kg (ppb)	Sample Results µg/kg (ppb)
Bromodichloromethane	20	N.D.
Bromoform	20	N.D.
Bromomethane	20	N.D.
Carbon tetrachloride	20	N.D.
Chlorobenzene	20	N.D.
Chloroethane	100	N.D.
2-Chloroethylvinyl ether	20	N.D.
Chloroform	20	N.D.
Chloromethane	20	N.D.
Dibromochloromethane	20	N.D.
1,2-Dichlorobenzene	40	N.D.
1,3-Dichlorobenzene	40	N.D.
1,4-Dichlorobenzene	40	N.D.
1,1-Dichloroethane	20	N.D.
1,2-Dichloroethane	20	N.D.
1,1-Dichloroethene	20	N.D.
Total 1,2-Dichloroethene	20	N.D.
1,2-Dichloropropane	20	N.D.
cis-1,3-Dichloropropene	20	N.D.
trans-1,3-Dichloropropene	20	N.D.
Methylene chloride	100	N.D.
1,1,2,2-Tetrachloroethane	20	N.D.
Tetrachloroethene	20	N.D.
1,1,1-Trichloroethane	20	N.D.
1,1,2-Trichloroethane	20	N.D.
Trichloroethene	20	N.D.
Trichlorofluoromethane	20	N.D.
Vinyl chloride	40	N.D.

Surrogate Recovery, %: 86
Analytes reported as N.D. were not present above the stated limit of detection.

NORTH CREEK ANALYTICAL

NORTH CREEK ANALYTICAL

18939 120th Avenue N.E., Suite 101 • Bothell, WA 98011-2569
Phone (206) 481-6200 • FAX (206) 485-2992

SEACOR	Client Project ID:	Ames Const.	Sampled:	Oct 16, 1991
330 112th Avenue N.E., #104	Sample Descript:	SP-1 @2.0'	Received:	Oct 18, 1991
Bellevue, WA 98004	Matrix:	Soil	Digested:	Oct 22, 1991
Attention: George Ehlers	Sample Number:	110-0754	Analyzed:	Oct 25, 1991
			Reported:	Oct 28, 1991

E.P.A. PRIORITY METALS

Analyte	Detection Limit mg/kg (ppm)	Sample Results mg/kg (ppm)
Antimony	25	N.D.
12 Arsenic	0.050	2
Beryllium	0.50	N.D.
1.3 Cadmium	0.50	1
73 Chromium	1.0	72
43 Copper	2.5	43
14 Lead	5.0	14
.041 Mercury	0.025	0.04
Nickel	20	N.D.
1.2 Selenium	0.25	2
1.5 Silver	0.50	1.5
Thallium	0.050	N.D.
83 Zinc	1.0	83

1.500 ppm in June 24, 1990 Draft MTCA cleanup levels

Analytes reported as N.D. were not present above the stated limit of detection.

NORTH CREEK ANALYTICAL

NORTH CREEK ANALYTICAL

19639 120th Avenue N.E., Suite 101 • Bothell, WA 98011-2529
Phone (206) 481-9200 • FAX (206) 485-2992

SEACOR	Client Project ID:	Ames Const.	Sampled:	Oct 16, 1991
330 112th Avenue N.E., #104	Sample Descript:	SP-2 @3.0'	Received:	Oct 18, 1991
Bellevue, WA 98004	Matrix:	Soil	Digested:	Oct 22, 1991
Attention: George Ehlers	Sample Number:	110-0755	Analyzed:	Oct 25, 1991
			Reported:	Oct 28, 1991

E.P.A. PRIORITY METALS

Analyte	Detection Limit mg/kg (ppm)	Sample Results mg/kg (ppm)
Antimony	25	N.D.
8.6 Arsenic	0.050	8.6
Beryllium	0.50	N.D.
.60 Cadmium	0.50	0.60
38 Chromium	1.0	38
18. Copper	2.5	18
11 Lead	2.5	11
.061 Mercury	0.025	0.061
Nickel	20	N.D.
1.6 Selenium	0.25	1.6
.60 Silver	0.50	0.60
Thallium	0.050	N.D.
43 Zinc	5.0	43

Analytes reported as N.D. were not present above the stated limit of detection.

NORTH CREEK ANALYTICAL

NORTH CREEK ANALYTICAL

18939 120th Avenue N.E., Suite 101 • Bothell, WA 98011-2569
Phone (206) 481-9200 • FAX (206) 485-2992

SEACOR	Client Project ID:	Ames Const.	
330 112th Avenue N.E., #104	Sample Descript:	Method Blank	
Bellevue, WA 98004	Matrix:	Water	Digested: Oct 22, 1991
Attention: George Ehlers	Sample Number:	BLK102291	Analyzed: Oct 25, 1991
			Reported: Oct 28, 1991

E.P.A. PRIORITY METALS

Analyte	Detection Limit µg/L	Sample Results µg/L
Antimony	500	N.D.
Arsenic	1.0	N.D.
Beryllium	10	N.D.
Cadmium	10	N.D.
Chromium	200	N.D.
Copper	50	N.D.
Lead	150	N.D.
Mercury	0.50	N.D.
Nickel	400	N.D.
Selenium	5.0	N.D.
Silver	10	N.D.
Thallium	1.0	N.D.
Zinc	20	N.D.

Analytes reported as N.D. were not present above the stated limit of detection.

NORTH CREEK ANALYTICAL

Scot Cocanour

NORTH CREEK ANALYTICAL

18939 120th Avenue N.E., Suite 101 • Bothell, WA 98011-2569
Phone (206) 481-9200 • FAX (206) 486-2992

SEACOR	Client Project ID:	Ames Const.	Sampled:	Oct 18, 1991
330 112th Avenue N.E., #104	Matrix Descript:	Soil	Received:	Oct 18, 1991
Bellevue, WA 98004	Analysis Method:	EPA 418.1 Modified (I.R. w/clean-up)	Extracted:	Oct 21, 1991
Attention: George Ehlers	First Sample #:	110-0754	Analyzed:	Oct 21, 1991
			Reported:	Oct 28, 1991

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS (WTPH-418.1)

Sample Number	Sample Description	Petroleum Oil mg/kg (ppm)
110-0754	SP-1 @2.0'	14
110-0755	SP-2 @3.0'	29
BLK102191	Method Blank	N.D.

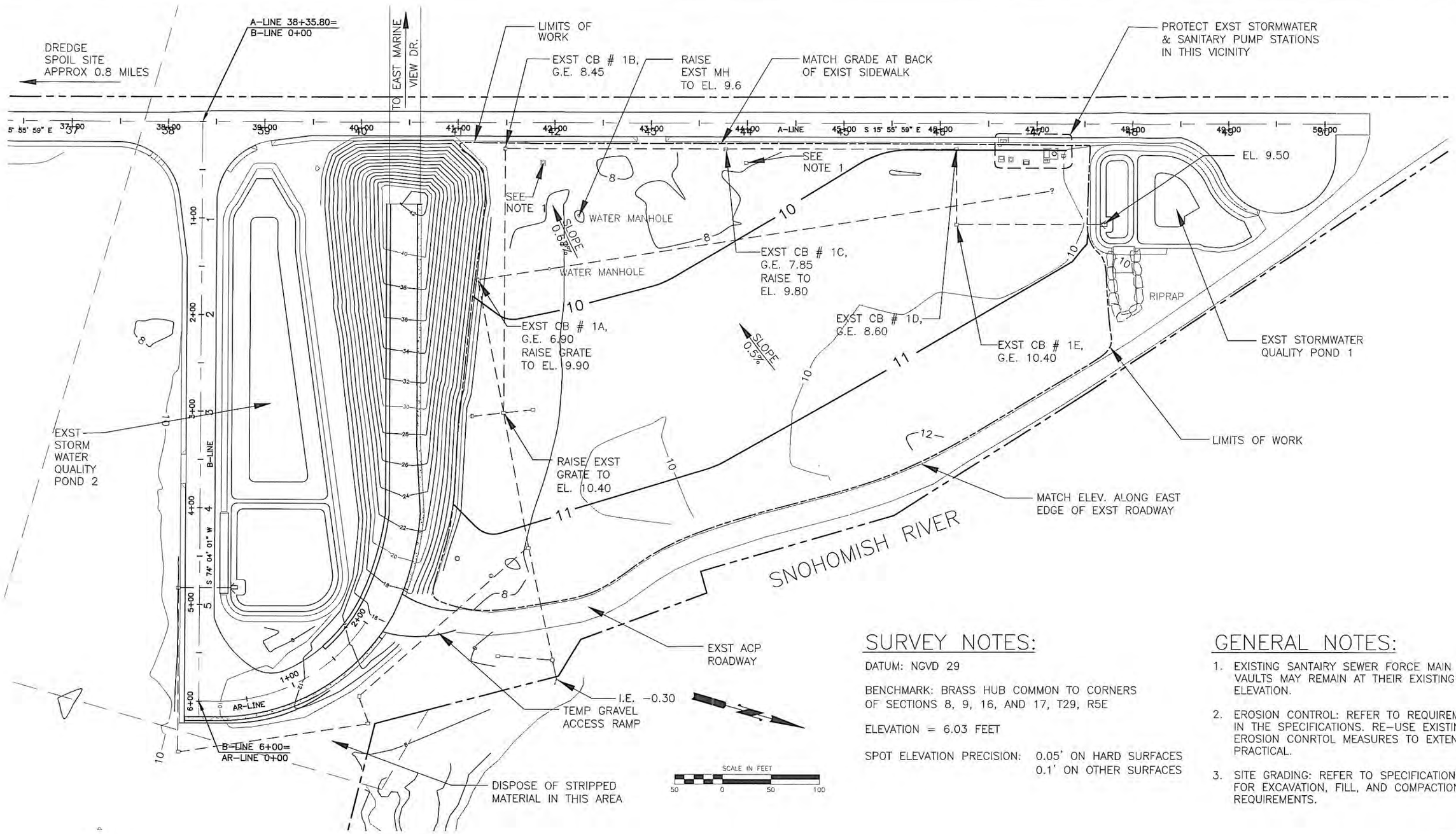
Detection Limits:	10

Analytes reported as N.D. were not present above the stated limit of detection.

NORTH CREEK ANALYTICAL

ATTACHMENT 3

2002 RBP North Site Grading Plan



SURVEY NOTES:

DATUM: NGVD 29

BENCHMARK: BRASS HUB COMMON TO CORNERS OF SECTIONS 8, 9, 16, AND 17, T29, R5E

ELEVATION = 6.03 FEET

SPOT ELEVATION PRECISION: 0.05' ON HARD SURFACES
0.1' ON OTHER SURFACES

GENERAL NOTES:

1. EXISTING SANTAIRY SEWER FORCE MAIN TAP VAULTS MAY REMAIN AT THEIR EXISTING TOP ELEVATION.
2. EROSION CONTROL: REFER TO REQUIREMENTS IN THE SPECIFICATIONS. RE–USE EXISTING EROSION CONRTOL MEASURES TO EXTENT PRACTICAL.
3. SITE GRADING: REFER TO SPECIFICATIONS FOR EXCAVATION, FILL, AND COMPACTION REQUIREMENTS.

FULL SIZE
11 X 17
DRAWING

Port of EVERETT
P.O. BOX 538
EVERETT, WA 98206
(425) 259–3164

NO.	DATE	BY	REVISION	NO.	DATE	BY	REVISION

PROJECT ENGINEER: J. KLEKOTKA	SCALE: 1"=100'
DESIGNED BY:	DATE: 7/2/02
DRAWN BY: D. STAR	CHECKED BY:
APPROVED BY:	

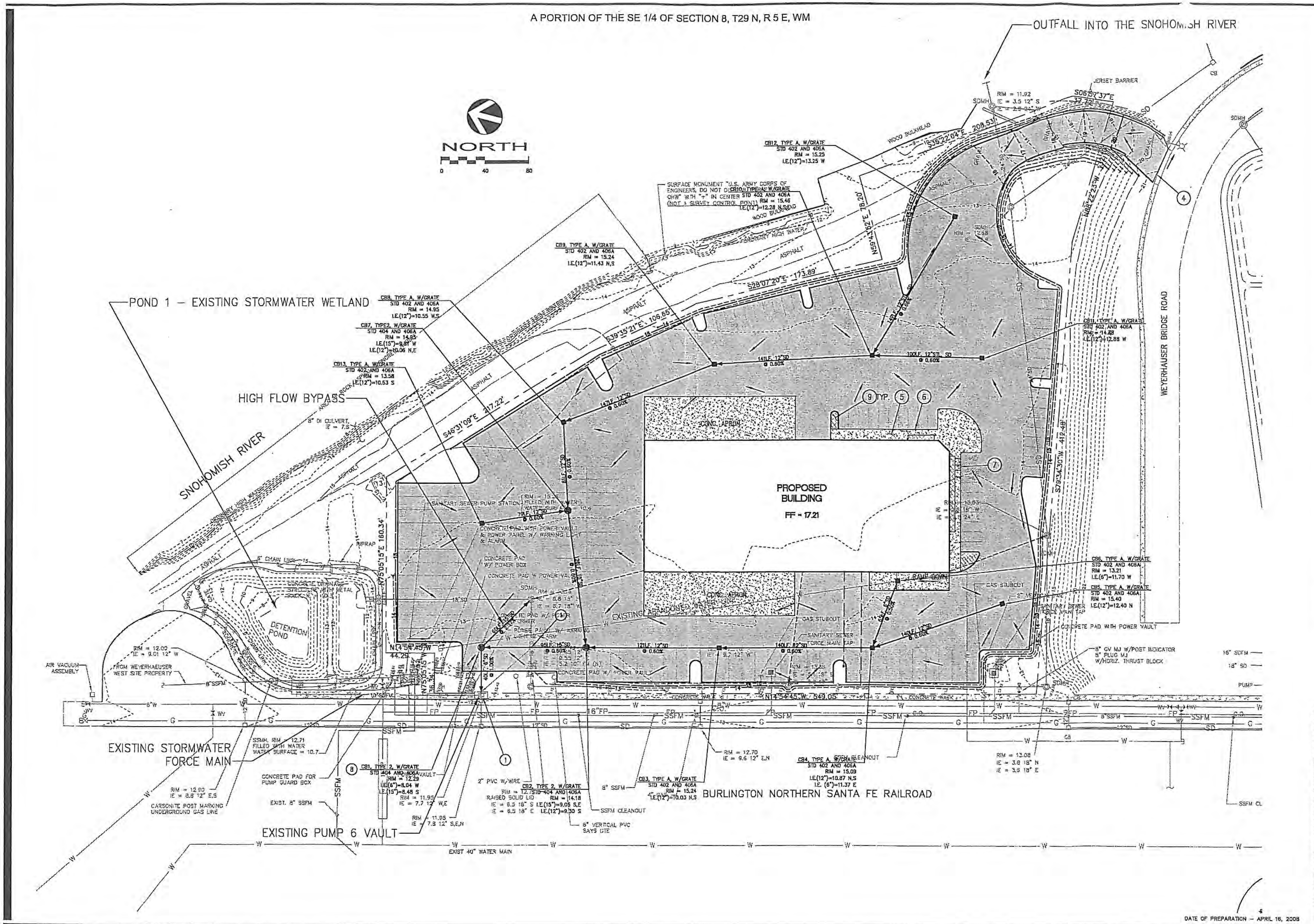
PORT OF EVERETT

RIVERSIDE BUISNESS PARK
NORTH SITE GRADING
GRADING PLAN & NOTES

DWG. NO.	1
CIP NO.	3–0–001–01
PROJECT NO.	PD–RS–2002–05
SHEET NO.	1 OF 1

ATTACHMENT 4

Cymbaluk Property Developed Conditions Map
(David Evans and Associates)



DEVELOPED CONDITIONS MAP

CYMBALUK TRUCK DEALERSHIP

EVERETT, WASHINGTON

DAVID EVANS AND ASSOCIATES INC.
1620 W. Marine View Drive, Suite 200
Everett Washington 98201
Phone: 425.259.4099

REVISIONS: APPD.

DATE: 2008
DESIGN: DAF
DRAWN: MMN
CHECKED:
REVISION NUMBER:

SCALE: 1" = 40'

PROJECT NUMBER:
OEVT0122-0122

DRAWING FILE:

SHEET NO.

FIGURE 3
OF 3

ATTACHMENT 5

2009 Upper Settling Basin Fill Analytical Data

CENWS-OD-TS-DM

MEMORANDUM FOR: RECORD

July 7, 2004
Updated October 1, 2004

SUBJECT: DETERMINATION ON THE SUITABILITY OF PROPOSED FEDERAL OPERATIONS AND MAINTENANCE DREDGED MATERIAL FROM THE **UPPER SNOHOMISH RIVER SETTLING BASIN AND UPSTREAM NAVIGATION CHANNEL (Reference: CENWS OD-TS-NS-22)** EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT (CWA) FOR OPEN-WATER DISPOSAL AT THE PORT GARDNER NONDISPERSIVE DISPOSAL SITE AND/OR FOR BENEFICIAL USE.

1. **Introduction**. The following summary reflects the consensus determination of the Dredged Material Management Program (DMMP) Agencies (U.S. Army Corps of Engineers, Department of Ecology, Department of Natural Resources, and the Environmental Protection Agency) with jurisdiction on dredging and disposal on the suitability of approximately 800,000 cy of sediment from the upper settling basin and adjacent navigational channel over the next five dredging seasons. Approximately 200,000 cy is scheduled for dredging and beneficial use in 2005, with the remainder dredged in two or three of the following four years (alternately with dredging in the downstream basin). This federal maintenance material from the **Upper Snohomish Navigation Channel** in Everett, Washington is proposed to be disposed at the Port Gardner DMMP unconfined open-water disposal site or at an approved beneficial use site.

This determination of suitability for open-water disposal is based on the acceptability of the sampling conducted by Seattle District, Corps of Engineers contractors and subcontractors in March 2004. All relevant test data from this sampling event is contained in a report submitted by Anchor Environmental dated June 2004. These data were considered sufficient and acceptable for decision-making by the agencies.

Table 1. Project Summary.

Time of proposed dredging	October 16 – February 14, as needed, throughout the 5-year public notice period (FY 2005 – 2009)
Proposed disposal sites	Port Gardner non-dispersive disposal site, or beneficial use
Sediment ranking	Low moderate, homogenous
Project last dredged	January 2002 (170,000 cy; upland beneficial use disposal)

Table 2. Regulatory Tracking Table.

Dredging Year	2005
SAP received	February 9, 2004
SAP Approval date	March 26, 2004
Sampling date(s)	March 29 - 31, 2004
Data report submittal date	June 15, 2004
DAIS Tracking # (DY05 Project)	EVEUS-1-A-F-194
Recency Determination Date: LM Concern (5-7 years)	March 2009 – 2011

2. **Background**. As part of the federal Snohomish River navigation channel the Upper settling basin provides a wide, deep spot in the river for sediments moving downstream to settle out. In general, settling basins allow navigation maintenance dredging to be concentrated in given areas, reducing the dredging footprint while continuing to provide depths necessary for navigation. Sediments in the Upper Snohomish Settling Basin are considered "homogenous" as they are dredged regularly and accumulate predictably on a seasonal basis.

The area proposed for maintenance dredging has not been previously characterized by the DMMP, as no previously dredged material has been disposed in open water. Dredging sediments have been used regularly for upland beneficial uses by local entities. Dredging was last performed in 2002 with disposal in a contained upland beneficial use site.

3. **Sampling**. The area proposed for dredging was ranked "low-moderate" by the DMMP agencies, based on results from downstream testing and a lack of upstream contaminant sources. For low-moderate homogenous material, the DMMP requires a minimum of one field sample for each 8,000 cy and one laboratory analysis for each 40,000 cy. For the current characterization, 21 core samples were combined into 12 composites for analysis. Each analysis represented one DMMU of between 27,000 and 38,000 cy of material (Table 3). Each DMMU also met the requirement of dredging independence, such that the area represented by each sample could be dredged independently from surrounding DMMUs should they have different suitabilities for open water disposal or beneficial use.

Sampling took place on March 29 – 31, 2004 aboard the Corps vessel *Puget*. The approved SAP was followed. Twenty-four core samples were taken with a Vibracore sampler and processed on board the vessel. The sampling equipment was unable to penetrate to the full depth of the dredge prism (see Table 3), so all sample material from a given DMMU came from the upper portion of the DMMU. Material from each core was composited with other cores from a given DMMU. No Z-samples were collected for any of the samples due to core the depth of the sampling prism.

Table 3. Sampling Details, Upper Snohomish Settling Basin, DY 2005.

PARAMETER	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
Sampling Depth Interval	0-4 ft	0-4 ft	4-11.5 ft	4-9.5 ft	4-11 ft	4-10.5 ft	4-10.5 ft	4-9 ft	4-10 ft	4-10 ft	4-11.5 ft	4-9.2 ft
DMMO Depth Interval (to bottom of 2' overdepth)			18	16.5	17.6	19	24.4	23.2	36.7	35.8	35.5	34.3
Volume, cubic yards	27,500	27,300	37,300	37,900	37,500	37,800	37,900	37,700	38,000	38,000	36,800	36,700

4. **Conventional and Chemical Analysis**. The Agencies' approved sampling and analysis plan was followed. Conventional (Table 4) and chemical analyses (Appendix A) were performed by Columbia Analytical Services (CAS) of Kelso, Washington. Chemical analysis results demonstrated that there were no detected or non-detected SL exceedances of any DMMP chemical of concern in any sample. All data complied with general QA/QC requirements of the DMMP (Table 5) and were acceptable as qualified by the laboratory.

Because this material has been proposed for use as capping material, it was also tested for Atterberg limits--a test used to estimate strength and settling characteristics. All material tested was found to be "non-plastic" by the Atterberg limit testing.

Table 4. Conventional Results, Upper Snohomish Settling Basin, DY 2004.

PARAMETER		S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
Grain Size	Gravel	1.40	1.86	0.51	0.72	0.73	1.65	2.45	8.49	6.10	0.74	0.50	1.23
	Total Sand	89.7	94.4	96.3	82.3	71.3	81.8	90.4	78.8	90.8	93.5	96.9	97.1
	Silt	3.11	1.04	2.78	11.00	21.70	11.20	4.05	7.77	1.29	2.90	0.42	0.52
	Clay	1.35	0.78	1.94	6.21	5.47	2.66	1.73	2.51	0.70	1.64	0.64	0.60
	Fines (silt + clay)	**4.46**	**1.82**	**4.72**	**17.21**	**27.17**	**13.86**	**5.78**	**10.28**	**1.99**	**4.54**	**1.06**	**1.12**
Total Organic Carbon (%)		0.45	0.28	0.61	0.99	1.30	2.71	3.00	5.39	1.22	0.98	0.27	0.25
Total solids (%)		75.4	78.3	76.4	73.6	72.3	65.3	72.2	56.6	73.4	72.4	75.8	79.2
Total volatile solids (%)		2.06	1.53	2.3	2.81	4.42	8.05	5.32	10.6	3.97	3.18	1.77	1.29
N-Ammonia (mg/kg)		11.8	2.3	5.5	25.3	36.1	66.4	14.8	46.9	2.6	2.9	2.0	1.1
Sulfide (mg/kg)		23.7	17.8	10.3	86.3	20.3	30.9	189	272	1.3	33.1	38.6	1.8

Table 5. QA/QC Warning and Action Limits (DMMP Program).

	QA Element	Warning Limits	Action Limits
Precision	Metals	None	20% RPD or COV
	Organics	35% RPD or COV	50% COV or a factor of 2 for duplicates
Matrix Spikes	Metals	None	75-125% recovery
	Organics: Volatiles Semivolatiles and Pesticides	70-150% 50-150%	None (however, zero percent recovery may be cause for data rejection)
Reference Materials	Metals	None	95% CI if specified for a particular CRM; 80-120% recovery if not.
	Organics	None	95% CI for CRMs. No action limit for uncertified RMs.
Surrogate Spikes	Volatiles	85% minimum recovery	EPA CLP chemical-specific recovery limits
	Pesticides	60% minimum recovery	
	Semi-volatiles	50% minimum recovery	

5. **Comparison to SMS Guidelines.** All results of the chemical analyses were organic carbon normalized, if necessary, and compared to Washington State Sediment Management Standards (Appendix B). As shown in Table 4, there was a wide variation in total organic carbon (TOC) content in the twelve analyzed samples. Samples with a TOC content of greater than 0.5% but less than 3.0% were carbon normalized (Appendix B, Table 1). Samples with TOC outside these ranges typically have their dry weight concentrations compared with dry weight Apparent Effects thresholds Appendix B, Table 2).

The analyses showed that levels of all detected and most undetected contaminants were below the Sediment Quality Standards (SQS) set by Washington State. One chemical (hexachlorobenzene) was not detected, but the reporting limit of the carbon-normalized value (0.46 mg/kg-OC) exceeded the SMS guidelines (0.38 mg/kg-OC) in one DMMU (C3). Though the TOC content of this DMMU exceeded 0.5%, it still had very little TOC (0.61%) and thus most likely showed this elevated non-detect for reasons related to the low TOC (see Michelson and Bragdon-Cook 1993). The DMMP agencies agreed that there is no reason to believe that this non-detected chemical is actually present at any level of concern. Thus, this analysis indicates that all sediments tested are suitable for beneficial uses under Washington State Sediment Management Standards, including use as cap material.

6. **Suitability.** This memorandum documents the suitability of proposed dredged sediments from the upper Snohomish settling basin and adjacent navigation channel for disposal at a DMMP open-water disposal site, or at an approved beneficial use site. 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 concluded that all **430,000 cy are suitable** for open water disposal. This determination of suitability does not preclude the consideration of this material for an appropriate beneficial use. It 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.

7. **References.**

Anchor Environmental 2004. Data Report: Sediment characterization results for the Upper Snohomish River settling basin and upstream navigation channel. Prepared for the Seattle District, US Army Corps of Engineers, June 2004.

Michelson, T and Bragdon-Cook, K 1993. Technical Information Memorandum: Organic Carbon Normalization of Sediment Data. Washington State Dept. of Ecology.

Concur:

11/17/04
Date

Lauran Cole Warner, Seattle District Corps of Engineers

18 Nov 2004
Date

John Malek, Environmental Protection Agency

11/22/04
Date

Tom Gries, Washington Department of Ecology

11/17/2004
Date

Peter Leon, Washington Department of Natural Resources

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Sally Thomas, EPA
DMMO file

APPENDIX A

Detected chemicals of concern compared with DMMP guidelines for the Upper Snohomish Turning Basin, DY 05.

Upper Snohomish DY04 DMMP chemistry	SL	BT	ML	Surface		Subsurface (progressing upstream)									
				1 (downstream)	2 (upstream)	3	4	5	6	7	8	9	10	11	12
Metals (mg/kg)															
Antimony	150	--	200	0.08N	0.08N	0.07N	0.12N	0.16N	0.17N	0.13N	0.15N	0.13N	0.09N	0.24N	0.10N
Arsenic	57	507.1	700	5.9	5.7	5.5	6.6	7.3	7.2	6.5	7.7	5.0	5.7	5.1	5.9
Cadmium	5.1	--	14	0.10	0.10	0.08	0.15	0.14	0.16	0.15	0.24	0.09	0.13	0.08	0.09
Chromium	--	267	--	18.3	17.2	20.4	26.9	29.0	22.3	21.1	21.9	17.8	17.9	22.5	18.0
Copper	390	--	1300	20.2	16.9	16.9	24.8	28.4	26.0	24.4	26.7	17.2	18.9	18.2	18.0
Lead	450	--	1200	4.24	3.60	3.96	6.30	8.32	6.42	4.74	5.34	3.81	3.94	3.45	3.78
Mercury	0.41	1.5	2.3	0.02	0.02J	0.02	0.04	0.05	0.04	0.02	0.04	0.03	0.02	0.01J	0.02
Nickel	140	370	370	21.5	21.1	21.3	26.5	29.1	25.1	23.4	23.5	20.5	20.6	22.1	22.0
Selenium	--	3	--			0.3J			0.3J	0.4J	0.4J		0.3J		
Silver	6.1	6.1	8.4	0.05	0.04	0.03	0.10	0.10	0.08	0.06	0.08	0.04	0.04	0.05	0.04
Zinc	410	--	3800	37.5	36.8	34.4	43.4	44.7	42.1	41.3	102	36.0	37.7	39.7	37.3
LPAHs (µg/kg-DW)															
Total LPAH	**5200**	**--**	**29000**	**15J**	**2J**	**6J**	**46J**	**55J**	**444J**	**43J**	**67J**	**18J**	**21.3J**	**16.6J**	**0**
Naphthalene	2100	--	2400	3.2J	2.3J	2.5J	9.1J	14	370	5.0J	23	4.9J	7.5J	6.2J	
Acenaphthylene	560	--	1300				6.8J	3.4J	2.3J						
Acenaphthene	500	--	2000	1.6J			4.7J	6.8J	14	4.7J	9.4J	1.7J	2.0J	1.8J	
Fluorene	540	--	3600				4.0J	6.0J	12	5.5J	8.8J	2.4J			
Phenanthrene	1500	--	21000	6.4J		1.9J	13	16	37	18	22	6.9J	7.8J	6.3J	
Anthracene	960	--	13000	3.5J		1.9J	7.9J	8.8J	8.4J	9.5J	3.4J	2.1J	4.0J	2.3J	
2-Methylnaphthalene	670	--	1900				4.8J	5.8J	7.3J	2.2J	4.2J		1.8J	2.0J	
HPAHs (µg/kg-DW)															
Total HPAH	**12000**	**--**	**69000**	**11.6J**		**17J**	**225J**	**89J**	**200J**	**42J**	**32J**	**16J**	**17J**	**25J**	**10J**
Fluoranthene	1700	4600	30000	4.8J		7.9J	33	20	33	17	13	4.6J	6.5J	7.5J	
Pyrene	2600	11980	16000	4.4J		6.2J	40	19	30	12	10	3.6J	5.5J	8.2J	
Benzo(a)anthracene	1300	--	5100				26	9.4J	25	4.2J		3.0J	2.1J	5.0J	
Chrysene	1400	--	21000	2.4J		2.4J	30	12	29	6.5J	4.6J	4.4J	2.8J	4.3J	
Benzo(b)fluoranthene	--	--	--				13	6J	17						
Benzo(k)fluoranthene	--	--	--				13		11						3.4J

Upper Snohomish DY04 DMMP chemistry	SL	BT	ML	Surface		Subsurface (progressing upstream)									
				1 (downstream)	2 (upstream)	3	4	5	6	7	8	9	10	11	12
Total Benzofluoranthenes	3200	--	9900				26	6J	28						3.4J
Benzo(a)pyrene	1600	--	3600				21	8.7J	14	2.7J	4.0J				3.2J
Indeno(1,2,3-cd)pyrene	600	--	4400				11	4.5J	6.0J						
Dibenzo(a,h)anthracene	230	--	1900				3.4J		7.4J						
Benzo(g,h,i)perylene	670	--	3200				8.5J	3.3J							
Chlorinated Hydrocarbons (µg/kg-DW)															
1,3-Dichlorobenzene	170	--	--												
1,4-Dichlorobenzene	110	--	120												
1,2-Dichlorobenzene	35	--	110												
1,2,4-Trichlorobenzene	31	--	64												
Hexachlorobenzene	22	168	230												
Phthalates (µg/kg-DW)															
Dimethylphthalate	.1400	--	--												
Diethylphthalate	1200	--	--												
Di-n-butylphthalate	5100	--	--	9.2J	6.7J	4.5J	7.3J	7.8J	8.2J	13	6.7J	7.9J	16	8.5J	15
Butylbenzylphthalate	970	--	--												3.0J
bis(2-Ethylhexyl)phthalate	8300	--	--	6.2J	3.9J	4.9J	25J	5.1J	27J	3.9J	8.1J		6.1J	5.6J	5.6J
Di-n-octylphthalate	6200	--	--												
Phenols (µg/kg-DW)															
Phenol	420	--	1200	9.3J	8.2J	10J	11J			97	18J	13J			5.5J
2-Methylphenol	63	--	77										6.8J	7.4J	
4-Methylphenol	670	--	3600	14	7.6J	8.8J	15	20	64		49	23	25	17	
2,4-Dimethylphenol	29	--	210												
Pentachlorophenol	400	504	690												
Miscellaneous (µg/kg-DW)															
Benzyl alcohol	57	--	870					5.3J	12		31		13	10	
Benzoic acid	650	--	760												
Dibenzofuran	540	--	1700				2.7J	3.2J	6.7J	3.1J	5.6J		1.8J		
Hexachloroethane	1400	--	14000												
Hexachlorobutadiene	29	--	270												
n-Nitrosodiphenylamine	28	--	130												

Upper Snohomish DY04 DMMP chemistry	SL	BT	ML	Surface		Subsurface (progressing upstream)									
				1 (downstream)	2 (upstream)	3	4	5	6	7	8	9	10	11	12
Volatiles (µg/kg-DW)															
Trichloroethene	160	--	1600												
Tetrachloroethene	57	--	210												
Ethylbenzene	10	--	50												
m,p-Xylenes	--	--	--												
o-Xylene	--	--	--												
Xylene (total)	40	--	160												
PCBs/Pesticides (µg/kg-DW)															
DDT (total)	6.9	50	69				1.3	0.99J	0.27JP	1.15JP	1.4	1.2P	0.41J		
4,4'-DDD	--	--	--				0.54JP	0.99J	0.27JP				0.41J		
4,4'-DDE	--	--	--							0.32JP					
4,4'-DDT	--	--	--				0.8J			0.83J	1.4	1.2P			
Aldrin	10	--	--									0.94J			
Dieldrin	10	--	--												
gamma-BHC (Lindane)	10	--	--												
alpha-Chlordane	10	37	--												
Heptachlor	10	--	--												
Total PCBs	130	--	3100					8.6J	9.0J						
PCBs/Pesticides (mg/kg-OC)															
alpha-BHC	--	10	--												
Total PCBs	--	38	--												

Notes:

- J: The result is an estimated concentration based on either a laboratory quality control sample exceedance, or the reported concentration is less than the method reporting limit (MRL) but greater than the MDL.
- DW: Dry weight
- OC: Organic carbon
- 2-Methylnaphthalene is not added to other LPAHs as part of the total LPAH levels.

APPENDIX B

Table 1. SMS chemicals of concern for DMMUs with TOC greater than 0.5% and less than 3.9%, compared with Washington State guidelines for the Upper Snohomish Turning Basin, DY 05.

Upper Snohomish DY04 SMS chemistry - OC normalized	units	SQS	CSL	Subsurface (progressing upstream)					
				3	4	5	6	9	10
Conventionals									
Total Organic Carbon (%)	--	--	--	0.61	0.99	1.30	2.71	1.22	0.98
Metals									
Arsenic	mg/kg	57	93	5.5	6.6	7.3	7.2	5	5.7
Cadmium	mg/kg	5.1	6.7	0.08	0.15	0.14	0.16	0.09	0.13
Chromium	mg/kg	260	270	20.4	26.9	29	22.3	17.8	17.9
Copper	mg/kg	390	390	16.9	24.8	28.4	26	17.2	18.9
Lead	mg/kg	450	530	3.96	6.3	8.32	6.42	3.81	3.94
Mercury	mg/kg	0.41	0.59	0.02	0.04	0.05	0.04	0.03	0.02
Silver	mg/kg	6.1	6.1	0.03	0.1	0.1	0.08	0.04	0.04
Zinc	mg/kg	410	960	34.4	43.4	44.7	42.1	36	37.7
PCBs									
Total PCBs	mg/kg-OC	12	65	3.27 U	2.02 U	0.66	0.33	1.63 U	2.04 U
SVOCs									
LPAH									
2-Methylnaphthalene	mg/kg-OC	38	64	1.63 U	0.48 J	0.44 J	0.26 J	0.81 U	0.18 J
Acenaphthene	mg/kg-OC	16	57	1.63 U	0.47 J	0.52 J	0.51	0.13 J	0.2 J
Acenaphthylene	mg/kg-OC	66	66	1.63 U	0.68 J	0.26 J	0.08 J	0.81 U	1.01 U
Anthracene	mg/kg-OC	220	1200	0.31 J	0.79 J	0.67 J	0.3 J	0.17 J	0.4 J
Fluorene	mg/kg-OC	23	79	1.63 U	0.4 J	0.46 J	0.44	0.19 J	1.01 U
Naphthalene	mg/kg-OC	99	170	0.4 J	0.91 J	1.07	14	0.4 J	0.76 J
Phenanthrene	mg/kg-OC	100	480	0.31 J	1.31	1.23	1.36	0.56 J	0.79 J
Total LPAH	mg/kg-OC	370	780	1.03	4.59	4.23	16	1.47	2.17
HPAH									
Benzo(a)anthracene	mg/kg-OC	110	270	1.63 U	2.62	0.72 J	0.92	0.24 J	0.21 J
Benzo(a)pyrene	mg/kg-OC	99	210	1.63 U	2.12	0.66 J	0.51	0.81 U	1.01 U
Benzo(g,h,i)perylene	mg/kg-OC	31	78	1.63 U	0.85 J	0.25 J	0.36 U	0.81 U	1.01 U
Chrysene	mg/kg-OC	110	460	0.39 J	3.03	0.92	1.07	0.36 J	0.28 J
Dibenzo(a,h)anthracene	mg/kg-OC	12	33	1.63 U	0.34 J	0.76 U	0.27 J	0.81 U	1.01 U
Fluoranthene	mg/kg-OC	160	1200	1.29 J	3.33	1.53	1.21	0.37 J	0.66 J
Indeno(1,2,3-cd)pyrene	mg/kg-OC	34	88	1.63 U	1.11	0.34 J	0.22 J	0.81 U	1.01 U

Upper Snohomish DY04 SMS chemistry - OC normalized	units	SQS	CSL	Subsurface (progressing upstream)					
				3	4	5	6	9	10
Pyrene	mg/kg-OC	1000	1400	1.01 J	4.04	1.46	1.1	0.29 J	0.56 J
Total Benzofluoranthenes (b+j+k)	mg/kg-OC	230	450	1.63 U	2.62	0.46	1.03	0.81 U	1.01 U
Total HPAH	mg/kg-OC	960	5300	2.7	20	6.37	6.36	1.27	1.72
Chlorinated Hydrocarbons									
1,2,4-Trichlorobenzene	mg/kg-OC	0.81	1.8	0.33 U	0.21 U	0.16 U	0.09 U	0.17 U	0.21 U
1,2-Dichlorobenzene	mg/kg-OC	2.3	2.3	1.63 U	1.11 U	0.76 U	0.36 U	0.81 U	1.01 U
1,4-Dichlorobenzene	mg/kg-OC	3.1	9	1.63 U	1.11 U	0.76 U	0.36 U	0.81 U	1.01 U
Hexachlorobenzene	mg/kg-OC	0.38	2.3	*0.46 U*	0.29 U	0.23 U	0.12 U	0.24 U	0.31 U
Phthalates									
bis(2-Ethylhexyl)phthalate	mg/kg-OC	47	78	0.8 J	2.52 J	0.39 J	0.99 J	16 U	0.62 J
Butylbenzylphthalate	mg/kg-OC	4.9	64	1.63 U	1.11 U	0.76 U	0.36 U	0.81 U	1.01 U
Diethylphthalate	mg/kg-OC	61	110	1.63 U	1.11 U	0.76 U	0.36 U	0.81 U	1.01 U
Dimethylphthalate	mg/kg-OC	53	53	1.63 U	1.11 U	0.76 U	0.36 U	0.81 U	1.01 U
Di-n-butylphthalate	mg/kg-OC	220	1700	0.73 J	0.73 J	0.6 J	0.3 J	0.64 J	1.63
Di-n-octylphthalate	mg/kg-OC	58	4500	1.63 U	1.11 U	0.76 U	0.36 U	0.81 U	1.01 U
Phenols									
2,4-Dimethylphenol	ug/kg	29	29	7.2 U	7.5 U	7.7 U	8.5 U	7.5 U	7.6 U
2-Methylphenol	ug/kg	63	63	10 U	11 U	9.9 U	10 U	10 U	6.8 J
4-Methylphenol	ug/kg	670	670	8.8 J	15	20	64	23	25
Pentachlorophenol	ug/kg	360	690	50 U	51 U	50 U	50 U	50 U	50 U
Phenol	ug/kg	420	1200	10 J	11 J	11 J	30 U	13 J	30 U
Miscellaneous									
Dibenzofuran	mg/kg-OC	15	58	1.63 U	0.27 J	0.24 J	0.24 J	0.81 U	0.18 J
Hexachlorobutadiene	mg/kg-OC	3.9	6.2	1.63 U	1.11 U	0.76 U	0.36 U	0.81 U	1.01 U
n-Nitrosodiphenylamine	mg/kg-OC	11	11	1.63 U	1.11 U	0.76 U	0.36 U	0.81 U	1.01 U
Benzoic acid	ug/kg	650	650	200 U	210 U	200 U	200 U	200 U	200 U
Benzyl alcohol	ug/kg	57	73	10 U	11 U	5.3 J	12	10 U	13

Notes:

- U: The compound was analyzed for, but not detected ("Non-detect") at or above the method detection limit (MDL).
- OC: Organic carbon
- Values *shaded in yellow with italic font* are non-detects that exceed SQS levels when OC normalized. See text for explanation.

Table 2. SMS chemicals of concern for DMMUs with TOC less than 0.5% and greater than 3.9%, compared with Washington State dry wt. AETs, for the Upper Snohomish Turning Basin, DY 05.

Upper Snohomish DY04 SMS comparisons for dry wt. criteria	units	SQS	CSL	Surface		Subsurface (progressing upstream)			
				1 (down-stream)	2 (up-stream)	7	8	11	12
Conventionals									
Total Organic Carbon (%)	–	15	–	0.45	0.28	3.00	5.39	0.27	0.25
Metals									
Arsenic	mg/kg	57	93	5.9	5.7	6.5	7.7	5.1	5.9
Cadmium	mg/kg	5	6.7	0.1	0.1	0.15	0.24	0.08	0.09
Chromium	mg/kg	260	270	18.3	17.2	21.1	21.9	22.5	18
Copper	mg/kg	390	390	20.2	16.9	24.4	26.7	18.2	18
Lead	mg/kg	450	530	4.24	3.6	4.74	5.34	3.45	3.78
Mercury	mg/kg	0	0.59	0.02	0.02 B	0.02	0.04	0.01 B	0.02
Silver	mg/kg	6	6.1	0.05	0.04	0.06	0.08	0.05	0.04
Zinc	mg/kg	410	960	37.5	36.8	41.3	102	39.7	37.3
PCBs									
Total PCBs	ug/kg	130		20 U	20 U	20 U	20 U	20 U	20 U
SVOCs									
LPAH									
2-Methylnaphthalene	ug/kg	670		10 U	10 U	2.2 J	4.2 J	2.0 J	10 U
Acenaphthene	ug/kg	500		1.6 J	10 U	4.7 J	9.4 J	1.8 J	10 U
Acenaphthylene	ug/kg	560		10 U	10 U	10 U	10 U	9.9 U	10 U
Anthracene	ug/kg	960		3.5 J	10 U	9.5 J	3.4 J	2.3 J	10 U
Fluorene	ug/kg	540		10 U	10 U	5.5 J	8.8 J	9.9 U	10 U
Naphthalene	ug/kg	2,100		3.2 J	2.3 J	5.0 J	23	6.2 J	10 U
Phenanthrene	ug/kg	1,500		6.4 J	10 U	18	22	6.3 J	10 U
Total LPAH	ug/kg	5,200		14.7	2.3	42.7	66.6	16.6	10 U
HPAH	ug/kg								
Benzo(a)anthracene	ug/kg	1,300		10 U	10 U	4.2 J	10 U	5.0 J	10 U
Benzo(a)pyrene	ug/kg	1,600		10 U	10 U	2.7 J	4.0 J	3.2 J	10 U
Benzo(g,h,i)perylene	ug/kg	670		10 U	10 U	10 U	10 U	9.9 U	10 U
Chrysene	ug/kg	1,400		2.4 J	10 U	6.5 J	4.6 J	4.3 J	10 U
Dibenzo(a,h)anthracene	ug/kg	230		10 UJ	10 UJ	10 UJ	10 UJ	9.9 UJ	10 UJ
Fluoranthene	ug/kg	1,700		4.8 J	10 U	17	13	7.5 J	10 U
Indeno(1,2,3-cd)pyrene	ug/kg	600		10 U	10 U	10 U	10 U	9.9 U	10 U

Upper Snohomish DY04 SMS comparisons for dry wt. criteria	units	SQS	CSL	Surface		Subsurface (progressing upstream)			
				1 (down-stream)	2 (up-stream)	7	8	11	12
Pyrene	ug/kg	2,600		4.4 J	10 U	12	10	8.2 J	10 U
Total Benzofluoranthenes (b+j+k)	ug/kg	3,200		10 U	10 U	10 U	10 U	3.4	10 U
Total HPAH	ug/kg	12,000		11.6	10 U	42.4	31.6	31.6	10 U
Chlorinated Hydrocarbons									
1,2,4-Trichlorobenzene	ug/kg	31		2.0 U	2.0 U	2.1 U	2.7 U	2.0 U	1.9 U
1,2-Dichlorobenzene	ug/kg	35		10 U	10 U	10 U	10 U	9.9 U	10 U
1,4-Dichlorobenzene	ug/kg	110		10 U	10 U	10 U	10 U	9.9 U	10 U
Hexachlorobenzene	ug/kg	22		2.8 U	2.7 U	3.0 U	3.8 U	2.8 U	2.2 U
Phthalates									
bis(2-Ethylhexyl)phthalate	ug/kg	1,300		6.2 J	3.9 J	3.9 J	8.1 J	5.6 J	5.6 J
Butylbenzylphthalate	ug/kg	63		10 U	10 U	10 U	10 U	9.9 U	3.0 J
Diethylphthalate	ug/kg	48		10 U	10 U	10 U	10 U	9.9 U	10 U
Dimethylphthalate	ug/kg	71		10 U	10 U	10 U	10 U	9.9 U	10 U
Di-n-butylphthalate	ug/kg	1,400		9.2 J	6.7 J	13	6.7 J	8.5 J	15
Di-n-octylphthalate	ug/kg	420		10 U	10 U	10 U	10 U	9.9 U	10 U
Phenols									
2,4-Dimethylphenol	ug/kg	29	29	7.3 U	7.1 U	7.7 U	9.8 U	7.3 U	7.0 U
2-Methylphenol	ug/kg	63	63	10 U	10 U	10 U	10 U	7.4 J	10 U
4-Methylphenol	ug/kg	670	670	14	7.6 J	10 U	49	17	10 U
Pentachlorophenol	ug/kg	140	690	50 U	50 U	50 U	50 U	50 U	50 U
Phenol	ug/kg	420	1,200	9.3 J	8.2 J	97	18 J	30 U	5.5 J
Miscellaneous									
Dibenzofuran	ug/kg	540		10 U	10 U	3.1J	5.6 J	9.9 U	10 U
Hexachlorobutadiene	ug/kg	11		10 U	10 U	10 U	10 U	9.9 U	10 U
n-Nitrosodiphenylamine	ug/kg	28		10 U	10 U	10 U	10 U	9.9 U	10 U
Benzoic acid	ug/kg	650	650	200 U	200 U	200 U	200 U	200 U	200 U
Benzyl alcohol	ug/kg	57	73	10 U	10 U	10 U	31	10	10 U

Feb 04, 2004 10:18am sdekleva C:\Documents and Settings\sdekleva\Desktop\Steve's Temp CAD\020202-Seattle Corps\020202\020202-11.dwg FIG 1

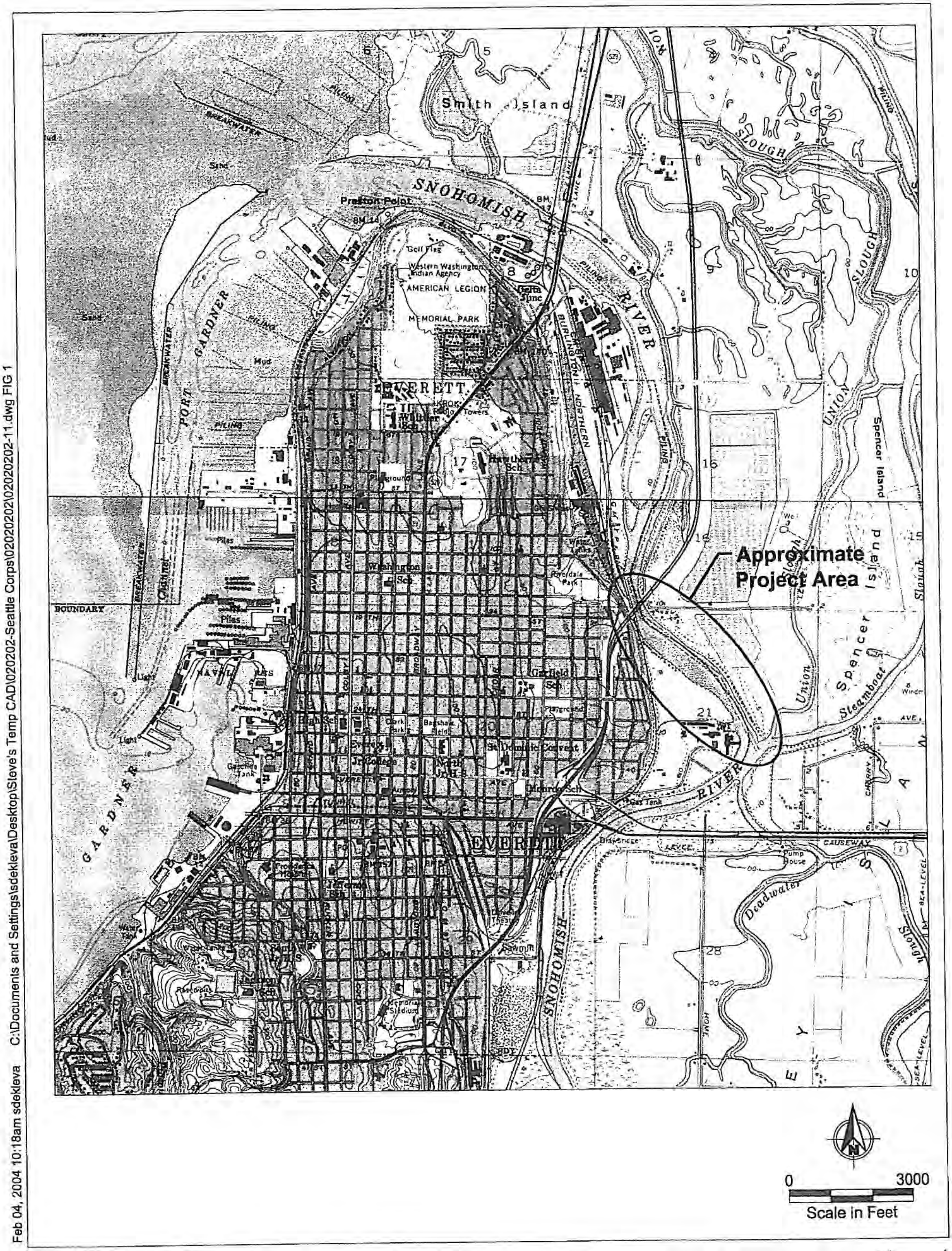
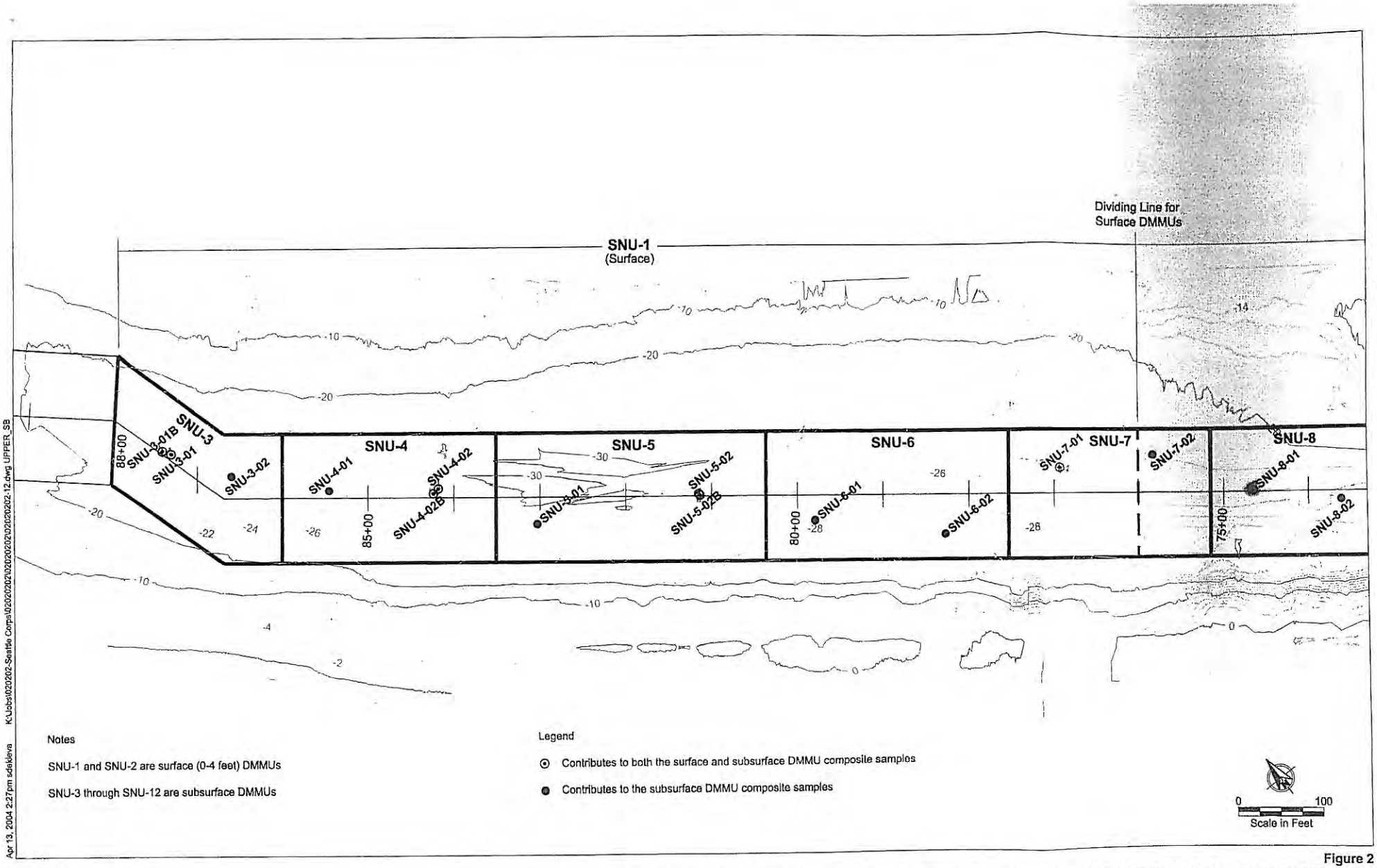


Figure 1
Vicinity Map
Upper Snohomish River Settling Basin

ANCHOR ENVIRONMENTAL, L.L.C.

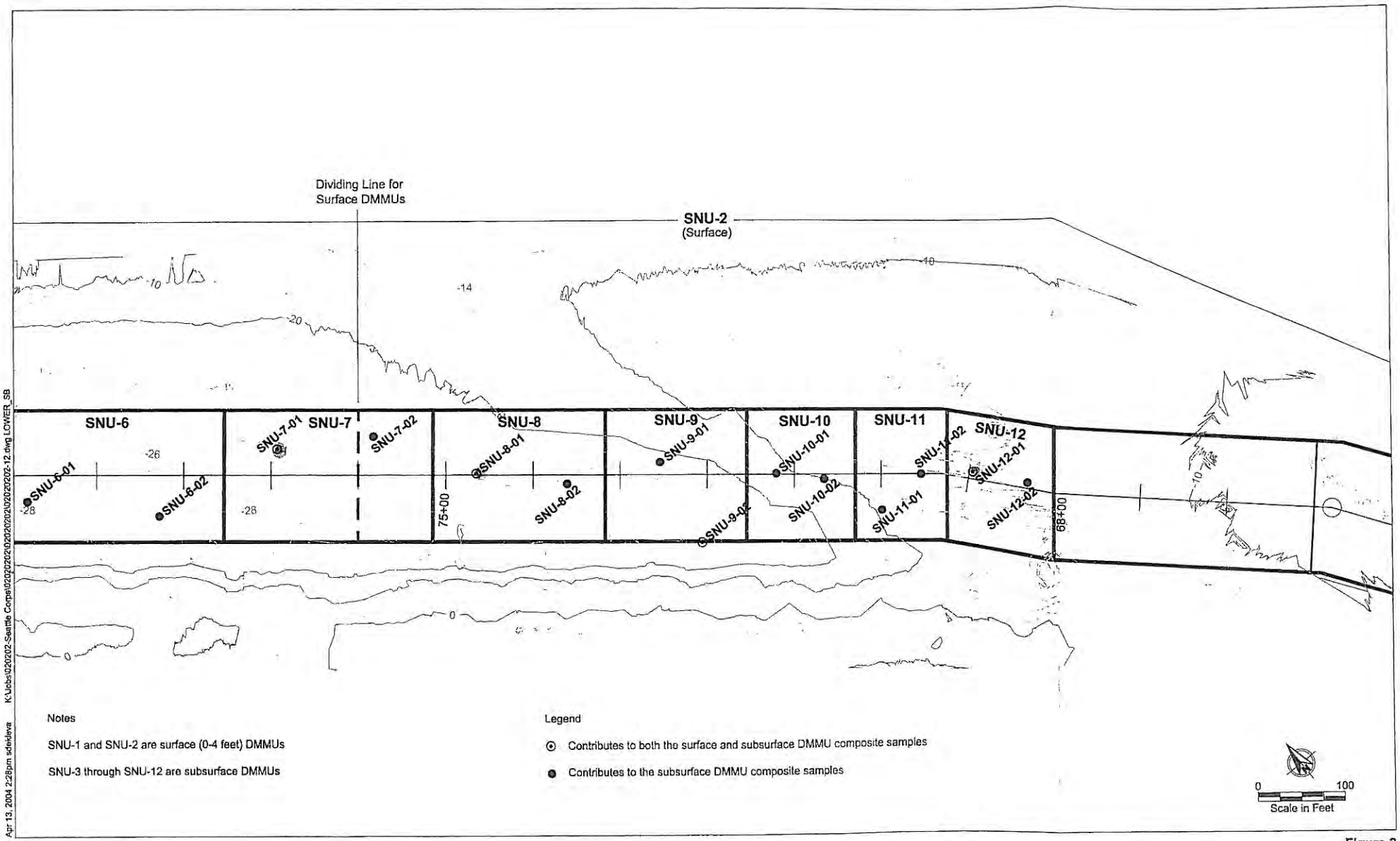


Apr 13, 2004 2:27pm sdekleva K:\Jobs\020202-Seattle Corps\020202\020202\020202\020202\020202-12.dwg UPPER_SB

Figure 2

DMMU Delineation and Proposed Sampling Locations in the Downstream Half of the Upper Snohomish River Settling Basin
Upper Snohomish River Settling Basin Sediment Testing

ANCHOR ENVIRONMENTAL, L.L.C.



Apr 13, 2004 2:28pm sdekleva K:\Jobs\020202-Seattle Corps\020202\020202020202\020202-12.dwg LOWER_SB

Figure 3

DMMU Delineation and Proposed Sampling Locations in the Upstream Half of the Upper Snohomish River Settling Basin

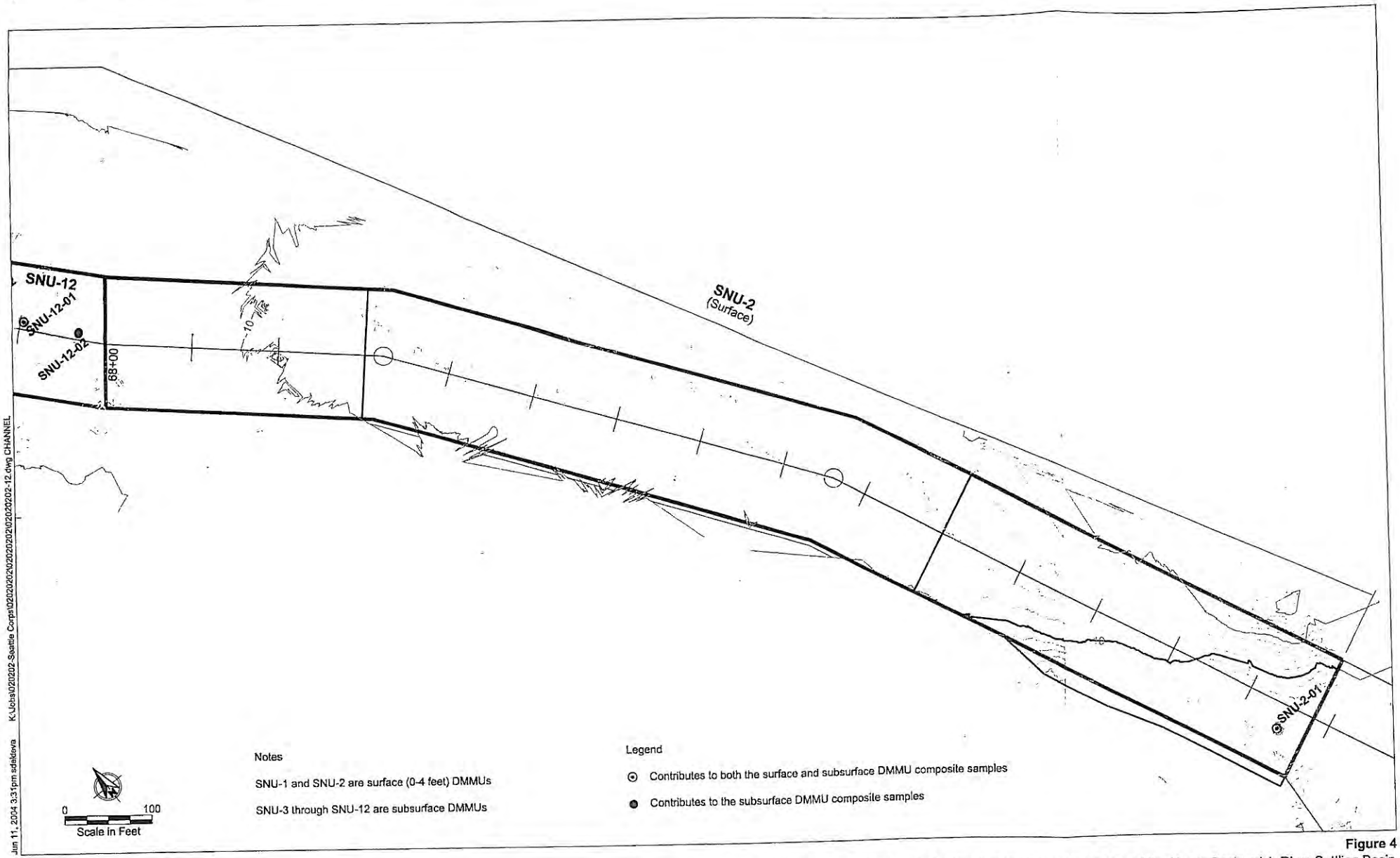


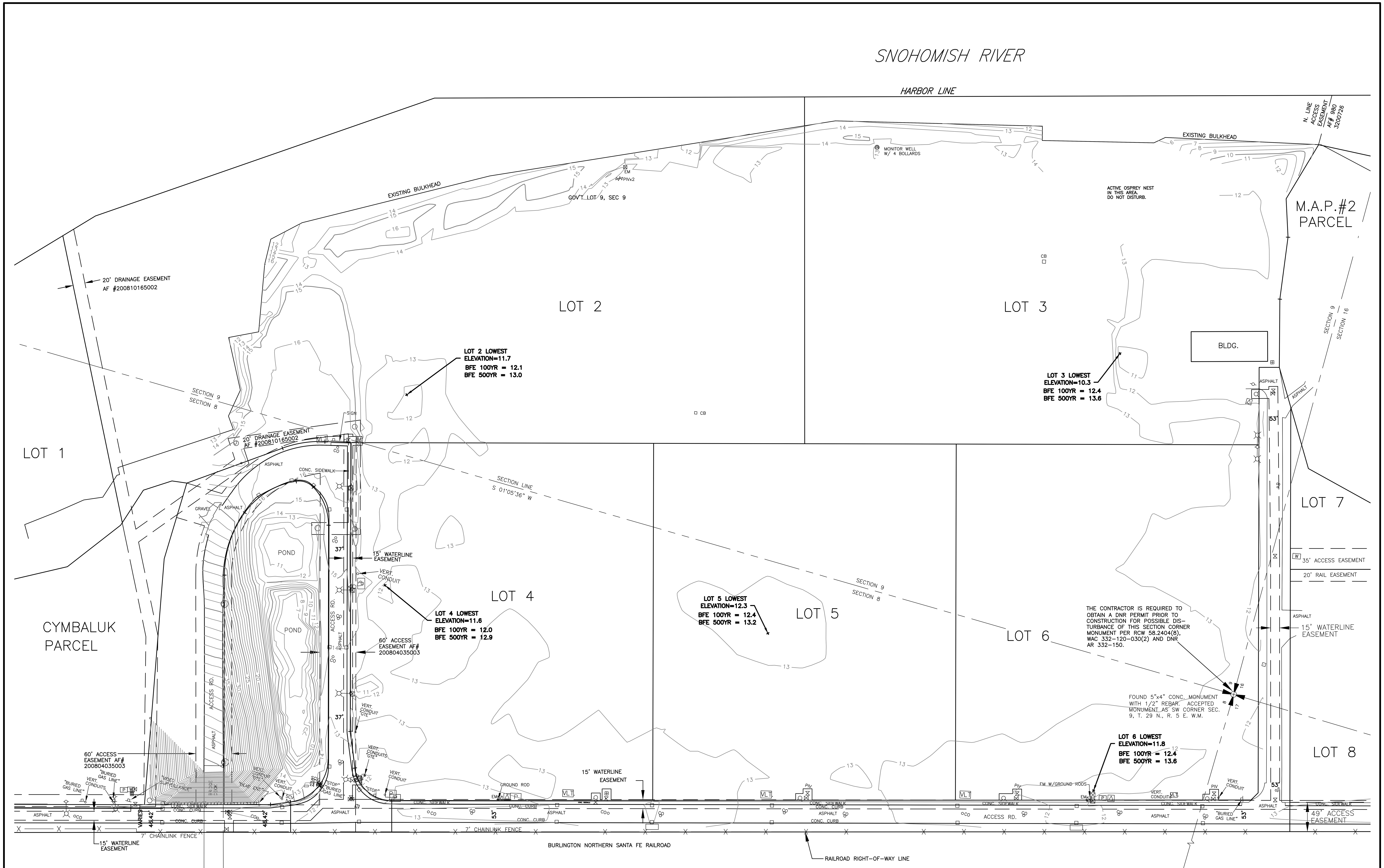
Figure 4

Actual Core Sampling Locations in the Navigation Channel Upstream of the Upper Snohomish River Settling Basin
Upper Snohomish River Settling Basin Sediment Testing

ANCHOR ENVIRONMENTAL, L.L.C.

ATTACHMENT 6

2011 Topographic Survey
(Reid Middleton)



SNOHOMISH RIVER
HARBOR LINE
EXISTING BULKHEAD
N. LINE ACCESS EASEMENT AF# 980 3200726
MONITOR WELL W/ 4 BOLLARDS
GOV'T LOT 9, SEC 9
ACTIVE OSPREY NEST IN THIS AREA. DO NOT DISTURB.
M.A.P.#2 PARCEL
20' DRAINAGE EASEMENT AF #200810165002
LOT 1
LOT 2
LOT 3
LOT 4
LOT 5
LOT 6
LOT 7
LOT 8
BLDG.
LOT 2 LOWEST ELEVATION=11.7
BFE 100YR = 12.1
BFE 500YR = 13.0
LOT 3 LOWEST ELEVATION=10.3
BFE 100YR = 12.4
BFE 500YR = 13.6
SECTION 9
SECTION 8
SECTION 16
SECTION LINE
S 01°05'36" W
POND
15' WATERLINE EASEMENT
VERT. CONDUIT
ACCESS RD.
60' ACCESS EASEMENT AF# 200804035003
LOT 4 LOWEST ELEVATION=11.6
BFE 100YR = 12.0
BFE 500YR = 12.9
LOT 5 LOWEST ELEVATION=12.3
BFE 100YR = 12.4
BFE 500YR = 13.2
CYMBALUK PARCEL
35' ACCESS EASEMENT
20' RAIL EASEMENT
THE CONTRACTOR IS REQUIRED TO OBTAIN A DNR PERMIT PRIOR TO CONSTRUCTION FOR POSSIBLE DISTURBANCE OF THIS SECTION CORNER MONUMENT PER RCW 58.2404(8), WAC 332-120-030(2) AND DNR AR 332-150.
FOUND 5"x4" CONC. MONUMENT WITH 1/2" REBAR. ACCEPTED MONUMENT AS SW CORNER SEC. 9, T. 29 N., R. 5 E. W.M.
LOT 6 LOWEST ELEVATION=11.8
BFE 100YR = 12.4
BFE 500YR = 13.6
CONC. SIDEWALK
CONC. CURB
ASPHALT
GRAVEL
7' CHAINLINK FENCE
49' ACCESS EASEMENT
BURLINGTON NORTHERN SANTA FE RAILROAD
RAILROAD RIGHT-OF-WAY LINE
BRIDGE DECK
SCALE IN FEET
60 0 60 120

SURVEY NOTES:

1. DATUM: CITY OF EVERETT WASHINGTON STATE PLANE NAD 83(91) HORIZONTAL AND NAVD88 VERTICAL DATUMS.

2. THIS SURVEY IS PREPARED FOR THE BENEFIT OF THE PORT OF EVERETT AND IS ENTIRELY WITHIN THEIR OWNERSHIP. THE PROPERTY SHOWN HEREIN DOES NOT PURPORT TO INDICATE ALL OF THE PORT OF EVERETT PROPERTY.

4. TRACTS BASED ON SNOHOMISH COUNTY BOUNDARY LINE ADJUSTMENT RECORDING NUMBER 201010135001.

5. BASE FLOOD ELEVATION (BFE) IS CALCULATED FROM FEMA FIS #53061CV003B DATED SEPT 28, 2010 STAMPED "PRELIMINARY" ON PROFILE CHART PANEL 75P AND 76P.

PRELIMINARY

NOTE: IF "L" DOES NOT MEASURE 1", ADJUST SCALES ACCORDINGLY.

I:\21\2011\007\SURVEY\1107RIVERSIDE

ReidMiddleton
728 134th Street SW · Suite 200
Everett, Washington 98204
Ph: 425 741-3800

PORT OF EVERETT
RIVERSIDE BUSINESS PARK

FILL AND GRADE PERMIT
TOPOGRAPHIC SURVEY

SCALE 1" = 60'	
DES. X	SHEET NO.
DR. SGL	1
CH. JJF	
F.B. 780L	OF 1 SHEETS
DATE 05/02/11	
FILE NO. 212011007	