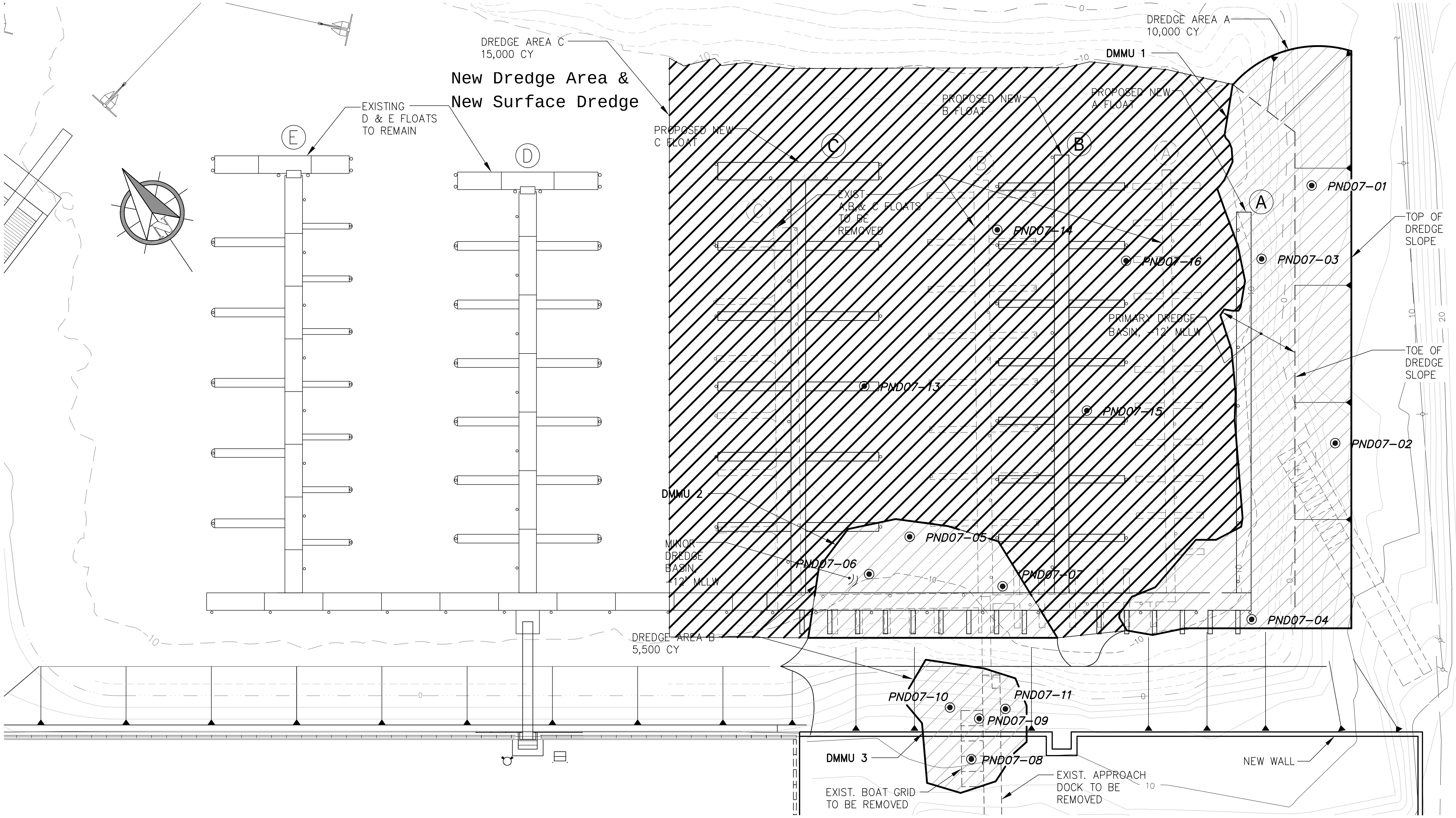

SOIL SAMPLING LOCATION PLAN

SCALE IN FEET

0 40 80 FT.

SAMPLE TABLE	
SAMPLE NO.	METHOD
PND07-01	DRILL
PND07-02	DRILL
PND07-03	DIVER
PND07-04	DIVER
PND07-05	DIVER
PND07-06	DIVER
PND07-07	DIVER
PND07-08	HAND SAMPLER
PND07-09	HAND SAMPLER
PND07-10	HAND SAMPLER
PND07-11	HAND SAMPLER
PND07-12	HAND SAMPLER
PND07-13	DIVER
PND07-14	DIVER
PND07-15	DIVER
PND07-16	DIVER

CITY/BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
DOCKS & HARBORS DEPARTMENT

REVISIONS

REV.	DATE	DESCRIPTION	DWN.	CKD.	APP.

PND ENGINEERS, INC.
9360 Glacier Highway Ste 100
Juneau, Alaska 99801
Phone: 907-586-2093
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DESIGN: KEI CHECKED: CRS
DRAWN: PJD APPROVED: CRS
SCALE: AS SHOWN

STATE OF ALASKA 49TH Charles R. Somerville CE-8845 REGISTERED PROFESSIONAL ENGINEER
DATE: 1/23/2007

OLD DOUGLAS HARBOR
RENOVATION
CBJ PROJECT NO. DH 06-350

SHEET TITLE:
SOIL SAMPLING
LOCATION PLAN

PN&D PROJECT NO.:062065.01 DWG. FILE:

1
SHEET 1 OF 1

Sampling and Analysis Plan
Old Douglas Harbor Renovation

November 2006

Prepared for:

CITY/BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
DOCKS & HARBORS DEPARTMENT

TABLE OF CONTENTS

List of Tables

1 Introduction

This document is specific to Douglas Harbor owned by the City and Borough of Juneau and located in Juneau, Alaska. The pre-dredge sampling program is part of the harbor renovation project. The preferred disposal location of the dredge material is in the Alaska Department of Natural Resources established Gastineau Channel ocean disposal site near Douglas Harbor, if deemed suitable. This location is provided as an attachment. The northerly corner of the disposal location is latitude 58° 16' 45" N and longitude 134° 22' 54" W. The alternative disposal site is a proposed timber-faced geotextile wall located within the harbor. The sampling program will be tailored to ensure that either disposal method will be acceptable.

This plan is in accordance with and meets the requirements of the Dredge Material Evaluation Framework for the Columbia River Management Area Manual, November 1998.

2 Project Information

2.1 Project Description

The purpose of this project is to renovate the existing Douglas Harbor in order to meet changing moorage demand in Juneau. The project consists of the removal of approximately 18,000 square feet of existing moorage at the A, B and C floats including all associated approach docks and finger floats. The project also includes the removal of existing east gangway, timber piles, and miscellaneous float mounted appurtenances. 55 creosote treated timber piles will be removed in their entirety with a vibratory extractor.

The project will replace the existing floats with approximately 21,000 square feet of timber moorage floats with galvanized steel piles. Maintenance dredging will occur to the original design depth, which is–12 feet MLLW (See Permit No. 2-2000-0495 Douglas Harbor 1). This occurs within the existing harbor near the Juneau Island Causeway. The slope from the top of the Juneau Island Causeway (approximately at +22 ft MLLW) to the -12 ft MLLW elevation will be graded to approximately a 2:1 slope. This will generally require fill material, which will be clean structural fill from an upland source. The dredging method is via clamshell but may also include a backhoe for the shallow and near shore portions. Dredging will be approximately 12,000 cubic yards over 1.3 acres and is intended for unconfined ocean disposal. If the material is not acceptable at the established DNR site within Gastineau Channel, the fill may be placed inside the timber-faced geotextile wall.

An existing boat grid will be partially located within the proposed bulkhead. This area will be sampled to determine if contamination occurs within the boat grid and what disposal method is appropriate. Disposal methods include encapsulating the boat grid and any contaminated material in the bulkhead or disposal at an upland location such as the landfill.

2.2 Site History

The existing Douglas Harbor facility is shown on the site plan of Appendix 1. The approximate 5.2 acre dredged basin is protected from Gastineau Channel by the Juneau Island Causeway, Juneau Island itself, a rock breakwater on the southeast side of the harbor entrance and the Dock Street fill. Existing improvements include moorage spaces for approximately 150 vessels, a boat grid, a two-lane boat launch ramp and parking for harbor users.

Douglas Harbor was created in a number of phases as summarized below:

- In the 1940's rock fill material were placed from the existing Douglas Island shoreline towards the city dock to create the existing Dock Street alignment.
- 1948: The Juneau Island Causeway was constructed to provide vehicle access between the Bureau of Mines facility on the island and nearby Douglas.
- ±1960: A containment dike was extended perpendicular to the Juneau Island causeway along the existing alignment of Savikko Road. The containment dike was constructed with a sand core and rock facing for the purpose of containing harbor dredge spoils for the then proposed harbor dredging.
- 1961: The U.S. Army Corps of Engineers (COE) completed site investigations, plans and specifications for dredging of the harbor basin and wave protection at the harbor entrance.
- 1962: the existing harbor basin was dredged to elevation -12 MLLW and construction of the existing entrance breakwater was completed as a COW construction project. The dredge materials were placed on the Douglas Island side of the Savikko Road berm and provided foundation for the various roadways, parking areas, park and recreational facilities which now constitute Savikko Park.
- 1962: The state of Alaska developed plans for Phase 1 of the inner harbor facilities in late 1962 which provided the primary float system, access dock, gangway, and boat ramp.
- 1965: Phase 2 of the Douglas Harbor Development results in the construction of additional stall floats and the boat grid.
- 1997: The COE dredges 25,000 cubic yards to straighten the entrance channel and to lower the northern areas of the basin by two feet.
- 1998: The CBJ constructed seven stall floats along the north side of C Float.
- 2003: The CBJ boat launch, fill, etc. bringing Douglas Harbor to its current configuration.

2.3 Project Team and Responsibilities

The following people are responsible for implementing the SAP:

Table 1 Project Team and Responsibilities

Task/Responsibility	Jennifer Lundberg, CEP	Dick Somerville, PE	Andrew Schicht	Kate Ivanowicz	Severn Trent Laboratories	R&M Engineering
Overall project management		✓				
Sampling Plan Development	✓					
Agency Coordination	✓					
Sediment Sampling	✓		✓	✓		
Chemical Analysis & QA					✓	
Physical Analysis						✓
Final Report	✓					

Jennifer Lundberg, CEP, PND, Incorporated

Dick Somerville, PE, PND, Incorporated

Andrew Schicht, PND, Incorporated

Kate Ivanowicz, PND, Incorporated

Katie Downie, Severn Trent Laboratories

R&M Engineering

3 LCRMA Sampling and Analysis Requirements

3.1 LCRMA Ranking

The Lower Columbia River Management Area (LCRMA) dredging evaluation manual does not directly cover the State of Alaska. However, no manual is available for Alaska so a regionally accepted manual will be used, namely the LCRMA.

The sampling approach for this site is to collect enough sediment for physical and chemical testing only. The project will not go forward if biological testing is required for dredging and disposal.

This site is not ranked under this manual but for purposes of this sampling program the dredging prism is divided into three areas with two rankings. The majority of the dredging area is assigned a low ranking of heterogeneous material based on the 1999 sampling program. These are dredge area 1 and dredge area 2. Due to how this project will be contracted out, the two dredge areas are treated as separate DMMUs though both have been assigned a low ranking. Dredge Area 1 will be designated as DMMU-1 and is approximately 10,500 cy. Dredge Area 2 will be designated as DMMU-2 and is approximately 1,500 cy. The area under the existing boat grid will be sampled separately and is approximately 1,500 cy. The reason for this is the boat grid has a higher risk for contamination due to historic uses and thus is assigned a ranking of moderate. In addition, the newly exposed surface will be tested for each of the above risk areas separately. The newly exposed surface for DMMU-1 will be identified as DMMU-4 and for DMMU-2 the newly exposed surface will be designated as DMMU-5. There is not a newly exposed surface for the boat grid as the intent is to fill. However, in the event that contaminant removal is required for some or all of the boat grid, sampling in the area of the boat grid will include two score segments and extend to 8 feet below the mud line.

For DMMU-1, two core samplings (dredge depth greater than 4 feet) will be taken using a drill rig and two shallow samples (dredge depth less than 4 feet) will be collected using a commercial diver. Samples will be composited per this plan.

For DMMU-2, three shallow samples (dredge depth less than 4 feet) will be collected using a commercial diver. Samples will be composited per this plan.

For DMMU-3, four core samplings (dredge depth greater than 4 feet) will be taken using a drill rig. Samples will be composited per this plan.

The newly exposed surface for all three areas will be sampled from the -12 to -13 foot MLLW elevation. The samples were be composited per this plan.

Sampling will occur at the same time to satisfy any upland disposal requirements by Alaska Department of Environmental Conservation (ADEC). This will entail running AK 101, AK 102, AK 103 and BTEX parameters for the near surface interval at each location. This will result in a total of seven sample locations in the dredging prism (DMMU-1 and -2, A horizon only) and four within the boat grid (DMMU-3).

3.2 Sampling and Analysis Requirements

The total dredging volume is approximately 12,000 cubic yards over 1.3 acres. This volume includes over excavation to allow for the replacement of riprap along the shore to provide erosion protection. The site will be dredged to -12 ft MLLW as shown on the attached drawing. To achieve the design depth, the dredging depth varies from 1 ft. to 6 ft.

There will be two (2) DMMU's within the dredging footprint with an assigned ranking of low and one within the boat grid area with an assigned ranking of medium. The newly exposed surface for each of the two DMMU's will also be sampled. The non-volatile parameters will be composited, per this plan, for each DMMU respectively. All volatile samples will be sampled discretely. An archive sample will be taken discretely for all non-volatile parameters within each sampling interval at each sampling location.

A DMMU has been designated for the existing boat grid area even though the intent is not to dredge but to bury this area. All samples will be taken discretely at the four sampling locations and for each core, of which there will be a total of eight samples. In addition to the ADEC requested parameters of GRO/BTEX, the volatile compounds required for the USACE will include TBT.

3.2.1 Physical and Chemical Testing Requirements

The SAP follows Tier IIB requirements. The testing protocols are described in *Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound* (PSEP 1996) and the specifications outlined in Chapter 8.2 Protocols in the LCRMA Evaluation Framework (November 1998) unless otherwise noted.

The following physical and chemical tests will be conducted on each sample.

- Grain Size
- Total Volatile Solids
- Gasoline range organics (GRO)
- BTEX

Samples that have ≥ 20% fines (meaning ≥ 20%of the material passes the 230 sieve or equivalent using a hydrometer) and/or ≥ 5% TVS require additional chemical testing per the USACE. The following chemical tests will be run on samples that fail the grain size and TVS tests. See Table 6 for the complete list of chemicals.

- PAHs
- RCRA metals (at a minimum antimony, arsenic, cadmium, copper, lead, mercury, nickel, silver, zinc)
- Chlorinated hydrocarbons
- TBT (DMMU-3 only)
- Diesel range organics (DRO)
- Residual range organics (RRO)

4 Sample Collection and Handling Procedures

Table 2 includes the existing elevation, design elevation (including over depth), the total length of each bore, and the core designations at each sampling location.

Table 2 Sampling and Testing Requirements

DMMU	Sampling Station & Method	Existing Elevation (MLLW)	Design Depth (MLLW)	Length of Bore
1	1 Drill	+4 ft	-6 ft	10 ft (+4 ft +2 = A +2 ft to -2 ft =B -2 ft to -6 ft =C)
	2 Drill	-6 ft	+2 ft	8 ft (+2 ft to -2 ft = A -4 ft to -6 ft = B)
	3 Diver	-10 ft	-12 ft	2 ft = A
	4 Diver	-10 ft	-12 ft	2 ft = A
2	5 Diver	-11 ft	-12 ft	1 ft = A
	6 Diver	-9 ft	-12 ft	3 ft = A
	7 Diver	-10 ft	-12 ft	2 ft = A
3	8 Drill	+10 ft	N/A	8 ft (+10 ft to +6 ft = A +6 ft to +2 ft = B)
	9 Drill	+8 ft	N/A	8 ft (+8 ft to +4 ft = A +4 ft to 0 ft = B)
	10 Drill	+6 ft	N/A	8 ft (+6 ft to +2 ft = A +2 ft to -2 ft = B)
	11 Drill	+4 ft	N/A	8 ft (+4 ft to 0 ft = A 0 ft to -4 ft = B)
4	1 Drill	+4 ft	>-6 ft	1 ft =F
	2 Drill	-6 ft	>-12 ft	1 ft = F
	3 Diver	-10 ft	>-12 ft	1 ft= F

DMMU	Sampling Station & Method	Existing Elevation (MLLW)	Design Depth (MLLW)	Length of Bore
	4 Diver	-10 ft	>-12 ft	1 ft= F
5	5 Diver	-11 ft	>-12 ft	1 ft= F
	6 Diver	-9 ft	>-12 ft	1 ft= F
	7 Diver	-10 ft	>-12 ft	1 ft= F

Table 3 Compositing and Field Duplicate Plan

DMMU	Core Sections	Volume	Laboratory Submitted Label[1]	Non-Volatiles Field Duplicate	Volatiles Field Duplicate
1 (Dredge Area 1)	1A 1B 1C 2A 2B 3A 4A	10,500 CY	PND-1	PND-5	PND-7 (taken at 2A)
2 (Dredge Area 2)	5A 6A 7A	1,500 CY	PND-2		PND-8 (taken at 7A)
3 (Boat Grid)	8A 8B 9A 9B 10A 10B 11A 11B	N/A	N/A	PND-6 (taken at 9A)	PND-9 (taken at 9A including TBT)
4 (Dredge Area 1)	1F 2F 3F 4F	N/A	PND-3		

[1] See Section 4.3 below regarding labeling schemes. Volatile compounds, including but not limited to GRO (AK101), BTEX, and TBT, cannot be composited.

5 (Dredge Area 2)	5F 6F 7F	N/A	PND-4		

4.1 Field Sampling Schedule

Sampling is planned for the week of February 19, 2007. Sampling will take place at extreme low tide. Chemical samples will be shipped via Gold Streak to Severn Trent Laboratories – Seattle in Tacoma, WA. Samples for physical testing (grain size) will be hand delivered to R&M Engineering in Juneau, AK.

4.2 Documentation

A field log book or another type of field record must be used to document the collection of samples and site data. This record must include:

(1) the name of each person on site supervising or conducting a characterization, assessment, or investigation;
(2) the date and time of sampling including tare weight (TW) of the GRO soil sample jars;
(3) weather conditions, including temperature, wind speed, humidity, and precipitation;
(4) the name of each person who physically collected the samples;
(5) clear photographs of the site;
(6) deviations from the sampling plan and the reason;
(7) a site map is shown in **Appendix A**, Soil Sample Station Locations, detailing the following:
    a. locations of the samples;
    b. property line locations;
    c. sampling locations and depths and corresponding sample ID numbers;
    d. any release sites;
    e. scale;
    f. a north arrow; and
    g. location of the dewatering area
(8) a final site map will be produced that shows the field notes.

A chain of custody will follow the samples. The person conducting the sampling and shipping the samples will sign off on the chain of custody and place it in the coolers prior to sealing them. The chain of custody should come with the jars from the laboratory and contain the following information:

- Sample ID
- Collection date and time
- Type of medium (soil, surface water, ground water)
- Analyses for each sample
- Transfer signature block with sufficient signature, name, date, and time spaces for all potential transfers of the samples

- Preservative, if applicable

4.3 Sample Containers and Labels

Two types of sampling containers will be used at this site. These include 4 oz glass soil jars with Teflon lined screw caps and 1 liter amber glass soil jars with Teflon lined septa sonically bonded to screw caps for TBT. See Table 6 for the specific type of container for each type of container required.

The label on each container will be completed with the following information:

(1) unique identifying number
   a. For Volatile samples and discrete archive samples, the identifying number will take the form: 2A or borehole number and sample increment. Therefore, the above sample was taken from borehole 2 at sample increment A, which is located in DMMU-1.
   b. For Composite samples the identifying number will take the form: PND -1 or Composite – DMMU designator. Therefore, the above example is a composite sample taken from DMMU-1.
   c. Two duplicates are required for the non-volatiles. This will be taken as a composite with PND-1 and labeled as PND-5, from within DMMU-1. The other duplicate will be taken from DMMU-3 with the 9A discrete sample and labeled as PND-6.
   d. Three duplicates are required for the volatiles because this includes GRO/BTEX and EPA 8260. The duplicates will be taken at 2A and labeled as PND-7; 7A and labeled as PND-8; and 9A and labeled as PND-9

(2) date and time of collection;
(3) name of person collecting the sample;
(4) each intended laboratory analysis for the sample;
(5) project name and location of sample;
(6) holding time; and
(7) tare weight for AK 101 sediment samples.

For AK-101/BTEX samples the containers will be provided by the testing laboratory. These are to be 4 oz soil jars with Teflon screw on lids and will come with the label affixed and the tare weight noted by the laboratory. The label for each container will be completed in indelible ink after the sample is taken and before moving to the next sample location:

4.4 Hygiene

The specific health and safety risks are not known for this site. However, based on historic use of the site, the possible contaminants include PAHs in the main dredge area and metals and TBT in the boat grid. All samples will all be collected using a combination of decontaminated sampling device and disposable tools. The person(s) conducting the sampling must wear disposable gloves and change them, at a minimum, for each sample to prevent cross contamination and personal safety. The sample containers must be wiped clean on the outside and at the seal to prevent leakage and cross contamination. All sample jars will be sealed in Ziploc bags to reduce the risk of contamination to samplers and lab staff in the event of jar breakage. No one conducting sampling will eat, smoke, drink, or touch their face during the sampling phase. The people conducting and/or handling the samples must wash their hands and face thoroughly prior to taking breaks or leaving the site for the day. All reusable sampling equipment must be thoroughly decontaminated per the Decontamination of Equipment section of this SAP prior to and after use for sampler safety and reduce the risk of cross contamination.

4.5 Decontamination of Equipment

All equipment must be thoroughly decontaminated. The minimum process for non-disposal equipment includes:

1. tools must be scrubbed with a stiff brush in a solution of water and laboratory-grade, critical cleaning detergent such as Alconox or a similar product;
2. tools must be rinsed twice in clean water; and
3. tools must be thoroughly rinsed with distilled or de-ionized water.

Disposable equipment will be placed in heavy duty garbage bags and properly disposed. No sampling jars/liners will be reused if they become contaminated or a sample discarded. All used and unused containers will be returned to the laboratory. The decontamination water will be hauled off site and disposed through the City's regular waste stream.

4.6 Positioning

The location of each sampling location will be identified by measuring and triangulating from known locations on the beach and/or existing dock. The distance from at least three known and permanent objects along the beach and within the basin will be documented in the field notes. The final report locations will be translated into Lat/Long coordinates.

4.7 Sample Collection Method

Samples will be collected for all potential physical and chemical tests at one time. Table 6 is the list of chemicals of concern and provides the analysis method. Table 4 provides the sampling requirements by method for each sample location and horizon.

Table 4 Tested parameters by sample location and horizon.

Sample Location and Horizon	Samples by method
1A	Grain size, TVS, GRO/BTEX, DRO/RRO, 8260, 8270, Metals
1B	Grain size, TVS, 8260, 8270, Metals
1C	Grain size, TVS, 8260, 8270, Metals
2A	Grain size, TVS, GRO/BTEX, DRO/RRO, 8260, 8270, Metals
2B	Grain size, TVS, 8260, 8270, Metals
3A	Grain size, TVS, GRO/BTEX, DRO/RRO, 8260, 8270, Metals
4A	Grain size, TVS, GRO/BTEX, DRO/RRO, 8260, 8270, Metals
5A	Grain size, TVS, GRO/BTEX, DRO/RRO, 8260, 8270, Metals
6A	Grain size, TVS, GRO/BTEX, DRO/RRO, 8260, 8270, Metals
7A	Grain size, TVS, GRO/BTEX, DRO/RRO, 8260, 8270, Metals
8A	Grain size, TVS, GRO/BTEX, DRO/RRO, TBT, 8260, 8270, Metals

Sample Location and Horizon	Samples by method
8B	Grain size, TVS, GRO/BTEX, DRO/RRO, TBT, 8260, 8270, Metals
9A	Grain size, TVS, GRO/BTEX, DRO/RRO, TBT, 8260, 8270, Metals
9B	Grain size, TVS, GRO/BTEX, DRO/RRO, TBT, 8260, 8270, Metals
10A	Grain size, TVS, GRO/BTEX, DRO/RRO, TBT, 8260, 8270, Metals
10B	Grain size, TVS, GRO/BTEX, DRO/RRO, TBT, 8260, 8270, Metals
11A	Grain size, TVS, GRO/BTEX, DRO/RRO, TBT, 8260, 8270, Metals
11B	Grain size, TVS, GRO/BTEX, DRO/RRO, TBT, 8260, 8270, Metals
1F	Grain size, TVS, 8260, 8270, Metals
2F	Grain size, TVS, 8260, 8270, Metals
3F	Grain size, TVS, 8260, 8270, Metals
4F	Grain size, TVS, 8260, 8270, Metals
5F	Grain size, TVS, 8260, 8270, Metals
6F	Grain size, TVS, 8260, 8270, Metals
7F	Grain size, TVS, 8260, 8270, Metals

Volatile samples will be collected first and immediately once the sample is available. This includes:

- GRO (A horizon only for DMMU 1 and 2, all samples for DMMU3)
- BTEX (A horizon only for DMMU 1 and 2, all samples for DMMU3)
- TBT (DMMU-3 only)

The remaining tests are for physical and non-volatile parameters and will be collected once the volatile samples are secured.

The attached sample location drawing and Table 2 provide the sample location for the USACE required tests. Two methods of sampling are planned. The first is using a drill rig mounted auger with a split spoon. This includes sample locations 1, 2, 8, 9, 10, and 11. Samples will be extracted from the split spoon and immediately taken for the volatile samples following the procedure detailed in the Volatiles section below. On-site physical characterization will occur next, per the Core Logging section. All non-volatile samples will be taken after the on-site physical characterization. All sample jars will be wiped clean and label completed as required in the Labeling section.

The second method is using a commercial diver. This is due to the inability to get a barge mounted drill rig into the sampling locations and is suitable because of the shallow dredge depth. The alternative, using a back hoe, was not selected due to the risk of cross contamination from lubricants on the bucket and the tracks. The diver will use a clean stainless steel trowel to expose the sample location. He will then use an 8 oz or larger sampling jar provided by the laboratory to take a sample, ensuring a minimum amount of headspace, and seal the lid. This sample will be given to the sampler and will be treated like a sample from a split spoon from this point on. Samples will be extracted from the large, clean jar and immediately taken for the volatile samples following the procedure detailed in the Volatiles section below. On-site physical characterization will occur next, per the Core Logging section. All non-volatile samples will be taken after the on-site physical characterization. All sample jars will be wiped clean and label completed as required in the Labeling section. The 8 oz laboratory provided jar will only be used once and returned to the laboratory for cleaning. The diver will provide position information to the sampler per the positioning section.

Sample containers will be wrapped in bubble wrap and placed in a cooler containing frozen blue ice. The temperature must remain a constant 4°C ± 2°C. Samples will be shipped per the Sample Transportation section.

Gloves must be changed at anytime that cross contamination may occur. This includes but is not limited to between samples and during any other interruption in sampling. Before moving to the next sampling location, all non-disposable equipment will be decontaminated and gloves changed. All disposable equipment including used gloves will be placed into a heavy-duty garbage bag and appropriately disposed of.

4.7.1 Volatiles

No compositing may occur for volatile compounds. Volatile compounds include but not limited to GRO (AK101), BTEX, and TBT.

For GRO/BTEX sampling, the 50 gram sample will be transferred to the pre-tare weighed sample container using stainless steel spoons. 25 mL of methanol preservative will be poured into the sample jar prior to sealing the lid. An additional 25 mL of methanol preservative may be poured onto the sample if the soil is not saturated. The label must be filled out and include the laboratory determined tare weight. No additional labels or tape may be added to the GRO/BTEX samples as this will affect the tare weight. Any errors on labels should be fixed only on the label provided at the laboratory without addition or subtraction. It is imperative that no additional labels or tape is added to the glass jars as this will skew the results. If this is also a QC location, (taken at the 2B, 7F, & 9A locations) the QC sample will be taken from the same area and labeled. At least 2 GRO/BTEX preserved samples and one unpreserved sample will be taken for each test location.

The TBT sample will also be taken immediately. Sample collection will follow the recommendations contained in the DMMP Clarification Paper, SMS Technical Information Memorandum for Tributyltin Analysis: Clarification of Interstitial Water Extraction and Analysis Methods – Interim, dated December 22, 1998. Amber glass containers with Teflon lids will be used to collect sediment samples for interstitial water TBT. The amber glass is selected as it will limit light to the sample after collection and while in transport. One TBT field duplicate is required and will be taken at 9A. The headspace will be minimized and shipped to Severn Trent Laboratory (STL) in Tacoma, WA. STL will purge the sample with nitrogen upon receipt and prior to storage.

4.7.2 Field Duplicate

At least one (1) field duplicate is required for every 10 samples taken. For the volatiles field duplicates, three duplicates will be taken for the GRO/BTEX at locations 2B, 7F, and 9A. For TBT, only one duplicate is required and will be taken at 9A.

For non-volatile compounds, there are twelve samples, including composite and discrete samples, so two duplicates for each parameter is required. These will be taken as a duplicate for the PND-1 composite sample and labeled as PND-5 and as a duplicate for the 9A sample and labeled as PND-6.

4.8 Compositing

No compositing may occur for volatile compounds. Volatile compounds include GRO (AK101), BTEX, and TBT.

The non-volatile subsamples DMMU-1 and -2 and their respective newly exposed surfaces horizon will be composited so there is a single sample submitted for testing for each DMMU, for a total of four samples. For example, for DMMU-1, this means that 1A, 2A, 2B, 3A, and 4A will be composited into a single sample for submission for testing. The same goes for DMMU-2. Only the material from the cores below -12 ft MLLW (C horizon) will be composited for DMMU-4 and DMMU-5, respectively. The samples in DMMU-3, the boat grid, will be discrete samples, for a total of eight samples. A total of twelve non-volatile samples will be submitted for laboratory testing. Archive samples will be collected for each sampling location and horizon.

4.8.1 Compositing Procedure for Volatiles

No compositing may occur for volatile compounds. Volatile compounds include but not limited to GRO (AK101), BTEX, and TBT.

4.8.2 Compositing Procedure for Non-volatiles

Sediment from each sampling location in the same DMMU will be placed into a stainless steel bowl and covered with foil until the entire DMMU is sampled. The sediment will be thoroughly mixed then placed into sample jars and labeled per the labeling section.

4.9 Core Logging/Soil Characterization

After the volatiles sample has been taken, each core section and/or grab sample will be inspected and described. For each section, the following data will be recorded in the field book and/or core log data sheet:

- Depth interval of each core section as measured from mud line (later translated into MLLW).
- Sample recovery
- Physical soil description in accordance with the Unified Soil Classification System (includes soil type, density/consistency of soil, color)
- Odor
- Visually identifiable stratifications and lenses
- Debris
- Biological activity (living and dead)
- Presence of oil sheen
- Any other distinguishing characteristics or features

4.10 Sample Handling

Each sample container lid will be sealed and labels finished before moving to the next sample location. Each sample container will be sealed in a Ziploc bag and wrapped in bubble wrap to prevent damage to the container during shipping. The containers will be placed immediately into coolers and packaged with blue ice prior to sealing the cooler with tape and USACE required seals.

Chain-of-custodies (CoC) must be completed and taped into the lid of the cooler for the samples inside that cooler prior to sealing. All samples will be maintained at 4°C ±2°C. If multiple coolers are required, CoC will reflect the samples contained within that cooler only and will be marked indicating that there are multiple chain of custodies.

No new or additional labels or tape will be placed onto GRO (AK 101) glass jars as this will affect the tare weight. Bubble wrap will be placed around the GRO jars but it will not be taped to the jars.

4.11 Sample Transportation and Chain-of-Custody Procedures

After chemical sample containers have been filled they will be packed on frozen blue ice into coolers. The coolers will be shipped via overnight Gold Streak immediately to STL – Seattle. Samples for physical testing will be hand delivered to R&M Engineering immediately. The TBT samples will be purged using nitrogen at the laboratory prior to storage. CoC procedures will commence in the field and will track delivery of the samples to STL – Seattle and the other laboratories. Specific procedures are as follows:

- Samples will be packaged and shipped in accordance with US Department of Transportation regulations as specified in 49 CFR 173.6 and 49 CFR 173.24.
    - Note: The transportation of the GRO (AK 101) preservative, methanol, is a regulated substance. It can be shipped in small quantities (less than 1 liter per shipping container) under an exempt status but this quantity must be declared in the shipping papers and on the shipping container.
- Individual sample containers will be packed to prevent breakage.
- The coolers will be clearly labeled with sufficient information (project name, time and date container was sealed, person sealing the cooler, and office name and address) to enable positive identification.
- A sealed plastic bag containing the chain-of-custody forms will be taped to the inside lid of the cooler.
- Signed and dated custody seals will be placed on all coolers prior to shipping.

The laboratory receiving person will break the shipping container seal upon arrival at the laboratory and the condition of the samples will be recorded by the receiver. The chain-of-custody form will be retrieved immediately and signed by the receiver. The temperature of the samples will be verified and noted on the chain-of-custody.

Table 5 Sample Storage Criteria

SAMPLE TYPE	HOLDING TIME	SAMPLE SIZE[1]	TEMPERATURE[2]	CONTAINER	ARCHIVE[3]
Particle Size	6 Months	100-200 g (150 ml)	4°C	1-liter Glass	X
Total Solids	14 Days	125 g (100 ml)	4°C	(combined)	
Total Volatile	14 Days	125 g	4°C		

SAMPLE TYPE	HOLDING TIME	SAMPLE SIZE[1]	TEMPERATURE[2]	CONTAINER	ARCHIVE[3]
Solids		(100 ml)			
Total Organic Carbon	14 Days	125 g (100 ml)	4°C		
Ammonia	7 Days	25 g (20 ml)	4°C		
Metals (except Mercury)	6 Months	50 g (40 ml)	4°C		
Semi-volatiles, Pesticides and PCBs	14 Days until extraction 1 Year until extraction 40 Days after extraction	150 g (120 ml)	4°C -18°C		
Total Sulfides	7 Days	50 g (40 ml)	4°C[4]	125 ml Plastic	
Mercury	28 Days	5 g (4 ml)	-18oC	125 ml Glass	
Volatile Organics	14 Days	100 g (2-40 ml jars)	4°C	2-40 ml Glass	
Bioassay	8 Weeks	4 liters	4°C[5]	5-1 liter Glass	
Bioaccumulation	8 Weeks	16 liters	4°C[5]	16-1 liter Glass	

1 Recommended minimum field sample sizes for one laboratory analysis. Actual volumes to be collected have been increased to provide a margin of error and allow for retests.
2 During transport to the lab, samples will be stored on ice. The mercury and archived samples will be frozen immediately upon receipt at the lab.
3 For every DMMU, a 250 ml container is filled and frozen to run any or all of the analyses indicated.
4 The sulfides sample will be preserved with 5 ml of 2 Normal zinc acetate for every 30 g of sediment.
5 Headspace purged with nitrogen.

5 Laboratory Physical and Chemical Sediment Analysis

Individual samples identified in Table 2 Core Section Designations and Depths will be analyzed for all the parameters listed in Table 6.

5.1 Laboratory Analysis Protocols

Laboratory testing procedures will be conducted in accordance with the LCRMA Evaluation Framework (November 1998) and the *Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound* (PSEP 1996).

5.1.1 Chain-of-custody

A chain-of-custody record for each set of samples will be maintained throughout all sampling activities and will accompany samples during shipment to the laboratory. Information tracked by the chain-of-custody records in the laboratory include sample identification number, date and time of sample receipt, analytical parameters required, location and conditions of storage, date and time of removal from and return to storage, signature of person removing and returning sample, reason for removing from storage, and final disposition of the sample.

5.1.2 Limits of Detection

For purposes of this project, detection limits of all chemicals of concern must be below the PSDDA screening levels. The screening levels for each target compound are provided in Table 6. Failure to achieve this may results in a requirement to reanalyze or reject the sample. The laboratory will be specifically cautioned to comply with the detection limits required by PSDDA. All reasonable means, including additional cleanup steps and method modifications, will be used to bring all limits of detection below PSDDA screening levels. In addition, an aliquot (250 mL) of each sediment sample for analysis will be archived and preserved at -18 °C for additional analysis if necessary. See the QAPP attached for handling of individual samples that do not meet quality control standards.

5.1.3 Sediment Conventionals

Analysis of grain size and total volatile solids will follow the *Recommended Protocols for Measuring Conventional Sediment Variables in Puget Sound* (PSEP, 1986).

5.1.4 Holding Times

All samples for physical and chemical analysis will be maintained at the testing laboratory at the temperatures specified inQuality Assurance/Quality Control

The chemistry QA/QC procedures found in Table 6 will be followed.

5.2 Laboratory Written Report

A written report will be prepared by the analytical laboratory documenting all activities associated with sample analyses. A Level 2 report will be provided. As a minimum, the following will be included in the report:

- Results of the laboratory analyses and QA/QC results.
- All protocols used during analyses.
- Chain of custody procedures, including explanation of any deviation from those identified herein.
- Any protocol deviations from the approved sampling plan.
- Location and availability of data.

As appropriate, this sampling plan may be referenced in describing protocols.

Table 6 Minimum Laboratory QA/QC

Analysis Type	Method Blank[2]	Duplicate[3]	RM[4]	Matrix Spikes[5]	Surrogates[6]
Grain Size		X			
TVS		X			
Metals	X	X	X[7]	X	
Semivolatiles[8]	X	X[9]	X[10]	X	X
Volatile Organics[11]	X	X[12]		X	X
Organometallic Compounds	X			X	X
PAHs	X	X		X	

6 Quality Control

The following quality control measures are required:

- Field Duplicate (one duplicate per 10 samples, minimum of one)
- Trip Blank (One per set of 20 volatile samples, minimum of one)
- Methanol Trip Blank (One per set of 20, minimum of one)

6.1 Field Duplicate Sample

Field duplicate samples are useful in documenting the precision (variability) of the sampling process and the site. They are independent samples collected as close as possible to the same point in space

[2] Frequency of Analysis = one per batch
[3] Frequency of Analysis = one per batch
[4] Frequency of Analysis = one per batch. Reference Material.
[5] Frequency of Analysis = one per batch
[6] Surrogate spikes will be included with every sample, including matrix-spiked samples, blanks, and reference materials.
[7] NIST certified reference material 2704.
[8] Initial calibration required before any samples are analyzed, after each major disruption of equipment, and when ongoing calibration fails to meet criteria. Ongoing calibration required at the beginning of each work shift, every 10-12 samples or every 12 hours (whichever is more frequent), and at the end of each shift.
[9] Matrix spike duplicate will be run.
[10] Canadian standard SRM-1.
[11] Initial calibration required before any samples are analyzed, after each major disruption of equipment, and when ongoing calibration fails to meet criteria. Ongoing calibration required at the beginning of each work shift, every 10-12 samples or every 12 hours (whichever is more frequent), and at the end of each shift.
[12] Matrix spike duplicate will be run.

and time. They are two separate samples taken from the same source, stored in separate containers, and analyzed independently.

At least one field duplicate must be collected for every 10 samples for each matrix sampled, for each target compound. Duplicate soil samples must be collected as close as possible to the same point in space and time. Field duplicates for non-volatiles will be thoroughly mixed (homogenized) with the sample prior to placing into two separate and clean containers. All field duplicates must be blind samples and must be given unique sample numbers just like any other field sample. Their collection should be adequately documented. The results from field duplicate samples must be used to calculate a precision value for field sampling quality control.

6.2 Trip Blank and Methanol Trip Blank

A trip blank is used to document if contamination occurred in the sample containers during shipping, transport, or storage procedures. This blank is a sample of contaminant-free media taken from the laboratory to the sampling site along with each batch of samples and returned to the laboratory **unopened**. An aqueous trip blank would contain organic free water and a methanol trip blank would contain methanol. This type of blank can be especially useful in documenting when trace volatile organic compounds are being investigated. A trip blank would be used for samples being analyzed for all volatile organic compounds such as GRO, BTEX, and volatile chlorinated solvents.

At least one trip or methanol trip blank must accompany each set of 20 samples that might contain volatile organic contaminants.

7 Laboratory Contact Information

7.1 Chemical Analysis

All samples will be delivered from the site to:

Severn Trent Laboratories Seattle
5755 8th Street East
Tacoma, WA 98424
Phone: 253-922-2310
Fax: 253-922-5047

7.2 Physical Analysis

R&M Engineering
6205 Glacier Hwy
Juneau, AK 99801
Phone: 907-780-6060

Table 7 Sample Schedule for Sediments

Parameter	Preparation/ Analytical Method[113]	Minimum Sample Size	Method Detection Limit[214]	Practical Quantitation Limit[315]	Container Description (Minimum)	Preservation/ Holding Time	Screening Level[16]
Grain Size	ASTM D 422 (modified)	200 g	n/a	n/a	4 oz soil jar; TLC	Cool 4 ^{o}C ± 2^{o}C / 6 months to extraction	n/a
Water Content	ASTM D 2216	200 g	n/a	n/a	4 oz soil jar; TLC	Cool 4 ^{o}C ± 2^{o}C / 14 days to extraction	n/a
Total Volatile Solids (%)	E160.4M	125 g	0.1	0.01%	4 oz soil jar; TLC	Cool 4 ^{o}C ± 2^{o}C / 7 days	n/a
RCRA Metals (mg/kg)							
Antimony	SW6010 by ICP	50 g	1.07	10	4 oz soil jar; TLC	Cool 4 ^{o}C ± 2^{o}C / 6 months to extraction	150 mg/kg dw
Arsenic	SW6010 by ICP	50 g	0.861	2.5	4 oz soil jar; TLC	Cool 4 ^{o}C ± 2^{o}C / 6 months to extraction	57 mg/kg dw
Cadmium	SW6010 by ICP	50 g	0.0426	1	4 oz soil jar; TLC	Cool 4 ^{o}C ± 2^{o}C / 6 months to extraction	5.1 mg/kg dw
Copper	SW6010 by ICP	50 g	0.228	2	4 oz soil jar; TLC	Cool 4 ^{o}C ± 2^{o}C / 6 months to extraction	390 mg/kg dw
Lead	SW6010 by ICP	50 g	0.41	2	4 oz soil jar; TLC	Cool 4 ^{o}C ± 2^{o}C / 6 months to extraction	450 mg/kg dw
Mercury	Method SW7471 by CVAA	5 g	0.00873	2	4 oz soil jar; TLC	Cool 4 ^{o}C ± 2^{o}C / 28 days to extraction	0.41 mg/kg dw
Nickel	SW6010 by ICP	50 g	0.101	2	4 oz soil jar; TLC	Cool 4 ^{o}C ± 2^{o}C / 6 months to extraction	140 mg/kg dw
Silver	SW6010 by ICP	50 g	0.0531	2	4 oz soil jar; TLC	Cool 4 ^{o}C ± 2^{o}C / 6 months to extraction	6.1 mg/kg dw
Zinc	SW6010 by ICP	50 g	0.0785	2	4 oz soil jar; TLC	Cool 4 ^{o}C ± 2^{o}C / 6 months to extraction	410 mg/kg dw
Chlorinated Hydrocarbons (µg/kg)							
1,3-Dichlorobenzene	Method 8270 by GC-MS		0.852	5 µg/Kg	4 oz soil jar; TLC	Cool 4 ^{o}C ± 2^{o}C / 14 days to extraction	170 µg/kg dw

13 Unless otherwise noted, all preparation and analytical methods refer to those contained in EPA's *Test Methods for the Evaluating Solid Waste, Physical/Chemical Methods*, SW-846.
14 Method detection limits (MDL), specified in 40 C.F.R. Part 136, Appendix B, revised as of July 1, 1996, adopted by reference, are determined at the department's chemistry laboratory and participating department-approved laboratories.
15 Practical quantitation limits (PQL), like method detection limits, are instrument specific. PQLs must be established by each laboratory and must equal or have a value lower than the PQL in the table. For purposes of this document, PQL = 10 x MDL.
16 Taken from LCRMA Evaluation Framework (November 1998) Appendix B unless otherwise stated. Values at or below the Screening Level are considered suitable for aquatic disposal without the need for additional biological testing.

Parameter	Preparation/ Analytical Method[113]	Minimum Sample Size	Method Detection Limit[214]	Practical Quantitation Limit[315]	Container Description (Minimum)	Preservation/ Holding Time	Screening Level[16]
1,4- Dichlorobenzene	Method 8270 by GC-MS		0.841	5 µg/Kg	4 oz soil jar; TLC	Cool 4 °C ± 2°C / 14 days to extraction	110 µg/kg dw
1,2-Dichlorobenzene	Method 8270 by GC-MS		0.679	5 µg/Kg	4 oz soil jar; TLC	Cool 4 °C ± 2°C / 14 days to extraction	35 µg/kg dw
1,2,4-Trichlorobenzene	Method 8270 by GC-MS		0.849	5 µg/Kg	4 oz soil jar; TLC	Cool 4 °C ± 2°C / 14 days to extraction	31 µg/kg dw
Hexachlorobenzene (HCB)	Method 8081 by GC		0.89	4 µg/Kg	4 oz soil jar; TLC	Cool 4 °C ± 2°C / 14 days to extraction	22 µg/kg dw
Tributyltin (TBT)[17]	Organotins by GC/MS Ion Trap Full Scan (PSEP); Krone	200-500 ml of interstitial water	0.0075 µg/L	0.0366 µg/L	1 Liter Plastic Jar	Cool 4 °C ± 2°C / 7 days to extraction	0.15 µg/L TBT
Gasoline range organics	AK101; SW 8260 BTEX/GRO by GCMS/FID using extraction EPA 5035	25 grams dry weight	0.251 mg/kg	4 mg/kg	Pretared 4 oz. soil jar, TLS	Methanol preservative, Cool 4 °C ± 2°C / 14 days to extraction	260 mg/kg[18]
Diesel range organics	AK102		5.33 mg/kg	20 mg/kg	4 oz. soil jar, TLS	Cool 4 °C ± 2°C / 14 days to extraction, less than 40 days to analysis of extract	230 mg/kg[19]
Residual range organics	AK103		9.9 mg/kg	50 mg/kg	4 oz. soil jar, TLS	Cool 4 °C ± 2°C / 14 days to extraction, less than 40 days to analysis of extract	9700 mg/kg[20]
Benzene[21]	AK101; SW 8260 BTEX/GRO by GCMS/FID using extraction EPA 5035		0.0047 mg/kg	0.02 mg/kg	Pretared 4 oz. soil jar, TLS	Methanol preservative, Cool 4 °C ± 2°C / 14 days	
Toluene[22]	AK101; SW 8260 BTEX/GRO by GCMS/FID using extraction EPA 5035		0.00259 mg/kg	0.04mg/kg	Pretared 4 oz. soil jar, TLS	Methanol preservative, Cool 4 °C ± 2°C / 14 days	

[17] See *Testing, Reporting, and Evaluating of Tributyltin Data in PSDDA and SMS Programs* at URL http://www.nws.usace.army.mil/publicmenu/DOCUMENTS/tbt_96.pdf and http://www.nws.usace.army.mil/PublicMenu/Menu.cfm?sitename=dmmo&pagename=Chem_testing. Use pore water analysis
[18] Taken from Table B2. Method Two – Petroleum Hydrocarbon Soil Cleanup Levels.
[19] Taken from Table B2. Method Two – Petroleum Hydrocarbon Soil Cleanup Levels.
[20] Taken from Table B2. Method Two – Petroleum Hydrocarbon Soil Cleanup Levels.
[21] The volatile aromatics (BTEX) are taken with the AK101 sample. All AK101 samples must be field preserved with methanol.

Parameter	Preparation/ Analytical Method[1][13]	Minimum Sample Size	Method Detection Limit[2][14]	Practical Quantitation Limit[3][15]	Container Description (Minimum)	Preservation/ Holding Time	Screening Level[16]
Ethylbenzene[23]	AK101; SW 8260 BTEX/GRO by GCMS/FID using extraction EPA 5035		0.00258 mg/kg	0.04 mg/kg	Pretared 4 oz. soil jar, TLS	Methanol preservative, Cool 4 °C ± 2°C / 14 days	
Total xylenes[24]	AK101; SW 8260 BTEX/GRO by GCMS/FID using extraction EPA 5035		0.00749 mg/kg	0.08 mg/kg	Pretared 4 oz. soil jar, TLS	Methanol preservative, Cool 4 °C ± 2°C / 14 days	
Total LPAH	SW8270 by GC-MS				4 oz soil jar; TLC	Cool 4 °C ± 2°C / 14 days to extraction	5,200 µg/kg dw
Naphthalene	SW8270 by GC-MS		0.886 µg/kg	2 µg/kg	4 oz soil jar; TLC	Cool 4 °C ± 2°C / 14 days to extraction	2,100 µg/kg dw
Acenaphthylene	SW8270 by GC-MS		0.589 µg/kg	2 µg/kg	4 oz soil jar; TLC	Cool 4 °C ± 2°C / 14 days to extraction	560 µg/kg dw
Acenaphthene	SW8270 by GC-MS		0.513 µg/kg	2 µg/kg	4 oz soil jar; TLC	Cool 4 °C ± 2°C / 14 days to extraction	500 µg/kg dw
Fluorene	SW8270 by GC-MS		0.646 µg/kg	2 µg/kg	4 oz soil jar; TLC	Cool 4 °C ± 2°C / 14 days to extraction	540 µg/kg dw
Phenanthrene	SW8270 by GC-MS		0.594 µg/kg	2 µg/kg	4 oz soil jar; TLC	Cool 4 °C ± 2°C / 14 days to extraction	1,500 µg/kg dw
Anthracene	SW8270 by GC-MS		0.38 µg/kg	2 µg/kg	4 oz soil jar; TLC	Cool 4 °C ± 2°C / 14 days to extraction	960 µg/kg dw
2-Methylnaphthalene	SW8270 by GC-MS		0.52 µg/kg	2 µg/kg	4 oz soil jar; TLC	Cool 4 °C ± 2°C / 14 days to extraction	670 µg/kg dw
Total HPAH	SW8270 by GC-MS				4 oz soil jar; TLC	Cool 4 °C ± 2°C / 14 days to extraction	12,000 µg/kg dw
Fluroanthene	SW8270 by GC-MS		1.01 µg/kg	2 µg/kg	4 oz soil jar; TLC	Cool 4 °C ± 2°C / 14 days to extraction	1,700 µg/kg dw
Pyrene	SW8270 by GC-MS		0.34 µg/kg	2 µg/kg	4 oz soil jar; TLC	Cool 4 °C ± 2°C / 14 days to extraction	2,600 µg/kg dw
Benz(a)anthracene	SW8270 by GC-MS		1.01 µg/kg	2 µg/kg	4 oz soil jar; TLC	Cool 4 °C ± 2°C / 14 days to extraction	1,300 µg/kg dw
Chrysene	SW8270 by GC-MS		0.715 µg/kg	2 µg/kg	4 oz soil jar; TLC	Cool 4 °C ± 2°C / 14 days to extraction	1,400 µg/kg dw

[22] The volatile aromatics (BTEX) are taken with the AK101 sample. All AK101 samples must be field preserved with methanol.
[23] The volatile aromatics (BTEX) are taken with the AK101 sample. All AK101 samples must be field preserved with methanol.
[24] The volatile aromatics (BTEX) are taken with the AK101 sample. All AK101 samples must be field preserved with methanol.

Parameter	Preparation/ Analytical Method[113]	Minimum Sample Size	Method Detection Limit[214]	Practical Quantitation Limit[315]	Container Description (Minimum)	Preservation/ Holding Time	Screening Level[16]
Benzofluoranthenes (b+k)	SW8270 by GC-MS		0.906 µg/kg	4 µg/kg	4 oz soil jar; TLC	Cool 4 ^{o}C ± 2^{o}C / 14 days to extraction	3,200 µg/kg dw
Benzo(a)pyrene	SW8270 by GC-MS		0.633 µg/kg	2 µg/kg	4 oz soil jar; TLC	Cool 4 ^{o}C ± 2^{o}C / 14 days to extraction	1,600 µg/kg dw
Indeno(1,2,3-c,d)pyrene	SW8270 by GC-MS		0.456 µg/kg	2 µg/kg	4 oz soil jar; TLC	Cool 4 ^{o}C ± 2^{o}C / 14 days to extraction	600 µg/kg dw
Dibenz(a,h)anthracene	SW8270 by GC-MS		0.621 µg/kg	2 µg/kg	4 oz soil jar; TLC	Cool 4 ^{o}C ± 2^{o}C / 14 days to extraction	230 µg/kg dw
Benzo(g,h,i)perylene	SW8270 by GC-MS		0.481 µg/kg	2 µg/kg	4 oz soil jar; TLC	Cool 4 ^{o}C ± 2^{o}C / 14 days to extraction	670 µg/kg dw

Legend to Table 7:

PAH = acenaphthene, anthracene, benzo-a-anthracene, benzo-a-pyrene, benzo-b-fluoranthene, benzo-k-fluoranthene, chrysene, dibenzo-a,h-anthracene, fluorene ideno-123-cd-pyrene, naphthalene, and pyrene
TLC = Teflon lined screw caps;
TLS = Teflon lined septa sonically bonded to screw caps

QAPP

1 Data Quality Objectives

Quantitative QA objectives are precision, accuracy, and completeness. They are defined below, and the acceptable numeric values are show in Table 7. Calculation of the data quality indicators is discussed in Data Reduction, Validation, and Reporting section.

Precision. Precision is a measure of the variability or random error in sampling, sample handling, preservation, and laboratory analysis. For purposes of this plan, precision is indicated by the relative percent difference (RPD) in measured analyte concentrations between laboratory duplicate samples.

Accuracy. Accuracy is a measure of the closeness of an individual measurement or an average number of measurements to the true value. For purposes of this plan, accuracy is indicated by percent recovery (PR) of matrix spike samples.

Completeness. Completeness is a measure of the amount of valid data obtained compared to the amount expected. For purposes of this plan, completeness is calculated as the number of valid samples divided by the minimum number of required samples, expressed as a percentage.

Table 8 Data Quality Objectives

Parameter	Matrix	Method	Detection Limit[1]	Precision as RPD[2]	Accuracy as PR[3]	Completeness (%)[4]
Metals	Sediment	Method 6010		35	80-120	85
		Method 7471	0.00873 mg/kg	25	75-125	85
Chlorinated Hydrocarbons	Sediment					
1,3-Dichlorobenzene	Sediment	Method 8260	0.852 µg/kg	18	86-122	
1,4- Dichlorobenzene	Sediment	Method 8260	0.841 µg/kg	18	88-132	
1,2-Dichlorobenzene	Sediment	Method 8260	0.679 µg/kg	18	88-126	
1,2,4-Trichlorobenzene	Sediment	Method 8270	0.849 µg/kg	28	51-141	85
Hexachlorobenzene	Sediment	Method 8081	0.89 µg/kg	35	70-130	85
PAH	Sediment					85
Total LPAH	Sediment	SW8270 by GC-MS				85
Naphthalene	Sediment	SW8270 by GC-MS	0.886 µg/kg	26	54-131	85
Acenaphthylene	Sediment	SW8270 by GC-MS	0.589 µg/kg	28	52-130	85
Acenaphthene	Sediment	SW8270 by GC-MS	0.513 µg/kg	27	50-144	85
Fluorene	Sediment	SW8270 by GC-MS	0.646 µg/kg	31	50-134	85
Phenanthrene	Sediment	SW8270 by GC-MS	0.594 µg/kg	28	55-133	85
Anthracene	Sediment	SW8270 by GC-MS	0.38 µg/kg	27	52-135	85
2-Methylnaphthalene	Sediment	SW8270 by GC-MS	0.52 µg/kg	27	51-138	85
Total HPAH	Sediment	SW8270 by GC-MS				85
Fluroanthene	Sediment	SW8270 by GC-MS	1.01 µg/kg	36	54-135	85

[1] All concentrations are in dry weights unless otherwise specified.
[2] Relative Percent Difference. See Data Reduction, Validation, and Reporting and Internal Quality Control.
[3] Percent Recovery. See Data Reduction, Validation, and Reporting and Internal Quality Control.
[4] ADEC Underground Storage Tanks Procedures Manual

Parameter	Matrix	Method	Detection Limit[1]	Precision as RPD[2]	Accuracy as PR[3]	Completeness (%)[4]
Pyrene	Sediment	SW8270 by GC-MS	0.34 µg/kg	31	47-152	85
Benz(a)anthracene	Sediment	SW8270 by GC-MS	1.01 µg/kg	27	55-135	85
Chrysene	Sediment	SW8270 by GC-MS	0.715 µg/kg	26	59-133	85
Benzofluoranthenes (b+k)	Sediment	SW8270 by GC-MS	0.906 µg/kg	31	43-154	85
Benzo(a)pyrene	Sediment	SW8270 by GC-MS	0.633 µg/kg	30	54-138	85
Indeno(1,2,3-c,d)pyrene	Sediment	SW8270 by GC-MS	0.456 µg/kg	29	45-153	85
Dibenz(a,h)anthracene	Sediment	SW8270 by GC-MS	0.621 µg/kg	30	50-150	85
Benzo(g,h,i)perylene	Sediment	SW8270 by GC-MS	0.481 µg/kg	28	54-142	85
TBT	Pore Water/ Sediment	Organotins	0.0075 µg/L			85
Gasoline Range Organics (GRO)	Sediment	AK101	0.251 mg/kg	20	60-120	85
Diesel Range Organics (DRO)	Sediment	AK 102	5.33 mg/kg	20	75-125	85
Residual Range Organics (RRO)	Sediment	AK 103	9.9 mg/kg	20	60-120	85
Benzene	Sediment	AK101; SW 8260 BTEX/GRO by GCMS/FID	0.0047 mg/kg	18	72-129	85
Toluene	Sediment	AK101; SW 8260 BTEX/GRO by GCMS/FID	0.00259 mg/kg	17	74-130	85
Ethylbenzene	Sediment	AK101; SW 8260 BTEX/GRO by GCMS/FID	0.00258 mg/kg	18	79-142	85
Total xylenes	Sediment	AK101; SW 8260 BTEX/GRO by GCMS/FID	0.00749 mg/kg	18	84-134	85
Grain Size	Sediment	ASTM D422 (modified)	n/a	n/a	n/a	85
Total Volatile Solids (TVS)	Sediment	Standard Method 2540 E				

Qualitative QA are representativeness and comparability.

Representativeness. Representativeness describes the degree to which data characterize the actual conditions at the site. To assure that measurements are as representative as possible, the sampling procedures described in Sample Collection and Handling Procedures will be used. These procedures are intended to ensure proper choice of sampling locations and the collection of sufficient numbers of samples.

Comparability. Comparability expresses the confidence with which one data set can be compared with another. To assure comparability, standard operating procedures will be used for the collection, preservation, and analysis of samples. Sampling and laboratory reports and procedures will be audited to assure that they follow these standard procedures and reporting formats.

2 Data Reduction, Validation, and Reporting

Data reduction describes the handling of standard, sample, and blank results, and how blank analysis results are used in calculating final results. Data validation is the systematic process of reviewing the data against criteria to assure adequacy. Data reporting details how reports are to be generated and content.

2.1.1 Reduction

The purpose of data reduction is to compile, condense, and simplify information into a more easily understood product. Much of data reduction will occur in the laboratory. Following this process, the product furnished by the laboratory will be examined using standard statistical techniques. The laboratory will provide EPA Level 2 Data Package.

2.1.2 Validation

Field Reports

All information collected through the field documentation process will be checked prior to leaving the site for:

- Qualitative completeness;
- Errors;
- Unexpected results (including possible explanations); and
- Adherence to specified sampling procedures.

Laboratory Data

Laboratory data validation will occur at three levels:

- The analyst will document and evaluate the analytical results using procedures set out in the approved QA Manual.
- The laboratory supervisor will examine the sample results and any attached documentation or explanations of the analyst.
- The laboratory QA officer, or other appropriate individual in the laboratory, will review the data a final time and provide written verification that the previously described steps were implemented.

Review of laboratory data will include:

- Completeness;
- Adherence to the Laboratory's Standard Operating Procedure for the analyte of concern; and
- Adherence to the laboratory's quality assurance procedures.

The review will focus on the establishment of detection and control limits. Any deviations will be flagged for discussion in final reports and possible corrective action. Identified deviations will include:

- Any limits outside of the acceptable range;
- Lack of documentation showing the establishment of necessary controls; and
- Unexplainable results or trends.

Sample Validity
Samples collected in accordance with the procedures outlined in this SAP including QA/QC plan will be considered valid unless otherwise indicated. Samples not collected in accordance with this plan will be considered invalid. In certain cases, a sample otherwise considered invalid may be considered valid, if a written explanation justifying the validity of the sample accompanies the data report. Invalid samples will accompany the data report and will results in appropriate corrective action, as outlined in Corrective Action section.

2.1.3 Reporting

The laboratory will provide the EPA Level 2 Data Package. This data package will include:

- Results of all samples analyses.
- Calculation of quality indicator for field and laboratory analytical results, and comparison of calculated indicators to objectives.
- Discussion of all deviations from procedures specified in this plan.

In addition, laboratory data reports will specifically include:

- Laboratory name, address, telephone number, fax number, and name of individual authorizing the release of laboratory data;
- Report date;
- Type of analysis;
- Analytical and extraction method used;
- Matrix type,
- Field sample number;
- Laboratory sample number;
- Laboratory file identification number;
- Date sampled;
- Date received;
- Date extracted/digested;
- Date analyzed;
- Location of the sample collection point;

- Project name;
- The concentrations of analyte (reported in milligrams per kilogram, dry weight);
- Definitions of any characters used to qualify data;
- Precision and accuracy values for each sample set:
- Ambient temperature of the interior of the shipping container at the time of receipt;
- A copy of the sample transfer logs for each sample or group of samples;
- Analyst's name, signature or initials, and date signed;
- Dilution factors; and
- A brief summary for each set of samples including a discussion of any significant matrix interferences, low surrogate recoveries, or analyte identifications as appropriate.

Replace the Quality Control Section with the following:

3 Quality Control

Quality control (QC) includes both field and laboratory procedures. Comparison of acceptable tolerances and actually derived values for each required QC element will accompany each project report.

3.1.1 Field Quality Control

This section defines the types of field QC checks and circumstances in which each type will be used. All Field QC check samples will be analyzed, and the results used to calculate data quality indicators. The following quality control measures are required:

- Field Duplicate (one duplicate per 10 samples)
- Trip Blank (One per set of 20 volatile samples, minimum of one)
- Methanol Trip Blank (One per set of 20, minimum of one)

Field Duplicate Sample

Field duplicate samples are useful in documenting the precision (variability) of the sampling process and the site. They are independent samples collected as close as possible to the same point in space and time. They are two separate samples taken from the same source, stored in separate containers, and analyzed independently.

At least one field duplicate must be collected for every 10 samples for each matrix sampled, for each target compound. Duplicate soil samples must be collected as close as possible to the same point in space and time. Field duplicates for non-volatiles will be thoroughly mixed (homogenized) with the sample prior to placing into two separate and clean core liners. All field duplicates must be blind samples and must be given unique sample numbers just like any other field sample. Their collection should be adequately documented. The results from field duplicate samples must be used to calculate a precision value for field sampling quality control.

Trip Blank and Methanol Trip Blank
A trip blank is used to document if contamination occurred in the sample containers during shipping, transport, or storage procedures. This blank is a sample of contaminant-free media taken from the laboratory to the sampling site along with each batch of samples and returned to the laboratory **unopened**. An aqueous trip blank would contain organic free water and a methanol trip blank would contain methanol. This type of blank can be especially useful in documenting when trace volatile organic compounds are being investigated. A trip blank would be used for samples being analyzed for all volatile organic compounds such as GRO, BTEX, and volatile chlorinated solvents.

At least one trip or methanol trip blank must accompany each set of 20 samples that might contain volatile organic contaminants.

3.1.2 Laboratory Quality Control

Laboratory QC functions will include the following:

Surrogates
A surrogate will be added to every sample that is being analyzed for organic compounds, including quality control samples, prior to sample preparation and analysis. The surrogate recovery, expressed as a percentage, is used to indicate the percent recovery of the analyte.

Retention Time Standard
A retention time standard will be analyzed with each batch of organics samples. This standard is used to verify integration range and provides data for column performance. The elution pattern indicates expected boiling ranges for petroleum products that have boiling range production criteria.

Column Performance
Column performance will be evaluated by separation number. Inadequate column performance can distort chromatograms, cause errors in quantitation and qualitative results, and produce distorted surrogate peaks.

Laboratory Spike and Laboratory Spike Duplicates
Laboratory spike and spike duplicate (MS/MSD) samples will be analyzed with each sample set, with a minimum of one spiking pair per 20 samples. These will provide the percent recovery and relative percent difference to document the accuracy and precision, respectively, of the analytical results. In laboratory spike and spike duplicate analysis, predetermined quantities of stock solutions of target analytes are added to a sample matrix prior to sample extraction, digestion, and analysis. Samples are split into duplicates, spiked with surrogates as applicable, and analyzed.

Reagent Blanks
Each set of samples (not to exceed 20 samples per set) will be accompanied by a reagent blank and calibration check sample. The reagent blank will be carried through the entire analytical procedure. The reagent blank should be the first sample analyzed. It is used to evaluate possible contamination of analytical process by target analytes. No analyte should be present in the reagent blank at a concentration greater than the method detection limit.

Method Detection Limit
Method detection limits are roughly the lowest concentrations at which an analyte can be reliably detected. Method detection limits are a function of the specific analytical method used, the analyte, the amount of sample, and other sample characteristics.

4 Calculation of Data Quality Indicators

The procedures and calculations presented here are used to determine if the results of sampling and analysis have met the data quality objectives, and to indicate whether correction actions are needed.

Precision. Precision is a measure of the variability or random error in sampling, sample handling, preservation, and laboratory analysis. For purposes of this plan, precision is indicated by the relative percent difference (RPD) in concentrations between duplicate samples, as expressed by the following formula:

$$RPD = \frac{(C_1 - C_2)}{(C_1 + C_2)/2} \times 100$$

RPD = Relative Percent Difference expressed as a percentage
C_1 = larger of the two observed values
C_2 = smaller of the two observed values

Accuracy. Accuracy is a measure of the closeness of an individual measurement or an average number of measurements to the true value. For purposes of this plan, accuracy is indicated by percent recovery (PR) of matrix spike samples as expressed by the following formula:

$$PR = \frac{C_m \times 100}{C_{srm}}$$

PR = Percent Recovery
C_m = measured concentration of a standard reference material
C_{srm} = actual concentration of a standard reference material

Completeness. Completeness is a measure of the amount of valid data obtained compared to the amount expected. For purposes of this plan, completeness is calculated as a percentage of the amount of usable samples divided by the minimum number of required samples, expressed by the following formula:

$$PC = (V/N) \times 100$$

PC = Percent Completeness
V = number of valid samples
N = number of required samples

Results of Calculations. If calculation of data quality indicators demonstrates that the data quality objectives have not been met, the appropriate corrective actions outlined in the Corrective Actions section will be taken. Results outside acceptance criteria will be flagged in the data reports along with the resulting corrective action.

5 Corrective Actions

Corrective actions are measures to correct or otherwise handle unacceptable deviations in sampling or analysis. An example of a corrective action is re-analysis of affected samples or reporting of questionable data with a note of explanation.

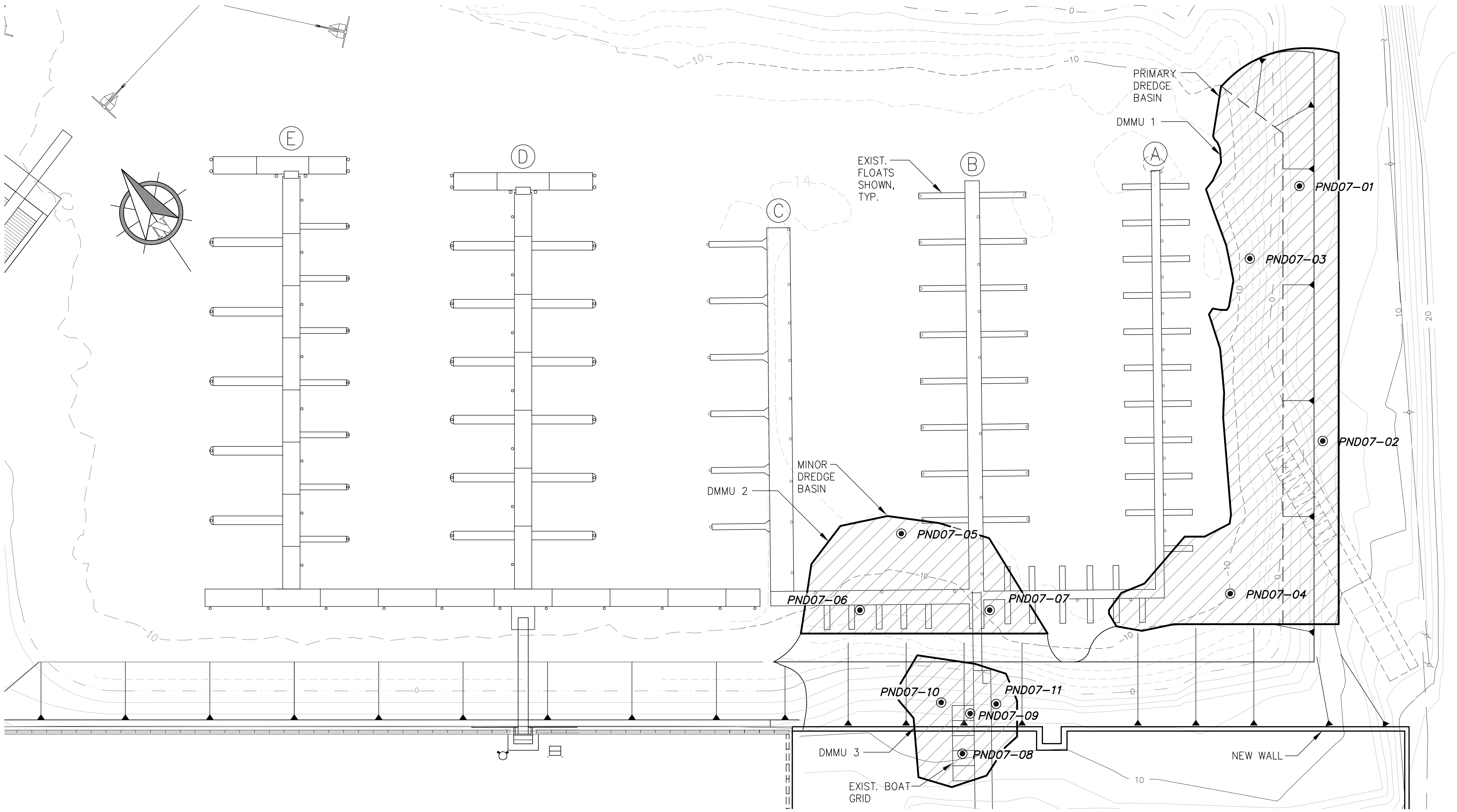
Choice of corrective action depends upon the nature of the deviation. Options include the following.

Invalid Samples. If the 95% completeness objective for the project is met and observations and field screening do not indicate an invalid sample was collected at a location with higher than the average contamination levels, then an explanatory note will accompany the data report and no further corrective action is required.

If the 95% completeness objective for samples at site is not met or observations indicate an invalid sample was collected at a location with higher than the average contamination levels at the site, then sample(s) will be recollected at the proper location on the site, properly analyzed, and reported with an explanatory note.

Data Processing, Management, or Analysis. Problems with data processing, management or analysis will be typically discovered during data reduction, validation and reporting. If problems occur, the QA officer or other appropriate person will be notified and the error corrected.

Other Problems. Other problems may interfere with meeting the data quality objectives. Appropriate corrective actions will be taken for these problems.



SOIL SAMPLING LOCATION PLAN

SCALE IN FEET
0 40 80 FT.

SAMPLE TABLE	
SAMPLE NO.	METHOD
PND07-01	DRILL
PND07-02	DRILL
PND07-03	DIVER
PND07-04	DIVER
PND07-05	DIVER
PND07-06	DIVER
PND07-07	DIVER
PND07-08	HAND SAMPLER
PND07-09	HAND SAMPLER
PND07-10	HAND SAMPLER
PND07-11	HAND SAMPLER

CITY/BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
DOCKS & HARBORS DEPARTMENT

REVISIONS

REV.	DATE	DESCRIPTION	DWN.	CKD.	APP.

PND ENGINEERS, INC.
9360 Glacier Highway Ste 100
Juneau, Alaska 99801
Phone: 907-586-2093
Fax: 907-586-2099
www.pnd-anc.com

DESIGN: KEI CHECKED: CRS SCALE: AS SHOWN
DRAWN: PJD APPROVED: CRS

STATE OF ALASKA 49TH Charles R. Somerville CE-8845 REGISTERED PROFESSIONAL ENGINEER
DATE: 1/23/2007

OLD DOUGLAS HARBOR RENOVATION
CBJ PROJECT NO. DH 06-350

SHEET TITLE: SOIL SAMPLING LOCATION PLAN

PN&D PROJECT NO.: 062065.01 DWG. FILE:

1
SHEET 1 OF 1

PND Field Notes for
Old Douglas Harbor, Juneau, AK

3/1/07
Sample Collections: Jennifer Lundberg
Other people present: Kate Ivanowicz (PND)
Mike Williams (Douglas Island Diving Services)
Weather: Overcast
Temp 5°F (-15°C)
Wind 10-15 mph (9-13 knots)
Precipitation: snow showers

Time	Sample Location	Sample ID	Notes
0850			• JL and KI arrive on site and set up sampling station on old boat ramp float.
1003	**PND07-3**		• Diver in water
1045			• Diver out of water. Only made 1 foot progress in digging hole.
1120			• Diver's regulator freezes and busts a hose. • Pack up and leave for the day.
1135			• Leave site. No further sampling due to weather conditions. Postponed for several weeks.

3/21/07
Sample Collections: Jennifer Lundberg
Other people present: Kate Ivanowicz (PND)
Brandon Ivanowicz (PND)
Weather: Rain showers
Temp 35°F (2°C)
Wind 25-30 mph (22-26 knots)

Time	Sample Location ID	Notes
0940		• JL, KI, and BI arrive on site and set up sampling station on boat grid. • After discussions with the engineer the night before, the entire boat grid will actually be buried in the new slope so only the first 2 feet of material will be sampled.
	PND07-10	• BI in charge of digging holes

Time	Sample Location ID	Notes
1003		• GRO/BTEX/8260B, Non-vols (includes 8270C, PCBs, metals, pesticides, and DRO/RRO), and dry weight sample taken. • This is saturated soil, medium gray, silty sand with gravel, surface has extensive vegetation and muscle cover.
1014		• TBT
1017	**PND07-11**	• Start digging
1026		• Take GRO/BTEX/8260B
1030		• TBT • Dark grey sand with silty brown portions, no odor or sheen observed, lots of small woody debris, unexpectedly dry.
1035		• Dry weight and Non-vols
1037	**PND07-9**	• GRO/BTEX/8260B
1039		• TBT • Dark grey silty sand with gravel, no odor, very light vegetative sheen, well saturated.
1048		• Dry weight
1050		• Non-vols
1058	**PND07-8**	• Started digging
1109		• GRO/BTEX/8260B
1111		• TBT • Dark grey silty sand with gravel and 1 cobble. Light organic sheening, no odor, muscle shells and some small woody debris.
1114		• Dry weight & non-vols • Clean up for the day
1134		• Left site
1224		• Delivered soil samples to R&M Juneau • Secured chemical samples in cooler with fresh blue ice.
1430		• Delivered chemical samples to GoldStreak

<u>3/22/07</u>

<u>Sample Collections</u>: Jennifer Lundberg
<u>Other people present</u>: Brandon Ivanowicz (PND)
Art (Douglas Island Diving Services)
<u>Weather</u>: Overcast
Temp 35°F (2°C)
Wind 5-10 mph (4-9knots)

Time	Sample Location & ID	Notes
0850		• JL and BI arrive on site and set up sampling station on "B" float.
0921		• Diver arrives, debriefed, and set up.
1034	**PND07-5**	• Diver in the water
1044	**PND07-5A**	• GRO/BTEX/8260B & dry weight
1054		• Non-vols • Dark to medium gray silt with fine sand, no odor, living worms.
1128	**PND07-5C**	• GRO/BTEX/8260B & dry weight
1130		• Non-vols • Dark to medium gray silt with fine sand.
1134	**PND-9**	• BI obtained the samples for boat grid field duplicate (forgotten yesterday) • GRO/BTEX/8260B & dry weight
1135		• Diver is cramping with the effort to shovel and comes out of the water for a break.
1140		• Non-vols
1157	**PND07-6A**	• Diver back in water
1207		• GRO/BTEX/8260B, dry weight, & non-vols • Dark gray silt with fine sand, no odor
1215	**PND07-6C**	• GRO/BTEX/8260B & dry weight • Top ½ is dark gray silt with fine sand. Bottom ½ is light grey silt with fine sand.
1219		• Non-vols
1237		• Diver took a break after last sample taken and is now back in the water.
1242	**PND07-7A**	• GRO/BTEX/8260B & dry weight • Dark gray with olive and brown streaks, organic odor, lots of living worms
1245		• Non-vols
1247	**PND-2 (composite) (5,6,7 combined for grain size analysis)**	• Non-vols
1251	**PND07-7C and PND-8 (field duplicate)**	• GRO/BTEX/8260B & dry weight
1256	**PND-4 (composite)**	• Non-vols
1257	**PND07-7C and PND-8 (field duplicate)**	• Non-vols

Time	Sample Location & ID	Notes
1310		• Left site and delivered physical samples to R&M Juneau. Later that afternoon they called and said that they couldn't do the samples on rush due to vacations and shipped them directly to R&M Anchorage. • Packaged chemical samples with fresh blue ice and sealed coolers
1250		• Delivered chemistry samples to Gold Streak.

<u>3/23/07</u>

<u>Sample Collections</u>: Jennifer Lundberg
<u>Other people present</u>: Brandon Ivanowicz (PND)
Art (Douglas Island Diving Services)
<u>Weather</u>: Overcast with periodic rain showers
Temp 38°F (3°C)
Wind 20-25 mph (17-22 knots)

Time	Sample Location & ID	Notes
0907		• JL and BI arrive on site and set up sampling station on "B" float.
0937	**PND07-9 (redo)**	• Resampled the GRO/BTEX/8260B sample as the lab called and said that sample was not in tared jar.
0940		• Diver in the water
0945	**PND07-15A**	• GRO/BTEX/8260B & dry weight • Medium to dark gray silt with fine sand, some brown sand areas, live muscles
0947		• Non-vols
0953	**PND07-15C**	• GRO/BTEX/8260B & dry weight • Top ½ dark gray silt with fine sand, bottom ½ medium gray fine sand with living worms
0955		• Non-vols
1004	**PND07-16A**	• GRO/BTEX/8260B & dry weight • Dark gray silt with fine sand, brown streaks, live muscles and worms
1011		• Non-vols
1014	**PND07-16C**	• GRO/BTEX/8260B & dry weight • Dark gray silt with fine sand with segments of medium gray fine sand.
1017		• Non-vols

Time	Sample Location & ID	Notes
1025	**PND07-14A**	• GRO/BTEX/8260B & dry weight • Dark gray silt with fine sand, muscles, and muscle shells, medium brown spots.
1029		• Non-vols
1031	**PND07-14C**	• GRO/BTEX/8260B & dry weight • Nearly black silty fine sand and muscle shells
1035		• Non-vols
1044	**PND07-12A**	• GRO/BTEX/8260B & dry weight • Medium to dark gray silty fine sand, worms and shells in one section.
1047		• Non-vols
1050	**PND07-12C**	• GRO/BTEX/8260B & dry weight • Medium gray silty fine sand, a few shells
1052		• Non-vols
1057	**PND07-13A**	• GRO/BTEX/8260B & dry weight • Medium brownish-gray silty sand with brown streaks, some woody debris and worms
1059		• Non-vols
1100	Harbor Dredge Comp	•
1104	**PND07-13C**	• GRO/BTEX/8260B & dry weight • Medium gray & brown silty fine sand, muscles, woody debris
1105		• Non-vols
1108	New Surface Dredge Comp	•
1127	**PND07-4A**	• GRO/BTEX/8260B & dry weight • Medium brown to medium gray silty fine sand, worms
1130		• Non-vols
1135	**PND07-4C**	• GRO/BTEX/8260B & dry weight • Top ½ dark gray silty fine sand; bottom ½ brown medium sand with gravel
1137		• Non-vols
1143	**PND07-3A**	• GRO/BTEX/8260B & dry weight • Mostly medium brown silty fine sand with some nearly black silty fine sand near top.
1146		• Non-vols
1150	**PND07-3C**	• GRO/BTEX/8260B & dry weight • Nearly black silty sand, wood fragments, muscles, worms
1153		• Non-vols • Clean up

Time	Sample Location & ID	Notes
1214		• Left site • Soil samples will now go to R&M Anchorage as the tech at the Juneau company will be on vacation and cannot do them rush. JL will deliver. • Delivered chemistry samples to Gold Streak.

3/24/07

Sample Collections: Jennifer Lundberg
Other people present: Paul Dzwonoski (PND)
Buck, driller (Denali Drilling)
Andy, helper (Denali Drilling)
Weather: Overcast with light snow and breeze
Temp 33°F (1°C)

Time	Sample Location & ID	Notes
0928		• JL and PD arrive on site and mark the drill sites • There is only sufficient time to drill 1 hole for environmental so selected PN07-2.
1010		• Driller's arrive on site. • JL set up sampling station on old boat ramp float • Debrief drillers on locations and determine method for obtaining environmental and geotechnical samples. JL gets the split spoon first for samples then PD finishes up the field description and classification. PD takes the sample for sediment analysis.
1047	**PND07-2**	• Start drilling
1103	**PND07-2A**	• Sample designation is 4'-6' and represents the top 2 ft (0 to -2' bgs). • GRO/BTEX/8260B, dry weight, and 8270C • No odor, 5'-6' segment is light gray, medium sand. 4-5' is nearly black silt with a gravel layer at the 5' interval.
1126	**PND07-2B**	• 6'-8' (-2' to -4' bgs) • Top 1/3 was gray fine sand. Bottom 2/3 was grey medium sand.
1140	**PND07-2C**	• 8-10' (-4' to -6'bgs) • Grey medium to course sand.
1141	**PND-1**	• Took composite of the "A" horizon
1142	**PND-3**	• Took composite of the "C" horizon • Clean up

Time	Sample Location & ID	Notes
1203		• Left site • Delivered chemistry samples to Gold Streak for Monday delivery • Packaged grain size samples for checked baggage.

3/26/07
Jennifer Lundberg hand delivered the grain size samples to R&M Engineering Anchorage.

3/1/07

AR 0850
Kate Ivanowich
Jennifer Lindberg
Mike Williams (diver)

1003 Diver in H_2O for RN007-03

1045 Diver out of H_2O
only 1 ft progress

1120 divers regulator frozen + busts hose.
pack up.

1135 lv site

Overcast, ~5°F, windy E
Snowing

3/21/07

35° F
25-30 mph wind
Rain

Kate
Brandon
Jennifer

AR 0940
set up for 8-11
- Δ to 2' hand dug samples
as further eval of
siteplans the entire area
will be buried
- started digging PND07-10

1003 PND07-10
GRO/BTEX, Dry wt + 8260

Saturated soil
Med gray
silty sand w/ gravel
lots of vegetation + mussels

1014 TBT

1017 Started PND07-~~09~~ 11

1026 GRO/BTEX

1030 TBT
~~DK~~ GREY w/ sandy Brown silty
no odor & sheen
lots of sm. woody debris
Dry - low moisture

1035 DRY WT, 8260

1037 PND-07-9
GRO/BTEX

1039 TBT

Drk Gray Silty sand w/gravel
No odor
very light sheen. Saturated

1048 Dry Wt
1050 8260

1058 Started digging
PND 07-8

1109 GRO/BTEX

1111 TBT

DRK Grey silty Sand
w/ gravel & 1 cobble

light organic sheening
No odor
muscle shells
some woody debris

1114 DRY WT, 8260

Cleanup.

~~12~~ 1134 left site

~~Packed~~

1224 Delivered soil samples
to E&M

Delivered samples ~~to~~
cooler ~~to~~ GoldStreak

3/22/07

850 ~~AM~~ AR on site for
#5-7 & 12-16

5-10 mph wind

Overcast

35°F

Brandon
Jennifer

0921 Diver AR

~~Art~~

Diver debrief + set up

1034 Diver in the water to
PND07-5

1044 GRO/BTEX / D.wt
PND 07-5A

1054 8270C

DK to med grey
- silt w/ fine sand
no odor
living worms

1128 PND07-5C
GRO/BTEX D.wt

DK to Med grey
silt w/ fine sand

1130 8270

PND-9 - Field Dup for Boat Grid

~~X~~ 1134 GRO/BTEX/Dry wt/TBT
1140 8270

Diver cramping. Out of H2O @ 1135

1157 Dive back in water for
PND07-6

1207 GRO/BTEX DW / 8270
PND07-6A
DK grey silt w/ fine sand
No odor

1215 PND 07-6C
GRO/BTEX

DK Grey top 1/2
silt w/ fine sand

lt grey bottom 1/2
silt w/ fine sand

1219 8260

1237 Diver back in Water
PND07-7

1242 GRO/BTEX DW
PND07-7A

DK Grey w/ Olive & Brown Streaks

Organic odor

worms

1245 8270

1247 PND-2
(Composite)

1251 PND07-7C &
PND-8 (Dup)
GRO/BTEX/DWt.

PND-4 1256

1257 PND 07-7C &
PND-8
8270

1310 left site

delivered samples to
K&M

3/23/07

38°F

Windy (20 MPH)

Overcast w/ Rain
Showers

Brandon
Art (diver)
Jennifer

0907 AR on site setup

0937 Redid GRO/BTEX for
PND07-4
* lab said submitted sample
not in pre-tared jar.

0940 Diver in Water

0945 PND07-15A
GRO/BTEX
Dry Wt

Med to Dk grey silt
w/ fine sand
Some brown sand
muscles

0947 8270

0953 PND07-15C
GRO/BTEX /D.W.

top 1/2 dk grey silt w/
fine sand
bottom 1/2 Med grey fine sand
Worms

0955 8270

1004 PND07-16A
GRO/BTEX
Dry wt.

DK grey silt w/ fine
sand, brown streaks
Muscles & worms

1011 ~~8~~ 8270

1014 PND07-16C
GRO/BTEX Dry Wt

DK grey silt w/ fine sand
w/ segments of Med
grey fine sand

1017 ~~82~~ 8270

1025 PND07-14A

GRO/BTEX
Dry wt

~~Dk~~ Dk grey silt w/ fine sand
Muscles + muscleshells
Med brown spots

1029 8270

1031 PND07 14C

GRO/BTEX
Dry wt

nearly black silty fine sand
& muscleshells

1035 8270

1044 PND07-12A

GRO/BTEX
DW

Med dk grey silty fine sand
~~Some~~ worms + shells
in one section

1047 8270

1050 PND07-12C
GRO/BTEX
D.W.

Med Grey silty fine sand
a few shells

1052 8270

1057 PND07-13A
GRO/BTEX
D.W

Med brownish grey silty
sand w/ Brown Streaks
some woody debris &
worms

1059 8260

1100 Harbor Dredge Comp

1104 PND07-13C
GRO/BTEX
D.W

Med Grey & brown
silty fine sand
Muscles
Wood debris

1105 8270

1108 New Surface Dredge
Comp

1127 PND07-4A
GRO/BTEX
D.W.

Med Brown to Med grey
silty fine sand
Worms

1130 8270

1135 PND 07-4C
GRO/BTEX
D.W

top ½ dk grey silty fine sand
bot ½' brown med sand w/ gravel

1137 8270

1143 PND07-3A
GRO/BTEX
DW

Mostly Med brown silty
fine sand
Some nearly black silty
fine sand near top.

1146 8270

1150 PND07-3C
GRO/BTEX Dry

nearly black silty
sand
wood fragments
mussels
worms

1153 8270

Cleaned up & left site
1214

Soil Samples have to
go to Anchorage as
The tech @ R&M on
vacation. JL will
deliver.

Delivered Samples to
Gold Streak.

3/24/07

0928 AR on site

Paul

Jennifer

Mark: the drill site; Denali drilling, Buck - driller, Andy - helper

1010 Drillers AR + Andy

~~JL set up sampling station~~

33°F

light snow

light breeze

1047 Started drilling PND07-2

1103 4'-6' bgs PND07-2A

All samples taken

See Paul's notes for soil type

- No odor 5'-6' lt grey med sand 4'-5' clearly

black silt, gravel in layer between

1126 6'-8' bgs

PND07-2B

~~Mostly~~ top 1/3 was fine sand grey

bottom ~~middle~~ 2/3 grey med sand

1140 8'-10' bgs

PND07-2C

grey med to course sand

1141 PND-1 (composit)

1142 PND-3 (composit)

Cleaned up + left site → 1203