CENWS-OD-TS-DM

MEMORANDUM FOR RECORD 3 January 2005

SUBJECT: **DETERMINATION OF THE SUITABILITY OF THE POST-DREDGE SEDIMENT SURFACE QUALITY RELATIVE TO THE WASHINGTON DEPARTMENT OF ECOLOGY'S ANTIDEGRADATION POLICY FOR THE LAKESIDE INDUSTRIES SAND AND GRAVEL SPILL REMOVAL DREDGING (2003-2-00198) AS EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT.**

1. The following summary reflects the consensus determination of the Agencies that comprise the regional Dredged Material Management Program (DMMP) for the State of Washington. The agencies include the Corps of Engineers, Department of Ecology, Department of Natural Resources, and the Environmental Protection Agency. The agencies are charged with determining the suitability of the post-dredge sediment surface quality after dredging approximately 142 cubic yards of spilled sand and gravel to restore water depths for barges docking at the pier. The sand/gravel spill material was not tested, but was considered by the DMMP to be clean material using "best-professional-judgement". This material was dredged and subsequently disposed upland at an Ecology approved upland site. The DMMP agencies required a sediment quality assessment of the post-dredge sediment surface based on a "reason-to-believe" after Ecology's SEDQUAL Sediment Quality Database showed a nearby station with 15 chemical CSL exceedances.

2. The project was ranked high (Salmon Bay) for testing purposes, and the Corps permit special condition required a sediment quality assessment of the top 10 cm of surface sediment following dredging of the sand/gravel spill material. A van Veen grab was used to collect a representative composited sample of the surface material at a single location (Figures 1 and 2).

3. Relevant dates for regulatory tracking purposes are included in Table 1.

**Table 1. Regulatory Tracking Information and Dates**

| | |
|---|---|
| Corps Permit #: | 2003-2-00198 |
| Initial SAP submittal date: | December 2, 2003 |
| SAP approval letter date: | December 10, 2003 |
| Sampling date(s): | November 5, 2004 |
| Sediment data characterization report submittal date: | December 20, 2004 |
| DAIS Tracking Number | LIPDS-1-A-O-205 |
| **Recency Determination Date: High** (2 years) | December 2006 |

4. The Sampling and Analysis Plan was approved by the Agencies on December 10, 2003, and called for characterization of the sediment surface after the sand/gravel spill had been removed by barge mounted crane with upland disposal. The single sampling station occupied was relocated approximately 73 feet northwest of the location identified in the DMMP approved SAP because the material at the initial station consisted of gravel rather than native sediment. The single sampling location specified in the SAP was followed with the slight deviation mentioned previously, and quality assurance/quality control guidelines specified by the PSDDA Users Manual were generally complied with. The data gathered were deemed sufficient and acceptable for decision-making by the DMMP agencies based on best professional judgment.

5. Table 2 provides an analysis summary of the results of the conventional and chemical analyses for the single sample of surface material compared to DMMP and SMS chemical guidelines. Chemical analysis of the single sample indicated that from a DMMP perspective there were eleven detected screening level

exceedances (Acenaphene, Fluorene, Phenanthrene, 2-methylnapthalene, Total LPAH, Fluoranthene, Pyrene, Benzo(a)anthrancene, Chrysene, Total HPAH, Dibenzofuran), four detection limit exceedances (Hexachlorobenzene and N-Nitrosodiphenylamine, 1,2-Dichlorobenzene, 1,2,4-Trichlorobenzene), and a single bioacummulation trigger exceedance (Fluoranthene) of DMMP Guidelines. From an SMS perspecitive there were seven SQS exceedances (Napthalene, Total HPAH, Benzo(a)anthracene, Benzo(a)pyrene, Total Benzofluoranthenes, Chrysene, and Indeno(1,2,3-cd)pyrene) and seven detected CSL exceedances (Total LPAH, Acenaphene, Fluorene, Phenanthrene, 2-Methylnaphthalene, Benzo (k) fluoranthenes, Dibenzofuran), and four undetected CSL exceedances (Hexachlorobutadiene, Hexachlorobenzene, Butylbenzylphthalate, and 2,4-Dimethylphenol) within the sediment surface. TOC was quantitated at 0.7 %. No biological testing was performed on this sample, and therefore from a DMMP perspective, the new exposed sediment surface represents a degraded sediment quality compared to the predredging surface. From an SMS perspective the sediment quality exceeds the Washington Department of Ecology's anti-degradation standard using Best-Professional-Judgement (BPJ).

6. The results of the single composited surface sample representing the post-dredge sediment surface layer failed to meet acceptable state sediment quality guidelines as specified by the PSDDA program (http://www.nws.usace.army.mil/publicmenu/DOCUMENTS/Antidegradation_Clarif.pdf), which is the Washington State anti-degradation policy.

7. This memorandum documents the sediment quality of the post-dredge sediment surface after restoring barge berthing depths at the Lakeside Industries Pier, and shows that the sediment quality is not in compliance with the DMMP/PSDDA post-dredge sediment quality standard, which is the State of Washington's anti-degradation policy. The DMMP agencies will coordinate this finding with the Ecology Cleanup Program for any follow-up action necessary to bring the surface sediment quality into compliance with the State of Washington's anti-degradation policy. This may require additional work to remediate the sediment surface quality by either additional dredging or placing a CAP.

Concur:

1/3/2005 — David R. Kendall
Date — David Kendall, Ph.D., Seattle District Corps of Engineers

FEB 16, 2005 — Thomas H. Gries
Date — Tom Gries/Cinde Donoghue, Washington Department of Ecology

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Date — Grant Yang, Washington Department of Ecology, Toxics Cleanup Program

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2/15/2005 — [signature]
Date — Peter Leon, Washington Department of Natural Resources

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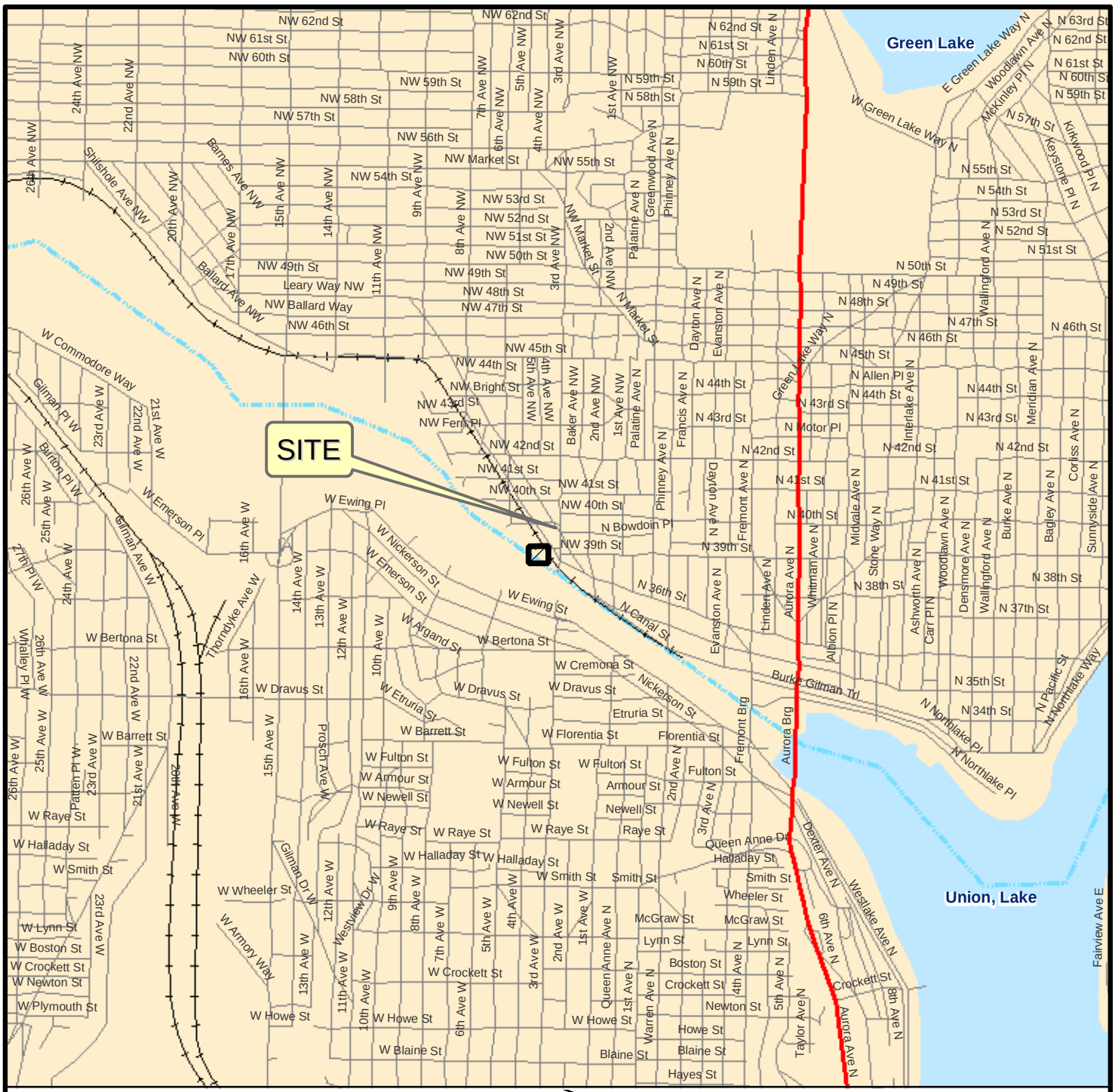
DMMO File




Data Sources: Interstates, state routes, and roads from TIGER 2000.
County boundaries, cities, and waterbodies from Department of Ecology.

All locations are approximate.

Lambert Conformal Conic
Washington State Plane North
North American Datum 1983

0 1,000 2,000 Feet

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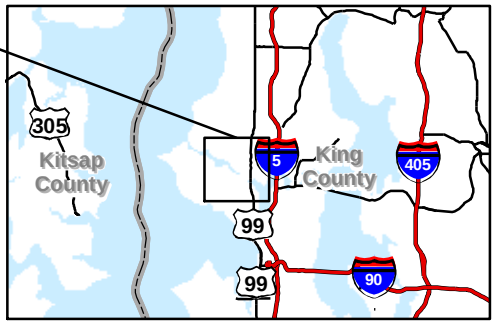


Note: This drawing is for informational purposes. It is intended to assist in showing features discussed in an attached document.

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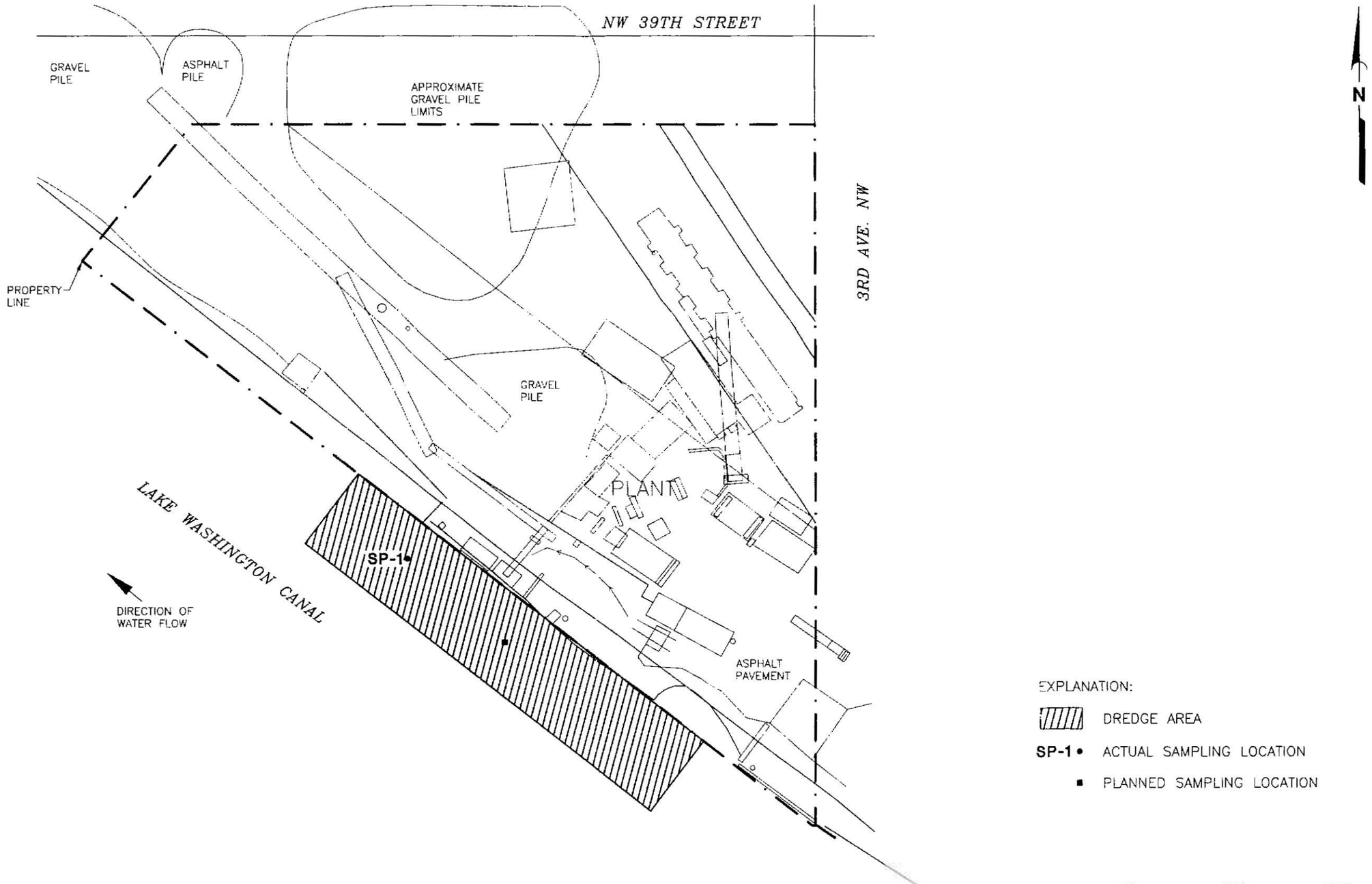
**VICINITY MAP**

**FIGURE 1**

Map Revised: October 22, 2003

Path: 0\0299016\00\GIS\029901600_FIG-1.mxd

Office: TAC




Notes: 1. The locations of all features shown are approximate.
2. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

Reference: Drawing created from sketch provided by GeoEngineers' personnel.

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**DREDGING AREA AND SAMPLING LOCATION**

**FIGURE 2**

TACO\0\0299016\00\CAD\029901600_FRPT_FIG-2.dwg VPE:SLF:SCY 12/09/04

## Table 2. Lakeside Industires Post-Dredge Surface Sediment Quality DMMP/SMS Comarison Summary

| | | | | | | | DMMU ID: | SP-1 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | DMMP | | | | SMS | | | mg/kg-dry wgt | mg/kg-OC | VQ |
| CHEMICAL NAME | Units | SL | BT | ML | Unita | SQS | CSL | DMMP | SMS | |
| Antimony | | 150 | | 200 | | | | 6.0 | | u |
| Arsenic | mg/kg | 57 | 0.5071 | 700 | mg/kg | 57 | 93 | 6.0 | | u |
| Cadmium | mg/kg | 5 | 11.3 | 14 | mg/kg | 5.1 | 6.7 | 0.20 | | |
| Chromium | mg/kg | (2) | 267 | (2) | mg/kg | 260 | 270 | 29.4 | | |
| Copper | mg/kg | 390 | 1,027 | 1,300 | mg/kg | 390 | 390 | 40.6 | | |
| Lead | mg/kg | 450 | 975 | 1,200 | mg/kg | 450 | 530 | 11.0 | | |
| Mercury | mg/kg | 0.41 | 1.5 | 2.3 | mg/kg | 0.41 | 0.59 | 0.06 | | u |
| Nickel | mg/kg | 140 | 370 | 370 | mg/kg | -- | -- | 30.0 | | |
| Selenium | mg/kg | (2) | 3 | (2) | mg/kg | -- | -- | 6.0 | | u |
| Silver | mg/kg | 6.1 | 6.1 | 8.4 | mg/kg | 6.1 | 6.1 | 0.4 | | u |
| Zinc | mg/kg | 410 | 2,783 | 3,800 | mg/kg | 410 | 960 | 66.1 | | |
| TBT ion (porewater) | ug/L | 0.15 | 0.15 | | ug/L | 0.05 | 0.35 | NA | | |
| Naphthalene | mg/kg | 2.1 | | 2.4 | mg/kg-OC | 99 | 170 | 0.60 | **100** | |
| Acenaphthylene | mg/kg | 0.56 | | 2.0 | mg/kg-OC | 66 | 66 | 0.07 | 11 | |
| Acenaphthene | mg/kg | 0.50 | | 2.0 | mg/kg-OC | 16 | 57 | **1.9** | **317** | |
| Fluorene | mg/kg | 0.54 | | 3.6 | mg/kg-OC | 23 | 79 | **1.5** | **250** | |
| Phenanthrene | mg/kg | 1.5 | | 21 | mg/kg-OC | 100 | 480 | **4.0** | **668** | |
| Anthracene | mg/kg | 0.96 | | 13.0 | mg/kg-OC | 220 | 1,200 | 0.67 | 112 | |
| 2-Methylnapthalene | mg/kg | 0.67 | | 1.9 | mg/kg-OC | 38 | 64 | **1.2** | **200** | |
| **Total LPAH** | mg/kg | 5.2 | | 29 | mg/kg-OC | 370 | 780 | **9.9** | **1,458** | |
| Fluoranthene | mg/kg | 1.7 | 4.6 | 30 | mg/kg-OC | 1,000 | 1,400 | **5.2** | 868 | E |
| Pyrene | mg/kg | 2.6 | 11.98 | 16 | mg/kg-OC | 1,000 | 1,400 | **3.8** | 634 | |
| Benzo(a)anthracene | mg/kg | 1.3 | | 5.1 | mg/kg-OC | 110 | 270 | **1.5** | **250** | |
| Chrysene | mg/kg | 1.4 | | 21.0 | mg/kg-OC | 110 | 460 | **1.8** | **301** | |
| Benzo(k)fluoranthenes | mg/kg | | | | mg/kg/OC | 31 | 78 | | **119** | |
| Benzofluoranthenes (b+k) | ug/kg | 3.2 | | 9.9 | mg/kg-OC | 230 | 450 | 2.01 | **336** | |
| Benzo(a)pyrene | ug/kg | 1.6 | | 3.6 | mg/kg-OC | 99 | 210 | 0.82 | **137** | |
| Indeno(1,2,3-cd)pyrene | mg/kg | 0.6 | | 4.4 | mg/kg-OC | 34 | 89 | 0.39 | **65** | |
| Dibenzo(a,h)anthracene | mg/kg | 0.23 | | 1.9 | mg/kg-OC | 34 | 88 | 0.16 | 27 | |
| Benzo(g,h,I)perylene | mg/kg | 0.67 | | 3.2 | mg/kg-OC | 31 | 78 | NA | | |
| **Total HPAH** | mg/kg | 12 | | 69 | mg/kg-OC | 960 | 5,300 | **17.7** | **2,618** | |
| 1,3-Dichlorobenzene | mg/kg | 0.17 | | | mg/kg-OC | -- | -- | 0.057 | | u |
| 1,4-Dichlorobenzene | mg/kg | 0.11 | | 0.120 | mg/kg-OC | 3 | 9 | 0.057 | | u |
| 1,2-Dichlorobenzene | mg/kg | 0.035 | | 0.110 | mg/kg-OC | 2.3 | 2.3 | **0.057** | | u |
| 1,2,4-Trichlorobenzene | mg/kg | 0.031 | | 0.064 | mg/kg-OC | 0.81 | 1.8 | **0.057** | | u |
| Hexachlorobenzne (HCB) | mg/kg | 0.022 | 0.168 | 0.23 | mg/kg-OC | 0.38 | 2.3 | **0.057** | **10** | u |
| Dimethylphthalate | mg/kg | 1.4 | | | mg/kg-OC | 53 | 53 | 0.057 | 10 | u |
| Diethylphthalate | mg/kg | 1.2 | | | mg/kg-OC | 61 | 110 | 0.057 | 10 | u |
| Di-n-butylphthalate | mg/kg | 5.1 | | | mg/kg-OC | 220 | 1,700 | 0.057 | 10 | u |
| Butylbenzylphthalate | mg/kg | 0.97 | | | mg/kg-OC | 4.9 | 64 | 0.057 | **10** | u |
| Bis(2-ethylhexyl)phthalate | mg/kg | 8.3 | | | mg/kg-OC | 47 | 78 | 0.110 | 18 | |
| Di-n-octylphthalate | mg/kg | 6.2 | | | mg/kg-OC | 58 | 4,500 | 0.057 | 10 | u |
| Phenol | mg/kg | 0.420 | | 1.20 | mg/kg | 0.42 | 1.2 | 0.057 | 57 | u |
| 2-Methylphenol | mg/kg | 0.063 | | 0.077 | mg/kg | 0.063 | 0.063 | 0.057 | 57 | u |
| 4-Methylphenol | mg/kg | 0.670 | | 3.60 | mg/kg | 0.67 | 0.67 | 0.057 | 57 | u |
| 2,4-Dimethylphenol | mg/kg | 0.029 | | 0.21 | mg/kg | 0.029 | 0.029 | 0.057 | **0.057** | u |
| Pentachlorophenol | mg/kg | 0.400 | | 0.69 | mg/kg | .36. | 0.69 | 0.28 | 280 | u |
| Benzyl alcohol | mg/kg | 0.057 | | 0.87 | mg/kg | 57 | 73 | 0.057 | 57 | u |
| Benzoic acid | mg/kg | 0.650 | | 0.76 | mg/kg | 650 | 650 | 0.570 | 570 | u |
| Dibenzofuran | mg/kg | 0.54 | | 1.7 | mg/kg-OC | 15 | 58 | **0.94** | **157** | |
| Hexachloroethane | mg/kg | 0.600 | | 1.60 | mg/kg-OC | | | | | |
| Hexachlorobutadiene | mg/kg | 0.029 | | 0.27 | mg/kg-OC | 3.9 | 6.2 | 0.001 | **10** | u |
| N-Nitrosodiphenylamine | mg/kg | 0.028 | | 0.13 | mg/kg-OC | 11 | 11 | **0.057** | 10 | u |
| Trichloroethene | mg/kg | 0.160 | | 1.60 | ug/kg | -- | -- | | | |
| Tetrachloroethene | mg/kg | 0.057 | | 0.21 | ug/kg | -- | -- | | | |
| Ethylbenzene | mg/kg | 0.010 | | 0.05 | ug/kg | -- | -- | | | |
| Total Zylene (sum of o-,m-,p-) | mg/kg | 0.040 | | 0.16 | ug/kg | -- | -- | | | |
| Total DDT (sum of 4,4'-DDD, 4,4'-DDE and 4,4'-DDT) | mg/kg | 0.0069 | 0.05 | 0.069 | mg/kg-OC | -- | -- | 0.002 | | u |
| Aldrin | mg/kg | 0.010 | | | mg/kg-OC | -- | -- | 0.001 | | u |
| Chlordane | mg/kg | 0.010 | 0.037 | | mg/kg-OC | -- | -- | 0.003 | | y |
| Dieldrin | mg/kg | 0.010 | | | mg/kg-OC | -- | -- | 0.002 | | u |
| Heptachlor | mg/kg | 0.010 | | | mg/kg-OC | -- | -- | 0.001 | | u |
| Alpha-BHC | mg/kg | | 0.010 | | mg/kg-OC | -- | -- | | | |
| Gamma-BHC (Lindane) | mg/kg | 0.010 | | | mg/kg-OC | -- | -- | 0.001 | | u |
| Total PCBs | mg/kg | 0.13 | 38*** | 3.1 | mg/kg-OC | 12 | 65 | 0.019 | | u |
| Total Solids | % | | | | | | | **80.0** | | |
| Total Volatile Solids | % | | | | | | | **2.0** | | |
| Total Organic Carbon | % | | | | | | | **0.6** | | |
| Total Ammonia | mg/kg | | | | | | | **3.6** | | |
| Total Sulfides | mg/kg | | | | | | | **2.4** | | |
| Gravel | % | | | | | | | **38.0** | | |
| Sand | % | | | | | | | **55.2** | | |
| Silt | % | | | | | | | **6.2** | | |
| Clay | % | | | | | | | **0.6** | | |
| Fines (percent silt + clay) | % | | | | | | | **6.8** | | |
| Bioassay Determination: (P/F) | | | | | | | | **NA** | | |
| BTs eyesceeded: | | | | | | | | **yes** | | |
| Bioaccumulation conducted: | | | | | | | | **no** | | |
| ML Rule exceeded: | | | | | | | | **no** | | |
| PSDDA Determination: | | | | | | | | **F(B)** | **FAIL (CSL)** | |
| DMMU Volume: | cy | | | | | | | **NA** | | |
| Rank | | | | | | | | High | | |
| Mean Core sampling depth | ft | | | | | | | 10 cm | | |
| Maximum sampling depth (mudline) | | | | | | | | 10 cm | | |
| DMMU ID: | | | | | | | | **SP-1** | | |

**Legend:**

**SL = Screening Level exceedance**
**BT = Bioaccumulation Trigger exceedance**
**P = Pass (Suitable for UCOWD)**
**F(B) = Failure (UCOWD Unsuitable wo biological testing)**
**SQS = Sediment Quality Standards exceedance (SMS)**
**CSL = Cleanup Screening Level exceedance (SMS)**

**VQ = Validation Qualifier**
**UCOWD = Unconfined open-water disposal**
**U = undetected at the reported concentration**
**E = positively ID'd, estimated concentration**

# TABLE 1
# SUMMARY OF CHEMICAL ANALYTICAL DATA[1] FOR SAMPLE SP-1 RELATIVE TO SMS[2] CRITERIA

| Chemical | SP-1 | SMS Criteria | |
|---|---|---|---|
| | | SQS[3] | CSL[3] |
| **Conventionals** (dry weight) | | | |
| Total Solids (%) | 80 | -- | -- |
| Total Volatile Solids (%) | 2 | -- | -- |
| Total Organic Carbon (%) | 1 | -- | -- |
| Ammonia (mg/kg) | 4 | -- | -- |
| Total Sulfides (mg/kg) | 2 | -- | -- |
| **Metals[3]** (mg/kg dry weight) | | | |
| Antimony | 6 U | -- | |
| Arsenic | 6 U | 57 | 93 |
| Cadmium | 0 U | 5.1 | 6.7 |
| Chromium | 29 | 260 | 270 |
| Copper | 41 | 390 | 390 |
| Lead | 11 | 450 | 530 |
| Mercury | 0 U | 0.41 | 0.59 |
| Nickel | 30 | -- | -- |
| Selenium | 6 U | -- | -- |
| Silver | 0 U | 6.1 | 6.1 |
| Zinc | 66 | 410 | 960 |
| **Organics** (mg/kg OC)[4] | | | |
| **LPAH** | | | |
| Total LPAH[5] | 1,458 | 370 | 780 |
| Acenaphthylene | 11 | 66 | 66 |
| Acenaphthene | 317 | 16 | 57 |
| Anthracene | 112 | 220 | 1,200 |
| Fluorene | 250 | 23 | 79 |
| Naphthalene | 100 | 99 | 170 |
| Phenanthrene | 668 | 100 | 480 |
| 2-Methylnaphthalene | 200 | 38 | 64 |
| **HPAH** (mg/kg OC)[4] | | | |
| Total HPAH[6] | 2,618 | 960 | 5,300 |
| Benzo(a)anthracene | 250 | 110 | 270 |
| Benzo(a)pyrene | 137 | 99 | 210 |
| Benzo (b) fluoranthene | 217 | 230 | 450 |
| Benzo (k) fluoranthene | 119 | 31 | 78 |
| Total Benzofluoranthenes[7] | 336 | 110 | 460 |
| Benzo(ghi)perylene | | 12 | 33 |
| Chrysene | 301 | 160 | 1,200 |
| Dibenzo(a,H)anthracene | 27 | 34 | 88 |
| Fluoranthene | 868 D | 1,000 | 1,400 |
| Indeno(1,2,3-cd)pyrene | 65 | 34 | 89 |
| Pyrene | 634 | 1,000 | 1,400 |
| **Miscellaneous Extractables** | | | |
| Dibenzofuran (mg/kg OC)[4] | 157 | 15 | 58 |
| Hexachlorobutadiene (mg/kg OC)[4,9] | 10 U | 3.9 | 6.2 |
| N-Nitrosodiphenylamine (mg/kg OC)[4] | 10 U | 11 | 11 |
| Benzoic Acid (µg/kg dry weight)[8] | 570 U | 650 | 650 |
| Benzyl Alcohol (µg/kg dry weight)[8] | 57 | 57 | 73 |

Notes appear on Page 2

## TABLE 1 (Page 2 of 2)

| Chemical | | SMS Criteria | |
|---|---|---|---|
| | | SQS | CSL |
| **Chlorinated Hydrocarbons (mg/kg OC)[4]** | | | |
| Hexachlorobenzene[9] | **10 U** | 0.38 | 2.3 |
| 1,2-Dichlorobenzene | 0 U | 2.3 | 2.3 |
| 1,3-Dichlorobenzene | 0 U | -- | -- |
| 1,4-Dichlorobenzene | 0 U | 3.1 | 9 |
| 1,2,4-Trichlorobenzene | 1 U | 0.81 | 1.8 |
| **Phthalates (mg/kg OC)[4]** | | | |
| Bis(2-ethylhexyl)phthalate | 18 | 47 | 78 |
| Butyl benzyl phthalate[9] | **10 U** | 4.9 | 64 |
| Diethyl phthalate | 10 U | 61 | 110 |
| Dimethyl phthalate | 10 U | 53 | 53 |
| Di-n-butyl phthalate | 10 U | 220 | 1,700 |
| Di-n-octyl phthalate | 10 U | 58 | 4,500 |
| **PCBs (mg/kg OC)[4]** | | | |
| Total PCBs | 3 U | 12 | 65 |
| **Phenols (µg/kg dry weight)[8]** | | | |
| Pentachlorophenol | 280 U | 360 | 690 |
| Phenol | 57 U | 420 | 1,000 |
| 2 Methylphenol | 57 U | 63 | 63 |
| 4 Methylphenol | 57 U | 670 | 670 |
| 2,4-Dimethylphenol[9] | **57 U** | 29 | 29 |

**Notes:**

[1] Chemical analysis performed by Analytical Resources Incorporated (ARI) of Tukwila, Washington.

[2] SMS = Sediment Management Standards (WAC 173-204) SQS = Sediment Quality Standards
MC = Maximum Chemical Criteria/Minimum Cleanup Levels

[3] Results are reported as milligrams per kilograms (dry weight).

[4] Results have been normalized to the total organic carbon content of the sample and are reported as milligrams per kilogram OC.

[5] Total LPAH = The sum of acenaphthylene, acenaphthene, anthracene, fluorene, naphthalene, and phenanthrene.

[6] Total HPAH = The sum of benzo(a)anthracene, benzo(a)pyrene, total benzofluoanthenes, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3,-c,d)pyrene, and pyrene .

[7] The total benzofluoranthenes is the sum of the concentrations of the b and k isomers of benzofluoranthene.

[8] Results are reported as micrograms per kilogram (dry weight).

[9] Analyte was not detected at the reported concentrations however, the reported concentration is greater than the SMS criteria for the analyte.

HPAH = high molecular weight polycyclic aromatic hydrocarbon
LPAH = low molecular weight polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
"--" = Not Established
U = Undetected
D = Diluted
mg/kg = milligrams per kilogram
µg/kg = micrograms per kilogram

Bolded text indicates that the concentration is greater than the SQS criteria.
Bolded text and shading indicate that the concentration is greater than the CSL criteria.

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