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Memorandum

To: Anne Summers and Marcel Hermans – Port of Portland

From: Ben Hung and John Verduin, PE – Anchor Environmental, L.L.C.

CC: Krista Koehl – Port of Portland; Tom Schadt, Todd Thornburg, and Elizabeth Appy – Anchor Environmental, L.L.C.

Date: April 18, 2007

Re: Draft Borrow Source Sampling and Analysis Plan
Port of Portland—Terminal 4 Early Action

Anchor Environmental LLC. (Anchor) under contract to the Port of Portland (Port) proposes to collect samples and perform Total Organic Carbon (TOC), Grain Size (GS), and additional chemical analysis of some of the quarries which could supply material to be used for the Confined Disposal Facility (CDF) berm.

The data obtained from this effort will provide insight into the expected range of TOC in berm material and help confirm that input parameters used in the CDF contaminant transport modeling are set at realistic values. The grain size specifications for the berm fill material are provided in the T4 EA 60 Percent Design Analysis Report Appendix G Section 352027 Article 2.3.

The quarry material samples will also be characterized for a number of chemicals to determine appropriate upper confidence levels for chemical criteria used during the early action borrow source assessment. Following analysis, the Port will submit a list of recommended borrow source chemical criteria based on the sample results of this borrow site chemistry characterization (and detection limits since many are likely to be non-detect) to the United States Environmental Protection Agency (USEPA) for their comment and review.

A specific supplier and/or quarry for berm material has not been selected yet, but since the objective is to get insight/verification of a realistic range for the parameters for this type of material in general, three potential sources for the material will be sampled. The proposed quarries include:

- Morse Bros Inc.; stockpile is located at 60371 Columbia River Highway, St Helens, OR 97051
    - Contact: Billy Stimpson: (503) 805-1270
- Scarsella; stockpile is located at the Port of Longview, Number 10 Port Way, Longview, Washington, 98632
    - Contact: Dennis Sigl: (253) 261-2469
- Lafarge; stockpile is located in Texada, PO 160 Van Anda, British Columbia, VON3KO, Canada
    - Contact: Kevin Spenst: (604) 486-7627

Sampling Procedures

Samples of berm fill materials will be obtained from stockpiles at the three quarries. Anchor staff will collect the samples at the quarries in Oregon and Washington. Lafarge staff will collect the samples at the quarry in Texada, Canada, under the direction of Anchor staff. The stockpiles at each quarry will be divided into quadrants for sampling purposes. The size of the stockpile will be estimated and sampling staff will verify whether the material is "pit-run" or washed. A decontaminated sampling device will be used to collect material from two locations in each quadrant. Approximately equal volumes of sample material from each quadrant will be placed in a decontaminated stainless steel tray and homogenized. The samples will then be placed into appropriate sample jars and then packaged on ice in a cooler. The parameter list, container list, holding times, and preservative requirements are provided in Table 1.

Analysis

All three samples will be transported to Analytical Resources, Inc. (ARI), located in Tukwila, Washington. The laboratory will perform the TOC, GS, and additional chemical analysis for the following:

- TOC by Plumb 1981
- Grain Size by ASTM D422/PSEP
- Moisture Content by EPA 160.3
- Metals by EPA 6020, 6010B, and 7471
- Northwest Total Petroleum Hydrocarbons (NWTPH)- gasoline
- NWTPH- diesel
- VOCs by EPA Method 8260B

- SVOCs by EPA Method 8270-SIM
- PCBs by EPA Method 8082
- Pesticides by EPA Method 8081A

The analytes, methods, method detection limits, method reporting limits, and reference levels are provided in Table 2.

Sampling and Reporting Schedule

Sampling will be performed within seven days of approval of this SAP. TOC analysis will be performed within 48 hour of receipt by the laboratory. A two week turn around time for results from the laboratory will be specified for the additional analysis. Results will be transmitted to the USEPA within seven days after they are received from the laboratory following an in-house data quality review.

Reference

DEQ 2002. Default Background Concentrations for Metals: Toxicology Workgroup, Technical Memorandum.

Attachments

Table 1 – Parameters, Containers, Holding Times, and Preservative

Table 2 – Analytes, Methods, Method Detection Limits, Method Reporting Limits, and TEC Level

TABLE 1
Parameters, Containers, Holding Times, and Preservative

Parameter	Container Size and Type	Holding Time	Preservative
Grain Size	16-oz Glass	NA	NA
Total Organic Carbon	8-oz Glass	28 days	NA
Moisture Content		NA	Sealed Jar
Metals		6 months except Hg (28 days)	Cool/4° C
Polychlorinated Biphenyls	8-oz Glass	14 days to Extraction when kept at 4°C; 1 year to Extraction at -20°C ; 40 days to analysis from extraction	Cool/4° C or Freeze -20°C
Pesticides			
Semivolatile Organics			
NWTPH-Dx			
NWTPH-Gx	1.5-oz Septa Jar	14 days to analysis	Cool/4° C (No Headspace)
Volatile Organics	1.5-oz Septa Jar	14 days to analysis	Cool/4° C (No Headspace)

TABLE 2
Analytes, Methods, Method Detection Limits, Method Reporting Limits, and TEC Level

Analyte	Method	Method detection Level- mg/kg	Method Reporting Level- mg/kg	TEC
Conventionals				
Total Organic Carbon	Plumb, 1981	41	200	--
Grainsize	ASTM D422/PSEP	--	0.10%	--
Moisture Content	Method 160.3	--	--	--
Inorganics				
Arsenic	6020	0.04	0.2	9.79
Cadmium	6010B	0.02	0.2	0.99
Chromium	6010B	0.016	0.5	43.4
Copper	6010B	0.02	0.5	31.6
Iron	6010B	0.21	0.5	--
Lead	6020	0.36	1	35.8
Mercury	7471	0.005	0.05	0.20[1]
Nickel	6020	0.16	0.5	22.7
Selenium	6020	0.13	0.5	--
Silver	6020	0.01	0.2	--
Zinc	6010B	0.8	1.0	121
Organics				
Diesel Range HC C_{12}-C_{24}	NWTPHDx	1.89	5	--
Oil Range HC C_{24}-C_{38}	NWTPHDx	3.27	10	--
Dichlorodifluoromethane	8260B	0.00042	0.001	--
Chloromethane	8260B	0.000697	0.001	--
Vinyl Chloride	8260B	0.000772	0.001	--
Bromomethane	8260B	0.000311	0.001	--
Chloroethane	8260B	0.000548	0.001	--
Trichlorofluoromethane	8260B	0.000688	0.001	--
Acrolein*	8260B	0.001725	0.05	--
Acetone*	8260B	0.002577	0.005	--
1,1,2-Trichloro-1,2,2-Trifluoroethane	8260B	0.000398	0.002	--
1,1-Dichloroethene	8260B	0.000374	0.001	--
Bromoethane	8260B	0.000363	0.002	--
Iodomethane	8260B	0.000141	0.001	--
Methylene Chloride	8260B	0.000281	0.002	--
Carbon Disulfide	8260B	0.000403	0.001	--
Acrylonitrile	8260B	0.000737	0.005	--
Methyl-t-butyl ether (MTBE)	8260B	0.000197	0.001	--
trans-1,2-Dichloroethene	8260B	0.000307	0.001	--
Vinyl Acetate	8260B	0.000734	0.005	--
1,1-Dichloroethane	8260B	0.000428	0.001	--
2-Butanone*	8260B	0.001228	0.005	--
2,2-Dichloropropane	8260B	0.000574	0.001	--
cis-1,2-Dichloroethene	8260B	0.000206	0.001	--
Chloroform	8260B	0.00037	0.001	--
Bromochloromethane	8260B	0.000467	0.001	--
1,1,1-Trichloroethane	8260B	0.000496	0.001	--
1,1-Dichloropropene	8260B	0.000418	0.001	--
Carbon Tetrachloride	8260B	0.000467	0.001	--
1,2-Dichloroethane	8260B	0.00037	0.001	--
Benzene	8260B	0.000325	0.001	--
Trichloroethene	8260B	0.000335	0.001	--
1,2-Dichloropropane	8260B	0.000341	0.001	--
Bromodichloromethane	8260B	0.000311	0.001	--
Dibromomethane	8260B	0.000154	0.001	--
2-Chloroethyl Vinyl Ether	8260B	0.001035	0.005	--
4-Methyl-2-Pentanone*	8260B	0.001466	0.005	--
cis-1,3-Dichloropropene	8260B	0.000428	0.001	--

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Analyte	Method	Method detection Level- mg/kg	Method Reporting Level- mg/kg	TEC
Toluene	8260B	0.000402	0.001	--
trans-1,3-Dichloropropene	8260B	0.000283	0.001	--
1,1,2-Trichloroethane	8260B	0.000233	0.001	--
1,2-Dibromoethane	8260B	0.000285	0.001	--
2-Hexanone*	8260B	0.001293	0.005	--
1,3-Dichloropropane	8260B	0.000237	0.001	--
Tetrachloroethene	8260B	0.000423	0.001	--
Chlorodibromomethane	8260B	0.000271	0.001	--
Chlorobenzene	8260B	0.000372	0.001	--
1,1,1,2-Tetrachloroethane	8260B	0.0004	0.001	--
Ethyl Benzene	8260B	0.000412	0.001	--
m,p-Xylene	8260B	0.000617	0.001	--
o-Xylene	8260B	0.000271	0.001	--
Styrene	8260B	0.000293	0.001	--
Bromoform	8260B	0.000201	0.001	--
Isopropyl Benzene	8260B	0.000259	0.001	--
1,1,2,2-Tetrachloroethane	8260B	0.000264	0.001	--
1,2,3-Trichloropropane	8260B	0.000226	0.002	--
trans-1,4-Dichloro-2-Butene	8260B	0.000699	0.005	--
n-Propyl Benzene	8260B	0.000098	0.001	--
Bromobenzene	8260B	0.0002	0.001	--
1,3,5-Trimethylbenzene	8260B	0.000203	0.001	--
2-Chlorotoluene	8260B	0.000405	0.001	--
4-Chlorotoluene	8260B	0.000299	0.001	--
t-Butylbenzene	8260B	0.000304	0.001	--
1,2,4-Trimethylbenzene	8260B	0.00022	0.001	--
s-Butylbenzene	8260B	0.000316	0.001	--
4-Isopropyl Toluene	8260B	0.00024	0.001	--
1,3-Dichlorobenzene	8260B	0.000173	0.001	--
1,4-Dichlorobenzene	8260B	0.000094	0.001	--
n-Butylbenzene	8260B	0.000239	0.001	--
1,2-Dichlorobenzene	8260B	0.000051	0.001	--
1,2-Dibromo-3-Chloropropane	8260B	0.000372	0.005	--
1,2,4-Trichlorobenzene	8260B	0.000208	0.005	--
Hexachloro-1,3-Butadiene	8260B	0.000346	0.005	--
Naphthalene	8260B	0.000112	0.005	--
1,2,3-Trichlorobenzene	8260B	0.000259	0.005	--
Naphthalene	8270-SIM	0.00274	0.0067	0.176
2-Methylnaphthalene	8270-SIM	0.00334	0.0067	--
Acenaphthylene	8270-SIM	0.00247	0.0067	--
Acenaphthene	8270-SIM	0.00429	0.0067	--
Dibenzofuran	8270-SIM	0.00365	0.0067	--
Fluorene	8270-SIM	0.00358	0.0067	--
Phenanthrene	8270-SIM	0.00447	0.0067	--
Anthracene	8270-SIM	0.00325	0.0067	0.0572
Fluoranthene	8270-SIM	0.0034	0.0067	0.423
Pyrene	8270-SIM	0.00346	0.0067	0.195
Benzo(a)Anthracene	8270-SIM	0.00618	0.0067	0.108
Chrysene	8270-SIM	0.00274	0.0067	0.166
Benzo(b)Fluoranthene	8270-SIM	0.00602	0.0067	--
Benzo(k)Fluoranthene	8270-SIM	0.00588	0.0067	--
Benzo(a)Pyrene	8270-SIM	0.00239	0.0067	0.150
Indeno(1,2,3-cd)Pyrene	8270-SIM	0.00339	0.0067	--
Dibenz(a,h)Anthracene	8270-SIM	0.00559	0.0067	0.0330
Benzo(g,h,i)Perylene	8270-SIM	0.00345	0.0067	--
Total PAHs (SMS)	--	--	--	1.610

TABLE 2
Analytes, Methods, Method Detection Limits, Method Reporting Limits, and TEC Level

Analyte	Method	Method detection Level- mg/kg	Method Reporting Level- mg/kg	TEC
1-Methylnaphthalene	8270-SIM	0.00408	0.0067	--
Dimethylphthalate*	8270-SIM	0.00159	0.01	--
Diethylphthlalate*	8270-SIM	0.004255	0.01	--
Di-n-butylphthalate*	8270-SIM	0.00295	0.01	--
Butylbenzylphthalate*	8270-SIM	0.000885	0.01	--
bis(2-Ethylhexyl) phthalate*	8270-SIM	0.0119	0.01	--
Di-n-octylphthalate *	8270-SIM	0.003395	0.01	--
Aroclor 1016	8082	0.00112	0.004	--
Aroclor 1242	8082	--	0.004	--
Aroclor 1248	8082	--	0.004	--
Aroclor 1254	8082	--	0.004	--
Aroclor 1260	8082	0.00133	0.004	--
Aroclor 1221	8082	--	0.004	--
Aroclor 1232	8082	--	0.004	--
Aroclor 1262	8082	--	0.004	--
Aroclor 1268	8082	--	0.004	--
Total PCBs (SMS)	--	--	--	0.0598
Alpha-BHC	8081A	0.000298	0.001	--
Beta-BHC	8081A	0.000754	0.001	--
Gamma-BHC (Lindane)	8081A	0.00041	0.001	0.00237
Delta-BHC	8081A	0.000404	0.001	--
Heptachlor	8081A	0.000331	0.001	--
Aldrin	8081A	0.000394	0.001	--
Heptachlor Epoxide	8081A	0.000181	0.001	0.00247
Gamma chlordane	8081A	0.000356	0.001	--
Alpha chlordane	8081A	0.000247	0.001	--
Total chlordane (SMS)	--	--	--	0.00324
Endosulfan I	8081A	0.000334	0.001	--
4,4'-DDE	8081A	0.000548	0.002	0.00316
Dieldrin	8081A	0.000516	0.002	0.0019
Endrin	8081A	0.000494	0.002	0.00222
Endosulfan II	8081A	0.000501	0.002	--
4,4'-DDD	8081A	0.000417	0.002	0.00488
Endrin Aldehyde	8081A	0.001111	0.002	--
4,4'-DDT	8081A	0.000646	0.002	0.00416
Endosulfan Sulfate	8081A	0.000734	0.002	--
Endrin Ketone	8081A	0.000802	0.002	--
Methoxychlor	8081A	0.005458	0.01	--
Hexchlorobutadiene	8081A	0.000415	0.001	--
Hexachlorobenzene	8081A	0.000225	0.001	--
Toxaphene	8081A	0.0481	0.1	--
2,4'-DDE	8081A	0.000917	0.002	--
2,4'-DDD	8081A	0.000921	0.002	--
2,4'-DDT	8081A	0.001261	0.002	--
Total DDT (SMS)	--	--	--	0.00528
oxy-Chlordane	8081A	0.000874	0.002	--
cis-Nonachlor	8081A	0.001133	0.002	--
trans-Nonachlor	8081A	0.000891	0.002	--

Notes:
1. DEQ (2002) Suggested Background Concentration for Mercury is higher than TEC (0.18)