ANNEXE 19

Analysis of rehabilitation alternatives

REPORT

ANALYSIS OF REHABILITATION ALTERNATIVES
ALCOA, BAIE-COMEAU, QUEBEC

Prepared for

Alcoa
Baie-Comeau, Quebec

Prepared by

Anchor QEA, LLC
Beverly, Massachusetts

June 2013

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LIST OF ACRONYMS AND ABBREVIATIONS

µg/L	micrograms per litre
AASI	Axys Analytical Services, Inc.
ABC facility	Alcoa Baie-Comeau facility
ACES	Automated Coastal Engineering System
ADCP	Acoustic Doppler Current Profiler
ADM	Anse du Moulin
ARA	Analysis of Rehabilitation Alternatives
BDA	Baie des Anglais
CAD	confined aquatic disposal
CDF	confined disposal facility
CEAA	Canadian Environmental Assessment Act
cm	centimetres
COPC	contaminants of potential concern
CSM	Conceptual Site Model
DOC	dissolved organic carbon
EERC	Energy and Environment Research Center
EHHRA report	Ecotoxocological and Human Health Risk Assessment
EPH	extractable petroleum hydrocarbon
EQA	Environment Quality Act
ERDC	Engineering Research and Development Center
ESIA	Environmental and Socioeconomic Impact Assessment
FEL	Frequent Effects Level
GRA	General Response Action
H:V	horizontal to vertical
Hazen	Hazen Research, Inc.
HQ	hazard quotient
ICPMS	inductively coupled plasma mass spectrometry
ISMER	Institute of Marine Sciences of Rimouski
kg/yr	kilograms per year
km	kilometres
K_{OC}	organic carbon-water coefficient

Maxxam	Maxxam Analytics, Inc.
MDDEP	Ministère du Dèveloppement Durable, de l'Environnement et des Parcs
mg/kg	milligrams per kilogram
mg/L	milligrams per litre
MHHW	mean higher high water
MHW	mean high water
MLLW	mean lower low water
MLW	mean low water
NER	Nelson Environmental Remediation, Ltd.
OEL	Occasional Effects Level
PAH	polycyclic aromatic hydrocarbon
PAH34	total PAHs including parent and substituted PAHs
PCB	polychlorinated biphenyl
PEL	Probable Effects Level
ppt	parts per thousand
RA	rehabilitation alternative
RAO	Rehabilitation Action Objective
Retec	The Retec Group Inc.
RI	risk index
SCMR	Societe Canadienne de Metaux Reynolds
SFE	supercritical fluid extraction
SNC	SNC-Lavalin Environment Inc. of Montreal
SOC	soot organic carbon
SPME	solid phase microextraction
STL	Severn Trent Laboratories, Inc.
TOC	total organic carbon
TPAH	parent PAH compounds with established regulatory criteria
TPCB	Total PCB
TPH	total petroleum hydrocarbon
TRV	toxicity reference value
TSS	total suspended solids
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency

1 INTRODUCTION

In this Analysis of Rehabilitation Alternatives (ARA) report, Alcoa presents the development, analysis, and evaluation of rehabilitation alternatives (RAs) for the Anse du Moulin (ADM). The detailed evaluation is based on extensive discussions with the Ministère du Dèveloppement Durable, de l'Environnement et des Parc (MDDEP) and other agencies, public consultation, and comprehensive environmental investigations and engineering studies to support selection of a RA for implementation.

Sediment located in the ADM in the vicinity of the Alcoa Baie-Comeau facility (ABC facility) contains contaminants of potential concern (COPCs) that include polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs). Sediment COPC concentration varies with location and depth based on comprehensive testing of sediment chemical and physical properties. Extensive environmental investigations have been undertaken by predecessor owners of the smelter and by Alcoa from the 1980s to the present. Localized areas of relatively high COPC concentrations have been identified in certain areas, which are discussed in Section 4 in this report.

The objectives of this rehabilitation project include the following:

- Reduce the potential impact of sediment contamination on aquatic organisms.
- Limit potential migration of contaminated sediments within the ADM, and from the ADM to the adjacent Baie des Anglais (BDA).
- Provide a long-term solution to the problem of sediment contamination.

Alcoa has proactively devoted significant resources and effort to achieve these objectives based on a scientifically sound and environmentally protective approach. This ARA report summarizes the development, evaluation, and selection of a recommended RA, based on comprehensive engineering studies using a significant body of field and laboratory investigation data.

1.1 Overview

The ABC facility is located in the city of Baie-Comeau on the ADM shoreline. Baie-Comeau is located approximately 420 kilometres (km) northeast of Québec City and 230 km southwest of the city of Sept-Îles (Figure 1-1). The ABC facility, including the port facilities, is situated on approximately 238 hectares (Figure 1-2). Alcoa's port facilities are situated on the southern ADM shoreline. The ADM is located within the larger BDA. The BDA is bordered to the south by Pointe Saint Gilles and to the north by Pointe Saint-Pancrace.

The ABC facility was constructed in 1957, is the largest employer in Baie-Comeau, and has an annual production of approximately 400,000 metric tonnes including T-ingots, rolling ingots, billets, and rod. The Baie-Comeau smelter has been successively owned by the Canadian British Aluminum Company, the Reynolds Metals Company, and Alcoa since 2000. The port facilities include Wharves 1, 2, and 3 and are owned and operated by Alcoa (Figure 1-2).

Alcoa has been engaged in discussions with MDDEP and other agencies dating back to the original project announcement in 2008 to evaluate potential rehabilitation options for addressing sediments within the ADM. Following a summary of all studies conducted in the ADM and the BDA (GENIVAR 2003), Alcoa undertook additional sediment characterization studies in 2006 to assess rehabilitation possibilities for ADM sediment. In December 2008, Alcoa sent a project notice to the MDDEP regarding navigational dredging, improvements to the existing wharves, and the addition of a new wharf (Hatch 2008). During the period from 2008 to early 2011, Alcoa worked toward developing sediment RAs that could be combined with planned upgrades to the port facilities proposed in the December 2008 project notice. The RA approaches developed combined dredging in navigational areas, construction of a confined disposal facility (CDF) in the slip located between Wharves 2 and 3 for placing dredged material, and capping in non-navigable areas to isolate sediment contaminants in situ in an environmentally protective manner.

In April 2011, Alcoa advised the MDDEP that it planned to modify its initial project to focus on the repair of the existing wharves and sediment rehabilitation in the ADM (SNC-Lavalin Environment Inc. of Montreal [SNC] 2011). Engineering studies (SNC 2011) concluded that Alcoa's wharves were in deteriorated condition and recommended proceeding with wharf repair, rehabilitation, or replacement as soon as possible in order to safeguard their use, prevent their collapse, and maintain regular operations at the port facilities required for the ABC facility's operation. Alcoa, therefore, submitted a request to the MDDEP on April 26, 2011, to quickly undertake emergency repair work on the wharves. The ABC facility received a decree (Quebec decree number 601 2011) to both conduct rehabilitation of the sediments in the ADM and complete the emergency repair of the wharves. The wharf repair work began in summer 2011.

Since April 2011, Alcoa has performed additional field and laboratory investigation studies, and completed human health and environmental risk assessment, hydrodynamic and sediment stability modelling reports, and this ARA report. During that period, Alcoa has continued to meet regularly with the MDDEP, other agencies, and the public to provide status updates on the project and ongoing study findings. Input received from those meetings has been incorporated in this ARA report.

1.1.1 Study Area

The ARA report focuses on the ADM and adjacent portions of the BDA, based on extensive investigation of both the BDA and the ADM. The ADM is included within the BDA (Figure 1-1). The ADM is surrounded by the Alcoa property and covers approximately 0.1 square km (Figure 1-2). The Study Area includes the ADM and portions of the BDA adjacent to the ADM.

1.1.2 Alcoa Plant Facility Source Control Measures

ABC facility discharges and transloading activities at the facility wharves have been identified as likely sources of ADM sediment contaminants. Over the years, several modifications have been made to the ABC facility operations, which have resulted in considerable improvements in the quality of effluent discharged to the ADM. These improvements include discontinued use of PCBs since the beginning of the 1980s, and decontamination in 1985 of process areas and equipment impacted by PCBs. Liquid effluent that included discharge from the carbon plant as well as discharge from the Söderberg potroom gas treatment system was discharged into ADM. The gas treatment system was replaced in the mid-1980s by a dry system for the potrooms and briquette production plant. These changes, combined with a new water treatment plant in 1991, reduced the amount of PAHs discharged into ADM through the effluent by approximately 99 percent.

In addition to liquid discharges, transloading activities are also responsible for some of the PAHs in the ADM due to accidental spills of solid pitch and coke (SNC 1995). Solid pitch was replaced by liquid pitch in 1993 and additional environmental measures greatly reduced solid discharges to the ADM.

PAH air emissions from the potrooms decreased significantly from 1984 to 1990, despite an increase in ABC facility production, due to technological modifications made to the ABC facility (GTCBA 1993). Prior to the 1980s and 1990s, air emissions would likely have settled on land areas and have been carried by stormwater runoff into the ADM, or settled directly in the ADM. These effects have been significantly controlled or eliminated since that time.

In summary, Alcoa has reduced discharges to the ADM by more than 99 percent.

1.2 Previous Investigations

The ARA includes evaluations based on comprehensive field and laboratory investigations, data analysis, human health and environmental risk assessment, and engineering studies. Alcoa has undertaken extensive data collection and analysis to support the studies, including the collection of several hundred environmental media samples in the ADM and adjacent BDA for laboratory testing. Environmental samples include surface and subsurface sediment, sediment porewater, surface water, and biota.

The investigations have dated to the 1980s when PAHs and PCBs were discovered in ADM and BDA sediments. For the current ARA report, previous investigations conducted before 1991 were reviewed and compared to more recent data to assess potential trends in sediment and biota concentrations, but were not included in the analysis. Multiple investigations that included field collection and laboratory analysis of aquatic organisms in the ADM and BDA were conducted from 1983 to 1991. Species sampled included the common whelk (*Buccinum undatum*), blue mussel (*Mytilus edulis*), snow crab (*Chion ecetes opilio*), eastern shovelnose ray (*Aptychotrema rostrata*), Atlantic herring (*Clupea harengus*), and Atlantic cod (*Gadus morhua*). SNC summarized the data into a single comprehensive report (SNC 1996). Based on the age of those data and differing analyses methods compared to the more recently collected data, the 1983 to 1991 data are not further analyzed in this ARA report.

Biological data are presented in the Environmental and Socioeconomic Impact Assessment (ESIA).

Several additional environmental investigations were also conducted in the area, including the following:

- 1994 – SNC conducted surface and subsurface sediment investigations to delineate the extent of Class 3 and 4 PAH and PCB sediment contaminants within the ADM and the BDA (SNC 1996). The SNC investigation included collection of sediment cores and surface sediment grab samples. Samples were analyzed for grain size distribution, total organic carbon (TOC), metals (As, Cd, Hg, Pb, Be, Cr, Cu, Ni, V, Zn), PAHs, PCBs (Aroclor), and mineral oil and greases.
- 2006 – The Retec Group Inc. (Retec) and GENIVAR conducted surface sediment investigations in the ADM and BDA to evaluate ADM/BDA sediment contaminant concentrations, document changes in conditions since the 1994 investigation, and assess the bioavailability and toxicity of sediment PAHs. The investigation included collecting and analyzing selected samples for PAHs, PCBs (Aroclors), TOC, mercury, and moisture content. Surface sediment samples were also collected for toxicity testing and for detailed PAH chemical analysis using supercritical fluid extraction (SFE), and analyzed for soot organic carbon (SOC), total solids, grain size distribution, pH, and ammonia. Sediment porewater was analyzed using solid phase microextraction (SPME) and included analysis of dissolved organic carbon (DOC) and freely dissolved PAHs.
- 2007 – Retec and GENIVAR conducted additional surface and subsurface sediment investigations that included collection of surface sediment grab samples and sediment cores. Surface grab and sediment core samples were analyzed for PAHs, PCBs (Aroclors), grain size distribution, percent moisture, and TOC. Three additional large volume surface sediment samples were collected with the grab sampler to evaluate the potential correlation of grain size with PAH and PCB concentrations. Sediment traps were also deployed to measure sedimentation rates and contaminant concentrations in accumulated sediment. Additional surface sediment samples were collected for toxicity testing, detailed PAH chemical analysis including total and rapidly available PAHs using SFE, SOC, total solids, grain size analysis, pH, and ammonia. Selected sediment samples were analyzed for total cyanide, free cyanide,

and metal cyanide complexes. Sediment porewater was analyzed using SPME for DOC and freely dissolved PAHs.

- 2008 – Retec and GENIVAR conducted surface and subsurface sediment investigations that included collecting surface sediment samples and sediment cores for laboratory analyses to measure percent moisture, TOC, petroleum hydrocarbons, PAHs, PCBs (congeners), metals, and grain size distribution. Sediment traps that were deployed in 2007 were evaluated in July 2008 for sediment deposition, PAH concentrations, and PCB concentrations in deposited sediment. Additional surface sediment grab samples were collected and analyzed for total and rapidly available PAHs using SFE, total solids, grain size, pH, ammonia, and sulfide. Toxicity testing was also performed on the samples. The 2008 investigations also included collecting sediment samples for engineering testing—column settling testing and modified elutriate testing.
- 2009 – Investigations led by GENIVAR included collecting sediment samples for engineering testing—pancake column leachate testing, bench-scale separation testing, and modified elutriate testing. The 2009 investigations also included collecting surface sediment samples and sediment cores, with selected samples analyzed for moisture content, grain size distribution, geotechnical index properties, PAHs, PCBs, TOC, and selected metals. Additionally, a geotechnical investigation coordinated by Hatch included borings drilled in fall 2009 to further evaluate deeper ADM and BDA sediment physical properties.
- 2011 – GENIVAR conducted a surface and subsurface sediment sampling investigation to support developing the human health and environmental risk assessment for the ADM and to provide information to support the ESIA. The investigation included collecting sediment cores, with selected samples analyzed for PAHs, TOC, percent moisture, PCBs and geotechnical testing. Surface sediment samples were analyzed for grain size, pH, percent moisture, cyanide + thiocyanate, leachable fluoride, nutrients, ammonia, TOC, metals, extractable petroleum hydrocarbons (EPHs), PAHs, PCBs, and toxicity testing. Additionally, whelk tissue and ten sea urchin samples were collected for analysis to measure concentrations of PCBs and PAHs.

These field and laboratory investigation methods and findings are discussed in more detail throughout this report.

1.3 Report Organization

The remainder of this report is organized into nine sections. The Study Area that includes the ADM and adjacent portions of the BDA is described in Section 2. Previous field and laboratory investigation methods and results are summarized in Section 3. Field and laboratory investigation findings are discussed in Section 4 and are used to describe the nature and extent of Study Area sediment contaminants.

To further support RA development, the human health and environmental risk assessment is summarized in Section 5 and a Conceptual Site Model (CSM) is presented in Section 6. Rehabilitation Action Objectives (RAOs) and General Response Actions (GRAs) are summarized in Section 7. Section 8 presents an evaluation/screening of potential rehabilitation technologies and development of potential RAs.

The detailed and comparative analyses of RAs are included in Section 9. Alcoa's recommended rehabilitation approach for the ADM is also presented in Section 9. Section 10 presents a list of reference materials cited in the ARA report.

2 STUDY AREA DESCRIPTION

The Study Area description includes a summary of ADM and adjacent portions of the BDA physical setting, and geologic, hydrodynamic, and biological conditions. An emphasis is placed on the conditions applicable to rehabilitation. In particular, hydrodynamics and associated sediment transport potential are discussed in detail because of the strong influence on the CSM and RA development and evaluation.

2.1 Physical Setting

The BDA is located on the north shore of the St. Lawrence River's Lower Estuary and is approximately 350 km northeast of Quebec City. The BDA is a triangular-shaped bay, covering an area of approximately 11 square km and bordered by Baie-Comeau and Pointe Saint-Pancrace (see Figure 1-1). ADM is located on the west side of the BDA. The west and south shores of ADM are occupied by the Alcoa port facilities (see Figure 1-2). The ADM is connected to the BDA by an approximately 250-metre (m)-wide opening.

The ADM has an approximate mean water depth less than 7 metres (m), except near the Alcoa port facilities where the navigation depth is approximately 10 m. The Cargill port facilities are located on the north shoreline of the ADM, where the ADM meets the BDA. The ADM receives the discharge from Lac Aber, located in the Saint-Georges district of Baie-Comeau, and Alcoa facility stormwater runoff and process effluent. The outfalls for these discharges are located in the northwest corner of the ADM. Additionally, a small unmapped seasonal stream (the Ruisseau du Moulin) occasionally discharges flow into the ADM in the vicinity of the outfalls.

The BDA covers approximately 11 square km (Figure 1-1). On the west side, the BDA is bordered by Baie-Comeau's port facilities and on the east side, by Pointe St. Pancrace. The water depth exceeds 40 m over an area of approximately 10 square km within the BDA, with a maximum depth of approximately 100 m. On the west side of the BDA and located in Baie-Comeau, the Abitibi-Consolidated paper mill effluent is discharged. In addition, the BDA receives effluent discharged from the Baie-Comeau municipal wastewater pumping station overflow.

The Riviere Aux Anglais is located north of ADM and the Cargill port facilities, and discharges into the BDA with a mean discharge of 11 cubic m per second.

2.2 Geologic Setting

The Study Area is located in the geological Grenville Province at the edge of the Canadian Shield. Bedrock in the Baie-Comeau region is mainly granite and granite-gneiss of Pre-Cambrian age (Proterozoic; SMI 2009). Numerous bedrock outcrops are observed along the BDA shoreline. BDA and ADM sediments generally were deposited near the end of the Quaternary glacial period, and include primarily granular sediment (sands and gravels) with occasional deposits of silt and/or clay.

The ADM shorelines include the following:

- A naturally rocky (self-armored) northern shoreline that consists of cobbles, boulders, and occasional concrete blocks and pockets of sandy gravel
- A constructed armor consisting of boulder riprap along the western shoreline north of Wharf 3
- Sheetpile walls that form the Alcoa Wharves 1, 2, and 3 along the remainder of the western shoreline, south of Wharf 3, and also along the southern shoreline

The following general stratigraphy was described in the 2009 geotechnical investigation report (SMI 2009), proceeding from surface sediment to deeper sediment:

- Compact upper sand deposit with occasional layers of gravel, and/or cobbles and boulders; occasional particles of pitch and alumina were observed in the surface sediment layer during the 2009 geotechnical investigation and other field investigations, particularly near the wharves
- Occasional firm clayey deposits
- Occasional very loose silty sand
- Compact to very dense silty sand with occasional layers of gravel, and/or cobbles and boulders
- Compact to very dense lower sand deposit with occasional layers of gravel, and/or cobbles and boulders
- Bedrock (granite)

Where bedrock was encountered, the depth to bedrock was approximately 50 m below the top of the overlying sediment layers. The sediment layers described above as "occasional" were not laterally continuous based on the boring findings. The geotechnical report is included in Appendix A. Cross-section locations and cross-sections showing general subsurface conditions are presented on Figures 2-1 through 2-3.

2.3 Hydrodynamics

Site hydrodynamics include a discussion of the ADM and BDA tides, waves, and circulation. Hydrodynamic studies of the ADM and BDA include:

- A fall 1995 study (Procean 1996) coupled hydrodynamics with a sediment transport study and was focused on quantifying the amount of material transported out of ADM and into BDA.
- In a 2008 study (GENIVAR 2008), hydrodynamic processes in ADM and BDA were discussed.
- A 2011 study (GENIVAR 2012a) further evaluated hydrodynamics and sediment stability and was performed as part of the ESIA. The 2011 study is summarized in Section 6.4 of this report as it is representative of most recent ADM and adjacent BDA conditions.

The hydrodynamic studies establish general flow patterns in the region and evaluate the influence of waves and tidal currents on potential sediment transport. The following hydrodynamic topics are summarized below:

- Tides
- Wind speed and direction
- Waves
- Current speed and direction

2.3.1 Tides

Water levels in ADM and BDA fluctuate in response to tides in the St. Lawrence River. Tides in ADM and BDA are semidiurnal. The tides in the region have a daily average amplitude of 2.6 m and a maximal daily amplitude of 3.0 m (GENIVAR 2012a). The average mean higher high water (MHHW) tide reaches 3.37 m (the elevation datum referenced in this report is the International Great Lakes datum 1985, also generally referred to as "Chart Datum" for navigation), and the average lower low water mean tide reaches 0.40 m (GENIVAR 2008). The maximum spring tide height is 4.16 m, whereas the minimum level is -0.13 m.

2.3.2 Wind Speed and Direction

Wind speed and direction are important in coastal settings for development of wind-generated waves. Winds blowing over the large fetch distances (ranging up to approximately 59 to 155 km) cause wind-generated waves to develop in the ADM. The fetch is the distance or area over which wind-generated waves are produced.

A wind analysis was performed by GENIVAR (2012a). Hourly wind data from the Baie-Comeau Airport from 1965 to 2012 were analyzed. Based on more than 45 years of measurements from the Baie-Comeau meteorological station, wind speeds generally ranged between 0 and 75 km per hour. Only four events with wind measurements greater than 80 km per hour were measured during this period. Section 3.1 of GENIVAR (2012a) presents the results of the analysis plus a wind rose for the Baie-Comeau station.

2.3.3 Waves

A detailed wave modelling study was performed by GENIVAR (2012a). The GENIVAR wind-wave hindcast model was used to generate the offshore wave climate based on wind data from the Baie-Comeau Airport station discussed in Section 2.3.2. To evaluate the nearshore wave transformation and determine the wave parameters (height and direction) in ADM, the steady-state spectral wave model STWAVE was used. STWAVE simulates the wave refraction and shoaling, the wave diffraction and the depth, and steepness-induced wave breaking. The wave modelling indicated that deep water waves from the northeast to the south-southwest are all refracted to a smaller incoming wave sector at the entrance of ADM. Results of the wave analysis are presented in Sections 3 to 5 of GENIVAR (2012a). Based on the wave modelling, the estimated nearshore wave heights are shown in Table 2-1.

Table 2-1

Extreme Nearshore Wave Height by Direction (Mean Water Level, 0.0 metres)

	Return Periods (years)					
	2	**5**	**10**	**25**	**50**	**100**
Direction From	**Extreme Nearshore Wave Height (metres)**					
NE	0.3	0.4	0.5	0.5	0.6	0.6
ENE	0.7	0.9	1.0	1.1	1.2	1.3
E	1.6	1.9	2.1	2.4	2.6	2.9
ESE	1.2	1.4	1.5	1.6	1.7	1.8
SE	0.9	1.1	1.2	1.4	1.5	1.5
SSE	0.5	0.7	0.8	0.9	1.0	1.2

Source: GENIVAR 2012a

In addition, two Acoustic Doppler Current Profilers (ADCPs) were deployed in ADM from October 7 to November 21. Wave heights, periods, and directions were measured during this period. During this period, six events were identified with a significant wave height greater than 0.3 m and a duration greater than 3 hours. These data are presented in Appendix 2 of GENIVAR (2012a).

2.3.4 Current Speed and Direction

The 2011 GENIVAR field investigation included current measurements. On October 4, 5, and 7, 2011, instantaneous currents measurements (magnitudes and directions) were collected using an ADCP along five transects inside and outside of ADM. Approximately 100 transects were collected during these 3 days with approximately 50 cross-sections collected inside ADM. In addition, from October 8 to November 23, 2011, two ADCPs were moored in the ADM. Details of this analysis are presented in Section 6.2 of GENIVAR (2012a).

The GENIVAR current measurements as well as hydrodynamic model simulations indicate that the currents in the ADM are influenced by tides, winds, and waves. There is a general counterclockwise circulation pattern within the ADM (also discussed in Procean 1996). A longshore transport current sets up along the northern shoreline due to waves with instantaneous current magnitudes measured up to 30 centimetres (cm) per second near the northern shoreline.

2.4 Bathymetric Analysis

Bathymetric data collected during fall 2007 and fall 2011 using multi-beam survey methods were compared to identify potential zone of erosion and accumulation in ADM (GENIVAR 2012a). Figure 25 from GENIVAR (2012a) shows the difference in elevation obtained by comparing the 2011 and 2007 datasets.

Two areas show a larger variation in elevation within ADM since 2007. The first area is located along the ADM north shoreline and shows some significant signs of erosion over the 4 years with differences ranging between approximately 75 and 100 cm. Note that this is in agreement with results shown in previous sections, showing stronger measured currents within the surf (wave breaking) zone in this area. The west ADM shoreline shows signs of accumulation with maximum difference in elevation on the order of approximately 50 cm. The sediment accumulation in this sector may be explained by the sediment discharge from the ADM outfalls, mainly during the spring flood or during intense summer rainfalls. As described in Section 3, the ABC facility outfall partially drains the Alcoa industrial site located directly upstream. This sediment deposition over the 4-year period may also be a result of longshore currents incoming from the east as well cross-shore transport induced by waves incoming from the eastern directions.

A small erosional area located at the end of Wharf 3 may be either the result of construction work in this area prior to October 2011 or local scour (see the bathymetry shown on Figure 1-2). Local scour could be also plausible at the nose of Wharf 3, but the slope observed in this sector remains relatively steep, which reduces the chance of having natural scour induced by waves in this area. Navigation and local docking and undocking activities could also explain this difference in elevation.

An erosional area located near the end of Wharf 1 was also observed (Figure 1-2), and may also be attributable to navigation and docking/undocking activities.

As a separate comparison, bathymetry data collected during fall 2011 and spring 2012 were compared to identify potential zones of erosion and accumulation following the storm that occurred during April 2012. The storm was characterized as a 2-year storm.

The estimated wave conditions observed at the entrance of the ADM under this storm event were the following:

- Maximum wind speed = 50 km per hour blowing from the east
- Significant wave height = 2.04 m
- Peak period = 5.8 seconds

Figure 25-B from GENIVAR (2012a) shows the difference in elevation obtained by comparing the 2012 and 2011 datasets. The bathymetric comparison indicates that the change in elevation within the ADM was not significant. One localized area in the northwestern corner of the ADM did show a decrease in elevation between approximately 40 and 100 cm. This observed erosion may be the result of the elevated current velocities in the area and/or may be due to waves.

2.5 Biological Setting

Biological assessments of the BDA have been performed from 1992 through 2010 and are discussed in the ESIA. During those assessments, the type and abundance of marine biota were inventoried. The results of these assessments have been combined with more general information in the ESIA prepared by GENIVAR (2012b) to characterize the biological resources within the ADM. The following is a summary of the biological setting as it pertains to the ARA report:

- In general, the BDA provides productive habitat for numerous forms of marine life including benthic organisms and vegetation, and water column dwellers that include multiple species of fish, phyto- and zoo-planktons, and mammals, including whale and dolphin.
- Within the ADM, the northern and western shoreline intertidal zones are generally rocky with marine vegetation in the intertidal zone and are considered to provide marine habitat for benthic species.
- The most abundant organisms in ADM sediment are bivalve mollusks, polychaetes, and sea urchins. The density of organisms varies from 186 to 2,141 organisms per square m, which demonstrates that the benthic fauna are well established in the ADM, and are relatively diverse and abundant in places.

3 DATA SOURCES

This section summarizes data sources and results of environmental investigations conducted in the ADM and BDA. The objectives of the investigations were generally to characterize environmental conditions in the Study Area. The investigations included the collection of shallow and subsurface sediment, sediment porewater, surface water, and biota samples for laboratory analysis and engineering studies.

The data developed during those investigations, the uses of the data, and other information derived from the investigations are summarized in this section of the ARA report.

3.1 Environmental Investigations

Environmental investigations include field sampling and laboratory testing to characterize sediment physicochemical and biological conditions. The investigations were conducted in the Study Area in 1994, 2006, 2007, 2008, 2009, and 2011. The objectives of the investigations included: 1) collecting data regarding the nature and extent of sediment contaminants; 2) characterizing sediment physical and geotechnical properties; and 3) collecting samples for laboratory studies to evaluate the engineering and treatability characteristics of sediment, ultimately to evaluate rehabilitation options. Additionally, previous biological investigations were conducted by Alcoa and others in the BDA and the ADM.

The 1994 investigation data are referenced in this report for completeness, but because of the age of the data are not included in data analyzed to support the analysis of RAs. Biological data, including data derived from historical and recent investigations, are discussed in the ESIA (GENIVAR 2012b).

The 2006 through 2009 investigations included collecting data to support sediment rehabilitation in association with the proposed upgrades to the port facilities. After the decision was made in April 2011 to repair the existing wharves on an emergency basis, the 2011 investigation focused on collecting information to support rehabilitation after the wharves had been repaired.

Sediment sampling included the collection of grab samples of surface sediment (the top 5 to 10 cm of sediment) and cores from which shallow and subsurface sediment samples were extracted. For the purposes of analysis, surface sediment samples are defined as sediment grabs including the 0- to 5-cm and 0- to 10-cm sample depths and sediment core samples from the 0- to 10-cm interval. Subsurface samples are defined as samples with end depths greater than 10 cm, and including some 0- to 20-cm and 0- to 50-cm samples, as well as deeper samples. Aqueous sample collection included ADM sediment porewater samples, surface water samples, and samples of ABC facility and Lac Aber outfall discharges.

Analytical samples collected between 2006 and 2011 and used in the analysis of RAs for this report included 246 surface sediment samples and 253 subsurface sediment samples selected from sediment cores at 84 sampling stations. Additional samples include sediment accumulated in sediment traps, ADM surface water, and sediment porewater. Samples collected from locations outside the immediate BDA area at “Reference Locations” were not included with data analyzed to support the analysis of RAs and, thus, are not included in the supporting data tables.

Engineering testing was also performed using sediment and surface water samples to support RA development and analysis.

A compilation of the 1994 to 2011 sediment sample locations is presented on Figure 3-1. Sediment sample and porewater extraction locations by year of investigation are shown on Figures 3-2 through 3-7, and surface water sample location from 2009 are shown on Figure 3-8.

Laboratory analyses results are organized in summary tables by laboratory analyses, year of investigation, and sample depth as follows:

- Table 3-1 includes the results of the 1994 sediment investigation.
- Tables 3-2a and 3-2b include surface sediment sampling and laboratory analyses results for investigations from 2006 through 2011. As mentioned previously, for the purposes of this analysis, surface sediment samples are defined as all sediment grabs including the 0- to 5-cm and 0- to 10-cm sample depths and sediment core samples

from the 0- to 10-cm interval. Table 3-2b includes analyses for PAHs for non-standard extraction methods only performed in 2006 and 2007.

- Table 3-3 includes sediment core subsurface sampling and laboratory analyses results for investigations from 2007 through 2011. As mentioned previously, subsurface samples are defined as samples with end depths greater than 10 cm, and including some 0- to 20-cm and 0- to 50-cm samples, as well as deeper samples.
- Table 3-4 includes surface water sampling and laboratory analyses results for the 2009 investigation.
- Table 3-5 includes porewater sampling and laboratory analyses results for the 2006 through 2008 investigations.

The environmental media sampled and laboratory analyses are summarized in the sections below, organized by year of investigation.

3.1.1 1994 – Surface and Subsurface Sediment Investigation

In 1994, SNC conducted a surface and subsurface sediment investigation on behalf of Societe Canadienne de Metaux Reynolds (SCMR) to delineate the extent of Class 3 and 4 PAHs and PCBs in sediment within the ADM and the BDA (SNC 1996).

The SNC investigation included the following:

- Forty-nine sediment cores were collected from locations within the ADM and the BDA. A total of 123 samples were extracted from cores.
- Forty-nine sediment grabs (0 to 5 cm) were collected with a Van Veen grab sampler from the same sampling stations as the cores.
- Samples were analyzed for grain size distribution, TOC, metals (As, Cd, Hg, Pb, Be, Cr, Cu, Ni, V, Zn), PAHs, PCBs (Aroclor), and mineral oil and greases.

The results of the investigation are summarized in Table 3-1. Figure 3-2 shows the location of the samples collected from within the ADM and BDA. The remaining 1994 samples were collected from locations further from the Study Area in the outer BDA.

3.1.2 2006 – Surface Sediment Investigations

In September 2006, Retec and GENIVAR conducted surface sediment investigations in the ADM and BDA on behalf of Alcoa (GENIVAR 2007; Retec 2007). The investigation team included the U.S. Army Corps of Engineers (USACE) Engineering Research and Development Center (ERDC) and the University of North Dakota Energy and Environment Research Center (EERC).

The objective of the GENIVAR investigation was to evaluate sediment contaminant concentrations in the ADM and the BDA and to document the changes in conditions since the 1994 investigation. The 2006 GENIVAR locations were generally co-located with the 1994 SNC sampling locations.

The objective of the Retec investigation was to assess the bioavailability and toxicity of sediment PAHs, specifically to evaluate whether the sediment PAHs had lower bioavailability and toxicity than what had been assumed for the sediment guidance developed by MDDEP and Environment Canada.

The GENIVAR investigation included the following:

- Twenty-three surface sediment grab (0 to 5 cm) samples were collected using a Van Veen grab sampler; 19 stations were located within the ADM and 4 were located in the adjacent BDA.
- Bulk sediment samples were analyzed for PAHs, PCBs (Aroclors), TOC, mercury (only 13 of the samples were analyzed for mercury), and moisture content by Bodycote Testing Group, and grain size distribution analyses were performed by the Institute of Marine Sciences of Rimouski (ISMER).
- Field measurements were taken of water quality properties (temperature, dissolved oxygen, pH, salinity, and conductivity) near the surface (50 cm below the water surface) and near the bottom (50 cm above mudline).

The Retec investigation included the following:

- Twelve surface sediment samples (0 to 10 cm) were collected with a Ponar grab sampler for toxicity testing; 10 of the 12 samples were located within the ADM and 2 were located within the adjacent BDA.
- Samples were selected for toxicity testing and for detailed PAH chemical analysis based on an initial PAH screen that included parent PAHs (i.e., 17 parent PAHs, including the 13 parent PAHs for which Quebec regulatory guidance criteria have been established [TPAH]) and alkylated PAHs (i.e., PAH34).
- Detailed chemical analysis of sediment samples was performed for: total and rapidly available TPAH and PAH34 compounds using SFE, SOC, and TPAH compounds performed by EERC; and total solids, grain size distribution analysis, pH, and ammonia performed by Severn Trent Laboratories, Inc. (STL) of Burlington, Vermont.
- Sediment porewater was analyzed by EERC using SPME. Samples analyzed using SPME methods also included analysis of DOC and freely dissolved PAHs (TPAH and estimated PAH34 concentrations).
- The chronic toxicity of PAHs to the marine amphipod, *Leptocheirus plumulosus* (*L. plumulosus*), was determined by the USACE ERDC by measuring amphipod survival, growth, and reproduction following exposure to sediments for 28 days.

The results of the 2006 surface sediment chemistry investigations are summarized in Table 3-2a. Detailed chemical analyses conducted on a subset of surface sediment sample locations is included in Table 3-2b. Sediment porewater results are presented in Table 3-5. Sample locations are shown on Figure 3-3.

3.1.3 2007 – Surface and Subsurface Investigations

From August through October 2007, Retec and GENIVAR conducted additional investigations on behalf of Alcoa.

The objectives of the GENIVAR investigation included:

- Collect surface sediment samples to confirm the 2006 results.
- Evaluate grain size distribution compared to PAH and PCB concentrations.
- Assess sediment chemistry at depth.
- Evaluate ADM sedimentation rates.

The objectives of the Retec investigation included further assessing the bioavailability and toxicity of sediment PAHs.

The GENIVAR investigation included the following:

- Nineteen surface sediment grab samples (0 to 5 cm) were collected with a Van Veen grab sampler; 14 samples were located within the ADM and 5 were located in the BDA. Twelve surface sediment grab sample stations from the 1994 and 2006 investigations were re-sampled and seven new sample stations were added.
- Three surface sediment samples of 15 litres volume (at stations 4, 5, and 33) were collected with the grab sampler to evaluate the potential correlation of grain size with PAH and PCB (Aroclor) concentrations. The samples were freeze-dried and dry sieved to separate grain sizes, and the different grain size fractions were analyzed for PAHs and PCBs.
- Six sediment cores were collected within the ADM (maximum penetration of approximately 2 m) with a Rossfelder vibracorer. The cores were subsampled in 20-cm increments. Twenty-four 20-cm subsamples were collected in total.
- The 2007 surface samples and selected samples from the sediment cores were analyzed by Bodycote Testing Group and by Maxxam Analytics, Inc. (Maxxam) laboratories for PAH, PCBs (Aroclors), TOC, percent moisture, and grain size.
- Thirteen sediment traps were installed in the ADM and in the BDA in October 2007 to evaluate sedimentation rates over a period of 1 year.
- Field measurements were taken of water quality properties (temperature, dissolved oxygen, pH, salinity, and conductivity) near the surface (50 cm below the water surface) and near the bottom (50 cm above mudline).

Similar to the 2006 Retec investigation, the 2007 Retec investigation focused on surface sediment and included the following:

- Eighteen surface sediment grab samples (0 to 10 cm) were collected with a Ponar grab sampler; 14 samples were located within the ADM and 4 were located in the BDA.
- Twelve surface sediment samples were collected for toxicity testing; 10 samples were located within the ADM and 2 were located within the adjacent BDA.

- Samples were selected for toxicity testing and for detailed PAH chemical analysis based on an initial PAH screen that included TPAH and PAH34.
- The detailed chemical analysis for the sediment samples included: analysis of total and rapidly available TPAH and PAH34 compounds using SFE, SOC, and TPAH compounds performed by EERC; and total solids, grain size analysis, pH, and ammonia performed by STL of Burlington, Vermont.
- Five of the sediment samples were analyzed by Clarkson University laboratories for total cyanide, free cyanide by microdiffusion, and metal cyanide complexes by ion chromatography.
- Sediment porewater was analyzed by EERC using SPME. Samples analyzed using SPME methods also included analysis of DOC and freely dissolved PAHs (TPAH and estimates PAH34).
- The chronic toxicity of PAHs to the marine amphipod, *Leptocheirus plumulosus* (*L. plumulosus*), was evaluated by the ERDC by measuring amphipod survival, growth, and reproduction following exposure to sediments for 28 days.

Tables 3-2a and 3-3 summarize the results of the GENIVAR and Retec investigations for surface samples and subsurface samples, respectively. Detailed chemical analyses conducted on a subset of surface sediment sample locations as part of the Retec evaluation is included in Table 3-2b. Sediment porewater results are presented in Table 3-5. Sample locations are shown on Figure 3-4.

3.1.4 2008 – Surface and Subsurface Investigations

In July 2008, GENIVAR and Retec conducted surface and subsurface sediment investigations.

The objectives of the GENIVAR investigation included further evaluating surface sediment quality to compare to previous datasets. GENIVAR sediment core locations were based on the 2006 and 2007 Retec bioavailability and toxicity test results. Additionally, the results were evaluated to confirm the apparent correlation between sediment PAHs, PCBs, TOC, and grain size observed in the 2007 investigation results (GENIVAR 2008). The sediment traps deployed in 2007 were also collected and evaluated.

The objectives of the Retec investigation included further evaluating the bioavailability and toxicity of sediment PAH in the northern part of the ADM.

The GENIVAR investigations included the following:

- Fifteen surface sediment (0 to 5 cm) samples were collected with a Van Veen grab sampler at stations within the ADM. Five of the 15 samples were separated into subsamples based on their stratigraphy to support analysis of the apparent correlation between sediment PAHs, PCBs, and TOC, versus grain size.
- Thirty-three sediment cores and were collected with a Rossfelder vibracore to a maximum depth of approximately 2 m, including 15 from within the ADM. The cores were subsampled in 50-cm increments for a total of 76 samples.
- Chemical analysis for the 2008 surface samples and sediment cores was performed by Bodycote Testing Group and particle size analysis was performed by ISMER. Samples were analyzed for percent moisture, TOC, petroleum hydrocarbons, PAHs, PCBs (congeners), metals, and grain size distribution.
- Six sediment traps that were deployed in 2007 were assessed in July 2008 for sediment deposition and accumulated sediment, and analyzed for PAHs, PCBs, petroleum hydrocarbons, and grain size distribution in deposited sediment.
- Field measurements were taken of water quality properties (temperature, dissolved oxygen, pH, salinity, and conductivity) near the surface (50 cm below the water surface) and near the bottom (50 cm above mudline).

Similar to 2006 and 2007 Retec studies, the 2008 Retec study focused on surface sediment and included the following:

- Seventeen surface sediment grab samples were collected with a Van Veen grab sampler within the ADM.
- Laboratory analyses for the sediment samples included total and rapidly available PAHs for both TPAH and PAH34 using SFE; TPAH using U.S. Environmental Protection Agency (USEPA) 8270 performed by EERC; and total solids, grain size, pH, ammonia, and sulfide performed by STL.

- The chronic toxicity of PAHs to the marine amphipod, *Leptocheirus plumulosus* (*L. plumulosus*), was evaluated by the ERDC by measuring amphipod survival, growth, and reproduction following exposure to sediments for 28 days.

The 2008 investigation included engineering testing of sediment samples including the column settling testing and pancake column leachate testing. Column settling testing and pancake column leachate testing were performed by Analytical Resources, Inc., of Tukwila, Washington. Results of the engineering testing are summarized in Appendix B.

Tables 3-2a, 3-2b, and 3-3 summarize the results of the GENIVAR and Retec investigations for surface samples and subsurface core samples, respectively. Sediment porewater results are presented in Table 3-5. Sample locations are shown on Figure 3-5.

3.1.5 2009 – Subsurface Investigations

In October 2009, GENIVAR, working under contract to Hatch, conducted a subsurface sediment investigation, which included the following:

- A total of 29 sediment cores were collected; 19 stations were within the ADM and 10 were within the adjacent BDA.
- Samples were analyzed for TPAH, PCBs (congeners), metals, grain size, moisture content, TOC, and total petroleum hydrocarbons (TPHs).
    - At 5 stations located in the ADM, cores up to 2 m in length were collected for possible geochronological dating. The geochronological cores are being stored at the facility for future testing, if desired.

Table 3-3 summarizes the laboratory chemistry results of the GENIVAR investigation for subsurface core samples. Sediment core locations are shown on Figure 3-6.

Additional engineering testing included modified elutriate testing performed by Maxxam, and separation testing performed by Hazen Research, Inc. (Hazen) of Golden, Colorado. Results of those analyses are presented in Appendix B.

Additionally, 21 geotechnical borings were drilled in fall 2009 within the ADM to further evaluate sediment physical properties. These tests were used to support engineering evaluation of rehabilitation technologies. Sediment samples were collected from the borings, including from locations in the slip between Wharf 2 and Wharf 3. The samples were analyzed for moisture content, liquid limit, plastic limit, plasticity index, and grain size distribution. The geotechnical engineering report is presented in Appendix A.

In addition to the 2009 investigations described above, a biological field investigation was performed in 2009 by Tecsult (2010a). The biological field investigation included surface water sampling and laboratory chemical analysis for metals, TPAH, PAH34, PCBs (congeners), and TPHs. Sampling and laboratory chemical analyses data for surface water samples are summarized in Table 3-4. Also included in Table 3-4 are the surface water results for the samples taken at locations DA-1 and DA-6 for modified elutriate testing analysis. Surface water sampling locations are shown on Figure 3-8.

3.1.6 2011 – Surface and Subsurface Sediment and Biota Collection

In September 2011, GENIVAR conducted a surface and subsurface sediment sampling event.

The objectives of the investigation included further evaluating ADM sediment contaminants, characterizing environmental conditions in the vicinity of Wharf 1 to support the ESIA required for the emergency wharf rehabilitation work, and collecting information to support characterizing potential risk for human health and the environment associated with ADM sediment contaminants.

The investigation included the following:

- Twenty sediment cores were collected within the ADM, and 70 samples were extracted from the cores at various depths. Fifteen of the sample locations were re-sampled from previous year's investigations to confirm depths of contamination for the development of RAs. The samples were analyzed by Maxxam for PAHs, TOC, percent moisture, and PCBs (congeners).
- Selected core samples were submitted for geotechnical testing performed by Groupe Qualitas Inc.

- Three cores (11DW1, 11DW2, and 11DW3) were composited for dewatering tests.
- Thirty surface sediment grab samples were collected within the ADM. Surface sediment grab samples were analyzed for grain size, pH, percent moisture, cyanide + thiocyanate, leachable fluoride, nutrients, ammonia, TOC, metals by inductively coupled plasma mass spectrometry (ICPMS), EPHs, PAHs, and PCBs (Aroclors and congeners). Additionally, selected samples were submitted to Maxxam for toxicity testing to support the risk assessment.
- Whelk tissue was collected for analysis from four sampling stations located in the ADM, three stations located in the BDA, and three reference stations located in the Baie de Godbout. The Baie de Godbout is located on the north shore of the St. Lawrence River, approximately 45 km east of the ADM. Whelk viscera and muscle tissue were analyzed by Axys Analytical Services, Inc. (AASI) of Sidney, British Columbia, for PCB congeners and PAHs.
- Sea urchin tissue was collected from four sampling stations in the ADM, three stations located in the BDA, and three reference stations located in the Baie de Godbout. Sea urchin whole bodies were also analyzed by AASI for PCBs (congeners) and PAHs.

Additional engineering testing included dewatering testing of three sediment samples. Dewatering testing was performed in the field by GENIVAR. The results of the dewatering testing are summarized in Appendix B.

Tables 3-2a and 3-3 summarize the results of the 2011 GENIVAR sediment chemistry investigation for surface grab samples and subsurface core samples, respectively. Sample locations for the 2011 field investigation are shown on Figure 3-7.

4 NATURE AND EXTENT OF SEDIMENT CONTAMINANTS

4.1 Introduction

COPCs were detected in ADM and adjacent BDA environmental media samples, including sediment, sediment porewater, surface water, and biota, in previous environmental investigations. This section provides a summary of the nature and extent of Study Area COPCs, focusing on sediment. Sediment porewater and surface water are also discussed in Sections 4.6 and 4.7 of this report as required. The nature and extent of COPCs in biota is addressed in the Ecotoxicological and Human Health Risk Assessment (EHHRA report) report and the ESIA.

The samples were grouped into those collected within the ADM and those collected within the adjacent BDA in this section. The limit of the ADM is shown on Section 3 and Section 4 figures extending from the most northeast point of the northern rocky shoreline of the ADM to the southeast end of Wharf 1.

Sediment has been divided in this ARA report into surface sediment (defined as the upper 0 to 10 cm of sediment, where the majority of benthic biological activity occurs) and sediment deeper than the top 10 cm, defined as subsurface sediment, as discussed previously. Surface sediment samples include both samples collected with a grab sampler (i.e., Van Veen grab or Ponar grab) from 0- to 5-cm and 0- to 10-cm depth intervals and core samples from the 0- to 10-cm depth interval. Subsurface samples were collected with vibracoring equipment. Subsurface sediment samples were extracted from core samples at depth intervals that were based on the investigation objectives. The 2006 to 2009 sediment sample depth intervals were targeted to characterize sediment proposed for navigation dredging to support the previous port facilities upgrade project. The 2011 sample intervals were targeted to support development of sediment RAs that are based on no change in the ADM shoreline configuration (i.e., after emergency repairs to the wharves have been completed, with no navigation dredging to support expansion of the port facilities).

The full sets of sediment data are presented in Tables 3-1 through 3-5 and discussed in Section 3. For the purposes of data analysis, duplicate samples for a particular location have been averaged for the figures presented in Section 4. These duplicate samples include field duplicates from all years, and field quadruplicates that were collected and analyzed for the 2006 "BC" series surface sediment samples.

4.2 Quebec MDDEP Regulatory Guidance for Sediment

Sediment quality criteria were adopted in 2007 by Environment Canada and the Quebec MDDEP (EC and MDDEP, 2007). The criteria constitute a screening tool for assessing the degree of contamination of sediment and include criteria for individual PAHs, PCB congeners, and metals. The criteria are also meant to be combined with other assessment tools, such as toxicity tests and biological field studies, to support remediation decisions based on the degree of contamination. The sediment criteria for constituents analyzed at the site are listed in Table 4-1.

Table 4-1
Quebec MDDEP Sediment Quality Criteria

Analyte	Units	Rare Effects Level (REL)	Threshold Effects Level (TEL)	Occasional Effects Level (OEL)	Probable Effects Level (PEL)	Frequent Effects Level (FEL)
PAHs						
2-Methylnaphthalene	mg/kg	0.016	0.02	0.063	0.2	0.38
Acenaphthene	mg/kg	0.0037	0.0067	0.021	0.089	0.94
Acenaphthylene	mg/kg	0.0033	0.0059	0.031	0.13	0.34
Anthracene	mg/kg	0.016	0.047	0.11	0.24	1.1
Benzo(a)anthracene	mg/kg	0.027	0.075	0.28	0.69	1.9
Benzo(a)pyrene	mg/kg	0.034	0.089	0.23	0.76	1.7
Chrysene	mg/kg	0.037	0.11	0.3	0.85	2.2
Dibenzo(a,h)anthracene	mg/kg	0.0033	0.0062	0.043	0.14	0.2
Fluoranthene	mg/kg	0.027	0.11	0.5	1.5	4.2
Fluorene	mg/kg	0.01	0.021	0.061	0.14	1.2
Naphthalene	mg/kg	0.017	0.035	0.12	0.39	1.2
Phenanthrene	mg/kg	0.023	0.087	0.25	0.54	2.1
Pyrene	mg/kg	0.041	0.15	0.42	1.4	3.8
Total PAH-13 (calculated)*	mg/kg	0.26	0.76	2.43	7.07	21.26
PCBs						
Total PCB Congeners	mg/kg	0.012	0.022	0.059	0.19	0.49
Metals						
Arsenic (As)	mg/kg	4.3	7.2	19	42	150
Cadmium (Cd)	mg/kg	0.32	0.67	2.1	4.2	7.2
Chromium (Cr)	mg/kg	30	52	96	160	290
Copper (Cu)	mg/kg	11	19	42	110	230
Lead (Pb)	mg/kg	18	30	54	110	180
Mercury (Hg)	mg/kg	0.051	0.13	0.29	0.7	1.4
Zinc (Zn)	mg/kg	70	120	180	270	430

Notes:

*Total PAH-13 was calculated by summing the individual PAH criteria concentrations.

mg/kg = milligrams per kilogram

Sediment laboratory chemical analysis results have been compared to these screening levels. A screening level for Total PAH 13 (TPAH-13) was calculated for the purposes of this analysis by summing the 13 indivudal PAHs for which the MDDEP provides a screening criteria value. Sediment concentrations exceeding Frequent Effects Levels (FELs) indicate remediation is likely to be required and feasibility studies should be undertaken.

4.3 Site COPCs

COPCs can be grouped into organic or inorganic classifications.

4.3.1 Organic COPCs

4.3.1.1 PAHs

PAHs include hydrocarbon compounds with a basic molecular structure of fused aromatic rings ranging from the two-ring relatively low molecular weight compounds (e.g., naphthalene), to the five- to six-ring high molecular weight compounds (e.g., benzo(a)pyrene). Some PAHs can be carcinogenic as well as toxic to organisms. PAHs are a constituent of pitch, scrubber blowdown, and incomplete combustion of petroleum products, all associated with historical and/or present ABC facility operations. Pitch was detected in sediment samples collected from within the ADM, and oil staining was observed in sediment cores collected from localized areas within the ADM. PAH analysis includes analysis of the TPAH-13 compounds, including the 13 parent PAH compounds for which there are Quebec MDDEP regulatory guidance criteria.

4.3.1.2 PCBs

PCBs are compounds with two to ten chlorine atoms substituted onto the biphenyl aromatic structure. PCBs were analyzed by two different methods: 1) Aroclor; and 2) congener. Samples collected after 2007 were analyzed by congener in accordance with Quebec MDDEP requirements, except that 2011 samples were analyzed both for congeners and by Aroclor for comparison to older samples also analyzed by Aroclor.

PCBs are believed to be associated with the ABC facility's operations, which included the use of mainly Aroclor 1242. Aroclor 1242 contains around 30 percent weakly chlorinated congeners (1 or 2 chlorine atoms), which have a tendency to deteriorate faster than the more chlorinated forms. After numerous years in the environment, the proportion of congeners detected and measured in 2011 Study Area sediment samples is closer to that of the more chlorinated Aroclor 1248 mixture. However, because Aroclor mixtures are for the most part made up of the same congeners (only the proportions vary), the concentrations measured for Aroclor 1248 virtually represent all of the PCBs (Sanexen 2012).

The discussion of the nature and extent of PCBs focuses on Total PCBs (TPCB; i.e., combined Aroclors or congeners), whereas the risk assessment discussion in Section 5 focuses on Aroclor 1248. The Quebec regulatory guidance criterion for TPCBs and PCB concentrations in sediment are included in Tables 3-2a and 3-3.

4.3.1.3 Petroleum Hydrocarbons

Petroleum hydrocarbon data are discussed in general, and in terms of total TPH. There is no Quebec regulatory guidance for petroleum hydrocarbons. Because of the general nature and large range of compounds included within the TPH group, risk assessments do not typically consider TPH as a group, but focus on the subset of TPH for which toxicological data are available (e.g., PAHs). PAHs are a subset of the compounds included in the TPH analysis. For that reason, petroleum hydrocarbons are not considered as a group in this ARA report, except to differentiate the petroleum hydrocarbons to support source characterization.

4.3.2 Inorganic COPCs

4.3.2.1 Metals and Metalloids

Metals are naturally occurring substances. Quebec regulatory guidance exists for seven metals as shown in Table 4-1. Because metals are naturally occurring substances, detection of metals does not necessarily indicate the metals are associated with manmade sources and would be considered contaminants, from the perspective of environmental quality.

Metals detected in the Study Area include: aluminum, antimony, arsenic, barium, beryllium, bismuth, calcium, cadmium, chromium, cobalt, copper, iron, lead, lithium, magnesium, manganese, mercury, molybdenum, nickel, potassium, selenium, silver, sodium, strontium, thallium, tin, titanium, uraniu,, vanadium, zinc, and zirconium. Of the metals with MDDEP criteria, only mercury had exceeded the FEL at one sampling location (C-32) in 2008; however, none of the metals detected in the 2011 investigation exceed the Quebec regulatory guidance FEL, and many are in the same range as naturally occurring sediment metal concentrations in the St. Lawrence River region (Sanexen 2012). Accordingly, metals are not further considered as COPCs in this ARA report, and are considered only for potential effects on RAs. Quebec regulatory guidance criteria and metals concentrations in sediment are summarized in Tables 3-1 through 3-3.

4.4 Surface Sediments

This section discusses the distribution of TPAH-13 and TPCB Aroclors and congeners in surface sediment in the ADM and BDA. Surface sediment contaminant concentrations measured in laboratory analysis were summarized in Tables 3-2a and 3-2b. Surface sediment samples were collected during the 2006 to 2009 and 2011 investigations.

Table 4-2 provides a summary of descriptive statistics for surface sediment sample information for samples collected in the ADM only. Results from Table 3-2b were not included in this statistical analysis because the extraction methods used for those data are more aggressive than the standard methods, and PAH results are biased high. As noted below, field duplicate sample results were averaged with the parent sample and counted as one sample in Table 4-2. In addition, the 2006 "BC" series samples, which were analyzed in quadruplicates, have been averaged and counted as one sample.

Table 4-2
Statistics for Surface Sediment – ADM Samples

	Surface Sediment Concentration (mg/kg)						
Analyte	**Number of Samples**	**Number of Detects**	**Minimum**	**Maximum**	**Mean**	**Median**	**Standard Deviation**
Total PAH-13	137	137	0.01	2,140	194	77	334
Total PCBs (Aroclors)	64	64	0.051	360	8.7	1.3	45
Total PCBs (congeners)	63	59	ND	87	3.4	0.61	12

Notes:

Field duplicates and 2006 quadruplicate analyses samples were averaged. Analysis does not include sample results from Table 3-2b due to analytical extraction method differences. Individual surface sediment results for all duplicate samples are included in Tables 3-2a and 3-2b.

mg/kg = milligrams per kilogram

TPAH-13, TPCB congener, and TPCB Aroclor concentrations measured in surface sediment samples are depicted on Figures 4-1 through 4-3, and are compared to MDDEP sediment quality guidance, where applicable (no MDDEP criteria are available for TPCB Aroclors).

Based on the spatial distributions shown on Figures 4-1, 4-2, and 4-3, the areas of highest TPAH-13 and PCB concentrations in surface sediment generally coincide and are located in the following two areas:

- ADM southern shoreline including the navigational area between Wharf 1 and Wharf 3 and in the slip between Wharf 2 and Wharf 3
- Outfall area in the northwest corner of the ADM

The areas of relatively lower TPAH-13 and PCB concentrations that generally do not exceed FELs also coincide and include the following:

- ADM northeastern area
- ADM western shoreline north of Wharf 1 and south of the Outfall area
- Adjacent BDA

The spatial distribution of sediment COPC concentrations in these relatively high and low areas is discussed further below.

4.4.1 ADM Southern Shoreline

The highest TPAH-13 concentration (2,140 milligrams per kilogram [mg/kg]) was measured in surface sediment in the ADM southern shoreline area at sample location CAP-4 collected in 2009, located in the Wharf 1 navigational area near the eastern end of Wharf 3. Similarly, the highest TPCB congener concentration (87 mg/kg) was also collected from sample location CAP-4-4. The highest TPCB Aroclor concentration (360 mg/kg) was measured at sample location 11ECO21 collected in 2011 in the the Wharf 1 berth area approximately 100 m to the southwest of the CAP-4 location. Overall, surface sediment samples in the southern ADM shoreline area show significant variability, and all surface samples except one (location BC_55, 2008) exceed the Quebec FEL of 21.43 mg/kg for TPAH-13.

4.4.2 Outfall Area

Surface sediment located near the ABC facility outfall in the most northwesterly corner of the ADM also exceeds the FELs, but results do indicate temporal declines in TPAH-13 concentration over the 2006/2007 to 2011 sampling period. TPAH-13 ranged in eight samples collected during the 2006/2007 investigation (SB04, ST4, ST82, ST84, BC_14, BC_30, BC_38, BC_39) from a maximum concentration of 546 mg/kg (ST84) to 32 mg/kg (BC_14) as shown on Figure 4-1. Nearby 2011 samples 11ECO1 and 11ECO3 had TPAH-13 concentrations of 99 mg/kg and 207 mg/kg, respectively.

TPCB congeners (Figure 4-2) were not analyzed in 2006 or 2007 for a temporal comparison. TPCB results from 2011 samples from the outfalls area showed variability and ranged from 0.16 mg/kg (11ECO1; which is below the FEL of 0.49 mg/kg) and 4.73 mg/kg (11ECO3; which exceeds the FEL). TPCB Aroclors were analyzed in both 2006/2007 and 2011 but do not show clear temporal trends in surface sediment concentrations. TPCB Aroclors (Figure 4-3) in the outfall area ranged from 0.63 mg/kg (ST83, 2007) to 1.4 mg/kg (SB04, 2006) for the 2006/2007 samples and 0.22 mg/kg (11ECO1) and 4.5 mg/kg (11ECO3) for the 2011 samples, which futher illustrates the variability in this area and the ADM in general.

4.4.3 ADM Western Shoreline

Samples collected along the ADM western shoreline north of Wharf 1 and south of the outfall area also generally exceeded FELs but had relatively lower surface sediment concentrations compared to the ADM southern shoreline area and in the outfall area (Figures 4-1 through 4-3). Samples collected in the ADM western shoreline show significant variability and range from 1,480 mg/kg (CAP-10) to 8.8 mg/kg (BC_41). As shown on Figure 4-1, several samples collected in this area did not exceed FELs for TPAH-13. Samples collected in this area between the 2006 and 2011 investigations had TPAH-13 and TPCB concentrations as shown in Table 4-3.

Table 4-3
Surface Sediment TPAH-13 and TPCB Concentrations
ADM Western Shoreline

Year of Investigation	Sample ID	TPAH-13 (mg/kg)	TPCB Congeners (mg/kg)	TPCB Aroclors (mg/kg)
2011	11eco4	8.0	0.03	0.31
2011	11eco5	27	0.27	0.87
2011	11eco6	60	1.19	1.50
2011	11eco8	52	1.98	2.90
2009	CAP-9	95	0.90	Not analyzed
2007	ST85	16	Not analyzed	0.60
2007	BC_41	8.7	Not analyzed	Not analyzed
2006	SB12	42	Not analyzed	0.55
2006	BC_18	50	Not analyzed	Not analyzed
2007	BC_32	46	Not analyzed	Not analyzed
2009	CAP-10	1480	3.4	Not analyzed
2006	BC_06	438	Not analyzed	Not analyzed
2007	BC_25	131	Not analyzed	Not analyzed
2006	SB06A	150	Not analyzed	2.9

Note:
mg/kg = milligrams per kilogram

The highest concentrations in this area were measured in samples collected from areas close to the north side of Wharf 3 and the ADM southern shoreline area.

4.4.4 ADM Northeastern Area

In the northeast portion of the ADM adjacent to the BDA, surface sediment samples had the lowest concentrations of TPAH-13 and TPCBs with few samples exceeding the FEL, as shown on Figures 4-1 through 4-3. For the purposes of this nature and extent discussion, the northeast portion of the ADM has been defined with the following “boundary” which includes the northern shoreline, 11ECO10/CAP-8/B-19 to the west, 11ECO15/ST23 and SB23 to the southwest, and BC_60 to the east.

Thirty-one of 43 surface sediment samples within this northeastern area had TPAH-13 concentrations less than the Quebec regulatory guidance FEL, and 25 of the samples had TPCB congener concentrations less than the FEL. Of the 12 samples that exceeded TPAH-13 FELs in the northeast area, only one had TPAH-13 concentrations that exceeded 100 mg/kg, relatively lower than the elevated concentrations found in the outfall and ADM southern shoreline areas, which included concentrations greater than 1,000 mg/kg. The maximum concentration in this northeastern area was from location CAP-6 (collected in 2009) with a TPAH-13 of 160 mg/kg. The TPCB congener was also elevated and exceeded the FEL at location CAP-6 with a result of 16 mg/kg. As shown on Figure 4-1, CAP-6 is located at the border of the northeastern ADM area nearest the wharves and middle of the ADM. The data in the northeastern area generally show a trend of decreasing concentrations moving away from the wharves and toward the northern ADM shoreline and adjacent BDA.

4.4.5 BDA

Sediment TPAH-13 and TPCB concentrations are significantly lower in the adjacent BDA than in the ADM as shown on Figures 4-1 through 4-3. The sample collected at location DA-2 in 2009 is the only sample with anomalously high TPAH-13 and TPCB concentrations exceeding the FEL. Table 4-4 provides a summary of information for surface sediment samples collected in the BDA, including with DA-2 and without DA-2.

Similar to the statistical summary table for ADM surface sediment samples, Table 4-4 averages all duplicate results.

Table 4-4
Statistics for Surface Sediment – BDA Samples

Analyte	Surface Sediment Concentration (mg/kg)						
	Number of Samples	Number of Detects	Minimum	Maximum	Mean	Median	Standard Deviation
With Sample DA-2							
TPAH-13	25	25	0.21	863	45	5	170
Total PCBs (Aroclors)	9	9	0.05	0.87	0.25	0.13	0.25
Total PCBs (congeners)	10	9	ND	30	3.2	0.16	9.4
Without Sample DA-2							
TPAH-13	24	24	0.21	43.6	11	4.5	12
Total PCBs (Aroclors)	9	9	0.05	0.87	0.25	0.13	0.25
Total PCBs (congeners)	9	8	ND	1	0.26	0.15	0.35

Note:
mg/kg = milligrams per kilogram

Only 6 of the 25 BDA samples exceeded FELs for TPAH-13, and only 3 of the samples exceeded FELs for TPCB congeners (one of which was DA-2). TPAH-13 and TPCB congener concentrations measured at location DA-2 in the western portion of the BDA were 863 mg/kg and 30 mg/kg, respectively. Concentrations measured at this location are an exception to the general trend of decreasing concentrations in the BDA and northeastern portion of the ADM. The presence of this relatively high measurement cannot be explained with existing information. Nearby sample concentrations are not similar to DA-2.

4.4.5.1 TOC and SOC in Sediment

Surface sediment TPAH-13 and TPCBs coincide with relatively elevated concentrations of sediment TOC and SOC near the outfall and ADM southern shoreline area. TOC and SOC in surface sediment are mapped on Figures 4-4 and 4-5. SOC comprises approximately one-half of TOC in both shallow and subsurface sediment samples (Figure 4-6; Retec 2007). BDA sediment TPAH-13 and TPCBs correlate strongly with TOC and SOC in both shallow and subsurface sediment samples (Figures 4-7 and 4-8).

PAHs and PCBs typically correlate with grain size. PAHs and PCBs tend to sorb to fine sediment fractions compared to the more granular fractions. The surface sediment grain size distribution is mapped on Figure 4-9. Based on grain size mapping compared to TPAH-13 and TPCBs mapping, there is not an apparent correlation; however, sediment fines are confined to a relatively small portion of the ADM and BDA and, therefore, are not present in a sufficient amount for a meaningful correlation. Additionally, the presence of pitch particles in the fine to coarse sediment grain size fractions result in an atypical correlation between sediment grain size fractions and contaminant concentrations. Sediment pitch content is further discussed in Section 4.9.

4.4.5.2 Historical 1994 Sediment Data

Although 1994 sediment data were not used for the ARA, the older 1994 data are useful for temporal comparisons with the most recent 2011 data. The 1994 and 2011 results for surface sediment TPAH-13 are shown on Figures 4-10 and 4-11, respectively. The temporal trends from 2011 compared to the 1994 data show a general decrease in concentrations for TPAH-13 and a general decrease with some variability for TPCB Aroclors. The maximum TPAH-13 in 1994 (6,170 mg/kg) collected at C-5 is approximately ten times higher than the maximum TPAH-13 in 2011 (605 mg/kg) collected at 11ECO21. Similarly, the average TPAH-13 in 1994 in the ADM was 533 mg/kg compared to the average TPAH-13 in 2011 in the ADM, which was 109 mg/kg, showing a general decrease over time. Summary statistics for the 2011 versus 1994 data are presented in Table 4-5.

Table 4-5
Statistics for ADM Surface Sediment – 1994 and 2011

Analyte	Surface Sediment Concentration (mg/kg)					
	Number of Samples	Number of Detects	Minimum	Maximum	Mean	Median
1994						
TPAH-13	33	33	1.03	6170	533	119
Total PCBs (Aroclor)	34	32	ND	12.6	2.5	0.86
TPCBs (congeners)	na	na	na	na	na	na
2011						
TPAH-13	30	30	1.1	605	109	56
Total PCBs (Aroclor)	30	30	0.05	360	15	1.3
TPCBs (congeners)	30	30	0.02	8.2	1.5	1.0
2011 Without 11ECO21						
TPAH-13	29	29	1.1	329	91	52
Total PCBs (Aroclor)	29	29	0.05	37	2.9	1.3
Total PCBs (congeners)	29	29	0.02	8.2	1.5	0.8

Notes:
na = not analyzed
mg/kg = milligrams per kilogram

Results for samples collected in the ADM in 1994 and 2011 and analyzed for PCB Aroclors are shown on Figures 4-12 and 4-13, respectively. PCB congeners were not analyzed in 1994 and no comparision over time can be made for congeners. The maximum TPCB Aroclor concentration in 1994 was 12.6 mg/kg collected at C-21 compared to the maximum TPCB concentration in 2011, which was 360 mg/kg collected at location 11ECO21. The 2011 maximum of 360 mg/kg appears to be anomalous and much higher than other results in the ADM and further demonstrates the variability in the data. The average TPCB Aroclor concentration in 1994 was 2.5 mg/kg compared to an average concentration in 2011 of 15.2 mg/kg (including the maximum concentration of 360 mg/kg in the average) and an average TPCB Aroclor concentration of 2.9 mg/kg (not includingthe 360 mg/kg maximum concentration in the average). A comparison of the maximum and averages shows the TPCB Aroclor concentrations have not changed significantly over time.

In summary, there are both trends and spatial variability in surface sediment TPAH-13 and PCB concentrations in all areas of the ADM and the BDA, but general trends are as follows:

- Concentrations were generally highest along the ADM southern shoreline near and between Wharves 1, 2, and 3.
- Concentrations are also relatively elevated in the outfall area in the northwest corner of the ADM.
- Lower concentrations were measured in the northwest portion of the ADM located north of Wharf 3 and east of the outfall area.
- There is a significant general decrease in concentrations in the northern ADM and adjacent portions of the BDA compared to concentrations within the ADM near the outfall and wharves.
- TPAH-13 and PCBs correlate strongly with TOC and SOC.
- TPAH-13 concentrations appear to be generally decreasing with time, and PCB Aroclors appear not to have changed significantly, but variability in the PCB data make trends hard to discern.

4.5 Subsurface Sediments

Subsurface sediment samples were collected during the 2007 to 2009 and 2011 investigations from sediment cores at depth intervals ranging from 10 to 20 cm to as deep as 300 to 380 cm. The nature and extent of PAHs and PCBs in subsurface sediment is discussed in this section. Subsurface sediment contaminant concentrations measured in laboratory analysis are summarized in Table 3-3.

A more detailed analysis of the spatial distribution of sediment TPAH-13 and TPCB congener concentrations compared to FELs for specific depth intervals is presented on Figures 4-14 through 4-21, and in depth profiles included in Appendix C. TPCB Aroclors are not presented in the depth profiles due to a lack of data. There were only six cores collected in 2007 for subsurface PCB Aroclor analysis (Table 4-3).

Subsurface sediment concentrations are organized for discussion in this section and on the figures into the following depth intervals, measured from the top of the sediment surface:

- 10 to 50 cm
- 50 to 100 cm
- 100 to 200 cm
- 200 to 300 cm

Samples that overlap one or more of these depth intervals were included in the depth interval based on the largest segment of the core located in the depth interval. In a few instances, these overlapping samples were not considered when an appropriate depth interval could not be assigned. For depth intervals with multiple samples for a particular location, the samples were averaged across the interval.

Sediment concentrations in the ADM generally decrease with depth, with the exception of the area along the western shoreline north of Wharf 3 and in the outfall area where sediment concentrations tend to increase with depth, or maintain relatively high subsurface concentrations. Figures showing sediment in the 100- to 200-cm and 200- to 300-cm depth interval for TPAH-13 (Figures 4-16 and 4-17) and TPCB congener (Figures 4-20 and 4-21) reflect these elevated concentrations at depth. The high concentrations at depth are located north of Wharf 3 along the western shoreline and near the outfalls in the northwest portion of the ADM and may be associated with historical discharges of materials with higher PAH and PCB concentrations that have been subsequently covered with more recently deposited, cleaner sediment. In addition, as explained in Section 6.4.2, this might be attributable to reworking and mixing of sediments associated with vessel movement.

ADM subsurface sediment TPAH-13 and TPCB concentrations are generally highest in the 10- to 50-cm depth interval as shown in Table 4-6 with average of 210 mg/kg and 5.1 mg/kg, respectively. The maximum TPAH-13 concentration of 1,174 mg/kg measured in a subsurface sediment sample was measured at location 11AQSC2, collected in 2011, and located in the slip between Wharf 1 and Wharf 2. The highest TPCB congener concentration measured in a subsurface sample was 77 mg/kg and was collected adjacent to the northeast side of Wharf 3 at location C-3 in 2008. ADM subsurface sediment TPAH-13 and PCB concentrations are summarized in Table 4-6.

Table 4-6
ADM Subsurface Sediment TPAH-13 and PCB Summary

Analyte	Depth Interval (cm)	Subsurface Sediment Concentrations (mg/kg)						
		Number of Samples	Number of Detects	Minimum	Maximum	Mean	Median	Standard Deviation
TPAH-13	10-50	38	36	ND	1,174	211	116	259
	50-100	40	35	ND	2,843	124	22	451
	100-200	38	27	ND	637	65	0.46	145
	200-300	15	8	ND	631	61	0.01	169
TPCBs (congeners)	10-50	33	29	ND	77	5.1	1.5	14
	50-100	34	18	ND	12	1.3	0.095	2.4
	100-200	35	16	ND	28	3.6	ND	7.1
	200-300	15	15	ND	30	2.9	ND	7.9

Note:
mg/kg = milligrams per kilogram

Comparison of surface sediment TPAH-13 and TPCB congener distributions on Figures 4-1 and 4-2 with the distribution of contaminants on Figures 4-14 through 4-21 show that areas of highest subsurface sediment and surface sediment contaminant concentrations are generally co-located near the northwest corner of the ADM in the vicinity of the ABC facility and Lac Aber outfalls, and in the slip between Wharf 2 and Wharf 3.

However, unlike surface sediment, elevated TPAH-13 and TPCB congener concentrations are present at high concentrations in subsurface sediment along the western ADM shoreline north of Wharf 3 where surface sediment concentrations are generally lower. Based on the vertical distribution of sediment contaminants presented on Figures 4-14 through 4-21 and the sediment profiles presented in Appendix C, relatively elevated PAH and PCB concentrations in the ADM extend to depths up to 2 to 3 m. In some locations near the western shoreline north of Wharf 3 (C-16A, C-6A, CAP-10, and CAP-4), relatively elevated concentrations were detected at the bottom of 3-m-long sediment cores. At those locations, elevated concentrations of TPAHs and PCBs could extend deeper than the sediment cores penetrated.

Similar to the relatively low surface sediment contaminant concentrations in the northeast portions of the ADM adjacent to the BDA, subsurface sediment samples in this area have significantly lower TPAH-13 and TPCB congener concentrations than ADM subsurface sediment.

Subsurface sediment samples collected within the BDA are also relatively low. With the exception of station DA-2, which has anomalously high COPC concentrations as discussed in Section 4.4, only two other samples collected from below 50 cm in the BDA exceeded FELs and include the following:

- DA-7: 24 mg/kg TPAH-13 from 50 to 100 cm
- Location 115: 0.82 mg/kg TPCB congeners from 50 to 100 cm

All other samples (approximately 39 samples) collected from below 50 cm from within the BDA had TPAH-13 and TPCB congener concentrations less than FELs. Similar to surface sediment, an exception to the distribution of TPAH-13 and TPCB congeners for subsurface sediment is location DA-2. Subsurface sediment concentrations at DA-2 are relatively elevated down to 100 cm, but concentrations are below the TPAH-13 and TPCB congener FEL in the 100- to 200-cm interval.

Similar to surface sediment, there is spatial variability in subsurface sediment TPAH-13 and TPCB concentrations in the ADM and the BDA, but general trends can be summarized as follows:

- Concentrations were generally highest along the ADM southern shoreline near the Wharf 1 navigational area, and in the slip located between Wharf 2 and Wharf 3.
- Concentrations are relatively elevated in the outfall area.
- Subsurface sediments in the ADM western shoreline area had higher concentrations than the surface sediments in this same area. Additionally, the depth to which relatively elevated TPAH-13 and TPCB concentrations extend is not known, and could exceed 3 m.
- There is a significant general decrease in concentrations in subsurface sediment in the northern ADM and adjacent portions of the BDA compared to other areas within the ADM.

- Similar to surface sediment, TPAH-13 and PCBs correlate strongly with TOC and SOC.

The nature and extent of TPAH-13 and TPCB in shallow and subsurface sediment is further discussed in Section 6.

4.6 Sediment Porewater

Sediment porewater samples were collected in the 2006 through 2008 Retec investigations, focusing on PAHs and TPH in porewater. There is no regulatory guidance for sediment porewater. Porewater concentrations of organic COPCs are influenced by the solubility of the COPCs, bulk sediment COPC concentrations, and presence of TOC and SOC in sediment. The partitioning of COPCs from sediment to porewater can be estimated based on modelling, or on direct measurements of porewater COPC concentrations, as has been done for the Study Area.

Sediment porewater COPCs are considered to be more bioavailable than COPCs sorbed to sediment solids and, therefore, are considered a better indicator of sediment toxicity than are bulk sediment COPC concentrations. Accordingly, sediment porewater samples were collected only from surface sediment, where most biological activity is located. Sediment porewater COPCs are also useful for evaluating effluent quality for rehabilitation technologies that include sediment dewatering.

TOC and SOC concentrations in Study Area sediment are relatively consistent throughout the student area (TOC averages 1 percent and SOC averages 0.5 percent with a few outliers as shown on Figures 4-5 and 4-9. Sediment porewater concentrations are summarized in Table 3-5. Sediment porewater concentrations are shown on Figure 4-22.

The relationship between bulk sediment PAHs and porewater PAHs is dependent on the partitioning between sediment and porewater organic carbon. The relationship is often described by the organic carbon-water partition coefficient (K_{oc}). The partitioning of PAHs to porewater is influenced by the fraction of organic carbon that is SOC. PAHs tend to sorb more strongly to SOC than to other forms of natural organic carbon. High SOC in sediment generally decreases the porewater PAH concentration, compared to sediment containing natural organic carbon types. Because of the variability in sediment type, TOC and SOC, contaminant speciation, contaminant type, and other sediment factors, the organic carbon-water partitioning is highly site-specific (USEPA 2011).

In the 2006 investigation, Retec measured K_{oc} values for both parent and alkylated PAHs and determined K_{oc} to be 10- to 100-fold greater than the default values generally used for estimating risk to benthic invertebrates. The higher K_{oc} values measured for PAHs are expected to result in a lower prediction of toxicity than would be assumed based on using literature-derived or modeled K_{oc} values (Retec 2007).

Additionally, variability in measured K_{oc} values was observed. Sample BC_06 had only 1.5 micrograms per litre (µg/L) of dissolved TPAH-13 in sediment porewater, and BC_15 and BC_21 had concentrations of 14.0 and 5.9 µg/L, respectively. The carbon content of all three samples and concentration of individual PAHs in bulk sediment was comparable. The increase in dissolved PAHs measured in porewater extracted from samples BC_15 and BC_21 was primarily associated with low molecular weight and mid-molecular weight alkylated PAHs. The difference in aqueous partitioning characteristics of PAHs in sediment sample BC_06 compared to samples BC_15 and BC_21 suggests that the source of PAHs for these samples may be different. BC_06 was collected adjacent to and on the north side of Wharf 3. Samples BC_15 and BC_21 were both collected in the Wharf 1 navigable area.

4.7 Surface Water

Surface water COPC concentrations were measured during a 2009 biological characterization undertaken by Tecsult (2010a) and in support of engineering modified elutriate testing. The surface water laboratory chemical analysis results are summarized in Table 3-4 and locations are shown on Figure 3-8. Surface water guidance values for acute and chronic effects to aquatic organisms are available in Quebec (MDDEP 2009; CCME 2010) for brackish and salt water for a limited number of constituents as listed in Table 3-4 with the surface water analytical data.

For PAHs, surface water guidance values are available for naphthalene (CCME 2010) and phenanthrene (MDDEP 2009). All PAH concentrations in samples collected in the ADM and the BDAwere less than the surface water guidance values. PAHs were detected in five of the seven samples collected in the ADM. Detected PAHs included low molecular weight compounds: naphthalene, acenaphthene, phenanthrene, fluoranthene, and pyrene. Except for naphthalene in sample DA-1 (concentration of 0.11 µg/L), all PAH concentrations were only slightly higher than the laboratory method detection limit. The only TPAH-13 compound detected in the BDA samples was fluoranthene, which was detected in two of four BDA samples. Fluoranthene concentrations in BDA samples were at or slightly above the laboratory method detection limits.

For metals, copper exceeded the chronic effects guidance value at two locations, DA-1 and DA-6, collected in 2009 from locations near the Wharf 1 navigable areas. No other metals exceeded the guidance values.

4.8 Estimation of Contaminated Sediment Volumes

The volume of sediment that exceeded FELs within the ADM was preliminarily estimated based on sediment TPAH-13 and TPCB congener concentrations. The ADM was divided into Thiessen polygons (Figure 4-23) based on sediment core locations. A depth was assigned to each as the base of deepest the core sample where the Occasional Effects Level (OEL) for TPCB congeners and TPAH-13 was exceeded. The depth was based on the OEL in accordance with MDDEP guidance that sediment exceeding FELs should be remediated to OEL levels. At 32 of the 41 core locations within the ADM, a core sample with no OEL exceedances was collected at the bottom of the core to confirm the depth of contamination. At nine locations, samples with TPAH-13 and TPCB congener concentrations exceeding OELs were found at the base of the core and elevated concentrations could extend deeper than the sediment cores penetrated.

The volume of sediment within each polygon was calculated by multiplying the surface area of the polygon by the depth to sediment OEL exceedance. The depths to OELs, polygon areas, and volume estimate calculations are summarized in Table 4-7. The preliminary estimate of the sediment volume that exceeds FELs and OELs within the ADM is approximately 74,000 cubic m.

4.9 Fate and Transport Properties

Fate and transport properties of PAHs and PCBs are summarized in this section.

4.9.1 PAHs

PAHs can be generalized into two groups: 1) petrogenic; and 2) pyrogenic. Petrogenic PAHs originate in petroleum product manufacturing, storage, and use. Pyrogenic sources include combustion byproducts. Coal tar pitch (pitch) and scrubber blowdown are pyrogenic materials that are potential sources of PAHs in the Study Area composed primarily of PAHs, with lesser concentrations of other organic compounds and metals. Pitch is generally present as a brittle solid at the typical range of ADM environmental temperatures; laboratory testing performed by Hazen (2010) indicated the melting point of the pitch material separated from ADM sediment samples was 140 °C (Appendix B).

Pitch is relatively insoluble in water, is not very volatile, and does not biodegrade rapidly. These properties indicate pitch is not very mobile or bioavailable in the environment and tends generally to resist degradation.

Pitch was separated from sediment and analyzed for PAH content by Hazen. The PAH distribution in the pitch is summarized in Table 4-8.

Table 4-8
PAH Composition of Pitch Sample

Compound	Concentration (mg/kg)
Acenaphthene	1,306
Acenaphthylene	Not detected
Anthracene	1,230
Benzo(a)anthracene	6,932
Benzo(a)pyrene	11,093
Benzo(b)fluoranthene	9,142
Benzo(ghi)perylene	7,821
Benzo(k)fluoranthene	8,694
Chrysene	7,745
Dibenzo(a,h)anthracene	418
Fluoranthene	11,974
Fluorene	653
Indeno(1,2,3-cd)pyrene	8,633
1-Methylnaphthalene	Not detected
2-Methylnaphthalene	Not detected
Naphthalene	896
Phenanthrene	5,604
Pyrene	9,696
Total	**91,837**

Notes:
mg/kg = milligrams per kilogram
Source: Hazen (2010)

Based on testing performed by GENIVAR (2008), PAHs were detected in varying amounts in the fine and granular fractions of ADM surface sediment samples. Typically, PAHs present in sediment in a dissolved phase tend to sorb to sediment solids, preferentially to the fines fraction. The presence of PAHs in the granular fraction of some samples, at concentrations approaching or higher than the fines fraction in the same sample contradicts that typical finding, and indicates the PAHs are likely associated with pitch particles.

Based on field logs, pitch particles were generally observed in sediment samples collected near the wharves during field investigations. Analysis of sediment samples by Hazen confirmed that pitch was present in granular and fine fractions, and that associated TPAHs could not be attributed to typical partitioning to finer sediment grain size fractions (Hazen 2010).

Although PAHs are discussed as a group, individual PAH compounds exhibit a wide range of physical and chemical properties that influence their distribution, mobility, and availability in environmental media. Low molecular weight PAHs (i.e., the two- to four-carbon ring PAHs) tend to degrade biologically (in most media) or photochemically (in surface water) and are more available to partition from the sediment solid phase to sediment porewater. These properties generally decrease with increasing molecular weight.

PAHs tend to partition strongly to sediment TOC, and particularly to SOC, which is a component of TOC. TOC and SOC results are summarized in Tables 3-1 through 3-5. Sediment TOC results are mapped on Figure 4-4. TOC concentrations are generally highest in the northwest corner of the ADM near the outfalls and north of Wharf 3, and in the ADM southern shoreline area. As noted, SOC is a component of the sediment TOC, and SOC is the TOC fraction that remains after the sample is heated to 375 °C. SOC sediment concentrations are mapped on Figure 4-5, and concentrations are generally the highest in the outfall area and ADM southern shoreline area.

Recent research indicates sediment contaminants—particularly PAHs—bind differently to organic carbon depending on the carbon type, with a stronger tendency for organic contaminants to bind to SOC than to natural organic carbon (USEPA 2011). Based on comparison and correlation of the TOC and SOC (Retec 2007), the SOC comprises, on average, approximately half of the TOC (Figure 4-6).

Work performed during previous investigations supports this PAH-TOC/SOC relationship in ADM sediment. The organic carbon-aqueous phase partition coefficient, k_{oc}, was calculated based on the measurements of PAHs dissolved in sediment porewater (Retec 2007). The Study Area-specific k_{oc} was determined to be 10 to 100 times the literature-based or theoretically based values typically used for prediction of PAH bioavailability and toxicity, confirming the sorptive capacity of the Study Area SOC/TOC for PAHs.

PAH degradation rates are controlled by molecular weight and solubility of the compounds. High molecular weight PAHs are typically less soluble than are low molecular weight PAHs and, therefore, are less degradable. Solid phase degradation is expected to occur at rates orders of magnitude slower than in the aqueous phase. Degradation rates, expressed as half life, for the PAHs can range from less than a year in aerobic porewater to decades for anaerobic degradation in the solid phase. Degradation of PAHs is likely to contribute to long-term contaminant mass reduction; however, because a significant fraction of the PAHs are high molecular weight PAHs that sorb strongly to solids and are most resistant to degradation, degradation is not expected to significantly reduce contaminant mass in the near term.

4.9.2 PCBs

PCBs are believed to be associated with the "Pydraul 230" hydraulic fluid, which was used during the ABC facility's operations. The hydraulic fluid contained mainly Aroclor 1242. Aroclor 1242 contains around 30 percent weakly chlorinated congeners (1 or 2 chlorine atoms), which have a tendency to deteriorate faster than the more chlorinated forms. After numerous years in the environment, the proportion of congeners detected and measured in 2011 Study Area sediment samples is closer to that of the more chlorinated Aroclor 1248 mixture. However, because Aroclor mixtures are for the most part made up of the same congeners (only the proportions vary), the concentrations measured for Aroclor 1248 virtually represent all of the PCBs (Sanexen 2012).

In general, PCBs are very stable in the environment. Similar to high molecular weight PAHs, PCBs are relatively resistant to degradation, have low solubility in water, and tend to sorb strongly to sediment solid and carbon phases. Recent research indicates PCBs dechlorinate and degrade over time, but these are likely not important near-term processes in the ADM (Alcoa 2010).

Degradation of PAHs and degradation/dechlorination of PCBs influence contaminant fate. Most degradation occurs in the aqueous phase, rather than in the solid phase. Degradation in surface sediment is likely to be primarily aerobic degradation, rather than anoxic because of contact of sediment porewater with oxygenated surface water. Bioturbation is expected to increase the potential for dissolved oxygen in porewater by mixing surface water in porewater. Additionally, there is a density difference between low or non-saline groundwater that flows into surface sediment and becomes part of sediment porewater and more saline surface water. The density difference typically results in oxygenated surface water mixing down into and becoming mixed with groundwater to form surface sediment porewater. Surface water salinity and dissolved oxygen were measured in 2009 (Tecsult 2010a). Salinity at the nine sampling stations located in the ADM and BDA was consistently within 1 part per thousand (ppt) of 27 ppt, and dissolved oxygen ranged from 9.3 to 10.5 milligrams per litre (mg/L). The presence of a viable benthic community (Tecsult 2010a) and the surface water data support an aerobic environment in surface sediment.

5 RISK ASSESSMENT

The EHHRA report (Sanexen 2012) estimates potential risks to human health (toxicological risks) and the environment (ecotoxicological risks) resulting from exposure to COPCs in the sediments and surface water of the ADM. The EHHRA report also characterizes risk reduction associated with candidate RAs for the ADM.

The EHHRA report was based on the measured or modeled concentration of the COPCs in the surface water, sediments, and biota of the ADM, and on the results of whole sediment bioassays performed on marine organisms (amphipods and polychaetes) using sediments collected from the ADM and from suitable reference areas. The EHHRA report included extensive field and laboratory investigations and data analyses and a detailed analysis of the physico-chemical properties of the sediments and surface water in the ADM.

As a basis for RA development, the EHHRA report provides the assessment of potential risks to human health and the environment associated with Study Area environmental conditions. The EHHRA report is summarized in this section.

5.1 Summary of Findings

The risk analysis concludes that, in its present state, the ADM poses low potential risks to aquatic organisms, benthic invertebrates, and some birds and mammals feeding on fish and invertebrates from the ADM. The risks for the invertebrates are mainly associated with PAH contamination, and the risks for birds and mammals mostly derive from the PCB contamination.

Aluminum concentrations in sediments, although greater than conservative ecotoxicological screening values and, therefore, a potential source of risk to ecological receptors, are similar to or lower than background concentrations measured in the St. Lawrence estuary.

The EHHRA report also indicates that human consumption of local fish could be a source of health hazards, especially for newborns breastfed by mothers eating those fish. The risk is mainly linked with the PCBs; however, available information suggests that people do not fish in the ADM given the industrial nature of the ADM and surrounding land with attendant access restrictions. As a result, fish from the ADM is not consumed and risks to human health, therefore, would be non-existent. Still, risk analysis shows that it is necessary to maintain actual restrictions on local shellfish consumption and fish contamination notices, in order to prevent actual consumption of these animals by people.

As described in detail in the EHHRA and in Section 5, it is important to briefly note the conservative nature of the exposure assumptions incorporated into the risk assessment study that result in the risk conclusions just mentioned, as follows:

- Benthic risks were evaluated by comparing sediment concentrations of COPCs to non site-specific sediment quality guidelines (i.e., FELs). Sediment quality guidelines do not incorporate site-specific conditions within the ADM, which may influence the bioavailability of PAHs and limit the overall quality of the benthic community found in the study area regardless of the presence of chemical contaminants.
- Wildlife risks were evaluated by comparing modeled concentrations of COPCs in prey items to dietary-based toxicity reference values (TRVs). Although the risk results considered seasonal absences from the ADM, the risk assessment did not consider the overall low habitat value in the ADM and surrounding shoreline for these receptors due to the presence of an active industrial facility and hardened shorelines (e.g., riprap and vertical bulkheads).

Given the conservative nature of the EHHRA report, RAs should be considered to be adequately protective of human health and the environment. Following is a brief description of the approach and the results of the EHHRA report.

5.2 Ecological Risk Assessment

5.2.1 Approach and Results

The ecological risk assessment component of the EHHRA report evaluated potential risks to surface water receptors, benthic receptors, fish, birds, and mammals as follows.

5.2.1.1 Surface Water Receptors

This receptor group includes aquatic macrophytes, marine microorganisms, phytoplankton/periphytoplankton, zooplankton, and fish. Risks were estimated by measuring and/or modelling average COPC concentrations in water and then comparing these concentrations to appropriate TRVs (e.g., water quality criteria for the protection of aquatic life). Hazard quotients (HQs) were calculated as the ratio of the COPC concentration in water to the water concentration-based TRV. An HQ greater than 1.0 indicates potential risks due to exposure to COPCs. HQs greater than 1.0 for surface water receptors include the following:

- Aluminum: HQ=1.26 (based on ADM sediment concentrations that are lower than background concentrations)
- Silver: HQ=250 (based on surface water data reported in Tecsult [2010a; those data were not included in the risk assessment]; these data were all non-detect—the HQ is based on half the laboratory method detection limit, where half the detection limit is 250 times higher than the surface water TRV for silver)
    - Accordingly, there is uncertainty that this is a valid finding, but the finding is retained in the analysis based on the conservative/protective risk assessment approach.
- Copper: HQ=1.35

These HQ values are either slightly above 1, based on sediment concentrations below background or based on non-detect values; therefore, surface water receptors should not be a focus during the development of RAs.

5.2.1.2 Benthic Receptors

This receptor group includes marine invertebrates. Risks were estimated through the completion of whole sediment bioassays using two test organisms and also by comparing sediment concentrations with FELs published by Environment Canada and MDDEP (MDDEP and Environment Canada 2007). The risk assessment concludes that the Study Area-specific bioassay results cannot be used to evaluate potential risks to the benthic community because there is a significant difference between Study Area results and reference area results, and also because of poor correlation between organism response and COPC concentrations when comparing reference area sample results with the Study Area sample results.

Rather than using the Study Area-specific bioassays, the risk assessment defaults to a comparison of sediment COPC concentrations to FELs. This comparison is defined as a risk index (RI), which is equal to the average concentration of the COPC measured in the 2011 sediment dataset divided by its respective FEL. Consistent with the discussion in Section 4, for PAHs, the RI is based on the sediment TPAH-13 concentration. The TPAH-13 RI is equal to the sum of each of the 13 quotients of the concentration of each PAH compound divided by its respective FEL (the concentration of each of the individual PAH compounds is equal to the average value of that compound based on the 2011 sediment sampling program). PCBs were analyzed by two different methods: 1) Aroclor; and 2) congener. Samples collected after 2007 were analyzed by congener in accordance with MDDEP requirements, except for 2011 samples analyzed by Aroclor for comparison to older samples also analyzed by Aroclor.

PCBs are believed to be associated with the ABC facility's operations, which mainly included the use of Aroclor 1242. The latter contains around 30 percent weakly chlorinated congeners (1 or 2 chlorine atoms), which have a tendency to deteriorate faster than the more chlorinated forms. After numerous years in the environment, the proportion of congeners detected and measured in 2011 Study Area sediment samples is closer to that of the more chlorinated Aroclor 1248 mixture; however, because Aroclor mixtures are for the most part made up of the same congeners (only the proportions vary), the concentrations measured for Aroclor 1248 virtually represent all of the PCBs (Sanexen 2012). Calculated average RIs greater than 1 are as follows (RIs can also be calculated at each discrete 2011 sampling location):

- TPAH-13: Average RI=56.67
- PCBs (Aroclor 1248): Average RI=29.65

Based on these results, both TPAH-13 and PCBs should be a focus during the development of RAs.

5.2.1.3 Avian and Mammalian Receptors

This receptor group includes the spotted sandpiper, ring-billed gull, osprey, double-crested cormorant, minke whale, and the grey seal. Risks were assessed by modelling the dietary intake of COPCs through the diet, including incidental sediment and water ingestion if appropriate, and then comparing this daily intake to appropriate dose-based TRVs. Exposure estimates were modified based on available habitat relative to foraging/home ranges and on seasonal absences from the Study Area. HQs were calculated as the ratio of the dietary dose of the COPC to a dose-based TRV. Calculated HQs greater than 1.0 include the following:

- Spotted sandpiper
    - Aluminum: HQ=27.98 (based on ADM sediment concentrations lower than background)
    - PCBs (Aroclor 1248): HQ=1.74 (1.16 if seasonal use factor is included)
- Ring-billed gull
    - Aluminum: HQ=3.75 (based on ADM sediment concentrations lower than background)
- Minke whale
    - PCBs (Aroclor 1248): HQ=1.55 (0.78 if seasonal use factor is included)
- Grey seal
    - Aluminum: HQ=2.21 (based on ADM sediment concentrations lower than background)
    - PCBs (Aroclor 1248): HQ=2.57

Aluminum HQ values above 1.0 are based on ADM sediment concentrations that are lower than the St. Lawrence region general background aluminum concentrations; therefore, the only potential issue identified for birds and mammals is due to trophic transfer of PCBs. These HQs are relatively low, in particular, if seasonal factors are considered. PCBs should be considered in the development of RAs in the context of benthic toxicity, and this would be expected to have a positive impact on wildlife HQs because the sediments are the source of PCBs in the ADM.

Because benthic receptors were determined to be the most sensitive receptors, RIs were mapped for benthic receptors.

A comparison of the RI map and the surface sediment TPAH-13 and PCB distribution maps presented on Figures 4-1 and 4-2 indicates potential risk to benthic receptors generally correlate with relatively elevated sediment TPAH-13 and PCB concentration. RIs shown on Figure 5-1 range from near zero (i.e., at the blue end of the range of colors shown) to more than 10 (at the red end of the range). RIs greater than 1 indicate sediment COPC concentrations proportionally exceed their respective FELs.

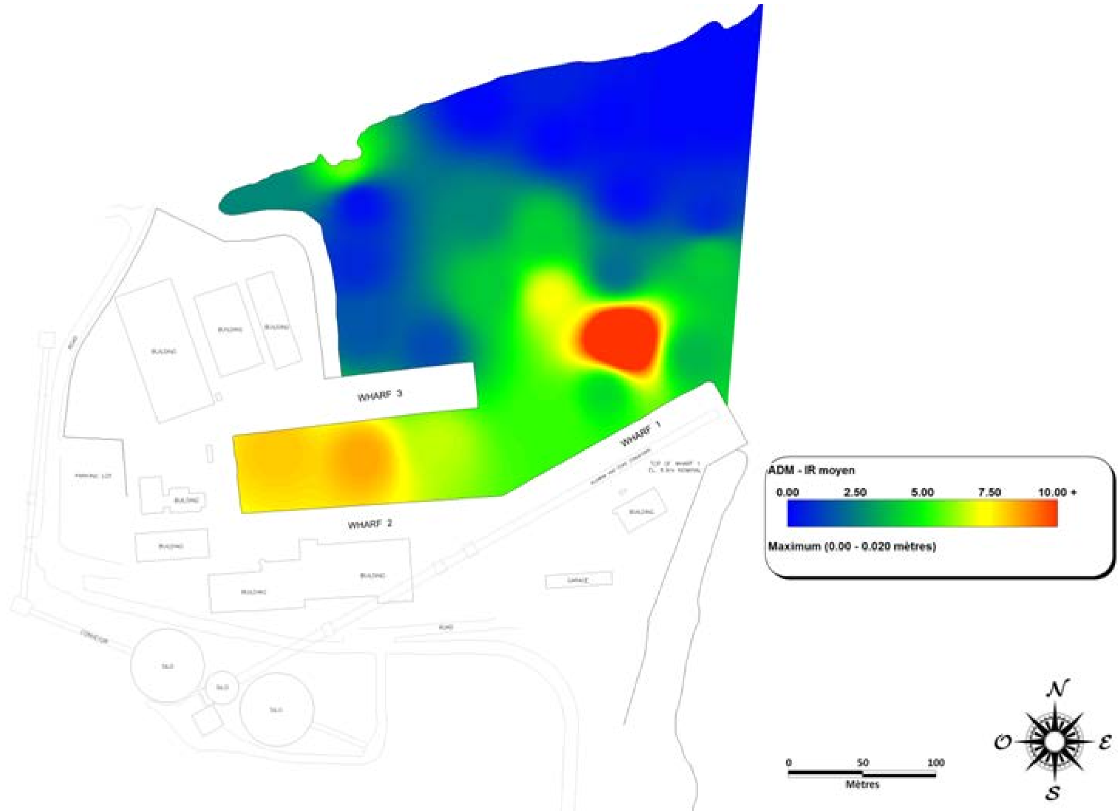

Figure 5-1
Map of Risk Index for Anse du Moulin Benthic Invertebrate Receptors (Sanexen 2012)

5.3 Summary of Human Health Risk Assessment

Similar to the ecotoxicological risk assessment, the human health risk assessment used modeled fish tissue concentrations from the ADM to assess excess lifetime cancer risks and non-cancer hazards due to dietary ingestion of contaminated seafood by people of all ages who consume fish (i.e., Atlantic cod and winter flounder), and also due to ingestion of contaminated breast milk by infants.

Contamination of breast milk is a result of ingestion of contaminated seafood by the mother and subsequent transfer of the contaminants within the mother. Non-cancer hazards are quantified using an HQ approach and consider the degree to which exposure due to the contamination in the ADM exceeds background exposure. An HQ of 1.0 is the defined threshold for exposure for those chemicals for which background exposure has been evaluated (i.e., PCBs, arsenic, cadmium, chromium, and nickel) and an HQ=0.2 is the defined threshold for exposure for those chemicals for which background exposure has not been evaluated. Cancer risks are calculated as the incremental excess lifetime cancer risk resulting from exposure to contamination in the ADM. An excess lifetime cancer risk of one additional risk case in one million exposed people is considered to be a threshold below which risks are negligible. The following is a summary of the results:

- Non-cancer hazards:
  - HQs are greater than 1.0 for PCBs (ranging from 1.0 for adults to 66.32 for infants) and chromium (1.05 to 2.28)
  - HQs are greater than 0.2 for barium (0.28 to 0.60) and certain TPAHs (0.76 to 39.83)
- Excess cancer risks:
  - Excess lifetime cancer risks are greater than 1.E-06 only for PCBs (4.03E-04)

The conservative nature of the exposure assumptions is thought to result in a significant over estimation of the potential human health risks. Examples of conservative assumptions used in the human health risk assessment include:

- For the exposure pathway that is based on ingestion of seafood from ADM:
  - Tissue concentrations are based on modelled estimates of contaminants (not measured) in fish tissue and mother's milk.
  - It was assumed fish spend 100 percent of their time in ADM, exposed to surface water and sediment.
- Inputs to the equation used to evaluate potential exposures included the following conservative assumptions:

  - It was assumed people get 100 percent of their seafood diet from seafood caught and consumed from ADM.
  - Very high ingestion rates of locally caught seafood were assumed, regardless of advisories and industrial nature of ADM and general lack of access.

The assessment of potential risk to human health was included only to provide a thorough evaluation, and is not considered to be representative of actual conditions. In addition, the presence of access restrictions maintained by the ABC facility, the shellfishing ban, and the fish consumption advisory in the ADM and BDA are considered highly effective Institutional Controls limiting potential human exposure to contaminated seafood for people who live in the area.

6 CONCEPTUAL SITE MODEL

The CSM ties together the information presented in the report including the physical, chemical, and biological setting, potential contaminant sources, nature and extent of contaminants, potential risks associated with the contaminants, and the stability, transport, and fate of contaminants. As discussed below, the relationship between hydrodynamics, sediment stability, and sediment transport potential are important components of the Study Area CSM because of the naturally highenergy coastal hydrodynamics and navigational traffic and resulting potential for sediment and associated contaminant transport.

The CSM (Figure 6-1) describes the Study Area as a system, and provides a basis for identifying, evaluating, and developing a preferred RA that achieves rehabilitation objectives.

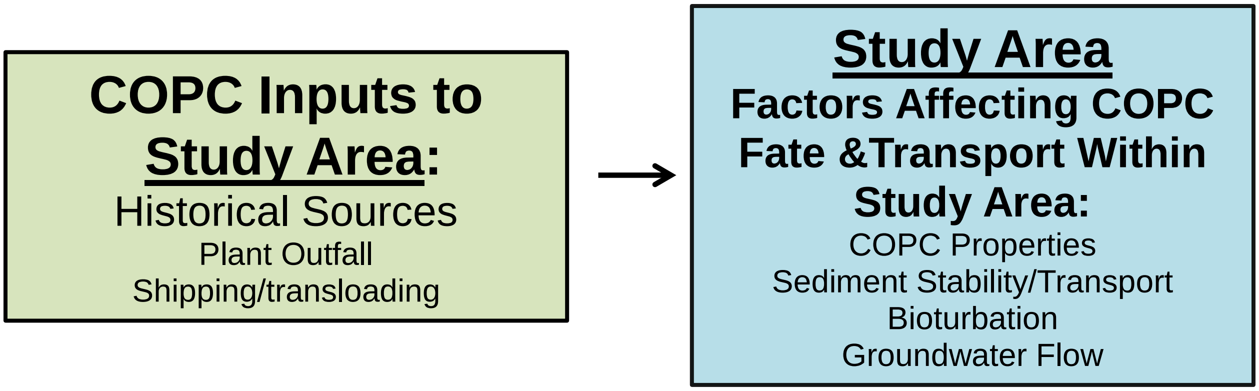

Figure 6-1
Contaminant Sources and Potential Fate and Transport Mechanisms

A brief summary of the major components of the CSM is presented below. Detailed discussion of contaminant sources, historical and current contaminant levels in sediment, and sediment stability and transport is presented in Sections 6.1 through 6.3. The risk assessments are discussed in Section 5.

6.1 Historical Contaminant Sources

Study area TPAH-13 and PCB sources are associated primarily with historical facility operations and discharges. PAHs in ADM and BDA sediment were first detected at the end of the 1980s (GENIVAR 2012b). PAHs in ADM sediment likely originated from discharges through the ABC facility outfall (Figure 2-2) into the small embayment in the northwest corner of the ADM, and accidental spills of ABC facility materials including coal tar pitch, coke, and petroleum hydrocarbons related to shipping and transloading operations (SNC 1995). Sources of ABC facility outfall discharges included the carbon plant and the Söderberg potroom gas treatment system. The discharge from the gas treatment system was combined with effluent water, and eventually made its way into ADM (GENIVAR 2003).

Solid pitch, originally of particle size equivalent to coarse sand and gravel, was introduced into the ADM by discharge from the carbon plant, and transloading activities including accidental spills of solid pitch and coke (SNC 1995). Solid pitch was replaced by liquid pitch in 1993 and additional environmental measures greatly reduced the amount of discharges in the 1990s compared to earlier ABC facility operations (SNC 1995).

Anode butts were crushed in the vicinity of Wharf 3, possibly also contributing to PAHs associated with particulate matter. The source particles are present in sediment grain size fractions ranging from sediment fines up to sand- and gravel-sized materials.

There were also PAH air emissions associated with the potrooms. Between 1957 and 1982, these emissions increased in direct proportion to production. From 1984 to 1990, despite the increase in production, these emissions went down because of technological modifications made to the ABC facility (GTCBA 1993). The ABC facility gas treatment system was replaced in the mid-1980s by a dry system for the potrooms and briquette production plant. This change, combined with the water treatment program implemented in 1991, reduced the amount of PAHs discharged into ADM by approximately 99 percent (GENIVAR 2012b). However, emissions may have been deposited on the ground surface and transported with precipitation runoff from nearshore portions of the ABC facility to the ADM.

An additional potential PAH source is incomplete combustion of fuel oil and other petroleum products by ships and heavy equipment using the facility wharves. This source has not been directly quantified.

Plant operations have been upgraded to result in additional reductions in PAHs and PCBs in effluent discharged through the ABC facility outfall. The PAH and PCB concentrations in the discharge are monitored monthly by the ABC facility and have decreased to approximately 1.1 kilograms per year (kg/yr) PAH and 0.12 kg/yr PCBs (a summary of ABC facility outfall data is presented in Appendix D).

In addition to the ABC facility outfall, the Lac Aber outfall also discharges to the ADM. The Lac Aber outfall is located adjacent to the ABC facility outfall and originates in Lac Aber (Figure 1-2). Investigations in the ADM have included sampling of water discharging from the Lac Aber outfall (Tecsult 2010b). PAHs were detected in water discharging from the Lac Aber outfall at concentrations near laboratory detection limits. However, relatively elevated turbidity (2.6 NTUs compared to the ADM surface water average of 0.44 NTUs) was measured in the discharge, and it is not known whether the sampling effort contributed to the elevated turbidity—the samples were collected approximately 3 m beyond the end of the outfall pipe in a water depth of only 10 cm. The source of the turbidity in the sample is not known—the turbidity could have resulted from erosion and transport of sediment solids located within the outfall pipe, or could have been generated in the sediment near the point of sampling. Because PAHs tend to sorb to the sediment solids that are the likely source of the elevated turbidity, and the source of the turbidity is unknown, it is not possible to assess the Lac Aber outfall as a potential source of PAHs to ADM sediment. Additional work to characterize the Lac Aber outfall discharges is ongoing.

6.2 Potential Sediment Contaminant Sources

Based on cross correlations between PCB/PAH/TOC concentrations discussed in Section 4, it appears some areas of elevated PCB and PAHs sediment concentrations may have had common sources. Areas with relatively elevated sediment PCB and PAH concentrations also generally have high concentrations of TOC, indicating the common contaminant source is also a source for the elevated TOC. Figures 4-5 through 4-7 show the correlations between PCB and PAH concentrations with TOC.

PAH and PCB distributions in sediment near the ABC facility outfall support the assertion that the ABC facility outfall is a likely historical source of PAH and PCB in sediment (Figures

4-4 and 4-5). In particular, deeper sediment located in the northwest corner of the ADM and subsurface sediment along the ADM western shoreline north of Wharf 3 near the outfall embayment has relatively higher PAH and PCB (and TOC) sediment concentrations, compared to sediment located more distant from the outfall embayment. The subsurface sediment COPC concentrations in the ADM western shoreline area are generally higher than overlying surface sediment, likely due to historical discharges from the ABC facility outfall.

Additionally, the distribution of sediment contaminants in the slip located between Wharves 2 and 3 and in the vicinity of Wharf 1 support another historical source in that vicinity. Elevated PAH concentrations in this area are likely associated with pitch loading and storage. Observations during 2011 to 2012 wharf rehabilitation of oily staining in deeper sediment in the slip located between Wharves 2 and 3 combined with elevated TPH concentrations in sediment samples collected in this area support shipping operations as a likely source for PAHs and hydrocarbons in this area.

Limited analysis of diagnostic PAH ratios support historical sources for TPAHs associated with ABC facility outfall and runoff discharges, and with shipping operations located near the wharves (Retec 2007). In summary, TPAH and PCB sources to the Study Area are limited to historical discharges from the ABC facility. Based on the limited mass of TPAHs and PCBs included in present outfall discharges, reductions of more than 99 percent for present compared to historical outfall discharges, present and future ABC facility discharges are not considered a significant source of TPAHs or PCBs to the ADM.

6.3 Historical and Current Contaminant Levels in Sediment

Study area COPCs of primary concern include PAHs and PCBs. Laboratory analyses have indicated the presence of other compounds, including TPH and metals. TPH are generally concentrated in the wharf areas and do not have established risk standards or methodologies for incorporating in risk assessment, and metals are generally present at concentrations lower than Quebec sediment quality guidance levels; therefore, this report focuses on PAHs and PCBs. Contaminants are present in the form of particles (pitch and coke), sorbed to sediment solids, and dissolved in sediment porewater. Low TPAH concentrations, slightly above laboratory method detection limits, have also been detected in ADM surface water.

Similar to PAHs and PCBs, TOC concentrations are generally highest in the northwest corner of the ADM near the outfalls and north of Wharf 3, in the slip located between Wharf 2 and Wharf 3, and in the navigable areas next to Wharf 1. SOC comprises approximately half the sediment TOC. Sediment PAHs and PCBs generally correlate strongly, and also correlate with TOC and SOC, supporting the common sources for TOC, PAHs, and PCBs.

Surface sediment contaminant lateral distribution can be summarized as follows:

- The areas of highest PAH and PCB concentrations generally coincide and are located in the northwest corner of the ADM near the ABC facility and Lac Aber outfalls, and along the southern ADM shoreline in the slip between Wharf 2 and Wharf 3 and in the navigable area next to Wharf 1.
- PAH and PCB concentrations decrease significantly toward the eastern portions of the ADM, particularly in the northeast corner of the ADM, and in the BDA.

Subsurface sediment contaminant distribution can be summarized as follows:

- In general, subsurface sediment contaminants are distributed similarly to surface sediment; areas of highest PAH and PCB concentrations generally coincide and are located in the northwest corner of the ADM near the ABC facility and Lac Aber outfalls, and along the southern ADM shoreline in the slip between Wharf 2 and Wharf 3 and in the navigable area next to Wharf 1.
- At certain locations, sediment COPC concentrations increase with depth or have relatively higher subsurface concentrations (compared to surface sediment). These areas include the navigable areas near the wharves, and the western ADM shoreline north of Wharf 3 and near the outfall area. The following are some observations associated with vertical distribution of sediment COPCs:
    - COPC concentrations are relatively consistent with depth in the navigable areas near the wharves likely due to propeller wash and mixing of sediments.
    - The relatively high concentration with depth near the western ADM shoreline north of Wharf 3 and near the ABC facility outfall area is likely associated with historical discharges of materials with higher PAH/PCB concentrations that have been subsequently covered with more recently deposited, cleaner sediment.

- In the northeasterrn ADM, and in the BDA sediment concentrations generally decrease with depth. Sediment samples collected from depths below 50 cm measured from the top of the sediment surface in the BDA indicate sediment has generally significantly lower concentrations than more shallow sediment. The decrease in COPC concentrations with depth in these areas may be attributable to relatively slow migration rates of small amounts of sediment COPCs from the ADM source areas to shallow sediment, along with low natural sediment deposition rates that would mix with and bury the sediment COPCs.

Concentrations of PCBs (Aroclors) and TPAH-13 were measured at selected sample stations in both 1994 and 2011, which allows for a comparison of these concentrations over time. Figures 4-10 through 4-13 presented a comparison of the oldest (1994) and most recent (2011) comparable datasets.

As discussed in Section 4, a general decrease in TPAH-13 concentrations can be observed by comparing the 1994 and 2011 data. This comparison was also attempted using data from interim year investigations (i.e., 2006 to 2009). However, differing sample collection and laboratory analyses methods and intrinsic variability in contaminant concentrations on small spatial scales make a point-by-point comparison of sediment chemistry over short time intervals difficult to interpret. A general decreasing trend, however, is apparent in the longer term analysis between the 1994 and 2011 PAH data. As discussed in Section 4, comparison of 1994 and 2011 PCB Aroclor data show no significant change over time.

Potential mechanisms for the decrease in TPAH-13 sediment concentrations include degradation of PAHs and mixing of historically impacted sediment with more recent, less impacted sediment. Additional discussion of these mixing processes is presented in Section 6.4.

6.4 Sediment Stability and Transport

This section includes discussion of sediment type and stability, hydrodynamics, and transport of sediment in areas with relatively elevated contaminant concentrations. Hydrodynamics include natural currents and vessel-related currents in the Study Area. Both currents, as described below, can have sufficiently high energy to potentially resuspend and transport sediment. Accordingly, sediment stability and transport is a significant component of the CSM.

The CSM includes evaluation of sediment stability analysis and modelling, sediment grain size analysis, assessment of historical and recent hydrodynamic information (see Section 3), bathymetry and topography surveys, radio-dating/geochronology data evaluation, and sediment concentration profiles. The CSM, therefore, includes evaluating the stability of sediments based on historical, observational, and empirical data, combined with sediment stability modelling.

Hydrodynamics and sediment stability have a combined influence on the transport of sediment contaminants and can be used to better understand the spatial distribution pattern for sediment contaminants. An understanding of the sediment transport potential is also necessary for developing and evaluating RAs.

As discussed in the following subsections, evaluations of sediment stability and transport include the following findings:

- Currents in the ADM are primarily wave induced and result in an anticlockwise general circulation in the ADM. Current magnitude varies and is dependent on wind speed and direction, wave height, and storm conditions.
- Sediments in the northern portion of the ADM are potentially unstable in moderate to more extreme currents and, therefore, are susceptible to resuspension. Sediments in the northwest corner of the ADM are subjected to wave breaking in relatively shallow water zones and, therefore, are more potentially unstable than in other areas because of turbulence and increased energy in wave breaking zones.
- Modelling of propeller wash indicates the potential for significant annual resuspension/mixing depths in the Wharf 1 area.
- Previous investigation field evaluations of sediment resuspension and deposition indicate ADM sediments are resuspended and redeposited at rates that vary depending on location in the ADM. Resuspension and redeposition of sediment result in mixing of surface sediment and redistribution of sediment contaminants.

- Sediment transport is expected to be limited by the average sand grain size. Sand has a relatively high settling velocity and, therefore, is resistant to transport unless currents are relatively high. This is consistent with the distribution of sediment contaminants in the ADM—PAH/PCB concentrations in BDA sediment are much lower than in ADM sediment and are limited primarily to surface sediment. This is likely attributable to stronger currents and deeper water in the eastern portions of the ADM and in the BDA, resulting in dispersal and attenuation of the relatively small amount of sediment contaminants that may be transported from the ADM to the BDA.
- Other mechanisms may contribute to Study Area COPC transport and fate, including groundwater transport and bioturbation; however, these are not considered as potentially significant as sediment transport.

6.4.1 Sediment Types and Stratigraphy

Sediment type and stratigraphy were discussed in general in Section 4. Sediment characteristics specific to potential transport properties are discussed in this section.

Surface and subsurface sediment grain size data were collected for sediments within the ADM and the BDA in the 1994, 2006 to 2008, 2009, and 2011 investigations. The investigations indicated ADM sediments were composed of, on average, approximately 80 percent sand-sized particles with occasional localized deposits of gravel, clay, and silt.

Results of the 1994 investigation indicated the inner portion of ADM included mostly coarse sand (0.5 to 1 millimetres [mm]) and fine sand (0.125 to 0.225 mm), whereas the outer portion of ADM included mostly fine sand (0.125 to 0.225 mm) and medium sand (0.250 to 0.500 mm; SNC 1995). In the BDA (in water depths of less than 20 m), the particle sizes were mostly composed of coarse silt (0.031 to 0.062 mm; SNC 1995). The sediments in the ADM were composed of natural mineralogical materials, with smaller amounts of black particles (characterized as pitch and coke) and cream-colored particles (characterized as alumina) interspersed (SNC 1995).

As summarized in GENIVAR (2008), results of the 2006 and 2007 grain size data also showed sand-sized particles composed the dominant grain size in ADM with a mean value of approximately 80 percent. Gravel, silt, and clay were present in some sediment samples, but were generally not a majority of the grain size range present. Where gravel was present, the percent gravel ranged from approximately 17 to 42 percent of the sample. Silts were also variable, but in general tended to be less than 5 percent of the sample. Only isolated locations had a proportion of silt greater than 5 percent, ranging up to approximately 48 percent.

Results of the 2008 grain size data were similar to the 2006/2007 data. Of the 15 surface sediment samples collected, only five sample stations (18, 21, 24, 25, and 31) had proportions of sand less than 80 percent. Station 18, located approximately 150 m north of the end of Wharf 3, was the exception to the general trend of primarily sand-sized particles—it was composed of only clays and silts. The percentage of gravel ranged from 0 to 58 percent in the sample set, and was not detected in the samples from six stations. Other than station 18, sediments included less than 10 percent silts and clays.

In the 2008 investigation, 12 sediment cores were collected and analyzed for particle size. Sediments were consistent throughout the core, with the exception of stations 18 and 32. At station 18 (located near the ADM northern shoreline) , the surface layer (0 to 50 cm) was composed of silts and clays; however, at depth (100 to 150 cm), the sediment was a mixture of sands (55 percent), silts (32 percent), and clays (13 percent). Station 32 (located near Wharf 1) sediments included a mix of gravel, sand, silt, and clay at the surface and at depth; however, the sediments at depth had proportionally more gravel than at the surface.

The influence of grain size to contaminant concentration was evaluated in the 2008 investigation. Six samples were freeze dried and dry sieved to separate the grain sizes and preserve sediment contaminant concentrations. The coarse sand fraction of the sediment contained the highest TOC, PAH, and PCB concentrations in five of the six samples. This finding is contrary to traditional sediment chemistry partitioning characteristics where hydrophobic organic contaminants are often associated with fine grained sediments (silt and clay), and is likely a result of the presence of pitch and coke particles mixed with the sediments. Additional work performed by Hazen (2010) supported this finding and is discussed in more detail in Section 8.2.2 below and in Appendix B.

The presence of pencil pitch and alumina may alter the sediment's bulk density and/or TOC content. Although the grain size analyses consistently indicate the presence of primarily sand-sized particles, caution should be used when interpreting the sediment transport potential based on typical approaches that assume sediment is primarily natural mineral and organic materials.

6.4.2 Sediment Stability Modelling

This section contains an analysis of waves and vessel prop wash impacts to sediment stability.

6.4.2.1 Wave Impacts on Sediment Stability

GENIVAR performed an assessment of ADM sediment stability in 2011 to 2012 (GENIVAR 2012). The sediment stability assessment estimated ratios of maximum to critical bed shear stresses (τ_{max} to $\tau_{critical}$) for particular flow events. τ_{max} to $\tau_{critical}$ is a theoretical relationship used to assess the threshold conditions required to initiate sediment movement.

A maximum/critical shear stress ratio in excess of 1 is considered theoretically sufficient for initial sediment movement. The estimated τ_{max} to $\tau_{critical}$ ratio threshold for sediment movement is theoretical and higher stresses may be required to initiate sediment movement. However, this analysis conservatively assumes a ratio equal to 1 is sufficient for sediment to be eroded.

Water levels and wave heights are both significant parameters to be considered to assess the sediment stability in ADM. The nearshore wave characteristics and the tide levels were combined to define the hydrodynamic conditions to be simulated. Large waves and high water level typically occur together in storm conditions. The correlation between water level and waves remains modest in areas where the astronomical component of the tides is much larger than the storm-surge component, which is typically the case in the ADM and BDA.

The 24-, 6-, and 1-hour wave heights were selected to simulate a representative range of energetic wave conditions in the ADM.

Based on the findings of the GENIVAR assessment, sediment is predicted to be unstable within a significant portion of the ADM for a 1 hour per year (corresponds approximately to a 25-year storm) wave height of 1.8 m (Figure 6-2). This scenario is based on storm conditions that include the most frequent wind direction, from the east, and the 1 hour per year wave height (1.8 m).

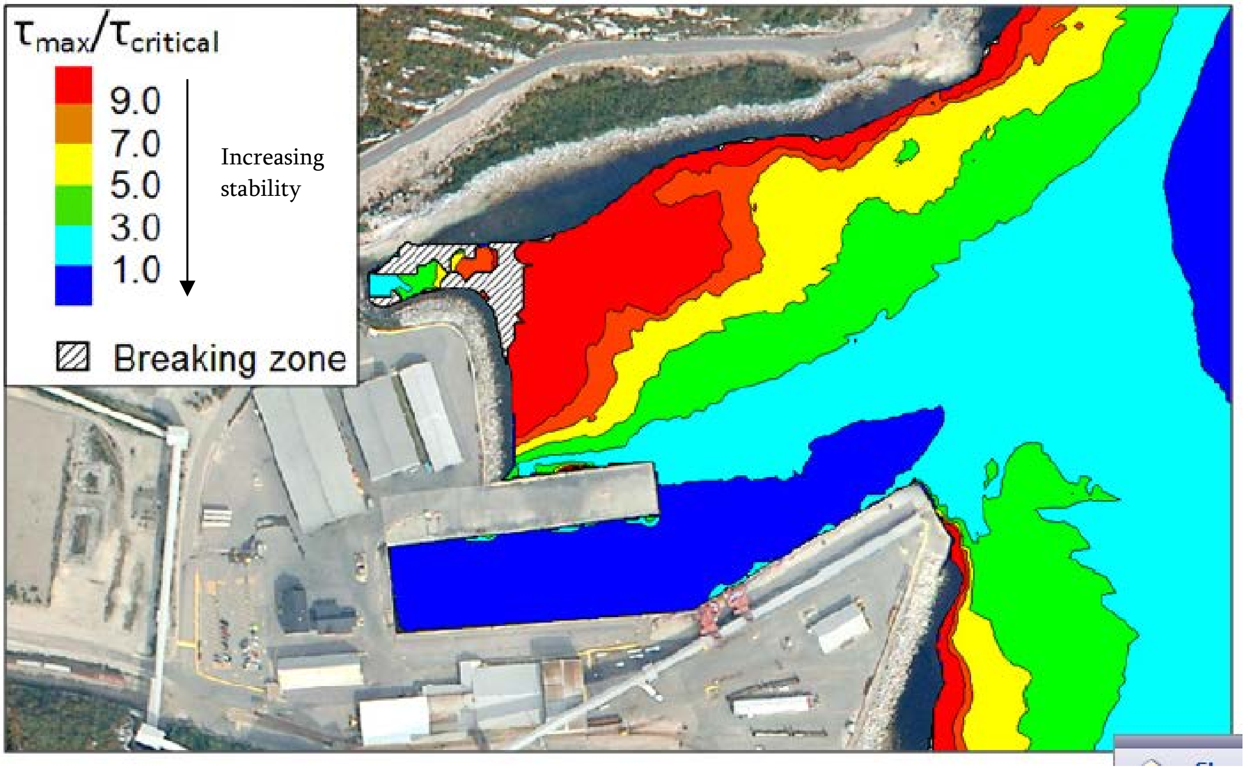

Figure 6-2
Sediment Stability under a Wave Height of 1.8 metres (1 hr/year) from the East combined with a Mean Water Level (GENIVAR 2012a)

For a less energetic 24 hour per year (i.e., a 1-year storm) wave height of 1.2 m, almost half of ADM remains stable, mainly in the southern part where water depths range between 8 and 12 m (Figure 6-3). Also, note that the BDA remains stable, particularly in the eastern portion where the water deepens significantly.

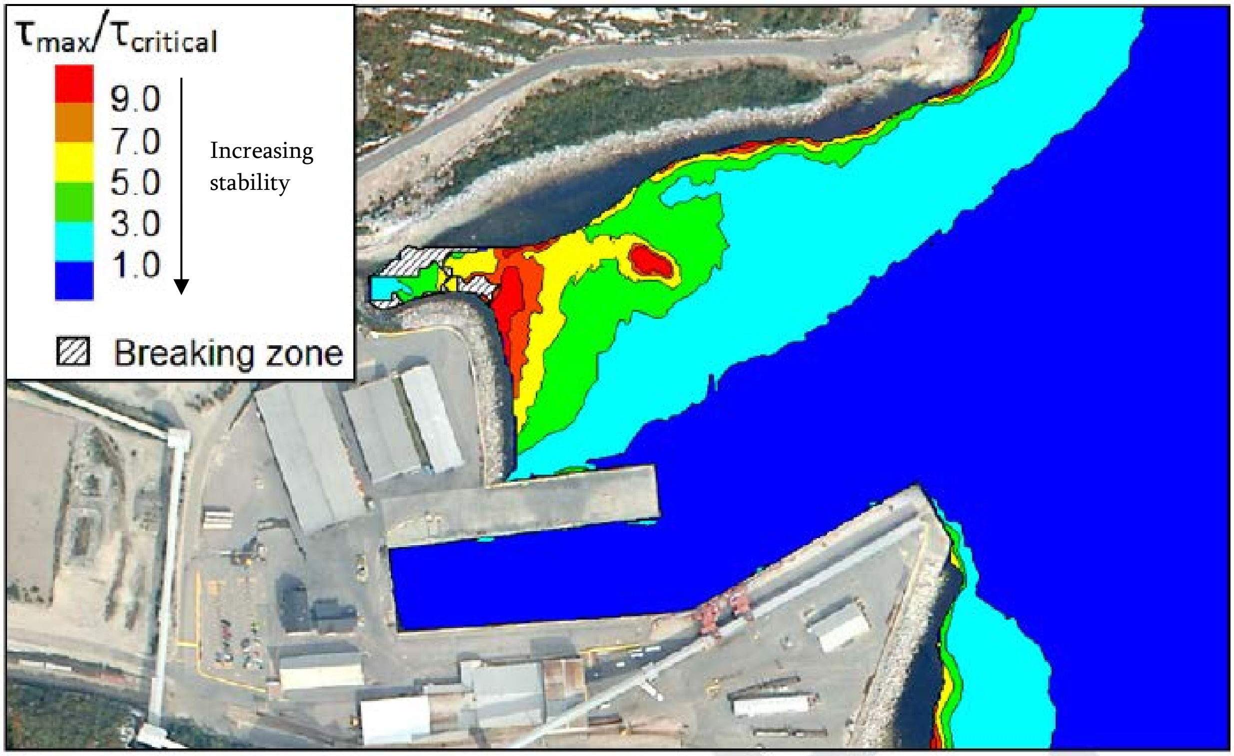

Figure 6-3
Sediment Stability under a Wave Height of 1.2 metres (24 hours/year) from the East combined with a Mean Water Level (GENIVAR 2012a)

For each scenario simulated, the area located in the western part of ADM, north of Wharf 3, remains unstable because of the wave breaking observed in this shallow part of the ADM. Additional analysis performed by Anchor QEA based on the GENIVAR hydrodynamic and sediment stability evaluation indicates annual general scour depths of 1 to 3 cm are possible in nearshore locations with water depths less than 2 m, based on hydrodynamic conditions expected for a typical year. Local scour potential may be higher based on wave breaking and turbulence.

6.4.2.2 Vessel Propeller Wash and Sediment Stability

In addition to sediment movement associated with natural flows, sediment may be resuspended and eroded by flows associated with vessel propellers and thrusters. As a vessel moves through the water, the propellers and/or thrusters used to control vessel movements produce an underwater jet of water. This turbulent jet is referred to as propeller wash (or prop wash). If this jet reaches the bottom, it can contribute to resuspension or movement of bottom particles.

Based on a review of the types of vessels and operating procedures for these vessels in the ADM, there are generally two types of vessel operations:

- Ocean-going vessels that dock at Wharf 1
- Tugboats that assist the ocean-going vessels in berthing and sailing

The types of ocean-going vessels that operate in the ADM generally range from approximately 142 to 200 m in length, between 20 and 30 m in width, with a draft of 10 m. Approximately three to five vessels arrive at the facility each month. Berthing operations take approximately 2 to 2.5 hours and sailing operations take approximately 0.5 hours. Tugboats are required for both operations; however, the potential for mixing or resuspension associated with larger vessels is considered more of a factor than for tugboats, and the analysis, therefore, focuses on larger vessels.

An evaluation of the potential for propeller wash to have generated the bathymetric low located east of the end of Wharf 1 was performed (Figure 1-2). This evaluation is useful for assessing propeller wash in general within the ADM navigable areas.

The potential for mixing or resuspension was estimated based on the relationships developed by Blaauw and van de Kaa (1978) and Verhey (1983). This model considers physical vessel characteristics (e.g., propeller diameter, depth of propeller shaft, and total engine horsepower) and operating/site conditions (e.g., applied horsepower and water depth) to estimate propeller-induced bottom velocities at various distances behind the propeller. The resuspension of finer grained surface sediments due to the propeller-induced bottom velocities were estimated based on Ziegler (2002). This is a conservative approach that likely overestimates erosion depths (e.g., does not consider the potential for self-armoring).

Table 6-1 shows representative vessel input parameters used in the analysis.

Table 6-1
Representative Vessel Physical Characteristics

Vessel Name	Vessel Type	Vessel Horsepower	Propeller Diameter (metres)	Depth of Propeller Axis (metres)
Borg Prinsenborg	Multi-Purpose	10,280	5.35	6.7
Federal Hudson	Bulk Carrier	10,720	5.50	7.5
Handymax Emma Maersk	Tanker/Bulk Carrier	12,240	5.70	7.4

Tables 6-2 and 6-3 summarize the estimated mixing or resuspension depths assuming 25 percent and 50 percent applied power acting on a single location on the sediment bed for 1 minute per berthing or sailing maneuver (this represents the general vessel maneuvering that is expected in the area).

Table 6-2
Propeller Wash Analysis Results – Erosion Rate for 25 Percent Applied Horsepower

Vessel Name	Depth (metres)	Maximum Bottom Velocity (metres/second)	Bed Shear Stress (Pascals)	Erosion Rate (centimetres/second)	Potential Mixing/Resuspension Depth per Year (centimetres)
Borg Prinsenborg	10	2.16	8.5	0.056	120.2
	11	1.62	4.7	0.012	25.6
	12	1.34	3.2	0.004	9.1
	13	1.11	2.1	0.002	3.3
Federal Hudson	10	2.90	15.4	0.257	556.4
	11	2.02	7.3	0.037	80.5
	12	1.60	4.5	0.011	22.8
	13	1.29	2.9	0.003	7.1
Handymax Emma Maersk	10	3.07	17.3	0.346	746.7
	11	2.14	8.2	0.050	108.5
	12	1.70	5.1	0.014	31.2
	13	1.37	3.3	0.005	9.7

Table 6-3
Propeller Wash Analysis Results – Erosion Rate for 50 Percent Applied Horsepower

Vessel Name	Depth (metres)	Maximum Bottom Velocity (metres/second)	Bed Shear Stress (Pa)	Erosion Rate (centimetres/second)	Potential Mixing/Resuspension Depth per Year (centimetres)
Borg Prinsenborg	10	2.72	13.6	0.184	398.7
	11	2.04	7.5	0.039	84.7
	12	1.68	5.0	0.014	29.4
	13	1.40	3.4	0.005	10.9
Federal Hudson	10	3.65	24.4	0.850	1840.0
	11	2.54	11.6	0.122	264.9
	12	2.02	7.2	0.035	76.8
	13	1.63	4.6	0.011	24.1
Handymax Emma Maersk	10	3.87	27.4	1.153	2489.5
	11	2.69	13.0	0.165	356.3
	12	2.14	8.1	0.048	103.4
	13	1.72	5.1	0.015	31.8

The analysis indicated that those areas where vessel operations may be frequent (i.e., the Wharf 1 navigable area), propeller wash has the ability to mix and suspend materials in water depths less than 13 m. The average water depth in the Wharf 1 navigable area is approximately 10 m. As indicated above, this is a conservative method for predicting mixing/resuspension depth, and is particularly sensitive to water depth. Vessel maneuvers are generally assisted by tugboats, and applied horsepower ranges shown above are higher than are typically used for nearhsore maneuvers. Note that the potential mixing/resuspension depth is 2 or 3 orders of magnitude lower in 13 m water depth compared to 10 m water depth.

In summary, sediment stability modelling indicates that sediments are susceptible to resuspension in the northwest portion of the ADM based on natural flows, and in the vicinity of the navigable area near Wharf 1. The potential depth of sediment resuspension is likely more significant in wave breaking areas in the northwest portion of the ADM, and in navigable areas, than in other areas with deeper water that are affected only by natural currents.

A comparison of 2011 and 2012 bathymetric mappings included in GENIVAR (2012) supports this general conclusion; however, the mapping includes erosional/depositional changes that occurred only during a 1-year period, and additional mapping would be required to further confirm this conclusion. It is also important to note that potential sediment instability does not necessarily indicate sediment transport will follow, as discussed below.

6.4.3 Sediment Remobilization and Sedimentation Rates

Investigations in 1995/1996 (Procean 1996) included estimates of sedimentation and remobilization rates. Sedimentation rates were computed in 1995 using the radioisotope, Cesium-137 (data were adjusted in Procean 1996 to account for updated bathymetry information), while remobilization rates were computed using sediment traps. The term “remobilization rate” was used for sediment traps because they included both vertical and horizontal sediment fluxes, not just the settling of sediment in an area.

In 2007, sediment traps were deployed by GENIVAR at 13 locations for 1 year. The sediment traps were flat aluminum plates with dimensions 1 m by 1 m by 0.7 cm. Based on that construction, the traps are likely to preferentially trap vertical flux, and accelerated horizontal flows may remove sediment accumulated in the traps during higher energy events.

Grain size analysis results from six stations (STD-1, STD-2, STD-3, STD-4, STD-9, and STD-10, circled on Figure 6-4) that had recoverable results showed suspended sediments were largely composed of sands (95 to 99 percent). Analytical results from these same locations showed exceedances of the Probable Effects Level (PEL) and FEL for PCBs and certain TPAHs in a majority of the samples of sediment deposited in the traps, possibly supporting the position that sediment contaminants are resuspended and redeposited.

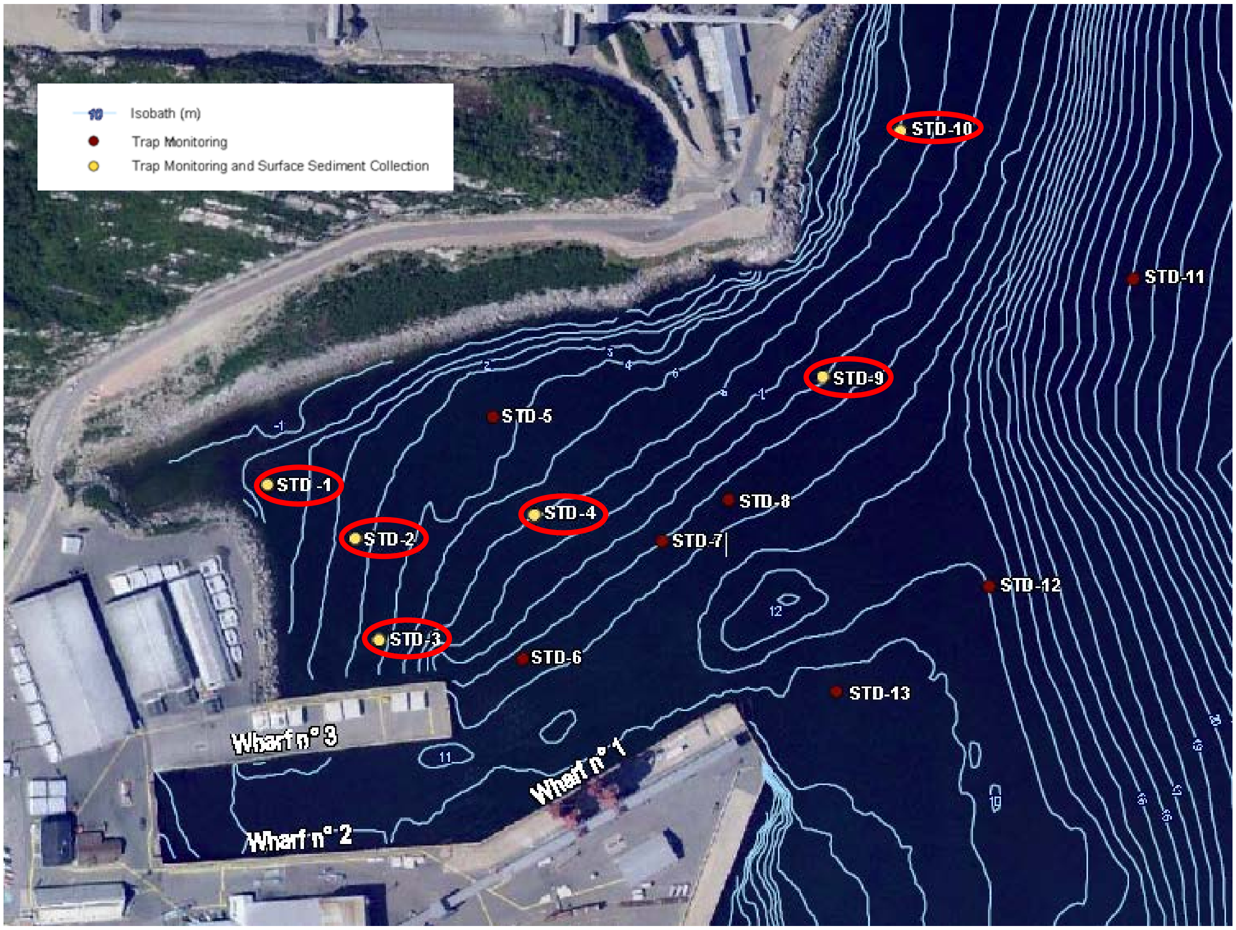

Figure 6-4

GENIVAR 2008 Sediment Trap Locations (GENIVAR 2009)

Sediment thicknesses accumulated in the traps ranged from 4 to 6.5 cm at stations STD-1, STD-2, and STD-10, and were less than 2 cm at stations STD-3, STD-4, and STD-9. No sediment was observed at stations STD-6 and STD-7, possibly because of proximity to the Wharf 1 navigable area and associated propeller wash that could limit sediment accumulation in traps.

The TPAH concentrations measured in the sediment traps were highest at station STD-4, lower at other stations in the western portion of the ADM, and were lowest at stations STD-9 and STD-10 in the eastern portion of the ADM.

The results of the Procean (1996) and GENIVAR (2007) studies are not conclusive with regard to sediment remobilization and sedimentation rates, but indicate these likely vary with location in the ADM, and are likely influenced by natural flows and vessel movements.

Sediment core data were evaluated to further assess potential sediment remobilization and sedimentation rates. Evaluation of sediment core TPAH and PCB data indicate the potential for resuspension and mixing of sediment. Sediment cores were identified with relatively elevated and consistent TPAH/PCB concentrations with depth based on the sediment vertical profiles included in Appendix C. Ten sediment cores were identified that had TPAH and/or PCB concentrations that remain relatively constant in the upper 1 m of sediment, or deeper. Eight of the 10 sediment cores are located in areas used presently or historically for navigation:

- Along Wharf 1: 11aqc32, C-33, and C-22
- In the slip between Wharf 2 and Wharf 3: 11aqsc2
- In the area north of Wharf 3: 11aqc16a, C-6a, CAP-10, and C-11

Exceptions to this trend include CAP-4, which is located in the area northeast of Wharf 3 and north of Wharf 1, and is on the edge of the navigational areas for those wharves. The other exception is 11aqc4, which is located in the northwest portion of the ADM near the outfall area. In this location, sediment mixing may result from waves breaking in shallow water resuspending and mixing sediment.

6.4.4 Sediment Transport

The transport of sediment in areas with elevated sediment COPC concentrations is of concern because of the potential for spreading of COPCs from those areas to other areas where COPCs are present, but at comparatively lower concentrations.

Transport of sediment and associated COPCs is dependent on sediment stability and hydrodynamics. Unstable sediments that are resuspended are potentially susceptible to hydrodynamic transport. The sediment volume and transport distance are dependent on a combination of factors including sediment grain size, density, resettling characteristics, and flow velocity. The direction of flow and flow velocity determines the trajectory and site of redeposition of the sediment.

The comparison of hydrodynamics and sediment stability were evaluated by GENIVAR (2012). Current velocities (magnitude and direction) were simulated and checked against field ADCP measurements. The evaluation of hydrodynamics and applicability to sediment transport can be summarized as follows:

- Comparison of measured (ADCP) and simulated currents indicate general flow directions align with an anticlockwise gyre in ADM when wave heights exceed 0.9 m from the east.
- Current velocities are mainly wave induced in the ADM. Under moderate storm conditions (e.g., significant wave height approximately 2 m, period approximately 6 seconds), simulated wave-induced current velocities are on the order of 50 to 110 cm per second in the north and west part of ADM. Velocities would be expected to be higher for more significant events. Tidal components of current velocities are significantly lower than wave-induced components.
- Areas located within the northwest corner of the ADM are within the wave breaking zone where instability and transport may be more significant.

Based on the combination of unstable sediment and the potential magnitude and direction of ADM flows in areas with relatively elevated sediment COPC concentrations, the potential exists for contaminated sediment to be transported upon resuspension. Based on available information, the extent to which sediment COPCs are transported within the ADM and from the ADM to the BDA is very likely limited.

The following information provides insight into sediment transport potential and indicates sediment transport from the ADM to the BDA is not likely a significant factor for contaminant fate and transport:

- PAH and PCB concentrations in BDA sediment are much lower than in ADM sediment. Additionally, sediment contaminants in the BDA are limited primarily to surface sediment, compared to both shallow and deeper subsurface sediment in the ADM. This distribution pattern is likely attributable to stronger currents and deeper water in the eastern portions of the ADM and in the BDA, resulting in dispersal and attenuation of a relatively small amount of sediment COPCs that may be transported from the southern and western portions of the ADM to the BDA.

- Also, interpreting DREDGE modelling performed by GENIVAR (2012a) as it pertains to sediment transport indicates sediment that would be resuspended (i.e., in the case of DREDGE modelling, by dredging) would be limited to a relatively small and low concentration plume of resuspended sediment, based on the relatively large predominant ADM grain size and associated settling velocity. The DREDGE model includes an assumption of a lower current velocity than the higher velocities associated with storm events, and is only an approximation of conditions that would be encountered during dredging. However, the DREDGE modelling outcome combined with the average sand ADM sediment grain size provides an indication that sediment that is resuspended by natural flows may not be transported over long distances.

6.4.5 Contaminant Transport with Groundwater Flows to the ADM

Groundwater transport of COPCs is not considered to be a significant transport mechanism. The relatively low solubility of TPAHs and PCBs in water limits potential for transport with groundwater. Additionally, a significant portion of the ADM shoreline has a sheetpile wall installed. The sheetpile wall has a relatively low permeability and, therefore, is likely to limit groundwater flow to sediment and subsequent discharge.

In areas other than those with a sheetpile wall installed along the shoreline, groundwater is likely to migrate through sediment. If groundwater were a significant factor in COPC transport, COPC would be expected to migrate to surface water as groundwater migrates through sediment and surface sediment porewater flows with groundwater to surface water. In surface water, COPCs would be expected to degrade via aqueous phase photodegradation, volatilization, and/or biodegradation.

Laboratory analysis of surface water samples collected in 2009 (Tecsult 2010a) in the ADM detected low concentrations (compared to the laboratory method detection limit) of TPAHs in surface water samples (see Section 4.5). As discussed in Section 4.4, TPAHs were also detected in sediment porewater; however, the surface water samples were not filtered and the PAHs/PCBs may be associated with solids suspended in the water column and captured in the sample, and may not be representative of dissolved phase transport of sediment porewater with migrating groundwater. Additionally, all TPAH concentrations were less than provincial water quality criteria. Groundwater migration through sediment is considered a possible transport mechanism, but is not considered as potentially significant as resuspension and hydrodynamic mechanisms because of the relatively low solubility of the PAHs and PCBs.

6.4.6 Contaminant Transport via Bioturbation

Recent surveys of benthic organisms (Tecsult 2010a) indicated an abundant and variably diverse benthic macro- and micro-invertebrate population in ADM sediment; therefore, it is likely that bioturbation transports PAHs and PCBs locally (i.e., over the primary range of movement of the organisms in surface sediment, and mixes surface sediment contaminants in surface sediment). Bioturbation may also release surface sediment porewater contaminants to surface water.

Contaminant transport via bioturbation is likely less significant than sediment transport in terms of mass flux and distance over which contaminants are transported and, therefore, is not considered to be as significant a factor in sediment contaminant fate and transport.

6.5 Ecotoxocological and Human Health Risk Assessment

Potential ecological and human health risks associated with sediment contaminants were evaluated in the EHHRA report and are discussed in greater detail in Section 5. Human health risks were evaluated despite a lack of fishing observed in the ADM, and Institutional Controls including a shellfishing ban and fish consumption advisory in the BDA and ADM, and ABC facility limitations on access to the ADM Alcoa. Estimated human health risks were elevated, but only for theoretical scenarios, and are not considered realistic based on the existing Institutional Controls, which are expected to be maintained for the foreseeable future. In the ecological risk assessment, the most sensitive receptors were determined to be benthic organisms. RIs were mapped for benthic receptors and generally correlate with sediment PAH and PCB concentrations.

7 REHABILITATION ACTION OBJECTIVES AND GENERAL RESPONSE ACTIONS

7.1 Introduction

This section presents Rehabilitation Action Objectives (RAOs), and identifies the General Response Actions (GRAs) for the development of RAs.

RAOs are defined for the purpose of identifying site-specific goals that address potential human health and ecological risks, and form the basis for comparing the effectiveness of various potential RAs. RAOs provide a general description of what the cleanup is expected to accomplish and help focus alternative development and evaluation. The project objectives, findings of the previous investigations, and the EHHRA report provide the basis for developing RAOs and identifying GRAs.

GRAs are major categories of cleanup activities such as source control, natural recovery, Institutional Controls, containment, removal, or treatment that may be considered to achieve RAOs and are consistent with regulatory agency requirements and public input.

7.2 RAOs and Delineation of Areas Proposed for Rehabilitation

7.2.1 Rehabilitation Action Objectives

RAOs are specific goals or objectives for the protection of human health or the environment. General project RAOs for the ADM have been developed based on the results of previous environmental investigations, findings of the EHHRA report, and discussions with regulatory agencies and the public, and include the following:

- RAO 1 - Reduce the potential impact of sediment contamination on aquatic organisms.
- RAO 2 - Limit potential migration of contaminated sediments within the ADM, and from the ADM to the adjacent BDA.
- RAO 3 - Provide a long-term solution to the problem of sediment contamination.

As discussed in Section 5, the EHHRA report indicates that in the present state, the ADM poses potential risks to benthic invertebrates and some birds and mammals feeding on fish and invertebrates from the ADM. The risks for the invertebrates are mainly associated with sediment PAHs and PCBs, whereas risks for birds and mammals are mostly associated with the sediment PCBs.

The EHHRA report also indicates that a theoretical exposure scenario involving human consumption of local fish could be a significant source of health hazards, mainly linked with PCBs, especially for newborns breastfed by mothers eating those fish. However, available information suggests that there is no human consumption of fish from the ADM, Alcoa limits access to the ADM for non-ABC facility uses, including recreational uses (because it is an industrial harbour), and there are a shellfish ban and fish consumption advisory due to input of contaminants from industrial sources to the BDA. The ban and advisory include the ADM; therefore, risks to human health are considered to be nonexistent.

The EHHRA report findings indicate it is necessary to continue to maintain the existing Institutional Controls that limit fish consumption, limit access to the ADM for non-ABC facility uses, and maintain shellfish ban and fish consumption advisory.

Based on RAO 1, a primary focus of rehabilitation is reducing ecotoxicological risks for benthic invertebrates, consistent with the outcome of the EHHRA report. Based on RAO 2, another area of focus for rehabilitation is to address potential sediment transport within the ADM and from the ADM to the BDA. Addressing the issues of ecotoxicological risks and potential sediment transport in turn addresses RAO 3.

7.2.2 Areas Proposed for Rehabilitation and Specific RAOs

Considering the RAOs and the CSM together, areas to focus rehabilitation efforts were identified based on the results of previous investigations, the EHHRA report findings, and the potential for transport of sediment COPCs from areas within the ADM with relatively elevated sediment COPC concentrations to other areas within and outside the ADM. Areas proposed for rehabilitation are presented on Figure 7-1.

The following are areas proposed for active rehabilitation:

- **ADM Western Shoreline Area and North of Wharf 3** (Figure 7-1). This area is north of Wharf 3, along the ADM western shoreline. Surface sediments in this area do not pose a potential risk based on RI mapping except for a localized area along the ADM northern shoreline, but there are relatively elevated sediment COPC concentrations in deeper sediment based on sediment core results. This vertical distribution of contaminants is consistent with the CSM, which includes relatively elevated PAH and PCB concentrations in deeper sediment in this area associated with historical discharges from the ABC facility outfall, and lower surface sediment concentrations due to significantly reduced concentrations in more recent and current ABC facility discharges.

  - Based on hydrodynamic and sediment stability modelling, the overlying cleaner sediment in this area is potentially susceptible to resuspension associated with high energy flows, and if transported from this area, could result in exposure of deeper, buried sediment with higher PAH and PCB concentrations.
  - Achieving the RAOs in this area requires addressing the subsurface sediment COPCs to minimize potential for exposure to the sediment, and for resuspension and transport of the sediment within the Study Area.

- **ADM Southern Shoreline Area** (Figure 7-1). This area generally includes the navigation areas located next to Wharf 1, as well as the slip located between Wharves 2 and 3, and exhibits the following characteristics:
  - This area has the relatively highest RI and surface sediment PAH and PCB concentrations.
  - Subsurface sediment also has relatively high PAH and PCB concentrations. This vertical distribution of contaminants is consistent with the CSM, which includes relatively elevated PAH and PCB concentrations in deeper sediment in this area associated with historical discharges from shipping and wharf operations.
  - Sediment in this area is susceptible to resuspension via propeller wash and potential transport.
  - The specific RAO proposed for this area includes addressing surface and subsurface sediment COPCs to minimize potential for exposure to the sediment, and for resuspension and transport of the sediment within the Study Area.

The remaining portions of the Study Area are not proposed for active rehabilitation based on the following rationale:

- **ADM Northeastern Area** (Figure 7-1)
  - Rehabilitation is not proposed for this portion of the ADM because the sediment COPC concentrations and the RI are relatively low.
  - The ADM northern shoreline is rocky and includes limited pockets of gravelly sediment, as described in Section 2. Because sediment is scarce in this area, sediment contaminants are expected to be similarly scarce; therefore, no rehabilitation is required for the northern shoreline of the ADM, based on field mapping of the extent of the rocky shoreline described in Section 2.
- **BDA**
  - Rehabilitation is not proposed for the BDA because the sediment COPC concentrations are significantly lower than in the ADM.
  - BDA surface sediment COPC concentrations are significantly less than ADM COPC concentrations. BDA COPCs are generally limited to the upper 50 cm of BDA sediment compared to significantly deeper COPCs in the ADM. The significant decrease in COPC concentrations with depth in BDA sediment is consistent with the CSM that includes potential migration of a relatively small portion of ADM sediment and associated PAHs and PCBs to the BDA but with significant dispersal and attenuation of contaminants due to deeper water and differences in hydrodynamic environments.
  - The ADM is more exposed to forces that resuspend and transport sediment than is the BDA. The BDA is also deeper than the ADM. The maximum water depth at ADM is approximately 10 m near the wharves, and 7 m, on average, in the remainder of the ADM. The BDA water depth exceeds 40 m over an area of approximately 10 square km, with a maximum depth of approximately 100 m. Near the ADM, BDA water depth increases rapidly from the northeast ADM shoreline to more than 20 m at a distance of less than 100 m from the ADM-BDA boundary, indicating a sharp drop in bathymetry (underwater slope). Moving to a distance of approximately 300 m eastward from the ADM-BDA boundary, the BDA deepens to more than 30 m. The greater water depth protects BDA sediment from resuspension and transport, as well as bed movement protection from storm waves, compared to the ADM; therefore, forces that resuspend sediment

(including storm waves and propeller wash) are more significant factors in the ADM.

- BDA water depths, bathymetry, and hydrodynamics impose practical limitations on rehabilitation, particularly dredging. BDA water depth and hydrodynamic conditions are expected to limit the effectiveness of environmental controls during rehabilitation, increasing the potential risk for releases of contaminants during rehabilitation.

In summary, the distribution of PAH/PCB in BDA sediment compared to ADM sediment fits the conceptual model of a historical source within the ADM. There has apparently been limited transport of PAHs/PCBs from the historical source areas to the BDA where stronger currents and deeper water resulted in more attenuated and dispersed concentrations of COPCs in eastern portions of the ADM and BDA surface sediment compared to western and southern ADM source area sediment.

In the following sections, RAs are systematically developed and evaluated for the rehabilitation areas discussed above.

7.3 General Response Actions

To support the development of potential RAs to achieve the general RAOs provided in Section 7.2.1 and in the rehabilitation areas and specific RAOs delineated in Section 7.2.2, GRAs were developed for the ADM. GRAs typically are media-specific technology types that may be used to satisfy one or more of the RAOs. For the areas proposed for rehabilitation, the GRAs are grouped into the following eleven broad categories:

- **No Further Action:** No further remedial activities would be performed within the ADM beyond the source control measures already completed by Alcoa. The no further action approach is considered a baseline to which other GRAs should be compared.
- **Monitoring:** A monitoring program would be developed to track future trends in environmental media as appropriate.

- **Institutional Controls:** Institutional Controls include access restrictions, shellfish ban, and fish consumption advisory as appropriate to reduce human consumption of ADM biota.
- **Source Control:** Source control includes measures to reduce direct TPAH and PCB sources to the ADM. Standard practice indicates that the source of significant contamination to sediments under investigation should be identified and controlled as early in the risk management process as possible.
- **Natural Recovery:** Natural recovery processes include sedimentation that buries sediment contaminants and contaminant degradation.
- **In Situ Containment:** In situ containment includes capping to isolate contaminants contained in the ADM from the water column and biota, and to limit potential migration of sediment contaminants. In situ containment may consist of thin layer caps, engineered caps, or active sediment caps.
- **In Situ Sediment Treatment:** In situ sediment treatment includes in situ management of sediment contaminants (e.g., activated carbon application, biodegradation, immobilization, and/or other potentially appropriate treatment technologies) to reduce sediment contaminant bioavailability, concentrations, and/or potential migration of sediment contaminants.
- **Sediment Removal:** Sediment removal includes removal of sediment via dredging or excavation.
- **Sediment Dewatering:** Sediment dewatering is the drying of sediment as required for subsequent management (e.g., transport, use as fill and disposal) and management of dewatering effluent.
- **Ex Situ Sediment Treatment:** Ex situ sediment treatment reduces sediment contaminant concentrations (following sediment removal), typically in combination with subsequent management requirements (e.g., reducing sediment contaminant concentrations to accommodate beneficial reuse of sediment as upland fill).
- **Sediment Disposal:** Sediment disposal includes on-site and off-site options for disposal of dredged/excavated sediment, following sediment removal, dewatering, and treatment, as applicable.

Technologies within each of these GRAs are discussed in detail in Section 8.

7.4 Regulatory Requirements and Guidance

RAs will be developed consistent with regulatory agency requirements and guidance. In addition to multiple discussions between Alcoa and the agencies during the 2008 to 2012 period, the following regulations and guidance were considered during RA development:

- MDDEP Soil Protection and Contaminated Sites Rehabilitation Policy
- Quebec Environment Quality Act (EQA) c. Q-2
- Canadian Environmental Assessment Act (CEAA) (LRC, 1992, c. 37)
- Criteria for the Assessment of Sediment Quality in Quebec and Application Frameworks: Prevention, Dredging and Remediation (MDDEP and Environment Canada 2007)
- Criteria for the Quality of Surface Water (MDDEP 2009)
- Quebec regulation RRQ, c. Q-2, r. 18, Regulation respecting the burial of contaminated soils

The requirements cited above are considered as part of the administrative and technical feasibility for screening of rehabilitation technologies, and evaluation of RAs.

8 SCREENING OF TECHNOLOGIES AND ASSEMBLY OF REHABILITATION ALTERNATIVES

8.1 Introduction

As described in Section 7.3, GRAs were developed for the rehabilitation areas based on the RAOs and the findings of the comprehensive assessments of environmental conditions. This section identifies and screens rehabilitation technologies and process options, and then combines these technologies/process options into candidate RAs. RAs have the following components:

- **GRAs:** major categories of cleanup activities such as source control/natural recovery, Institutional Controls, containment, removal, or treatment
- **Rehabilitation technologies:** types of technologies within each GRA, such as different containment options (e.g., thin-layer capping, engineered caps, active caps)
- **Process options:** specific variations in the way technologies are implemented such as variations in removal technologies (e.g., mechanical and hydraulic dredging) and capping technologies (e.g., cap armor layer and chemical isolation layer components)

From the available list of site-specific GRAs identified in Section 7.3, potential rehabilitation technologies and process options were compiled.

The evaluation of technologies and process options is a three-step process:

- **Step 1 - Initial Screening of Rehabilitation Technologies:** The GRAs and technologies were first pre-screened on the basis of implementability within the ADM.
- **Step 2 - Evaluation of Rehabilitation Technologies and Selection of Representative Process Options:** The rehabilitation technologies retained in Step 1 were evaluated based on overall effectiveness, implementability, and relative cost.
- **Step 3 - Identify and Retain Representative Process Options:** Based on the two-step evaluation and technology screening process, representative process option(s) for each GRA/technology type were identified and retained for incorporation into potential ADM-specific RAs for further analysis.

Rehabilitation technologies are then assembled into RAs based on capacity and compatibility of the assembled technologies to achieve RAOs for the rehabilitation areas.

8.2 Screening of Technologies

8.2.1 Step 1 – Initial Screening of Rehabilitation Technologies

A wide array of possible technology types and process options were evaluated based on their technical implementability in the ADM. Technical implementability is a general, non-detailed evaluation of whether a technology type or process option is implementable with respect to specific ADM conditions, whether implementation is feasible, and whether the technology has been developed for full-scale use. This analysis was based on general knowledge in conjunction with an understanding of the ADM environmental conditions, Study Area-specific studies, experience gained from other sediment sites, and information available in the literature.

Technologies that have not been demonstrated in practice to be effective in addressing ADM-specific issues, or that could not be implemented due to ADM-specific conditions, were eliminated from further consideration during this screening. This initial screening step reduced the number of potential rehabilitation technologies that were subjected to a more rigorous evaluation in Step 2.

The screening process is summarized in Table 8-1. Table 8-1 summarizes the identification and screening of potential technologies/process options that could reasonably be applied in the ADM. The first two columns of the table identify GRAs with several broad technology types and associated process options. This table also provides a brief description of each process option, along with comments on technical implementability. Process options retained for further evaluation in Step 2 (see Section 8.2.2) are shaded. With the exception of some in situ and ex situ treatment, sediment dewatering, water treatment, and sediment disposal process options, most process options were retained for further evaluation.

The following selected rehabilitation technologies were subjected to comprehensive testing to evaluate technical implementability based on 2009 discussions with regulatory agencies wherein the agencies discussed their preference for a technological approach that would reduce the volume of sediment requiring disposal and/or treatment by reducing the volume of sediment contaminants:

- Separation of sediment (i.e., after removal) based on different grain size fractions and to remove pitch particles from natural material. In theory, a decrease in contaminated sediment volume can be accomplished by concentrating the contaminants via separation of sediment fines from granular materials, or in cases where contaminants are particle-based, by separating the particles from the natural sediment materials. Based on the presence of pitch/coke particles and elevated TPAH/PCB, ADM sediment would require both approaches to successfully concentrate sediment contaminants. Alcoa engaged Hazen to perform bench-scale separation testing. The Hazen report findings were discussed previously in Section 4 and Section 6. The report is presented in Appendix B. The following summarizes the Hazen separation testing findings (Hazen, 2010):
    - Based on visual inspection, a relatively small amount of pencil pitch was observed in the coarse (plus 10-mesh) fractions of two samples tested. Although most of the TOC (used as a proxy for organic contaminants in some analyses) was contained in the minus 200-mesh fraction, preliminary PAH analyses of this size fraction did not show significant PAH in the fines of either sample. The separation testing combined with the 2008 GENIVAR findings indicate that pitch particles and elevated PAH concentrations were detected in granular fractions, and it is therefore unlikely that size separation alone will effectively concentrate the PAH into a low-weight fraction.
    - Gravity separation was not effective in concentrating contaminants.
    - Flotation did effectively concentrate TOC; however, variability of sediment with regard to particle size, biological material, and contaminant concentration, combined with the complexity of the process and potential environmental impacts associated with candidate flotation liquids, indicate the process is highly unlikely to be technically implementable.
    - Separation technologies were not retained based on the bench-scale separation testing findings.
- **Thermal treatment to evaluate the technical implementability of thermal remediation of ADM sediment (i.e., after removal via dredging).** Anchor QEA also worked with a thermal remediation vendor (Nelson Environmental Remediation, Ltd., [NER] of Edmonton, Alberta) to evaluate another potential treatment technology. The thermal

treatment unit would be assembled on the ABC facility to avoid transport of sediment off site to a treatment facility. NER reviewed available laboratory chemical and physical testing results for ADM sediment, and developed required unit operating temperatures and residence times based on those results. Based on the operating temperature and residence time required for the thermal treatment unit, sediment PAHs and PCBs would be thermally destroyed. Anchor QEA also reviewed a thermal treatment technology developed by TPS Tech that is based on heating of stockpiled dredged material using electrodes placed within the stockpile. Dredged material would require extensive dewatering prior to thermal treatment, regardless of the thermal treatment method; however, thermal treatment is considered potentially technically implementable at this stage of technology evaluation and was retained for further evaluation in Step 2.

8.2.2 Step 2 – Evaluation of Rehabilitation Technologies and Selection of Representative Process Options

Rehabilitation technologies and process options retained in Table 8-1 (i.e., those that are shaded) were further evaluated based on the expanded criteria of overall effectiveness (including ability to meet RAOs), implementability (technical and administrative), and relative cost. The various process options within a particular technology group were evaluated against other process options in the same technology type. Where appropriate, process options from each technology type were retained for the development of potential RAs. Selection of representative process options is not intended to eliminate other retained process options in a technology type from possible use; it is simply intended to streamline the development of potential RAs. A process option(s) not selected as representative still could be considered during rehabilitation design if its technology type was part of the selected RA. The screening criteria used in this evaluation are described below.

Criterion 1: Effectiveness

The potential effectiveness of each process option was evaluated relative to the following: 1) whether general and specific RAOs can be achieved with the process option included as part of a RA; 2) potential effects to the environment during the construction and implementation phase; and 3) reliability of achieving RAOs with respect to ADM sediment contaminants and environmental conditions. General knowledge of other sediment sites and findings of ADM environmental and geotechnical investigations were also used for this evaluation.

Criterion 2: Implementability

Both the technical and administrative feasibility of implementing each process option were evaluated. Because technical implementability was the focus of the initial screening step, this evaluation concentrated on the institutional aspects of implementability, including the ability to obtain necessary approvals from regulatory agencies, ability to achieve public acceptance, availability of any storage/disposal services needed, compatibility with facility operations, and availability of necessary equipment and personnel.

Criterion 3: Cost

Relative costs (i.e., high, moderate, or low) were identified so that process options within each rehabilitation technology type could be compared. This relative evaluation was conducted because detailed cost comparisons cannot be made among different rehabilitation technologies or GRAs at this point in the evaluation process. In addition, it should be noted that certain rehabilitation technology types (e.g., sediment dewatering) can only be used in combination with other technology types to form a complete RA, but others (e.g., no further action, Institutional Controls) may stand alone.

Table 8-2 summarizes Step 2 of the screening process (i.e., evaluation of GRAs retained after Step 1 for Criteria 1 through 3 listed above). Selected representative process option(s) for each technology type are described below.

8.2.3 Step 3 – Identify and Retain Representative Process Options

Based on the first two steps of the evaluation and technology screening process, a representative process option(s) for each GRA/technology type was identified and retained for incorporation into potential ADM-specific RAs for further analysis. The basis of selection for each representative process option within each GRA/technology type is described below and is further justified in Table 8-2. Retained representative process options for each technology type are summarized in Table 8-3.

A. No Further Action

No further action was retained as a representative process option during the initial screening step. Although this process option does not include any form of active rehabilitation, it will be retained and used as a baseline against which other alternatives may be evaluated.

B. Monitoring

Site sediment and water quality monitoring was retained as a representative process option under this GRA. Monitoring activities would provide a mechanism to track natural recovery processes and effects of active rehabilitation measures. A detailed monitoring plan would be developed during the rehabilitation design phase.

C. Institutional Controls

For this GRA, consumption advisories were retained as a representative process option. Access restrictions are also included as process options under this GRA, and are currently in place. Alcoa owns the ADM and limits access to the waterway to ABC facility operations and facility workers.

D. Source Control

Source control has been retained as a process option. Extensive source control measures have been implemented at the ABC facility since the 1980s resulting in a greater than 99 percent reduction in ABC facility discharges compared to historical discharges, and an ongoing modernization project is expected to further reduce discharges. As described in more detail below, a retention pond is considered for inclusion with ADM RAs.

E. Natural Recovery

Natural recovery processes were retained as representative process options. Natural recovery processes are believed to be ongoing, based on significant reduction in contaminant sources to the ADM, and reductions observed over time in surface sediment contaminant concentrations.

F. In Situ Containment

Capping was retained as a process option under in situ containment for non-navigable areas. The following cap types were retained:

- Armored cap. Armored caps include placement of stone over chemical containment layers or over existing substrate. The chemical containment layers may consist of sand, engineered materials, and/or reactive covers or caps. The intent of the armored cap in the ADM is to stabilize sediment in scour and sediment transport prone areas with deeper elevated concentrations of PAHs and PCBs. The armored cap and underlying filter layers, if required, are placed over existing sediment to stabilize the sediment. The armor stone layer is designed to resist erosion and movement of the stones in the armor layer by estimating the erosive forces associated with natural hydrodynamics and propeller wash-induced scour in the ADM. Design of the armor layer includes selecting a median stone size in the armor layer that resists excessive movement associated with these hydraulic forces. In addition to stone, manmade armored material can be used for armored caps (e.g., Tensar Marine Armor Mattresses).
- Reactive cover or caps. Reactive cover or caps are constructed from natural soil material combined with reactive materials, such as high TOC amendments, to provide increased isolation of the underlying contaminants. Sand layers can be placed over the reactive cap to provide habitat for benthic organisms. For sites with particularly high concentrations of mobile contaminants, sorptive capacity beyond that available in natural materials might be required to isolate contaminants. In those cases, an engineered materials cap might be required, based on higher sequestering capacity of some engineered materials compared to natural materials.
- Engineered fill. Engineered fill includes placement of soil and rock over ADM sediment to create land. The created land may be used by the facility for operations. As an example, engineered fill may be placed in the ADM near the ABC facility outfall to support a retention pond placed on top of the engineered fill.
- Asphalt cap. Asphalt caps are used in combination with engineered fills and CDFs, placed above high water to cover sediment or dredged material and additional materials placed over the sediment or dredged material. Asphalt caps limit access to underlying contaminants and precipitation infiltration to underlying materials.

G. Sediment Treatment

Sediment treatment includes management of sediment in place (in situ treatment) and management of sediment after removal (ex situ treatment). Sediment treatment would be used in combination with other technology types to achieve RAOs. As detailed below, the only process options retained for sediment treatment are limited in situ and ex situ stabilization/solidification.

In Situ Treatment

In situ sediment treatment would stabilize sediment contaminants without significantly reducing concentrations in the stabilized sediment, but would reduce contaminant mobility and bioavailability.

Based on experience on other sites, large-scale in situ treatment of sediment is unlikely to achieve risk reductions that would meet RAOs; however, in situ stabilization/solidification was retained for in situ sediment treatment. Stabilization/solidification has potential uses in the ADM only for limited use in close proximity to nearshore sensitive structures that may not tolerate dredging and, therefore, was retained as a representative process option for the RAs.

Ex Situ Treatment

Ex situ stabilization/solidification of sediment was retained as a process option for managing dredged material for transport off site. Ex situ stabilization/solidification is most commonly used for drying dredged material prior to subsequent management. This process option does not reduce contaminant concentrations, except for limited volatilization of low vapor pressure dredged material constituents that are driven off during aeration and heat generated during chemical processes that stabilize and solidify the dredged material.

Ex situ treatment of sediment (i.e., as dredged material) would be required to reduce sediment contaminant concentrations for beneficial upland reuse on the facility. “Beneficial reuse” is defined in this context as use of dredged material for backfill in accordance with ABC facility land use needs. Management of dredged material on land in Quebec is regulated by legislation. MDDEP Law 72 criteria for soil protection and contaminated land (MDDEP 2002) requires that any dredged material placed in upland areas must be managed to avoid constituting a new source of environmental contaminants.

The policy classifies upland soils according to three quality criteria (A, B, and C) and presents management options according to their contamination. These criteria are presented in Table 8-4. Additionally, dredged material cannot be placed on upland areas if the dredged material contaminant concentrations are higher than those in upland soils.

ABC facility upland soil contaminant concentrations were considered along with the policy requirements for developing ex situ treatment goals for sediment. To comply with Quebec requirements, dredged material would have to be treated to remove PCBs because PCBs have not been detected in upland soils at the ABC facility. Additionally, TPAH concentrations in dredged material would have to be decreased significantly.

Available sediment treatment technologies generally include technologies that remove sediment contaminants by chemical extraction, separation of the contaminants from the sediment, and destruction of the sediment contaminants via thermal or chemical processes. Ex situ treatment of dredged materials has typically not been successful on a full scale at achieving contaminant concentration reductions (USEPA 2005) that would be required by the policy to be consistent with facility upland soil contaminant concentrations. Site-specific treatability studies were done (Appendix B) to evaluate the potential effectiveness of separating contaminants, particularly pitch particles, from the sediment and reducing contaminant concentrations. Based on the treatability studies, sediment treatment by separation of contaminants from sediment materials is not expected to be effective.

The water content of the sediment and presence of PCBs reduces the expected technical feasibility of ex situ thermal treatment of the sediment. Water content can be controlled to a limited extent via the nature of the equipment selected for the dredging operation; however, dewatering requirements based on dredged material water content is an uncertainty that is difficult to resolve.

Dewatering testing performed during the 2011 field investigation included combination of ADM surface water with surface sediment samples in combinations ranging from no water added, to a mixture of 50 percent water and 50 percent sediment. The sediment and water were combined in a geotextile bag typically used for geotube dewatering testing. The samples were allowed to drain and water content was measured initially, after 1 hour, and overnight. A total of five tests were run. Two of the five tests included addition of a polymer flocculant. The dewatering testing indicated the sediment samples drained relatively freely, achieving water contents ranging from approximately 18 percent to 25 percent. Dewatering test results are summarized in Appendix B.

Based on knowledge of dredging operations, dewatering testing results, and recommended water content range of 10 to 15 percent for thermal treatment, extensive dewatering is expected to be required for ADM dredged material prior to thermal treatment for an environmentally sound, efficient, and cost-effective treatment. Evaluating the feasibility and cost of achieving the recommended water content range for dredged material would require an expensive pilot test. The thermal treatment process consumes significant energy, delivered by use of either diesel fuel or propane. Energy requirements and costs increase significantly with increasing water content. The cost for thermal treatment is expected to be high. Additionally, public acceptance of thermal treatment of dredged material containing PCBs has been problematic at some sites in Canada and in the United States and, therefore, is expected to reduce institutional feasibility. For those reasons, thermal treatment was not retained for further evaluation.

H. Sediment Removal

Sediment removal equipment available and commonly used in this region of the St. Lawrence River and other readily available dredge equipment were considered in this evaluation (Table 8-5). The dredges in Table 8-5 are divided into mechanical, hydraulic, and environmental dredges. Mechanical dredges remove sediment by penetrating the sediment with a bucket or shovel, and removing the sediment by lifting it through the water column. Hydraulic dredges typically break up the sediment with an agitator (e.g., horizontal auger or cutterhead) and then pump the agitated sediment and entrained water as a slurry through a pipeline. Some dredges are more suited to environmental dredging than to navigational dredging. For environmental dredging, there is typically a need to minimize resuspension of sediment during the dredging process, and to remove sediment without over dredging and creating more dredged material requiring management. The advantages and disadvantages of different types of dredging, based on experience in the St. Lawrence region, are summarized in Tables 8-6 through 8-8.

Factors considered in evaluating dredging process options include the following:

- Water depths range from 0 (near the time of low tide in the ADM western shoreline and north of Wharf 3 area) to up to 10 m in the ADM navigable areas.
- Based on the hydrodynamic modelling and knowledge of ADM and BDA environmental conditions, working conditions are expected to include waves and wind that will make rehabilitation activities more difficult to complete with accuracy and precision that may be realized in calmer environments.
- The ADM sediment is primarily sand (approximate average of 80 percent sand).
- ADM sediment contaminants are primarily low solubility organic compounds (i.e., PCBs and high molecular weight PAHs) and tend to sorb to solids. Resuspension of sediment solids should be minimized during remediation to avoid significant transport and redeposition of sediment contaminants. DREDGE modelling and modified elutriate testing have been performed to evaluate potential impacts during dredging and indicate potential limited water quality impacts are possible and will be addressed with monitoring and operational controls as described in more detail in Section 8.5.
- Underwater photography indicates there are significant amounts of debris within nearshore areas of the ADM.

Considering the equipment available in the Province of Quebec/St. Lawrence River region and the above factors, mechanical dredging was retained as the representative process option. Dredging would likely be accomplished using mechanical dredging (e.g., an excavator or crane utilizing a clamshell bucket) to minimize generation of water requiring treatment. Hydraulic dredging was also considered, but is not preferred compared to mechanical dredging because of the increased amount of water that is generated from hydraulic dredging that would require management, and concerns with impacts of debris on hydraulic dredging.

Dredge volume estimates were calculated based on Thiessen polygons and the depth of contamination to the OEL or FEL. A table of Thiessen polygon surface area and depth of contamination was developed that was based on the full size of the Thiessen polygons (Figure 4-23). Each polygon contains a single core, and the core data are assumed to be representative of the area within the polygon. The dredge depth was based on the depth of contamination (i.e., sediment is removed to the OEL). The dredging footprint is compared to the Thiessen polygon table, and the table is adjusted where the proposed dredging footprint contains only a portion of a particular Thiessen polygon.

The area of the adjusted polygons is then multiplied by the required dredge depth for an estimation of the volume within the polygon. The volumes by polygon are then summed to estimate the total "design" volume, or minimum volume required to achieve the target cleanup levels or depth for navigation. It is assumed that to achieve these depths, some overdredging and dredging of sideslopes must occur. For this project we have assumed a 1.5x factor, per USACE guidance for feasibility study level work (USACE 2008). The 1.5x factor was applied to the total "design" volume to calculate an estimate for the total "expected" volume that includes consideration to overdredging and sideslopes. Finally, the total expected volume was rounded by two significant digits to clearly indicate that the volume is an estimate, and subject to change during future detailed design phases.

Dredged areas would be backfilled after dredging is completed with approximately 15 cm of clean sand.

I. Sediment Dewatering

The retained sediment dewatering process options are presented in Table 8-2 and include a variety of methods that are applicable to sediment dredged by mechanical methods. Decisions regarding appropriate dewatering method(s) are typically based on compatibility with other process options included in the RA, with disposal rehabilitation technologies the primary consideration.

J. Water Treatment

Retained water treatment options are limited to filtration and carbon treatment because ADM contaminants generally have low solubility and are manageable using these process options. Final decisions regarding the most appropriate process option would typically be made during RA design and construction if dewatering and water treatment are necessary to support a RA that involves sediment removal.

K. Sediment Disposal

Off-site sediment disposal includes landfill disposal in either an existing or newly constructed landfill, beneficial reuse (e.g., as fill for a construction project), and confined aquatic disposal (CAD). Beneficial reuse and disposal in an off-site CAD cell were considered but not retained. Similar to beneficial reuse requirements for the upland portion of the ABC facility, significant reductions in sediment PAH and PCB concentration would be required to comply with environmental requirements for off-site beneficial reuse. Significant reductions in sediment PAH and PCB concentration would also be required to comply with open ocean disposal criteria developed jointly by MDDEP and Environment Canada (2007). As discussed above, sediment treatment is not expected to feasibly achieve these reductions.

Landfill disposal of dredged material must comply with Quebec regulation RRQ, c. Q-2, r. 18. Under these regulations, sediment must fall within Soil Classifications A to C to be eligible for landfill disposal without additional treatment. Sediment classified as Class D requires pretreatment to reduce contaminant concentrations to be eligible for landfill disposal. Off-site landfill disposal was retained for sediment in Classes A to C, which are classes that do not require pretreatment. The feasibility of constructing an off-site landfill cell was evaluated for ADM dredged material; however, the preliminary cost estimates were high enough that this process option did not compare favorably to other process options. The construction of an off-site landfill disposal cell, therefore, was not retained as a process option for dredged material.

L. On-site Sediment Disposal

On-site sediment disposal includes a nearshore CDF, landfill disposal in a newly constructed on-site landfill, and CAD within the ADM.

The process options retained for on-site disposal of dredged material is nearshore CDF. On-site beneficial reuse of sediment and construction of an on-site upland landfill disposal cell were considered but were not retained. Similar to off-site beneficial reuse of dredged material, on-site reuse would require extensive treatment to reduce sediment PAH and PCB concentrations to levels below those of existing upland soils, and to reduce water content to comply with reuse considerations. As discussed above, sediment treatment is not expected to feasibly achieve the required contaminant concentration reductions. The on-site upland disposal cell was not retained because there are limited feasible locations for an upland cell, and costs are expected to be very high compared to other process options.

CAD would require control of discharge of dredged material through the water column to minimize potential water quality impacts during placement. The greater water depths in the BDA compared to the ADM would make controlling potential impacts to water quality during placement of the dredged material less feasible compared to placement in the more shallow water of the ADM where potential impacts could be more readily controlled and monitored. Similar controls and monitoring would be required during capping of the dredged material within the CAD location. Mechanical dredging is more typically used to remove sediment for CAD disposal. The dredged material is transported in a barge and placed in the CAD cell by dumping or using mechanical equipment for unloading and placement of dredged material within the CAD cell. Surface water quality impacts are monitored during placement. Partial or full enclosure of the CAD may be required during placement to minimize potential surface water quality impacts.

Containment structures used for CAD in aquatic environments are distinguished by characteristics of the proposed construction site and the depth of water. The following types of aquatic disposal sites can be built in deep and shallow water:

- **Natural depression.** Contaminated materials are immersed in a natural depression of the water and are then covered with clean material.
- **Artificial depression.** A pit is dug at the bottom of the water and contaminated materials are discharged and then covered with clean material.
- **Mound.** Contaminated materials are immersed in the form of a mound before being covered with clean material.
- **Dam.** A dam is built under water by placing the contaminated materials at the center and then covering with clean material.
- **Artificial island or peninsula.** A dam is built in open water or at the tip of a peninsula so as to form an enclosed and fully submerged containment structure.

CAD is a common disposal method for dredged material. Recent examples are Boston Harbor in Massachusetts, USA, and Port Hueneme, California, USA.

A relatively large capacity CAD would be required for ADM dredged material. Available space is limited by the presence of nearshore structures that limit excavation of a CAD facility. A CAD cell was not retained due to constraints on space, and other on-site options that are more easily implemented.

On-site nearshore confined disposal would be expected to include construction of a nearshore CDF to contain dredged material with elevated PAH and PCB concentrations. The CDF could be located over sediment containing PAHs and PCBs (and, therefore, not require dredging of these sediments) and also contain dredged material. CDF containment structures can be constructed from soil and rock (e.g., in a berm or dike type configuration) or from typical structural materials (e.g., steel, concrete). Many sites have had CDFs constructed or planned to contain dredged material including Thunder Bay and Hamilton Harbour in Ontario, and numerous sites in the United States and internationally.

CDFs would require detailed analysis of the transport and fate of contaminants in dredged material placed within the facilities. The facilities are designed and constructed to minimize potential impacts to the surrounding environment. A post-construction monitoring plan is typically required and is used to further evaluate and protect against potential impacts to the environment.

The on-site nearshore CDF option was retained and would be located in the slip between Wharves 2 and 3. Locations within the ADM (other than Wharves 2 and 3) were considered for additional CDF disposal but were not retained due to water depth and associated disposal volume limitations.

8.3 Basis for Development of Potential Rehabilitation Alternatives

The rationale for development of candidate RAs is based on the combined CSM, RAOs, and areas proposed for active rehabilitation as discussed in Section 7.2.

8.3.1 Additional Considerations for Developing Rehabilitation Alternatives

The following are additional considerations for developing RAs for the ADM:

- Plant operations require access to the waterfront and wharves. Alternate means for transporting production materials and finished products to and from the ABC facility are limited. This requires minimizing interference and potential impacts on ABC facility operations. Specific ABC facility-related considerations include the following:
    - The ABC facility requires continuous access to the waterfront from the land, and to Wharf 1 from the water. This requires maintaining navigability of the Wharf 1 berth, and the navigation channel in the ADM and the BDA. Approximately three to five vessels arrive at the ABC facility each month.
    - The ABC facility and Lac Aber outfalls in the northwest corner of the ADM are required to be maintained operational during and after rehabilitation construction.
    - Rehabilitation cannot damage nearshore structures including Wharves 1, 2, and 3 and the stabilized ADM western shoreline located north of Wharf 3.
    - Additional considerations associated with waterfront structures include the following:
        - Wharf 2 and Wharf 3 slip walls that were not repaired in 2012 will require bracing for continued use of the wharves.
        - The north side of Wharf 3 requires bracing, not including the repaired end section of Wharf 3.
        - Wharf 1 requires scour protection in the navigable area next to the wharf.
- In-water work activity may be restricted when marine biota are active within the ADM.
- Debris including metal, timber, and other materials is present in the ADM near the wharves.
- Potential impacts to the ADM during and after rehabilitation will require monitoring and mitigating measures to minimize potential environmental impacts, including water column releases and noise.
- A service life of 100 years is assumed to be the design standard for rehabilitation, in accordance with standard engineering practice.
- The ABC facility is considering construction of a retention pond in the outfall area to manage water quality associated with the facility discharge. The proposal includes rerouting the Lac Aber outfall and Ruisseau du Moulin flows so that discharge is

outside the retention pond. Further evaluation is required to determine the economic feasibility of this option.

8.3.1.1 Removal Target Areas

The requirement to maintain navigability of the Wharf 1 berth and the ADM and BDA navigation channels limits general rehabilitation approaches in those areas. To minimize potential impacts on operations, the area located next to Wharf 1 is designated a removal area. Capping is not expected to be a viable rehabilitation technology for this area because of the limitations imposed on current and/or future navigation. Scour protection would be applied in a limited portion of this area, immediately adjacent to Wharf 1 at the bottom of the wharf sheetpile wall.

Removal, therefore, is the only rehabilitation technology considered for navigable areas. Sediment removal near shoreline structures in the removal area will require care to ensure that structural integrity is not compromised.

Dredging was not considered for the area between Wharves 2 and 3 because of concerns regarding wharf stability. If dredging were included for this area, the dredging would likely be limited to the interior of the slip area (i.e., away from the wharf walls), and an alternate rehabilitation approach (e.g., containment) would be required for residual sediment that would remain located along the wharf walls. Based on current and future anticipated ABC facility operations, navigability does not need to be maintained for the slip area.

8.3.1.2 Areas with Potentially Unstable Sediment

Hydrodynamics and sediment transport were evaluated using a combination of field investigation data and modelling. The general hydrodynamics and sediment stability evaluations indicate high energy flows and potentially unstable sediment in shallow water locations in the northwest corner of the ADM during 2-year and higher storm events and a general counterclockwise circulation with longshore currents along the northern ADM shoreline. Sediment is potentially unstable in the northwest corner of the ADM in the area of highest energy, and is susceptible to potential transport with ADM flows.

In the area along the ADM western shoreline north of Wharf 3, the RI for surface sediment is relatively low. However, consistent with the CSM that includes ABC facility outfall historical discharges of higher concentrations of PAHs and PCBs, subsurface sediment in this area contains elevated PAH and PCB concentrations. If surface sediment were eroded from this area, the buried subsurface sediment would be exposed and the RI would presumably increase. Additionally, the subsurface sediment would be potentially exposed to erosive and transport forces.

This report conservatively assumes the northwest portion of the ADM and the western shoreline area north of Wharf 3 include potentially unstable sediment and transport of that sediment from those areas would be inconsistent with general RAO 2. Accordingly, these areas have been proposed for rehabilitation.

For the northwest portion of the ADM, a retention pond is being considered for the ABC facility outfall to manage potential releases and protect ADM water quality. The retention pond would include an engineered fill consisting of a bottom liner, and a containment structure (e.g., an earthen berm protected with rock armoring, or a steel sheetpile retaining wall). Discharge from the ABC facility outfall would be contained within the retention pond and then discharged from the pond to the ADM via a weir-type structure. Lac Aber outfall and Ruisseau du Moulin flows would be rerouted outside the retention pond. Following the implementation of ADM rehabilitation measures, the ABC facility discharges would be allowed to continue to discharge to the ADM.

The retention pond would also function as an engineered fill over ADM sediment and, therefore, would limit potential contact with ADM sediment PAHs and PCBs, and prevent potential transport of sediment contaminants. The pond would be designed for a 100-year service life (from the perspective of resisting significant damage in conditions up to and including the 100-year storm) and, therefore, would achieve RAOs 1, 2, and 3. Accordingly, the proposed construction of the retention pond would eliminate the need for other rehabilitation approaches in the northwest corner of the ADM. If the retention pond proves infeasible based on subsequent detailed engineering evaluations, the armored capping proposed for the ADM Western Shoreline area would be extended to the outfall area.

Armored capping is proposed as the most viable option for the ADM western shoreline area north of Wharf 3 (and, therefore, would be extended to the outfall area if the retention pond were not determined to be feasible). The rationale for this is based on the following site constraints and conditions:

- The RI for surface sediment in this area is relatively low.
- The natural armoring that has developed along the northern shoreline of the ADM supports that an armored capping approach can be effective.
- Capping is expected to have significantly less resuspension of contaminants than dredging.
- Rehabilitation along the stabilized western shoreline is limited to capping to maintain the surface sediment in place over the subsurface sediment with higher PAH/PCB concentrations. Removal in this area would require either bracing of the shoreline or maintaining a significant "no removal" margin along the shoreline to prevent slope failure associated with removal depths of up to more than 3 m. Bracing would likely require excavation to install bracing structures, resulting in exposure of surface water to buried subsurface sediment elevated PAHs/PCBs. A "no removal" margin would require capping to minimize potential erosion and transport of subsurface sediment.

These areas and proposed general rehabilitation approaches are shown on Figure 8-1.

8.4 Assembly of Potential Rehabilitation Alternatives

The assembly of candidate RAs is influenced by the following:

- Regulations and guidance
- Sediment physicochemical properties and associated limitations on compatible rehabilitation technologies
- EHHRA report findings
- Additional considerations listed in Section 8.3.1, including ABC facility and ADM environmental setting and uses
- Study area conditions that include high hydrodynamic energy and potential for sediment transport within the ADM, with deeper water and decreased hydrodynamic energy at the sediment water interface in the BDA

These factors influence the selection of the primary rehabilitation technologies, and thus the RAs, that are applicable to ADM environmental conditions and can achieve RAOs.

The area with the most elevated RI includes the section of the ADM used for navigation and the slip located between Wharves 2 and 3. Dredging is the most appropriate rehabilitation technology for the navigation area to maintain navigation depths. Dredging requires disposal of dredged material. As discussed in Section 7, options for treatment of dredged material to reduce and concentrate the volume of the most contaminated dredged material are not feasible. This limitation eliminates the option of on-site or off-site beneficial reuse.

Construction of an on-site or off-site landfill cell for dredged material disposal is also not feasible because of technical and administrative feasibility limitations. Accordingly, the following options were retained for management of dredged material:

- **On-site nearshore CDF.** The disposal capacity of the nearshore CDF is limited by available space within the slip located between Wharves 2 and 3, the elevation of the adjacent Wharves 2 and 3, the need for a containment structure near the mouth of the slip (with an appropriate setback distance to allow vessels to dock at Wharf 1), and the need to place a cover over the material, to limit potential exposure of the dredged material to terrestrial animals, birds, and to the atmosphere. The CDF has the additional advantage of addressing the sediment that is located between Wharves 2 and 3. The sediment located between Wharves 2 and 3 have a relatively high RI, based on the risk assessment. Sediment removal here is practically limited because removal might destabilize Wharves 2 and 3. The dredged material and cover materials placed within the CDF are also expected to stabilize the Wharves 2 and 3 slip walls, providing beneficial reuse of the dredged material, and satisfying an ABC facility requirement.
- **Disposal of dredged material at an off-site landfill.** Dredged material requires transport over long distances for off-site disposal, increasing the risk of accidents and releases of dredged material compared to on-site disposal options. Accordingly, disposal of dredged material at an off-site facility is retained only for RAs that include dredging sediment that would exceed the capacity of the on-site CDF.

The RAs require a combination of rehabilitation technologies/process options that combine with the primary rehabilitation technology of dredging, CDF disposal, and off-site landfill disposal to address target removal areas and areas with potentially unstable sediment, and additional consideration of engineered fill and armored capping to address areas with potentially unstable sediment.

As described below, supporting rehabilitation technologies that are compatible with and support these primary rehabilitation technologies are combined to develop candidate RAs.

Because of constraints imposed by site sediment, environmental conditions, and site uses, the candidate RAs include similar combinations of rehabilitation technologies and, therefore, differ primarily in the extent of areas addressed. This allows, as described in Section 9, evaluation of the different RAs based on balancing the criteria of effectiveness, implementability, and cost.

8.5 Rehabilitation Alternatives

Four RAs, RAs 1 to 4, were developed for detailed evaluation. RA 1 is a no further action alternative and was included only as a baseline to which other RAs should be compared. RA layouts for RAs 2 through 4 are shown on Figures 8-2 through 8-7.

The RAs are referred to as follows:

- RA 1 – No Further Action
- RA 2 – Limited Dredging/CDF
- RA 3 – Dredging/CDF/Armored Capping
- RA 4 – Dredging/CDF/Off-site Landfill Disposal

RA 2 includes dredging limited to the highest RI sediment, an approach that focuses on addressing the highest sediment concentrations in the ADM. Dredged material is disposed of in an on-site CDF that requires placement of a cover and rock stabilization for Wharves 2 and 3 slip walls over the CDF. RA 2 also includes the assumption that the retention pond for the ABC facility outfall would be constructed and, therefore, also addresses sediment located in the northwest portion of the ADM.

RA 2 was developed primarily to allow for assessment of effectiveness, implementability, and cost by focusing only on the highest RI sediment, rather than expanding the rehabilitation efforts to other areas of the ADM with a relatively lower RI, but that may still pose a potential risk in a relative sense. RA 2 does not address other sediment with a relatively elevated RI located in the navigable area located adjacent to Wharf 1, and addresses the potential for erosion and transport of buried subsurface sediment located along the western ADM shoreline north of Wharf 1 by monitoring the area to assess erosion.

RA 3 includes dredging a larger area of sediment than RA 2, including the majority of sediment with a relatively elevated RI. Dredged material is disposed of in an on-site CDF that is filled and capped to a final elevation equal to adjacent Wharves 2 and 3. RA 3 also conservatively addresses the potential for erosion and transport of buried subsurface sediment located along the western ADM shoreline north of Wharf 1 via armored capping of this area. Similar to RA 2, RA 3 includes the assumption that the retention pond for the ABC facility outfall would be constructed and, therefore, also addresses sediment located in the northwest portion of the ADM. If the retention pond is not determined to be feasible during detailed design evaluation, the armored cap proposed for the ADM western shoreline would be extended and would cover the outfall area.

RA 4 includes dredging a larger area of sediment than RA 3, including ADM sediment with a relatively elevated RI (similar to RA 3), addresses buried subsurface sediment located along the western ADM shoreline north of Wharf 1 via dredging of this area, and further extends dredging to the northeast portion of the ADM to remove sediment that exceeds any of the Quebec sediment quality guidance FEL, but does not have an elevated RI. Dredged material is disposed of in an on-site CDF, with excess sediment above the capacity of the CDF transported for off-site landfill disposal. Similar to RA 2 and RA 3, RA 4 includes the retention pond assumptions for the ABC facility outfall and, therefore, also addresses sediment located in the northwest portion of the ADM. If the retention pond is not determined to be feasible during detailed design evaluation, sediment located in the outfall area would be either capped or removed.

Like RA 2, RA 4 was also developed primarily to allow for assessment of effectiveness, implementability, and cost, but for an approach opposite to RA 2. RA 4 includes all areas that pose potential risk, and goes further by incorporating sediment that exceeds sediment quality guidance but does not pose potential elevated risk based on the EHHRA report findings.

RA 2 through RA 4, therefore, cover a wide range of possible risk reduction that allows for a comparison, and optimal balancing of effectiveness, implementability, and cost over that range.

RAs are described in more detail below.

8.5.1 RA 1 – No Action

This RA includes no further action in the ADM and was retained only as a baseline for comparison of other alternatives.

8.5.2 RA 2 – Limited Dredging/CDF

Mechanical dredging would be performed to remove sediment in the area where sediment exceeds an RI of approximately 7.5 (Figure 8-2). This area is located in the navigable area located adjacent to Wharf 1. RA 2 assumes the following:

- Dredging would be limited to an area of approximately 4,200 square m and a dredge volume of approximately 5,700 cubic m of sediment, with an estimated bulked volume of 6,300 cubic m requiring disposal.
- In the dredging area, dredging would extend to a depth where sediment PAH and PCB concentrations are less than OELs in sediment samples, or to a depth of 0.60 m, whichever is deeper. A 0.30-m overdrege allowance is included in the dredge volumes described below.
- Following dredging, a 15-cm-thick layer of clean sand would be placed over the dredged area to restore the area.

Dredged material would be placed in a CDF located in the slip area between Wharves 2 and 3. This process would include the following:

- An approximately 4-m-high earthen berm with 2 horizontal to 1 vertical (H:V) slopes would be placed at the mouth of the slip to retain the dredged material and cap. The crest elevation of the berm would be below the elevation of mean lower low water (MLLW) (Figure 8-3). Based on shipping requirements, the toe of the berm is set back 35 m from the end of Wharf 1 to allow ships safe access to Wharf 1. An armor layer consisting of stone sized to resist significant movement and damage in a 100-year storm would be placed over the seaward berm slope. The earthen berm would be constructed prior to dredging to accommodate dredged material disposal.
- Placement of dredged material would include transport of dredged material via barge to the slip between Wharves 2 and 3. The dredged material would be removed from the barge using a hydraulic unloader. To minimize dewatering requirements and water treatment, only enough water would be added to the dredged material to liquefy the dredged material as needed for transport. Additional water from the ADM would be pumped into the dredged material only if needed. The dredged material would be placed within the CDF using a submerged pipeline that could be moved to evenly distribute the dredged material within the CDF. The sediment would be evenly distributed within the slip up to an approximate average elevation of -8.1 m.
- Based on expected surface water impacts during CDF filling, additional water column controls would likely be required.
- A base layer of rock would be placed over the dredged material. The base layer would be placed in lifts over a geogrid, allowing the dredged material to compact under self weight first, and then to compact more as thin rock layers are added. Following placement of dredged material and the base rock layer, an armor layer consisting of stone would be placed on the seaward berm slope. Rock fill to reinforce the Wharf 2 and Wharf 3 walls would be placed over the CDF. The significant thickness of rock required to stabilize the wharves would limit potential exposure to and contact with contaminants in the CDF fill materials. The rock fill necessary to complete stabilization of portions of Wharves 2 and 3 is not included in RA 2, but is assumed to be added shortly after CDF construction.

The CDF would also contain the sediment currently located in the slip area between Wharves 2 and 3.

- The retention pond for ABC facility discharge would include engineered fill placed over sediment located in the northwest corner of the ADM. The pond would include a liner system and retaining structure designed to withstand a 100-year storm event (for both outfall flows and for ADM storm waves) without excessive damage and, therefore, would effectively contain sediment in this area.
- Environmental controls during rehabilitation construction would include the best management practices for water quality and control sediment resuspension during the operation of the rehabilitation construction equipment. Best management practices would include the following:
    - Water quality monitoring will be performed during dredging, backfilling, capping, and initial containment cell berm construction work. The configuration of the monitoring setup, frequency of monitoring, and parameters to be monitored will be developed during detailed design, but are expected to include near-field and far-field monitoring stations to allow comparison of water quality measurements near the work with water quality measurements more distant from the work and representative of background conditions. Near-field results will be used to evaluate the need for and type of operational controls.
    - General operational controls that apply to dredging, capping, CDF construction, and backfilling include:
        - Specifying properly sized equipment, with adequate power and production rate capacity for intended operation
        - Routinely inspecting construction equipment to ensure good working order
        - Limiting work when wave and weather conditions may result in decreased control over operations
        - Varying the rate of the work to decrease suspended sediment
        - Identifying, mapping, and removing from the ADM debris that could interfere with the work
    - Operational controls for dredging include:
        - Slowing the rate of dredging, including the raising and lowering of the bucket through the water, particularly when the bucket is close to the bottom of the ADM

        - Varying the number of dredge cuts to achieve target dredge depth, to increase sediment capture
        - Resisting excessive and rapid movement of the dredge bucket such as dragging the bucket on the bottom, or re-opening the bucket after initial closure
        - Adding sensors to the dredging equipment to monitor completeness of bucket closure
        - Minimizing over-penetration of the dredge bucket to prevent overfilling
        - Rinsing the dredge bucket before re-entering the water
    - Operational controls for capping, backfilling, and CDF containment berm material placement include:
        - Specifying cap and backfill material gradations that minimize the content of silt- and clay-sized particles
        - Adjusting the rate of material placement
        - Changing the drop height of the material when being placed
    - Operational controls during sediment transport and CDF placement include:
        - Partially filling barges during sediment transport and placement to avoid overfilling and spillage
        - Using drip aprons as needed to prevent spillage for loading and offloading operations
        - Inspecting pumps and pipelines daily and maintain as needed
- In general, daily meetings between the Contractor and Engineer will be required to evaluate the rehabilitation operations, water quality monitoring results, and effectiveness of operational controls, and to develop revisions to the operational controls as needed. These requirements will be included in the project specifications.
- In addition, Alcoa will work with equipment vendors and potential contractors to evaluate the suitability of engineered controls (e.g., different types of turbidity barriers, pneumatic curtains) for the project based on ADM site-specific conditions.
- Previous experience during the wharf repair project indicated that the use of turbidity barriers will likely not be effective for controlling sediment resuspension due to the depth of water, the average 3-metre tidal range and tidal exchange between the ADM and the BDA, and the potential for significant wave action during high wind events.

- This finding is consistent with more general experience attempting to use turbidity barriers in higher energy environments at other sites. Experience with sediment resuspension and water quality management on other projects will be combined with site-specific experience and the significant knowledge of ADM conditions based on extensive laboratory testing, modeling, and analyses to evaluate and develop a comprehensive water quality management program during detailed design studies. The results of this evaluation will be provided to MDDEP in advance of the start of the work.
  - Noise monitoring would be performed, with modifications to operations and equipment (e.g., maintain noise control equipment on heavy equipment) as required to comply with noise requirements.
  - Monitoring for marine mammal movements would be performed, with modifications to operations, including stopping in-water work as needed, included to comply with marine mammal protection requirements.
- Long-term monitoring for RA 2 would include the following:
  - Monitoring of the CDF during the post-construction period, including surface water monitoring in the ADM would be performed.
  - Monitoring of natural recovery processes in the ADM western shoreline areas located north of Wharf 3 and adjacent to the ADM western shoreline would be performed and would include the following:
    - Monitoring of surface sediment stability
    - Monitoring of surface sediment chemistry
  - Routine inspections of the retention pond would be performed.

8.5.3 RA 3 – Dredging/CDF/Armored Capping

Mechanical dredging would remove sediment in the navigable area adjacent to Wharf 1. The RA 3 dredge area includes the area included in RA 2 and additional areas with sediment with a relatively elevated RI (Figure 8-4). RA 3 includes the following:

- Dredging in an area of approximately 30,000 square m and a dredge volume of approximately 54,000 cubic m of sediment, with an estimated bulked volume of

59,000 cubic m requiring disposal. Dredge depths would be similar to those described for RA 2.

- Following dredging, a 15-cm-thick layer of clean sand would be placed over the dredged area to restore the area.

Dredged material would be placed in a CDF located in the slip area between Wharves 2 and 3. This process would include the following:

- An earthen berm with 2:1 slopes and a crest elevation of +7.4 m (equal to the elevation of the top of the adjacent Wharves 2 and 3) would be constructed at the mouth of the slip to retain the dredged material (Figure 8-5). The CDF would be filled with dredged material to an approximate elevation of +4.5 m to accommodate placement of an approximately 3-m-thick cover system constructed from a sand cover and an asphalt cap. The actual thickness of the cover system would depend on the amount of settlement in the dredged material after placement. Because the dredged material has an average sand content of 80 percent, significant settlements after dewatering are not expected. The CDF would have an approximate volume capacity of 60,500 cubic m, which accommodates the dredged material plus an approximately 10 percent allowance for water management within the CDF. Based on shipping requirements, the toe of the CDF containment berm is set back 35 m from the end of Wharf 1 to allow ships safe access to Wharf 1. An armor layer consisting of stone sized to resist significant movement and damage in a 100-year storm would be placed over the seaward berm slope. The earthen berm would be constructed prior to dredging to accommodate dredged material disposal.
- Placement of dredged material would include transport of dredged material via barge to the western end of Wharf 3. The dredged material would be removed from the barge using a hydraulic unloader. To minimize dewatering requirements and water treatment, only water contained within the CDF would be added to the dredged material to liquefy the dredged material as needed for transport. The dredged material would be placed within the CDF using a submerged pipeline that could be moved to evenly distribute the dredged material within the CDF. This approach minimizes ADM potential surface water quality impacts because, unlike RA 2, the CDF is fully separated from the ADM by the berm. Potential impacts to air quality are also minimized because the dredged material is maintained primarily in a

submerged mode, limiting contact with the air, during the dredging and disposal operations.

- Water would be removed from the CDF and treated as needed. It is anticipated that water treatment would not be required in the early stages of CDF filling. Removal and treatment of water would be required as the CDF fills with dredged material, particularly as the dredged material nears the top-of-fill elevation. After solids are allowed to settle in the CDF, water would be removed by pumping and passed through a treatment system that would include filtration and carbon treatment to comply with provincial water quality requirements for discharge to the ADM. It is expected that some of the water pooled in the CDF would filter through the earthen containment berm. As described in Section 9, the containment berm would be designed to accommodate drainage of water from the dredged material and retain contaminants within the berm.
- A cap would be placed over the CDF, including geogrid placed first over the dredged material after filling the CDF has been completed, to more evenly distribute the load associated with the overlying CDF cap. The cap would then include placing an initial thin (15 to 30 cm) sand layer to limit potential exposure to the dredged material, and to limit odor emissions. After initial settlement of the dredged material, additional sand layers would be placed in 15- to 30-cm lifts followed by final placement of an asphalt layer over the sand fill. It is assumed dewatering of the dredged material during initial settlement and consolidation under the weight of the cap would be accomplished by drainage of excess water through the earthen containment berm. Additional dewatering measures (e.g., wick drains and active dewatering followed by treatment of effluent) will be further evaluated during design. The asphalt layer would be graded to drain precipitation away from the CDF to minimize potential infiltration to the cap and dredged material. Surface drainage would be managed in accordance with stormwater management practices.
- Similar to the CAD facility included in RA 2, the CDF would also contain the sediment located in situ within the slip area between Wharves 2 and 3.
- Similar to RA 2, the retention pond for ABC facility discharge would include engineered fill placed over sediment located in the northwest corner of the ADM.
- An armored cap would be constructed in the ADM western shoreline area north of Wharf 3. The armored cap would consist of an approximately 0.6-m-thick layer of

stone (median stone size of approximately 0.4 m) sized to resist excessive damage in conditions up to and including a 100-year storm. The cap would be placed in an area of approximately 10,000 square m.

- Environmental controls during RA construction would include the following:
  - Surface water quality monitoring during dredging, dredged material placement, and armored cap construction
  - Water quality monitoring and controls similar to those described above for RA 2, with less concern for potential water quality impacts during RA 3 CDF filling, compared to RA 2 CDF filling—the RA 3 CDF berm is higher than the RA 2 CDF berm, and limits potential migration of dredged material from the CDF to the ADM
  - Noise monitoring and controls similar to those described above for RA 2
- Long-term monitoring for RA 3 would include the following:
  - Monitoring of the CDF during the post-construction period including the following:
    - Monitoring of ADM surface water quality near the CDF
    - Settlement monitoring of the CDF fill and cap materials, with repair of the cap as required
  - Monitoring of the armored cap including the following:
    - Monitoring to evaluate the cap stability
    - Repair and replacement of cap materials on an as-needed basis
  - Routine inspections of the retention pond

8.5.4 RA 4 - Dredging/CDF/Off-site Landfill Disposal

Mechanical dredging would be similar to RA 3 except that the RA 4 dredge area includes the following:

- The area included in RA 3, and additional sediment in the northeast portion of the ADM that exceeds the Quebec sediment quality guidance for any of the FELs but does not have a relatively elevated RI is included in the RA 4 dredge area (Figure 8-6). Additionally, rather than RA 3 armored capping for the surface sediment and buried subsurface sediment potentially susceptible to erosion/transport located north of Wharf 3 along the ADM western shoreline, RA 4 would remove this sediment. Dredge depths would be similar to those described for RA 2 and RA 3 in areas common to those RAs and to RA 4.

- Dredging in an area of approximately 58,000 square m and a dredge volume of approximately 88,000 cubic m of sediment, with an estimated bulked volume of 97,000 cubic m requiring disposal. As described in Section 4.6, the estimated in situ volume of ADM sediment exceeding FELs was approximately 75,000 cubic m. The volume described above in excess of 75,000 cubic m is based on additional volume required during removal, to achieve transition slopes, accommodate overdredging, and allow for bulking of sediment after removal.
- Deeper dredging along the ADM western shoreline would be limited to dredging in short sections along the shoreline, followed by backfilling to avoid destabilizing the shoreline. Additional analysis of shoreline stability and protective measures would be required to evaluate the need for additional protective measures. It is possible that additional protective measures would be required to avoid destabilizing the shoreline.
- Following dredging, similar to RA 2 and RA 3, a 15-cm-thick layer of clean sand would be placed over the dredged area to restore the area.

CDF construction would be similar to RA 3 and would include the following:

- An earthen berm with a configuration similar to that described in RA 3 would be constructed. The following would be differences between the RA 3 CDF and the RA 4 CDF:
  - The CDF would be filled with dredged material to an elevation of +5.2 m to accommodate additional sediment volume and placement of an approximately 2-m-thick cover system constructed from a sand cover and an asphalt cap (Figure 8-7).
  - The CDF would have an approximate volume capacity of 64,400 cubic m. It is assumed the CDF would be filled to capacity with dredged material (i.e., approximately 64,000 cubic m based on bulked volume) leaving minimal allowance for water management within the CDF. Additionally, the remaining 33,000 cubic m volume of sediment would require disposal off site, as described

below. The assumption of filling the CDF to capacity would increase water management requirements, compared to RA 3. The assumption of filling the CDF to capacity would require further evaluation during design; filling the CDF to capacity may not prove feasible based on subsequent analysis, but is included as an assumption in the RA 4 conceptual design. If filling to capacity is not feasible, the volume of dredged material placed in the CDF would be decreased, and the dredged material not placed in the CDF would be added to the material requiring off-site landfill disposal.

- The 33,000 cubic m of dredged material that could not be disposed of in the CDF would be disposed of in an off-site landfill. It is assumed the dredged material would be transported to the AES, Inc. landfill disposal facility in Larouche, Quebec, based on capacity and approval under Quebec regulation RRQ, c. Q-2, r. 18, respecting the burial of contaminated soils, to accept up to Criteria D materials. Landfill disposal would require the following:
    - A dredged material management area would be constructed at the ABC facility, lined (assumed to be lined with asphalt) to collect dewatering effluent, for stockpiling, dewatering, water treatment, drying sediment, and loading dredged material for transport off site.
    - Dredged material would be placed in the CDF for initial dewatering, then removed, stockpiled in the management area, and allowed to dewater further by gravity drainage.
    - Dewatering effluent would be circulated through the same treatment system as used for CDF dewatering effluent, and discharged similarly.
    - Further drying of dredged material would be performed by adding a drying agent to stabilize the sediment. Based on project experience, it has been assumed that approximately 5 percent (by weight) Portland cement would be added to the dredged material.
    - Stabilized dredged material would be loaded in trucks, and transported 350 km to the AES, Inc. facility.
- Water would be removed from the CDF and treated as described for RA 3. More dewatering and water treatment are expected compared to RA 3 because of the

greater sediment volume, higher fill elevation, and associated decreased freeboard within the CDF for storing water.

- A cap would be placed over the CDF similar to RA 3 with the exception that a thinner sand layer (approximately 2 m for RA 4 compared to almost 3 m for RA 3) would be placed to reach the elevation for placement of the asphalt cap.
- Similar to RA 2 and RA 3, the retention pond for ABC facility discharge would include engineered fill placed over sediment located in the northwest corner of the ADM.
- Environmental controls during rehabilitation construction would be similar to those described for RA 3.
- Long-term monitoring for RA 4 would include similar monitoring to that of RA 3 except that armored cap monitoring would not be required.

The primary components of RA 1 through RA 4 are summarized in Table 8-9. Although representative process options were identified in the RAs, it should be recognized that these may be modified during the design process.

9 ANALYSIS OF REHABILITATION ALTERNATIVES

This section presents the detailed analysis of RAs that were developed and described in Section 8. The detailed evaluation includes evaluation of the RAs on an individual basis and a comparative basis. Technology components common to the RAs are evaluated in Section 9.1. A comparative analysis of each RA is presented in Section 9.2. Recommendations are presented in Section 9.3.

The four potential RAs are summarized in Table 8-9. RA 1 – No Further Action is discussed only where relevant.

Evaluation criteria are described in more detail below.

9.1 Evaluation Criteria

The four RAs were evaluated on the basis of three criteria: effectiveness, implementability, and cost.

9.1.1 Effectiveness

The criterion effectiveness is based on short- and long-term effectiveness and permanence and includes the following factors:

- Risks associated with RA construction, including adequacy and reliability of control measures (i.e., to limit discharges to the environment during construction) and other potential short-term risks
- Overall protection of human health and the environment, based on the overall ability of an RA to reduce potential risk by controlling or reducing potential exposures to TPAHs and PCBs in both the short and long term, including magnitude of residual risk remaining after implementation, along with the adequacy and reliability of control measures (e.g., containment systems and Institutional Controls)

9.1.2 Implementability

Implementability factors include technical feasibility, administrative feasibility, and availability of services and materials required for implementation.

9.1.3 Cost

Factors include present-worth (present day dollars) direct and indirect capital, operating, long-term monitoring, and maintenance costs associated with implementing a RA. Cost estimates were developed for RAs 2 through 4.

9.2 Detailed Evaluation

This section presents the detailed analysis of the RAs that were assembled from the retained technologies and process options described in Section 8.5. Key technology components and process options (i.e., dredging, CDF disposal) that comprise the RAs are evaluated with respect to the criteria summarized in Section 9.1. The results of this detailed analysis are used to support the comparative analysis of the RAs presented in Section 9.3.

The detailed analysis relies on a significant body of Study Area-specific field investigation and laboratory data, data analyses, Study Area-specific modelling, and general experience with sediment rehabilitation sites. Field investigation and laboratory analyses results have been discussed previously in this report and are discussed again as needed. Additionally, Study Area-specific analysis and modelling are presented and discussed to support detailed evaluation.

The potential RAs identified in Section 8 are referred to in subsequent sections of this report using the abbreviated names listed in Table 8-9. Although RA conceptual designs were developed as described in Section 8.5, it should be recognized that RA conceptual design components may be modified during the design and implementation phases of the selected RA due to engineering considerations, localized ADM conditions, and/or new information.

9.2.1 Effectiveness

The effectiveness of dredging, CDF placement of dredged material, and capping are evaluated based on Study Area-specific analyses.

9.2.1.1 Short-term Risks

Short-term risks are primarily construction related and include potential releases to surface water and air during rehabilitation activities. Rehabilitation activities common to RAs 2 through 4 include dredging and on-site sediment transport, on-site dredged material management, and on-site disposal. RA 4 includes off-site sediment disposal in addition to on-site CDF placement of dredged material.

On-site dredged material management follows the dredged material from the point where the dredged material has been transported on site to the slip between Wharves 2 and 3, and prepared for CDF placement (for RAs 2, 3, and 4) and during transport for off-site disposal (for RA 4). Short-term risks are more applicable to on-site dredged material management than to CDF storage of dredged material, where potential long-term risks are more relevant. Short-term risks include potential for releases of contaminants to the air, ADM surface water, and the upland surface and subsurface.

9.2.1.1.1 Dredging

Potential short-term risks associated with dredging include potential for releases to the water column during dredging and on-site dredged material transport.

Based on the presence of debris in the ADM that would likely interfere with hydraulic dredging, and the preference to limit water generated during dredging that requires management, mechanical dredging was selected for the RAs that included dredging.

Potential short-term risks during dredging include releases of sediment and associated contaminants to the water column during dredging. Because most contaminants are solid-sorbed, releases of dissolved phase contaminants are not expected to be significant, and the primary concern, therefore, is associated with potential releases of sediment solids during dredging. Research for environmental dredging operations indicates resuspension rates can vary from less than 1 percent to more than 5 percent (Bridges et al. 2008). Resuspension rates vary and are dependent on site-specific factors including the presence of debris, sediment grain size characteristics, type of dredging and support equipment used, and hydrodynamics (Palermo et al. 2008).

GENIVAR performed DREDGE modelling to evaluate the potential for releases of sediment solids during dredging. The DREDGE model approximates total suspended solids (TSS) concentrations in surface water resulting from dredging, based on a combination of site-specific inputs and assumed values based on engineering judgment and empirical relationships. The DREDGE model is used only as a guide and not as a strictly predictive tool.

The DREDGE evaluation was based on use of a mechanical dredge with a 4-cubic-m bucket operating in conditions specific to the Wharf 1 berth area (i.e., 10- to 13-m water depth, sediment median grain size ranging from 150 to 400 µg, and depth averaged current velocity based on measurements during the 2011 hydrodynamic field work). A 60-second dredge cycle time was assumed. For the worst case scenario where the smaller median grain size was combined with the shallower water depth (median grain size = 150 mm and water depth = 10 m), the predicted TSS increase above background TSS remains lower than 1 mg/L at approximately 80 m downstream from the dredge.

The DREDGE model assumes relatively low winds, waves, and water velocities (i.e., normal working conditions). It is assumed that water quality monitoring would be performed during dredging using sensors deployed upstream and downstream from dredging operations. Based on general experience with dredging projects, and the approximated TSS values, potential short-term impacts associated with dredging should be limited and can be managed by implementing the following measures:

- Operational controls
  - Implement operational controls described in Section 8.5.2.
  - Select and modify dredging equipment as needed. The DREDGE model is based on the assumption that the dredge bucket is an open clamshell. Project experience varies with regard to lower TSS measurements for dredging projects using an environmental clamshell rather than a typical open clamshell. Operator ability and other site and operational factors are important components of the resuspension experienced during dredging, and may indicate during detailed design evaluation that a standard clamshell bucket, or other type of dredging equipment, is preferable to an environmental clamshell bucket.

- Engineering controls
  - As discussed in Section 8.5.2, engineering controls (e.g., turbidity barriers) are not expected to be effective in the ADM, based on site conditions, site-specific experience with turbidity barriers, and more general experience.

On-site dredged material transport would be accomplished by transporting the sediment via barge to the slip between Wharves 2 and 3 for disposal for RAs 2, 3, and 4. For RA 4, dredged material that would not be expected to fit within the CDF would be transferred from the CDF after initial dewatering to the staging area for additional on-site management, including stockpiling, dewatering, dewatering effluent treatment and discharge to the ADM, and transport off site for landfill disposal. Short-term risks associated with the additional on-site management included in RA 4 are discussed in Section 9.2.1.1.2.

Risks associated with on-site barge transport include releases to the water column of dredged material resulting from spillage of dredged material and accidents. Spillage can be controlled by limiting the barge filling to less than the capacity of the barge, and regular inspection and maintenance of barge hulls and coamings. Accidents are minimized by coordinating rehabilitation project navigation requirements with the Alcoa ADM vessel navigation schedule, and limiting barge movements based on weather and water conditions.

Removal of material from the barge and transport to the CDF would include transport via a hydraulic unloader. Piping and pumps used to recycle water accumulated within the CDF and pump into the barge would be inspected and maintained at regular intervals. Operations would be ceased in the event of a malfunction, and the project specifications would include provisions for response and cleanup actions in a short-term response to a spill.

In summary, short-term risks associated with dredging and on-site dredged material transport would be addressed through a combination of operational and engineering controls. Controls would be implemented with a combination of design and field adjustments during the early stages of work. Based on experience on comparable projects, it is expected that short-term risks associated with dredging and on-site dredged material transport could be adequately controlled to comply with regulatory requirements.

9.2.1.1.2 On-site Dredged Material Management

Potential short-term risks associated with on-site dredged material management include potential for releases to the air and surface water.

For RA 2, dredged material would be managed on site by placing and capping the dredged material in a CDF located in the slip between Wharves 2 and 3. Management of dredged material would be performed in the submerged environment. This limits the potential for releases of contaminants to air. Contaminants released to the water column may volatilize from dissolved phase in water to air, but this transfer is not expected to be significant based on the relatively low solubility of the contaminants.

However, there is the potential for releases to the water column associated with dredged material placement and management in the CDF during RA 2. For RA 2, dredged material would be placed in the CDF for on-site management and long-term disposal, after the containment berm is constructed; however, the containment berm crest would be located at an elevation lower than MLLW. Surface water, therefore, is in contact with dredged material during placement within the CDF. Based on the direct connection between surface water and the CDF, there is a potential for sediment contaminants to be transported in the solid-sorbed and dissolved phases from the CDF with surface water. A temporary berm or other barrier would address the sediment solid transport. Short-term dissolved phase transport is not expected to be significant based on the low solubility of the contaminants.

For RA 3 and RA 4, the containment berm crest is located at an elevation well above MHHW; therefore, the CDF is not directly connected to ADM surface water. Water that collects in the CDF during dredging would be managed as described below. Collected water would be expected to either be removed via pumping for treatment or would flow through the berm where chemical and physical processes described in Section 9.2.1.3.2 would limit potential transport of contaminants to the ADM.

Modified elutriate testing results indicate PAHs are present in laboratory-simulated effluent within the CDF. The modified elutriate testing analyses predict the concentration of contaminants in dewatering effluent that would be generated in a CDF by combining sediment and surface water samples to simulate conditions during dredged material placement in the CDF. The modified elutriate testing results indicate the effluent PAH concentrations are, as expected, influenced by sorbed contaminants. PAH concentrations in modified elutriate testing effluent were generally higher than associated dissolved PAH concentrations in the three samples submitted for analysis, by a factor of as much as 8. The PAH concentration includes solids and sorbed contaminants, and the dissolved concentration is based on a filtration to remove fines and sorbed contaminants, leaving only the dissolved phase present in the modified elutriate testing effluent. Additionally, for two of the five PAHs for which Quebec has developed water quality standards (for protection of aquatic life with acute and chronic concentration thresholds, respectively), the concentration in the effluent dissolved samples was less than both the acute and chronic surface water quality criteria. Modified elutriate testing testing indicated exceedances for phenanthrene and fluorene in two of the three samples, and also for copper in two of the three samples (chromium and nickel were not detected in the samples, but the laboratory detection limits were higher than water quality criteria). Exceedances were observed in both the dissolved and total fractions of the samples.

Modified elutriate testing results indicate removal of solids in CDF effluent will likely reduce TPAH concentrations in effluent, and additional treatment of effluent (e.g., carbon filtration) prior to discharge into the ADM is assumed to be required. Modified elutriate testing results are included in Appendix B.

An additional predictive measure of water quality for effluent discharge and treatment requirements, and the associated potential for releases to surface water during construction, is based on the results of the column settling testing. The column settling testing results indicate that the TSS concentration in the water column overlying settled sediment, consolidation of settled sediment, and reduction in pore volume in settled sediment all reached near-maximum values within, at most, several hours from the beginning of the test. In particular, the TSS concentration after several hours approached the original TSS concentration in the water column. The column settling testing results indicate solids would be expected to settle efficiently in the disposal facility, consistent with dredged material grain size (80 percent sand on average). Column settling testing results are presented in Appendix B.

The column settling testing results combined with the modified elutriate testing results indicate effluent PAH (and PCBs, based on low solubility compared to PAHs) concentrations would be relatively low, based on low TSS and sorbed contaminants in effluent, but dissolved phase contaminants may require additional treatment prior to effluent discharge to the ADM.

For RAs 2, 3, and 4, dredged material would be managed in the CDF after transport from the dredging site. Excess water for RAs 3 and 4 would be removed from the CDF by a combination of pumping and treating dewatering effluent, and via filtration through the earthen containment berm.

For RA 2, elevated TSS and dissolved phase contaminants would be expected in ADM surface water within the slip area during dredged material placement. Releases of solids and contaminants beyond the slip area to the ADM would be controlled by operational and engineering controls, combined with water quality monitoring, similar to the controls/monitoring used for dredging. A temporary barrier would very likely be required across the entrance to the slip to manage TSS and potential water quality impacts during RA 2 CDF filling and closure. The potential for releases to the ADM of dissolved phase contaminants exists for RA 2 because of the difficulty in limiting contact between ADM surface water and dredged material within the CDF during construction.

RA 2 could be modified to include construction of the containment berm to an elevation above mean high water (MHW) during construction to address the potential releases to ADM surface water, with the top portion of the berm left in place, or removed after construction. However, this would require placement of a significant volume of additional clean fill and associated cost, particularly when compared to the smaller volume of dredged material placed within the CDF. If the portion of the berm above MHW were left in place after construction, additional stabilizing rock fill would be added over the base rock layer placed over the CDF and, therefore, would eliminate surface water over the CDF.

Potential releases to the ADM during CDF management of dredged material for RAs 3 and 4 would be controlled by the presence of the containment berm, which would be constructed at or near full height (i.e., to the top of the adjacent wharves and above the elevation of surface water) before filling operations begin. The berm would prevent releases of dredged material and associated contaminants to the ADM.

The potential for releases to surface water would then be limited to processes including treatment and discharge of effluent from the CDF to the ADM. Treatment would be expected to include settling and additional filtration as needed to remove solids, and carbon filtration as needed to remove dissolved organic contaminants. This approach has worked effectively on many environmental dredging projects. Startup testing would be included to modify the treatment system as needed to achieve water quality standards for discharge, and ongoing monitoring would be performed to maintain required water quality. Regular treatment system inspection and maintenance would be specified to reduce the potential for malfunctions and accidents that might result in releases of contaminants to the ADM. Requirements for incident response and cleanup procedures would be required in the project specifications.

RA 4 requires additional on-site dredged material management compared to RA 2 and RA 3 that includes temporary stockpiling and preparation of dredged material for off-site disposal. For RA 4, dredged material removed from the western end of the CDF after initial dewatering would be removed with an excavator and loaded into trucks for transport to the staging area. The dredged material would be removed after initial dewatering in the CDF to accommodate placement of additional dredged material. The dredged material stockpiled in the staging area would be allowed to partially dewater and would then be transported to an on-site staging area where the dredged material would be mixed with drying agents (e.g., Portland cement) to stabilize the dredged material for transport. The following are short-term risks and mitigating measures associated with stockpiling, dewatering, and stabilizing the material and controls:

- Vapors, dust, and odors could be generated by stockpiling and mixing of dredged material. Air quality monitoring for organic vapors and dust would be performed around the processing area perimeter to monitor potential impacts associated with sediment management including dust and organic vapor emissions from stockpiled materials. If needed (based on air quality monitoring or detection of odors), stockpiles would be covered with temporary covers or foam to limit potential air emissions.

- Drying agents would be stored in a silo. Air quality monitoring would be performed during drying agent/dredged material mixing. If needed, the mixing operation could be performed within a temporary structure to limit air emissions. Recent experience working on sites drying dredged material containing PAHs with concentrations higher than ADM sediment indicates temporary structures are generally not required to protect air quality.

In summary, short-term potential risks associated with on-site management of dredged material are managed using a combination of engineering controls, combined with monitoring of air and water quality, and engineering design practices that specify inspection and maintenance of engineered systems, and incident response and spill control.

9.2.1.1.3 Off-site Disposal

Potential short-term risks associated with off-site disposal are limited to RA 4. These potential risks include potential for vehicle accidents during transport of dredged material for off-site disposal.

Truck transport of excess dredged material to the AES, Inc. landfill in Larouche, Quebec, for disposal includes transport of approximately 33,000 cubic m (bulked volume) of dredged material 350 km one way. Assuming a truck-semi-trailer combination can transport 80 percent of the allowable 46,500-km load (RAC 2003) for road transport, and assuming an estimated unit weight of 1,600 km per cubic m for stabilized sediment, each truck would transport approximately 23 cubic m of dredged material. That requires more than 2,800 one-way truck trips, or more than 1,400 round trips times 700 km per round trip from Larouche to Baie-Comeau, resulting in more than 1,000,000 km of truck transport for off-site disposal of dredged material. Much of that truck travel would be on two-lane roads with steep slopes and no auxiliary lanes. Based on these factors, there is a potential risk of increased truck accidents on the route from Baie-Comeau to Larouche.

Short-term risks associated with off-site transport are more difficult to control than other on-site risks and are based on road and traffic conditions, weather, and driver ability and awareness.

9.2.1.1.4 RA 2 CDF Closure

RA 2 includes placement of a subaqueous base rock layer over the dredged material in the CDF, followed by filling the majority of the slip with rock placed over the cap to brace Wharf 2 and Wharf 3 slip walls. (For RA 3 and RA 4, the dredged material and cap within the CDF are expected to adequately brace the wharf walls).

Placement of materials over sediment can resuspend sediment. This would be of particular concern for RA 2 because the base layer is placed over dredged material that overlies native sediment. The dredged material would be expected to be less compact than the native sediment. If the cap material is not placed carefully, the pressure wave associated with placement and impact of the cap material could resuspend dredged material and, in a worse case, displace the dredged material via mud waving. This could impact surface water quality.

To reduce the risk of dredged material losses during base layer placement, the dredged material would be covered with a geosynthetic layer that would contain the dredged material, and spread the load associated with the overlying cap material. Placement of base layer material in thin, evenly distributed layers would be specified. As discussed above, the granular nature and column settling testing properties of the dredged material indicate the material will consolidate relatively efficiently and effectively, mitigating concerns about dredged material stability during base layer placement. A temporary berm or other barrier would likely have to be maintained across the slip entrance during construction to limit potential migration of dredged material possibly resuspended during construction. Requirements for incident response and cleanup procedures would be required in the project specifications.

9.2.1.2 RA 3 Armored Capping

RA 3 includes armored capping of the ADM western shoreline area located north of Wharf 1. Short-term potential risks associated with capping include potential releases of sediment and associated contaminants to ADM surface water during cap placement, and potential water quality impacts associated with an increase in turbidity related to suspension of capping materials in ADM surface water during placement of the cap. Short-term risks for placement of the armored cap in the ADM western shoreline area for RA 3 (Figure 8-4) include the possibility for releases of surface sediment during cap placement. Sediment grain size information in this area indicates the presence of sand and gravel, with occasional deposits of silt and clay. Cobbles and small boulders are present on the sediment surface along the shoreline. On the ADM western shoreline, much of the cobble and boulder deposit is associated with riprap that stabilizes the upper shoreline. On the northern shoreline, the armored cap would transition into the retention pond and/or an area of cobbles and boulders.

Portions of the cap located above mean low water (MLW) would be placed "in the dry." This would limit potential water quality impacts. Because the risk assessment indicated a relatively low RI for surface sediment in the cap area, the concern for potential resuspension of sediment is more associated with potential displacement of the surface sediment that buries deeper sediment with higher contaminant concentrations than concern for water quality impacts from resuspension of the sediments being capped. For portions of the cap that would be placed while the cap area is submerged, the operational controls described in Section 8.5.2 would be implemented as needed.

9.2.1.3 Overall Protection of Human Health and the Environment

All RAs include Institutional Controls based on continued restricted access by Alcoa to the ADM for non-ABC facility related uses, and continued shellfish ban and fish consumption advisory in the ADM and BDA. Continuation of these Institutional Controls is protective of human health in both the short and long term.

9.2.1.3.1 Dredging

Dredging protects the environment by removing from the ADM aquatic environment sediment with the highest RI calculated in the EHHRA report, and reducing potential exposures to contaminants for aquatic biota (general RAO 1). Dredging also reduces the potential for long-term transport and redeposition of sediment contaminants to other areas within the ADM and the BDA (general RAO 2). The long-term effectiveness of dredging is dependent upon controlling or eliminating ongoing contaminant sources to the ADM. As discussed in Section 1.1.2**Error! Reference source not found.**, sources associated with the

ABC facility have been controlled or eliminated. Lac Aber discharge is currently being monitored to ensure that it is not a significant source to the ADM.

Dredging for RA 2 and RA 3 is based on targeting high RI areas identified in the EHHRA report. Dredging for RA 2 focuses on the area with the highest relative RI. Dredging for RA 3 removes sediment from areas with a relatively elevated RI, compared to the remaining areas of the ADM. RA 4 dredging conservatively removes all sediment with a relatively elevated RI and additional sediment that does not have a relatively elevated RI, but exceeds the Quebec sediment quality guidance FEL.

Dredging typically results in residual contaminant concentrations in surface sediment, based on sediment resuspension and redeposition. Residuals fall into two categories: undisturbed residuals and generated residuals (Bridges et al. 2008). Undisturbed residuals result from sediment contaminants that are exposed during dredging due to inadequate lateral or vertical characterization of the extent of contaminants, dredging near structures, or hard layers that impede removal operations. Generated residuals result from dredging and related activities that resuspend and redeposit sediment, and sloughing of dredged slopes into the dredged area. Residuals associated with environmental dredging have been recently researched in field studies and analysis, and can range from approximately 2 to 10 percent of the contaminant mass removed, based on the presence of debris and other obstructions to dredging, sediment type, and dredging equipment and operations.

Residuals can be managed using a combination of approaches including debris removal and operational controls such as limiting dredge cycle, residual covers, or caps. Cleanup dredging passes (i.e., after initial dredging) have been attempted but typically have not successfully achieved cleanup objectives.

In the ADM, residuals are proposed to be managed by dredging to area-specific depths where previous investigations indicate sediment PAH and PCB concentrations are at or less than Quebec regulatory guidance OELs, followed by backfilling with clean sand.

A debris survey would be performed and debris would be identified, mapped, and removed prior to or during dredging to reduce interference with dredging operations and associated increased potential for generated residuals. The operational controls (see Section 9.2.1.1.1) to reduce potential releases during dredging would also reduce potential generated residuals. The use of comprehensive sediment characterization data to delineate dredge areas and depths reduces the potential for undisturbed residuals. Additionally, an overdredge allowance would be developed during detailed design analysis and specified to accommodate expected weather conditions and limitations on dredging. A 15-cm-thick residual cover of clean sand would be placed in dredged areas after dredging is completed.

An additional potential short-term risk associated with RA 4 dredging is based on sediment removal in the ADM western shoreline north of Wharf 3. Dredging here includes removal of subsurface sediment to depths of 3 m or deeper, and poses the potential additional risk of destabilizing the ADM western shoreline and Wharf 3. Risk reduction measures would include extensive shoring and monitoring of the shoreline and structures, and would increase the risk for increased undisturbed residuals based on dredging near the shoreline and Wharf 3.

9.2.1.3.2 On-site Disposal

On-site disposal includes placement of dredged materials in the CDF located in the slip between Wharves 2 and 3.

Short- and long-term protection of human health and the environment is dependent on the effectiveness of CDF containment of dredged material contaminants.

For RA 2, containment is provided by a base rock layer and stabilizing rock that is placed over the dredged material located within the CDF. A significant thickness of rock would be placed over the CDF, limiting access and exposure to the dredged material.

Detailed containment modelling and design would be required if RA 2 were further pursued. In this report, it is assumed that containment can be achieved within the contingencies included in RA 2.

Monitoring of RA 2 CDF performance would be limited to monitoring of surface water in the slip between Wharves 2 and 3. The presence of an armor layer over the containment portion of the cap would make monitoring of the containment layer impractical.

The chemical isolation of contaminants within the RA 3 and RA 4 CDF was analyzed in detail. The analysis is presented in Appendix E. Transport of PAHs and PCBs is dependent on the flow of groundwater from upland areas as well as infiltration of rainfall into the CDF. A conservative coupled groundwater flow and contaminant fate and transport model was employed to assess the degree of transport and estimate the potential for long-term impacts to surface water from contaminants contained within the dredged material after placement in the CDF.

The transport of TPCBs and three representative PAHs—selected based on range of mobility, detection frequency in the proposed dredge areas, and relative toxicity—was simulated over a 100-year period. Relatively conservative parameters were selected for use in the model. For example, boundary conditions and recharge values were selected to result in a conservatively high flow rate through the CDF. Likewise, literature-based partitioning coefficients were used, even though ADM-specific data indicate mobility could be lower by an order of magnitude or more.

For two of the modeled contaminants, acenaphthene and fluoranthene, available surface water quality criteria for the protection of aquatic life (chronic) were considered in evaluating the simulated aqueous concentrations at the berm/ADM interface. Model results indicate that concentrations within the outer edge of the berm were predicted to be below the criterion for acenaphthene throughout the 100-year simulation. Fluoranthene would reach a concentration in groundwater exiting the berm that would slightly exceed the provincial criterion for surface water for protection of aquatic life (chronic effect) at the berm-ADM interface within 100 years (i.e. after approximately 80 years). Because the modeled fluoranthene concentration is in groundwater and would immediately be significantly diluted upon migration of the groundwater into surface water, the environmental impact is expected to be minimal. Additional modeling and evaluation of contaminant migration will be performed during detailed design evaluation to confirm the expected minimal impact. Quebec regulatory guidance indicates estimation of a mixing zone is appropriate for discharge of effluent to surface water (MDDEP 2008).

These results were generally consistent for the likely case with degradation (specifying relatively conservative half-lives) and a case without degradation. For all contaminants but acenaphthene, results indicated that only a very minor amount would be transported from the CDF to the ADM over 100 years. For acenaphthene, the proportion of mass relative to the initial mass placed in the dredged material that was predicted to migrate to the ADM was 3 percent or less over 100 years. Overall, the simulation results indicate that the conceptual CDF design evaluated in this report would not be expected to produce adverse impacts to surface water.

Options other than an earthen berm were evaluated for CDF chemical and physical containment including sheetpile-based structures, caisson-type structures, and concrete structures. A primary reason for selecting the earthen berm over these other options considered was the expected performance and service life for chemical containment. During future design phases, the evaluation presented in Appendix E will be refined if necessary as additional details on the project are developed.

There is the potential for accumulated groundwater within the CDF to flow through the wharf walls to the subsurface and, therefore, bypass the CDF berm. However, this is unlikely unless the walls of the wharves are in significantly perforated and degraded condition, and the areas of degraded wharves align with highly pervious zones of subsurface soils. Even in deteriorated condition, the permeability of the sheetpile walls is still expected to be significantly lower than the containment berms. Accumulated groundwater in the CDF will follow the more pervious path (i.e., through the pervious containment berm).
In summary, ADM dredged material contaminants are expected to be contained for the proposed service life of 100 years and very likely significantly more for disposal facilities included in RAs 3 and 4.

Physical containment of the dredged material is dependent on resistance to erosional forces that could potentially degrade the integrity of the containment structures. For RA 2, rock that would be placed over the cap to stabilize Wharf 2 and Wharf 3 walls should provide this function. For the CDF containment berms in RAs 2, 3, and 4, placement of an armor layer is included on the outer side of the CDF berm.

The armor layer on the CDF containment berm would be required to protect against forces that could damage the armor layer based on an analysis of wind driven waves resulting from major storm events.

As described in the USEPA's and the USACE's *Guidance for In-Situ Subaqueous Capping of Contaminated Sediments* (Palermo et al. 1998):

> *"The cap component for stabilization/erosion protection has a dual function. On the one hand, this component of the cap is intended to stabilize the contaminated sediments being capped, and prevent them from being resuspended and transported offsite. The other function of this component is to make the cap itself resistant to erosion. These functions may be accomplished by a single component, or may require two separate components in an in-situ cap."*

In addition, USEPA's *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (USEPA 2005) states that:

> *"[t]he design of the erosion protection features of an in-situ cap (i.e., armor layers) should be based on the magnitude and probability of occurrence of relatively extreme erosive forces estimated at the capping site. Generally, in-situ caps should be designed to withstand forces with a probability of 0.01 per year, for example, the 100-year storm."*

The primary objective of the armor layer for the CDF berm is similar to that described above for cap armor layer (i.e., to prevent exposure and erosion of the underlying materials). The potential for erosion of the armor cap/layer depends on the erosive processes that are likely to occur in the ADM, as well as the materials comprising the armor layers. The following are potential erosive processes that may act on the proposed CDF containment berm armored layer:

- Wind-generated waves due to storm events
- Currents due to typical circulation conditions

- Winter ice buildup and resulting scour processes

Section 9 of Ropars (2009) discusses ice cover in the ADM: *"Pilots' comments about ice and ship berthing are that ice "can cause problems occasionally on the South side (once or twice per year) but no problems on the North side."* This is supported by ABC facility personnel observations. Ice-related forces would likely not be significant factors, but would be considered further in future design efforts.

Based on a review of the hydrodynamic conditions at the site (as described in GENIVAR 2012a and in Section 2.3 of this report), it was conservatively assumed that the dominant erosional force that could act on the CDF containment berm armor layer and RA 3 armored cap are breaking waves. Due to the amount of turbulence generated by breaking waves in the surf zone, the CDF containment berm armor layer was modeled as a rubble mound berm (or revetment) in the surf zone.

The surf zone is defined as the region extending from the location where the waves begin to break to the limit of wave run-up on the shoreline slope. Within the surf zone, wave breaking is the dominant hydrodynamic process (USACE 2006).

The CDF berm was assumed to include a rock armor layer overlying core fill materials (rock, gravel, sand).

The ADM western shoreline armored cap was assumed to consist of an armor layer overlying a filter layer. The physical properties (e.g., grain size distribution) of the filter layer (below the cap armor layer) would be selected to prevent wave-induced turbulence from moving the chemical isolation layer materials into or through the cap armor layer (i.e., "piping").

The USACE Automated Coastal Engineering System (ACES) computer program Rubble Mound Revetment Design Module was used to compute the armor stone gradation and thickness that would apply to the berm and to the cap in the surf zone (USACE 1992). The ACES methodology is based on van der Meer's (1988) paper titled *Deterministic and Probabilistic Design of Breakwater Armor Layers*. The ACES assumes that the waves would propagate and break on the slope of the armor layer. The structure is assumed to be permeable, thereby minimizing wave reflection. Stable particle sizes (i.e., armor sizes) for a slope of 2H:1V for the CDF containment berm were evaluated using the model. Because the RA 2 CDF containment berm is shorter than the RA3/RA 4 CDF containment berm, the RA 2 CDF containment berm is less exposed in the surf zone and, therefore, will experience lower wave energies. However, the model was run for the RA 3/RA 4 berms, and the results were conservatively applied to the RA 2 CDF containment berm.

Revetments (analogous to the CDF berm and to the armored cap) used for coastal protection projects are often designed allowing for some movement of the armor layer, which could necessitate maintenance over time. The revetment design methodology allows consideration of variable amounts of displacement (movement) of the armor layer. The amount of displacement considered can be categorized as the following:

- No Displacement: no armor stone displacement due to wave energy (this does not account for settlement)
- Minor Displacement: few armor stones displaced due to wave energy (less than 5 percent) and potentially redistributed within or in the near vicinity of the armor layer
- Intermediate Displacement: ranging from moderate to severe; armor stones are displaced

The armor was evaluated considering the Minor Displacement scenario. The Minor Displacement scenario is the same as that typically applied at other sediment remediation sites, and provides a balance between protectiveness, initial capital cost, and maintenance cost for the armor layer.

For the armor layer evaluation, the 100-year return-interval wave height and period of 2.9 m and 7.8 seconds, respectively, determined by GENIVAR (2012a) was used. The median armor stone based on the 100-year design wave height and period as described above with a CDF berm slope of 2H:1V is 1.2 m. Accordingly, boulder-sized materials would be required for the CDF containment berm armor layer, underlain by a cobble filter layer. This design is consistent with observations of the naturally armored ADM northern shoreline, which has remained stable, based on visual inspection, through numerous major storms for more than 60 years.

In summary, chemical containment of ADM dredged material contaminants is expected to be achievable for a proposed minimum service life of 100 years for disposal facilities included in RAs 2, 3, and 4. Overall protection of human health is achieved for all RAs. Overall protection of the environment would be limited for RA 2 based on limited dredging and not addressing the potential for sediment COPC transport. Overall protection of the environment would be expected to be achieved for RA 3 and for RA 4 based on ability to reduce potential risks by controlling or reducing potential risks exposures to PAHs and PCBs in both the short and long term, and based on adequacy and reliability of chemical and physical containment.

9.2.1.3.3 Off-site Disposal

Short- and long-term protection of human health and the environment associated with RA 4 off-site disposal is dependent upon landfill facility operations and controls for containment of dredged material and associated contaminants. The dredged material would be transported to a landfill approved for disposal of Criteria D material. It was assumed that the dredged material would be stabilized on site and transported to the AES, Inc. landfill facility in Larouche, Quebec, which is approved for Criteria D material. Quebec requires liners and leachate collection systems for Criteria D landfills.

Short- and long-term protection of human health and the environment were assumed to be adequate for RA 4 off-site disposal based on disposal at a facility approved for Criteria D materials.

9.2.1.3.4 Armored Cap

The armored cap included in RA 3 contains surface sediment in the western ADM shoreline area located north of Wharf 1. The RI calculated in the EHHRA report for surface sediment in this area was relatively low, but deeper sediment contains higher contaminant concentrations. Additionally, based on modelling, hydrodynamics in this general area include potential for breaking waves and high energy, and surface sediment is susceptible to potential erosion and transport; therefore, short- and long-term protection of human health and the environment requires addressing the buried sediment. RA 3 accomplishes this by armored capping to maintain the surface sediment layer.

Long-term protection of human health and the environment for the armored cap is based on physical and chemical containment requirements discussed in Section 9.2.1.3.2 for RA 3/RA 4 CDF containment berm armored layers. Armored cap function and exposure to potential erosive forces are similar to CDF containment berms. Accordingly, the modelling and outcome described in Section 9.2.1.3.2 applies similarly to the armored cap.

Using the modelling approach described in Section 9.2.1.3.2 and a 10H:1V slope for the RA 3 armored cap, the median armor stone size (D_{50}, m) is approximately 0.39 m. Cobble-sized materials would be required for armor layers, underlain by a gravel filter layer.

9.2.2 Implementability

Based on project team meetings with federal and provincial regulatory agencies, the RAs are all considered to be administratively feasible (i.e., consistent with environmental permitting requirements, regulations, and guidance).

Technical feasibility requires access to the ADM and ABC facility and available space for rehabilitation operations and support activities. RAs 2, 3, and 4 require staging areas and waterfront access. Because RA 1 does not include any active rehabilitation, implementability is not relevant to RA 1.

Staging and waterfront access require space and coordination with ABC facility operations and vessel traffic. Similarly, work and equipment installations within the ADM will require coordination with ABC facility shipping operations.

An additional consideration is the availability of equipment, materials, and services/experience.

9.2.2.1 Dredging

Dredging is required for RA 2, RA 3, and RA 4. Dredging equipment is available in the St. Lawrence region, and contractors have environmental dredging experience, but it is relatively limited. During preparation of this report, project team representatives met with contractors and engineers based in the St. Lawrence region to discuss the availability of equipment, operators, and project experience with environmental dredging. Additionally, project reports and summaries for rehabilitation projects in Quebec were reviewed. Based on that assessment, there is considerable navigational dredging experience, equipment, and operators available in the Quebec area. Environmental dredging experience is less common, and is generally limited to relatively smaller projects.

RA 2, RA 3, and RA 4 include dredging in the Wharf 1 navigable area near Wharf 1. RA 3 and RA 4 dredging would be close enough to Wharf 1 to require placement of scour control mats along the bottom of Wharf 1. It is likely that the scour control mats would be placed after dredging is complete. The scour control mats could be installed using a land-based crane working along the edge of Wharf 1, or from a barge. This operation would require coordination with ABC facility shipping and nearshore operations.

9.2.2.2 On-site Dredged Material Management

On-site dredged material management requires considerable space near the ABC facility waterfront. Available space in the waterfront area at the ABC facility is limited. That space would be regularly accessed by transport vehicles, maintenance vehicles and equipment, and other heavy equipment required to support ADM sediment rehabilitation. Space and movement of equipment, materials, and vehicles would need to be coordinated with ABC facility operations.

Because most of the dredged material management for RA 2 and RA 3 is entirely within the CDF located in the slip between Wharf 2 and Wharf 3 and not in the upland nearshore areas, these are more implementable than dredged material management, which would likely require use of and access to upland nearshore areas to support the off-site disposal component in RA 4.

Based on discussions with St. Lawrence region contractors and engineers, there are equipment and operators available in the Quebec area for on-site dredged material management. Experience managing dredged material is less common, and is generally limited to relatively smaller projects.

9.2.2.3 On-site Disposal

The implementability of the RA 3 and RA 4 CDFs is limited by available space for staging areas, equipment, and delivery of materials, and the need to coordinate waterfront activities with the ABC facility operations. Because the slip located between Wharf 2 and Wharf 3 is no longer used by the ABC facility, access should not be an issue; however, general implementability is expected to require considerable effort to coordinate scheduling and access for rehabilitation project and ABC facility operations. The RA 3 and RA 4 CDFs have the advantage of also stabilizing the Wharf 2 and Wharf 3 walls, thereby eliminating the need for additional stabilization.

The CDF in RA 2 poses challenges for implementability based on constructing the containment berm, and placing dredged material and overlying cap underwater. The dredged material may not adequately consolidate and may not support the load associated with the overlying rock stabilization without damaging the cap, or displacing the dredged material. As discussed in Section 9.2.1.1.2, design of a larger CDF containment berm, similar to RA 3 and RA 4 was considered for RA 2.

Experience constructing CDFs in Quebec is more limited than environmental dredging. There is considerable construction experience related to marine earth works projects that can be adapted and modified for CDF construction requirements that include berm construction, CDF filling, and capping.

9.2.2.4 Off-site Disposal

The implementability of off-site disposal is influenced by the capacity of the AES, Inc. facility to accept the volume of dredged material proposed for landfill disposal. According to discussions with AES, Inc. facility representatives, the facility currently has capacity to accept the dredged material, and is expected to for the next several years.

Transport vehicles, support equipment and personnel, and landfill facility personnel are available for off-site disposal.

9.2.2.5 RA 2 CDF Closure

Placement of a cap and stabilizing rock fill over the dredged material in RA 2 to close the CDF is expected to be difficult to implement. Placement of the cap requires first placing a geogrid over the dredged material to distribute the load more evenly over the cap. Placing a geogrid underwater is typically a complex operation. Placement in the RA 2 CDF is expected to be less complicated than is typical for sub-aqueous placement because the Wharf 2 and Wharf 3 walls provide a well-defined boundary for material placement, and stable location to stage installation equipment.

Although column settling testing results and grain size information indicate the sediment should compact relatively quickly, the water content and strength of the sediment are difficult to predict in an underwater environment, and may not adequately support the load associated with the base rock layer, and particularly with the subsequent overlying rock stabilization required for the Wharf 2 and Wharf 3 walls. Placing the base layer in thin, even layers is expected to further evenly distribute the load, but adds complexity to the operation. There is potential for failures due to displacement of low strength dredged material under the overlying base and stabilizing rock layers, differential settlement, and mud-waving; therefore, the RA 2 CDF is not considered readily implementable and would require detailed design evaluation and careful, methodical, and practical construction practices.

9.2.2.6 RA 3 Armored Capping

RA 3 armored capping is expected to be readily implemented. A portion of the cap would be placed in the dry near the time of low tide either from land or from a barge, and the remainder of the cap material would be placed in deeper water from a barge. The cap would be transitioned into the existing riprap shoreline protection on the ADM western shoreline, and would require coordination with the proposed rock stabilization of the north side of Wharf 3. Filter layers would be placed under the armored cap to retain finer sediments. Filter layer characteristics (material gradation and layer thickness) would be further evaluated during design.

Equipment required for capping is available in Quebec; however, in our discussions with St. Lawrence region contractors and engineers, experience with environmental sediment capping is limited. Marine construction skills and equipment are available for comparable projects (e.g., revetment construction) and those skills and equipment are adaptable to capping operations.

9.2.3 Cost

Cost estimates were developed for RA 2, RA 3, and RA 4 based on the combinations of rehabilitation technologies and process options described in Section 8 and evaluated in Section 9. Costs are included for present-worth (present day dollars) direct and indirect capital, operating, long-term monitoring, and maintenance costs. The costs are summarized in Appendix F and are summarized in Section 9.3.3. Costs are lowest for RA 1 and increase through RA 4.

9.3 Comparative Evaluation

Section 9.2 presents a detailed evaluation of the potential RAs developed for the ADM using the evaluation criteria: effectiveness, implementability, and cost. The results of the analysis are used in this section to compare relative advantages and disadvantages of the RAs.

9.3.1 Effectiveness

9.3.1.1 Short-term Risks

Short-term risks are associated primarily with rehabilitation construction and, therefore, are comparatively lowest for RA 1 because it does not include construction. Short-term risks associated with other RAs are dependent on the nature and intensiveness of the rehabilitation construction and short-term risks associated with implementing the component rehabilitation technologies.

The following are comparative potential short-term risks for the RAs:

- RA 1: There are no short-term risks.
- RA 2: The potential for releases to ADM surface water during dredging is proportional to the volume to be dredged and contaminant concentration in dredged

material, and location of dredging. RA 2 includes the smallest dredged material volume, but the highest contaminant concentrations. Dredged material placement presents the highest potential short-term risk of the RAs because it is placed in water within the slip between Wharves 2 and 3 slip, and is connected to the ADM, unless a temporary barrier is constructed across the entrance to the slip. Dredged material management is less controlled and, therefore, poses more potential risk than does management in the RA 3/RA 4 CDF. For RA 2 there is a direct connection between the CDF and ADM surface water (unless the temporary barrier is constructed) and associated potential for contaminant transport between the slip and the ADM. Contaminants susceptible to potential transport include suspended sediment and associated sorbed contaminants, and dissolved contaminants.

- RA 3: Short-term risks associated with dredging are considered to be slightly higher for RA 3 than for RA 2 because RA 3 includes the dredge area in RA 2, plus additional area and volume. Dewatering and water treatment pose lower short-term risks than RA 2 during on-site dredged material management. In RA 3, dredged material is managed and contained within the CDF containment berm that separates the dredged material from ADM surface water compared to RA 2 where the containment berm height allows occasional direct contact between ADM surface water and dredged material.
- RA 4: Potential short-term risks associated with RA 4 include the comparatively highest potential for releases during dredging and dredged material transport because RA 4 has the largest dredge area and volume of the RAs, including the additional dredging in the northeast and western portions of the ADM. Dredging in the western portion of the ADM includes removal of subsurface sediment with relatively high COPC concentrations to depths of 3 m or deeper and associated potential for releases to surface water. RA 4 also poses the potential additional risk of destabilizing the ADM western shoreline and Wharf 3. Additional dredged material volume in RA 4 limits the space within the CDF available to accumulate dewatering effluent for treatment, increasing risks associated with releases during water treatment and discharge. RA 4 also has comparatively unique potential short-term risks associated with on-site upland nearshore management, and off-site transport and disposal of stabilized dredged material.

9.3.1.2 Overall Protection of Human Health and the Environment

RA 1 overall protection of human health and the environment is limited by the natural restoration processes that are occurring in the ADM. Natural restoration processes are limited by relatively low degradation rates of ADM contaminants, particularly PCBs, and high molecular weight PAHs. Of the RAs, RA 1 provides the comparatively lowest overall protection of human health and the environment.

RA 2 includes reduction of potential exposures only to sediment with the highest RI. Potential residual risk would remain for sediment with a relatively elevated RI that would not be removed. In the EHHRA report, the calculated risk reduction was 46 percent for RA 2 for the most sensitive exposed population, benthic invertebrates. The risk reduction calculations were based on predicted post-rehabilitation conditions compared to existing conditions.

Potential exposures and risk associated with dredged material placed in the slip between Wharves 2 and 3 would be controlled for the short and long term by placing a cap over dredged material in the CDF. The cap combined with placement of rock stabilization for Wharves 2 and 3 over the cap is expected to be effective in stabilizing the cap and limiting potential exposure to underlying dredged material.

RA 2 does not directly address the potential risk of exposure and transport of subsurface sediment located along the ADM western shoreline north of Wharf 3, but the area would be monitored for erosion.

RA 3 includes reduction of potential exposures to sediment with the highest RI and further reduces potential residual risk by removing additional sediment with a relatively elevated RI. Potential exposures and risk associated with dredged material placed in the slip between Wharves 2 and 3 would be controlled for the short and long term by containment within the CDF. CDFs have been proven effective for chemical and physical isolation of sediment contaminants, including Thunder Bay, Ontario, and numerous CDFs in the U.S. Great Lakes and East Coast and West Coast ports. The predicted effectiveness of the chemical containment portion of the CDF earthen berm, combined with placement of an armored layer over the berm would provide long-term effectiveness by chemically containing the dredged material contaminants and physically stabilizing the CDF berm.

RA 3 also reduces the potential risk of exposure and transport of subsurface sediment located along the ADM western shoreline north of Wharf 3 by armored capping in the area. Armored capping is expected to provide long-term protection based on the expected longevity of the cap.

Based on the combination of dredging, CDF disposal, and capping, the calculated risk reduction for benthic invertebrates for RA 3 was 92 percent.

Similar to RA 3, for RA 4, potential risk and exposures are reduced by removing sediment with relatively elevated RIs. Additional sediment that does not have an elevated RI, but exceeds FELs would also be removed.

Potential exposures and risk associated with dredged material placed in the slip between Wharves 2 and 3 would be controlled for the short and long term based on placement in the CDF and, therefore, would be comparable to RA 3. Excess sediment disposed of off site in a landfill is assumed to be disposed of in a Criterion D landfill and, therefore, would be adequately controlled.

RA 4 also reduces the potential risk of exposure and transport of subsurface sediment located along the ADM western shoreline north of Wharf 3 by dredging sediment in this area. Dredging is expected to provide long-term protection based on removal of the majority of the subsurface sediment and associated COPCs, but deeper dredging and dredging near structures and the reinforced ADM western shoreline will likely result in greater resuspension of contaminants and, therefore, is likely to leave elevated residuals behind, compared to the capping approach in RA 3.

Despite removal of significantly more sediment (60 percent more sediment removal than RA 3), the calculated risk reduction for benthic invertebrates for RA 4 was 99 percent (compared to 92 percent for RA 3).

9.3.2 Implementability

Because RA 1 includes no activities, it is not relevant to the comparative analysis of RA implementability.

RA 2, RA 3, and RA 4 include similar rehabilitation components—environmental dredging, armored capping, and submerged earthen berm construction; therefore, available equipment, services, and experience are expected to be similar for RA 2, 3, and 4. The scale of components differs between RAs.

Based on the largest volume of dredged material requiring on-site management and associated space, access, and coordination with ABC facility and waterfront activities, RA 4 has lower implementability than RA 3.

Underwater operations including construction of the CDF containment berm, dredged material placement, and construction of base rock layer and rock stabilizing fill for RA 2 result in significantly increased complexity and reduced implementability for RA 2 compared to RA 3 and RA 4.

9.3.3 Cost

Estimated costs are presented in Appendix F and Table 9-1.

Table 9-1

Summary of Estimated Rehabilitation Alternative Construction Cost Estimates

Alternative	Rehabilitation Alternative Description	Rehabilitation Cost Estimate (USD)
RA 1	No Action	$0
RA 2	Limited dredging, CAD disposal in the slip between Wharves 2 and 3	$8,000,000
RA 3	Dredging, CDF disposal, armored cap	$27,000,000
RA 4	Expanded dredging, CDF and off-site disposal	$60,000,000

Assumptions and information used to develop the estimated costs are presented in Appendix F. A comparison of cost versus risk ecological reduction for each RA is presented on Figure 9-1.

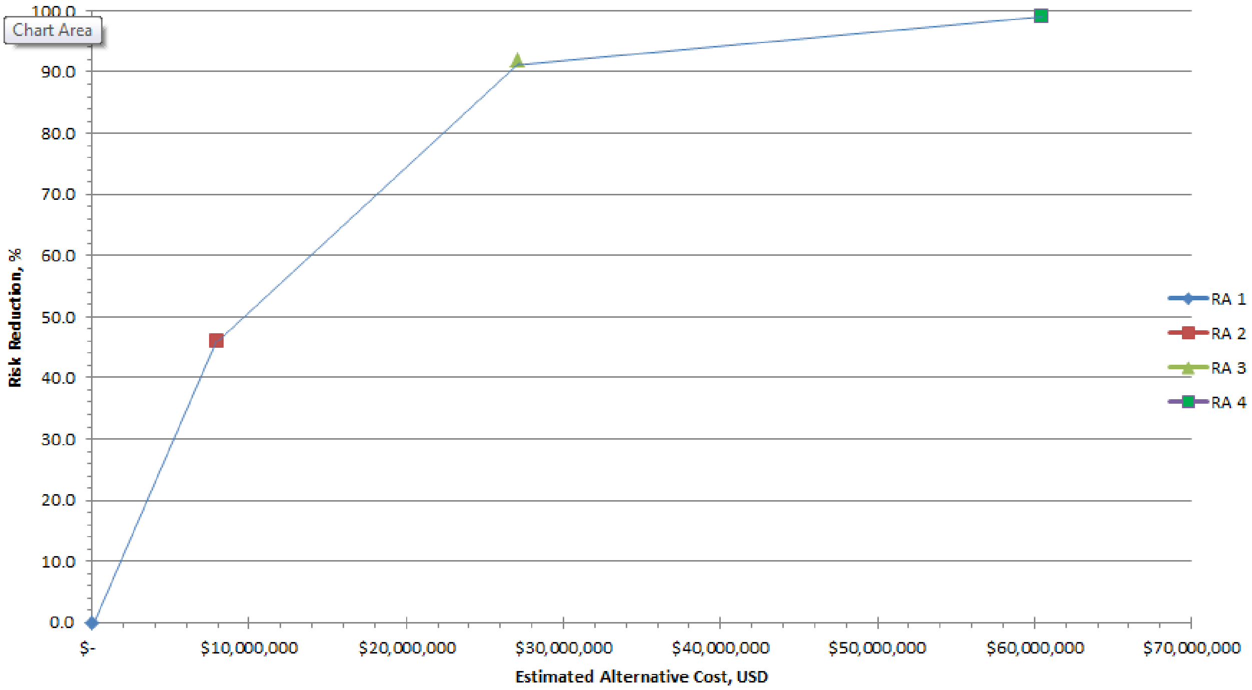

Figure 9-1
Cost vs. Risk Reduction for Benthic Invertebrates for Rehabilitation Alternatices RA 1 to RA 4

Based on the comparison of estimated RA construction cost and risk reduction for the most sensitive receptor, benthic invertebrates, RA 3 provides the comparatively best balance of cost and risk reduction.

9.4 Conclusions and Recommendations

This section presents the recommended RA, and additional recommendations to support RA design and implementation. The recommendations are based on the detailed and comparative evaluations of RAs.

Based on the results of the RA evaluations, the following conclusions can be made:

- The use of the ADM waterfront to support ABC facility operations limits rehabilitation approaches to sediment removal in ADM navigable areas.
- Based on the volume of sediment requiring removal to achieve a significant risk reduction, disposal options for dredged material are limited to on-site, nearshore CDF disposal in the slip located between Wharves 2 and 3.
- Dredging in the Wharf 1 navigable area, and disposal of dredged material in the CDF located between Wharves 2 and 3 address sediment COPCs and relatively elevated RIs along the ADM southern shoreline.
- Armored capping in the ADM western shoreline north of Wharf 3, combined with rock filling to stabilize Wharf 3, and the outfall area retention pond to improve ABC facility discharges, limits potential exposure to and transport of subsurface sediment with elevated COPC concentrations.
- The RAOs, therefore, can be best achieved by a combination of sediment removal in navigable areas, on-site disposal of dredged material, and armored capping in non-navigable areas.
- RA 3 includes these rehabilitation technologies and provides the best combination of effectiveness, implementability, and cost.

Accordingly, RA 3 is recommended for implementation.

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TABLES

Table 3-1

Summary of 1994 Sediment Sampling and Laboratory Analysis Results

Location ID							C-2	C-2	C-2	C-4	C-4	C-4	C-5	C-5	C-6A	C-6A	C-6A
Sample Depth							0-5 cm	20-40 cm	80-90 cm	0-5 cm	0-20 cm	20-40 cm	0-5 cm	120-146 cm	0-5 cm	20-40 cm	80-100 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N
Sample Description							Grab	Core	Core	Grab	Core	Core	Grab	Core	Grab	Core	Core
Year							1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**											
Conventionals																	
Total organic carbon	%	--	--	--	--	--	**4.5**	**8.96**	**11.6**	**30.6**	**8.59**	**10.5**	**32**	**0.14**	**0.22**	**10.3**	**1.43**
Metal																	
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	na
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																	
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**1.34**	1 U	**4**	**27**	**42**	**14**	**117**	0.1 U	**0.11**	**7**	**1**
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	1 U	1 U	1 U	1 U	1 U	1 U	0.1 U	0.01 U	1 U	1 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**5.58**	1 U	**16**	**131**	**106**	**27**	**355**	0.1 U	**0.45**	**21**	**5**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**12.4**	**29**	**31**	**237**	**378**	**154**	**656**	**0.6**	**1.32**	**77**	**15**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**16.2**	**44**	**33**	**414**	**526**	**202**	**907**	**1.1**	**1.91**	**112**	**18**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**16.1**	**54**	**38**	**369**	**401**	**181**	**830**	**1.3**	**1.96**	**112**	**22**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**4.3**	1 U	**9**	**89**	**164**	**46**	**165**	0.1 U	**0.3**	**26**	**4**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**15.2**	**78**	**66**	**477**	**512**	**249**	**1290**	**2**	**2.94**	**159**	**11**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**1.32**	1 U	**3**	**21**	**14**	**3**	**83**	0.1 U	**0.08**	1 U	**1**
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	**0.64**	1 U	1 U	**9**	1 U	1 U	**33**	0.1 U	0.01 U	1 U	1 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**8.87**	**23**	**37**	**141**	**209**	**100**	**577**	**0.7**	**0.89**	**52**	**15**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**14.6**	**67**	**56**	**447**	**476**	**232**	**1160**	**1.8**	**2.51**	**136**	**6**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**96.5**	**295**	**293**	**2360**	**2830**	**1210**	**6170**	**7.5**	**12.5**	**702**	**98**
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																	
3-Methylcholanthrene	mg/kg	--	--	--	--	--	na	1 U	**1**	na	**14**	**7**	na	0.1 U	na	1 U	1 U
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	na	1 U	**2**	na	1 U	1 U	na	0.1 U	na	1 U	1 U
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**25.2**	**50**	**56**	**707**	**748**	**365**	**1460**	**2**	**3.55**	**218**	**37**
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	na	1 U	**4**	na	**38**	**14**	na	**0.7**	na	1 U	**1**
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**13.4**	**38**	**23**	**229**	**425**	**182**	**563**	**0.6**	**1.2**	**100**	**18**
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	na	1 U	1 U	na	1 U	**17**	na	0.1 U	na	1 U	1 U
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	na	1 U	1 U	na	**47**	**3**	na	0.1 U	na	**8**	**1**
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	na	1 U	**1**	na	**142**	**21**	na	0.1 U	na	**32**	**5**
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**13.9**	**29**	**23**	**259**	**457**	**160**	**595**	**0.5**	**1.32**	**82**	**14**
Polychlorinated Biphenyls (Aroclor)																	
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	**0.99**	**3.39**	**9.6**	**3.4**	**7.7**	**1.28**	**2.3**	**0.5**	**0.15**	**14.2**	**2.3**

Table 3-1
Summary of 1994 Sediment Sampling and Laboratory Analysis Results

Location ID							**C-8**	**C-8**	**C-12**	**C-12**	**C-12**	**C-14**	**C-14**	**C-14**	**C-15**	**C-15**	**C-16**
Sample Depth							**0-5 cm**	**40-60 cm**	**0-5 cm**	**40-60 cm**	**80-100 cm**	**0-5 cm**	**0-20 cm**	**20-40 cm**	**0-5 cm**	**120-140 cm**	**0-5 cm**
Sample Type							**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Sample Description							**Grab**	**Core**	**Grab**	**Core**	**Core**	**Grab**	**Core**	**Core**	**Grab**	**Core**	**Grab**
Year							**1994**	**1994**	**1994**	**1994**	**1994**	**1994**	**1994**	**1994**	**1994**	**1994**	**1994**
Major Remediation Area							**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**											
Conventionals																	
Total organic carbon	%	--	--	--	--	--	**0.41**	**5.91**	**1.38**	**1**	**0.09**	**1.96**	**0.12**	**0.14**	**2.54**	**5.38**	**1.97**
Metal																	
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	na
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																	
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**7.8**	**21**	**3.7**	**1**	0.01 U	0.1 U	0.01 U	0.01 U	**4.4**	0.01 U	**0.78**
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.1 U	1 U	0.1 U	1 U	0.01 U	0.1 U	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**21**	**30**	**10.6**	**11**	0.01 U	**1.3**	0.01 U	0.01 U	**16**	0.01 U	**4.39**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**56**	**44**	**26.1**	**12**	0.01 U	**12.5**	0.01 U	0.01 U	**43.7**	0.01 U	**5.43**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**81.8**	**46**	**41.6**	**16**	0.01 U	**18.1**	0.01 U	0.01 U	**72.8**	0.01 U	**6.35**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**70.1**	**49**	**40.8**	**15**	0.01 U	**12.5**	0.01 U	0.01 U	**59.6**	0.01 U	**6.34**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**7.6**	**3**	**9.1**	**3**	0.01 U	**1.2**	0.01 U	0.01 U	**16.1**	0.01 U	**1.21**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**104**	**66**	**54.1**	**35**	0.01 U	**22.4**	0.01 U	0.01 U	**81.4**	0.01 U	**10.4**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**4.3**	**13**	**2**	**1**	0.01 U	0.1 U	0.01 U	0.01 U	**3.2**	0.01 U	**0.79**
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	**1.3**	1 U	**0.9**	1 U	0.01 U	0.1 U	0.01 U	0.01 U	**2.1**	0.01 U	**0.14**
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**38.7**	**64**	**16.8**	**11**	0.01 U	**0.9**	0.01 U	0.01 U	**25.4**	0.01 U	**7.04**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**96.7**	**58**	**50.6**	**28**	0.01 U	**24.9**	0.01 U	0.01 U	**74.4**	0.01 U	**9.06**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**490**	**394**	**256**	**133**	ND	**93.8**	ND	ND	**399**	ND	**51.9**
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																	
3-Methylcholanthrene	mg/kg	--	--	--	--	--	na	**1**	na	1 U	0.01 U	na	0.01 U	0.01 U	na	0.01 U	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	na	1 U	na	1 U	0.01 U	na	0.01 U	0.01 U	na	0.01 U	na
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**129**	**83**	**68.8**	**25**	0.01 U	**31.7**	0.01 U	0.01 U	**116**	0.01 U	**10.8**
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	na	**5**	na	**1**	0.01 U	na	0.01 U	0.01 U	na	0.01 U	na
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**58.4**	**45**	**27.5**	**10**	0.01 U	**8.3**	0.01 U	0.01 U	**44.5**	0.01 U	**4.34**
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	na	**2**	na	1 U	0.01 U	na	0.01 U	0.01 U	na	0.01 U	na
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	na	**4**	na	1 U	0.01 U	na	0.01 U	0.01 U	na	0.01 U	na
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	na	**16**	na	1 U	0.01 U	na	0.01 U	0.01 U	na	0.01 U	na
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**62.6**	**40**	**28.3**	**11**	0.01 U	**5.9**	0.01 U	0.01 U	**47.3**	0.01 U	**4.56**
Polychlorinated Biphenyls (Aroclor)																	
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	**0.9**	**9.7**	**11.5**	**1.16**	na	**0.49**	na	na	**5.8**	**0.93**	**9**

Table 3-1
Summary of 1994 Sediment Sampling and Laboratory Analysis Results

						Location ID	C-16	C-16	C-18	C-18	C-18	C-21	C-21	C-21	C-21	C-23	C-23
						Sample Depth	20-40 cm	60-75 cm	0-5 cm	20-40 cm	40-60 cm	0-5 cm	20-40 cm	40-60 cm	120-135 cm	0-5 cm	20-40 cm
						Sample Type	N	N	N	N	N	N	N	N	N	N	N
						Sample Description	Core	Core	Grab	Core	Core	Grab	Core	Core	Core	Grab	Core
						Year	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**											
Conventionals																	
Total organic carbon	%	--	--	--	--	--	**0.13**	**3.47**	**0.11**	**0.13**	**0.2**	**5.08**	**2.72**	**3.18**	**4.14**	**0.91**	**0.15**
Metal																	
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	na
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																	
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**1**	**3**	0.01 U	0.01 U	0.01 U	1 U	na	**11**	**2**	0.1 U	0.01 U
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	1 U	1 U	0.01 U	0.01 U	0.01 U	1 U	na	1 U	1 U	0.1 U	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**5**	**11**	**0.3**	0.01 U	0.01 U	**7**	na	**40**	**7**	**6.6**	0.01 U
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**35**	**40**	**1.05**	0.01 U	0.01 U	**123**	na	**89**	**18**	**12.3**	0.01 U
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**41**	**43**	**1.65**	0.01 U	0.01 U	**59**	na	**106**	**20**	**26.7**	0.01 U
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**59**	**55**	**1.9**	0.01 U	0.01 U	**25**	na	**108**	**23**	**26.1**	0.01 U
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**10**	**3**	**0.19**	0.01 U	0.01 U	1 U	na	**30**	**4**	**1.7**	0.01 U
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**64**	**75**	**2.88**	0.01 U	0.01 U	**192**	na	**161**	**39**	**38.4**	0.01 U
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**1**	**2**	0.01 U	0.01 U	0.01 U	1 U	na	**9**	**2**	0.1 U	0.01 U
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	1 U	1 U	0.01 U	0.01 U	0.01 U	1 U	na	**2**	1 U	0.1 U	0.01 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**11**	**33**	**0.7**	0.01 U	0.01 U	**16**	na	**89**	**20**	**8.4**	0.01 U
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**56**	**64**	**2.45**	0.01 U	0.01 U	**165**	na	**145**	**34**	**35.9**	0.01 U
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**283**	**329**	**11.1**	ND	ND	**587**	na	**790**	**169**	**156**	ND
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																	
3-Methylcholanthrene	mg/kg	--	--	--	--	--	**1**	**1**	na	0.01 U	0.01 U	na	na	**3**	1 U	na	0.01 U
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	1 U	1 U	na	0.01 U	0.01 U	na	na	1 U	1 U	na	0.01 U
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**104**	**93**	**3.2**	0.01 U	0.01 U	**173**	na	**168**	**39**	**46.6**	0.01 U
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	**4**	**5**	na	0.01 U	0.01 U	na	na	**11**	**2**	na	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**48**	**42**	**0.31**	0.01 U	0.01 U	**8**	na	**85**	**18**	**13.1**	0.01 U
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	**1**	**1**	na	0.01 U	0.01 U	na	na	1 U	1 U	na	0.01 U
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	**2**	**8**	na	0.01 U	0.01 U	na	na	**34**	**1**	na	0.01 U
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	**12**	**15**	na	0.01 U	0.01 U	na	na	**13**	**2**	na	0.01 U
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**39**	**37**	**1.01**	0.01 U	0.01 U	**7**	na	**87**	**16**	**17.4**	0.01 U
Polychlorinated Biphenyls (Aroclor)																	
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	**4.7**	**31.5**	**0.4**	na	na	**12.6**	**7.6**	**9.3**	**4.4**	**0.78**	na

Table 3-1
Summary of 1994 Sediment Sampling and Laboratory Analysis Results

Location ID							C-23	C-25	C-25	C-25	C-26	C-26	C-26	C-28	C-28	C-28	C-28
Sample Depth							80-96 cm	0-5 cm	0-20 cm	20-40 cm	0-5 cm	0-20 cm	100-120 cm	0-5 cm	0-20 cm	80-100 cm	120-134 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Grab	Core	Core	Grab	Core	Core	Grab	Core	Core	Core
Year							1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**											
Conventionals																	
Total organic carbon	%	--	--	--	--	--	**0.25**	**0.19**	**0.19**	**0.16**	**0.039**	**0.039**	**0.62**	**3.22**	**1.22**	**2.86**	**1**
Metal																	
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	**2.1**	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	**0.08**	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	**8**	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	**11**	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	**20**	na	na	na	na	na	na
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	0.02 U	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	**7**	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	**2**	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																	
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	0.01 U	**0.05**	0.01 U	na	**1.9**	0.01 U	0.1 U	0.1 U	**1**	**4**	**2**
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.01 U	0.01 U	na	0.1 U	0.01 U	0.1 U	0.1 U	1 U	1 U	1 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	0.01 U	**0.17**	0.01 U	na	**11.8**	0.01 U	**1.1**	0.1 U	**6**	**17**	**9**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	0.01 U	**0.36**	0.01 U	na	**19.3**	0.01 U	**6.3**	**18.1**	**14**	**31**	**12**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	0.01 U	**0.64**	0.01 U	na	**38**	0.01 U	**8.7**	**29.5**	**17**	**29**	**12**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	0.01 U	**0.83**	0.01 U	na	**34.8**	0.01 U	**8.2**	**33.3**	**19**	**32**	**15**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	0.01 U	0.01 U	0.01 U	na	**8.8**	0.01 U	**1.7**	**3.4**	**4**	**9**	**2**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	0.01 U	**0.9**	0.01 U	na	**57.9**	0.01 U	**12.2**	**50.3**	**30**	**52**	**35**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	0.01 U	0.01 U	0.01 U	na	**2.3**	0.01 U	0.1 U	0.1 U	**1**	**5**	**3**
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.01 U	0.01 U	0.01 U	na	**0.8**	0.01 U	0.1 U	0.1 U	1 U	1 U	1 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	0.01 U	**0.25**	0.01 U	na	**17.2**	0.01 U	**3.4**	**30.7**	**11**	**44**	**24**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	0.01 U	**0.81**	0.01 U	na	**55.5**	0.01 U	**10.6**	**54.1**	**25**	**48**	**30**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	ND	**4.01**	ND	na	**248**	ND	**52.2**	**219**	**128**	**271**	**144**
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																	
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.01 U	na	0.01 U	na	na	0.01 U	0.1 U	na	1 U	**1**	1 U
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.01 U	na	0.01 U	na	na	0.01 U	0.1 U	na	1 U	1 U	1 U
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	0.01 U	**1.11**	0.01 U	na	**64**	0.01 U	**16.3**	**50.7**	**30**	**45**	**20**
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	0.01 U	na	0.01 U	na	na	0.01 U	**0.6**	na	**1**	**4**	**2**
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	0.01 U	**0.32**	0.01 U	na	**22.7**	0.01 U	**8**	**14.2**	**13**	**19**	**7**
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	0.01 U	na	0.01 U	na	na	0.01 U	0.1 U	na	1 U	1 U	1 U
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	0.01 U	na	0.01 U	na	na	0.01 U	**1.8**	na	**3**	**4**	1 U
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	0.01 U	na	0.01 U	na	na	0.01 U	**1**	na	**4**	**8**	1 U
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	0.01 U	**0.14**	0.01 U	na	**17.8**	0.01 U	**6.6**	**15.1**	**13**	**20**	**6**
Polychlorinated Biphenyls (Aroclor)																	
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	**0.63**	na	**0.29**	**2.3**	**2.1**	**9.6**	**6.9**

Table 3-1
Summary of 1994 Sediment Sampling and Laboratory Analysis Results

						Location ID	C-30	C-30	C-33	C-33	C-33	C-33	C-35	C-35	C-35	C-50	C-50
						Sample Depth	0-5 cm	20-40 cm	0-5 cm	0-20 cm	20-40 cm	100-117 cm	0-5 cm	20-40 cm	120-138 cm	0-5 cm	20-40 cm
						Sample Type	N	N	N	N	N	N	N	N	N	N	N
						Sample Description	Grab	Core	Grab	Core	Core	Core	Grab	Core	Core	Grab	Core
						Year	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	BDA	BDA
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**											
Conventionals																	
Total organic carbon	%	--	--	--	--	--	**0.09**	**0.36**	**2.37**	**3.34**	**0.12**	**0.24**	**0.4**	**0.16**	**0.16**	**0.11**	**0.13**
Metal																	
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	na
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																	
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	0.01 U	0.01 U	0.1 U	**1**	0.01 U	0.01 U	**0.28**	0.01 U	0.01 U	**3.7**	0.01 U
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.01 U	0.1 U	1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**0.02**	0.01 U	**2.7**	**1**	0.01 U	0.01 U	**1.22**	0.01 U	0.01 U	**12.8**	0.01 U
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**0.12**	0.01 U	**15.2**	**10**	0.01 U	0.01 U	**2.35**	0.01 U	0.01 U	**23.7**	0.01 U
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**0.3**	0.01 U	**19**	**14**	0.01 U	0.01 U	**3.91**	0.01 U	0.01 U	**32**	0.01 U
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**0.45**	0.01 U	**15.2**	**13**	0.01 U	0.01 U	**3.67**	0.01 U	0.01 U	**33**	0.01 U
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	0.01 U	0.01 U	**0.3**	**3**	0.01 U	0.01 U	**0.93**	0.01 U	0.01 U	**6.4**	0.01 U
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**0.41**	0.01 U	**35.3**	**19**	0.01 U	0.01 U	**5.6**	0.01 U	0.01 U	**44.7**	0.01 U
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	0.01 U	0.01 U	**1.2**	**1**	0.01 U	0.01 U	**0.24**	0.01 U	0.01 U	**3.4**	0.01 U
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.01 U	0.01 U	0.1 U	1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**1.3**	0.01 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**0.09**	0.01 U	**9.1**	**8**	0.01 U	0.01 U	**1.99**	0.01 U	0.01 U	**21.7**	0.01 U
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**0.37**	0.01 U	**31.1**	**17**	0.01 U	0.01 U	**4.93**	0.01 U	0.01 U	**40.1**	0.01 U
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**1.76**	ND	**129**	**87**	ND	ND	**25.1**	ND	ND	**223**	ND
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																	
3-Methylcholanthrene	mg/kg	--	--	--	--	--	na	0.01 U	na	1 U	0.01 U	0.01 U	na	0.01 U	0.01 U	na	0.01 U
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	na	0.01 U	na	1 U	0.01 U	0.01 U	na	0.01 U	0.01 U	na	0.01 U
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**1.01**	0.01 U	**45.6**	**28**	0.01 U	0.01 U	**6.77**	0.01 U	0.01 U	**54.2**	0.01 U
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	na	0.01 U	na	**1**	0.01 U	0.01 U	na	0.01 U	0.01 U	na	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**0.21**	0.01 U	**3.9**	**14**	0.01 U	0.01 U	**2.47**	0.01 U	0.01 U	**18.1**	0.01 U
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	na	0.01 U	na	1 U	0.01 U	0.01 U	na	0.01 U	0.01 U	na	0.01 U
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	na	0.01 U	na	**2**	0.01 U	0.01 U	na	0.01 U	0.01 U	na	0.01 U
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	na	0.01 U	na	**3**	0.01 U	0.01 U	na	0.01 U	0.01 U	na	0.01 U
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**0.08**	0.01 U	**7**	**11**	0.01 U	0.01 U	**2.68**	0.01 U	0.01 U	**17.2**	0.01 U
Polychlorinated Biphenyls (Aroclor)																	
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	**0.81**	**0.15**	na	na	**0.22**	**0.09**	na	na	na

Table 3-1
Summary of 1994 Sediment Sampling and Laboratory Analysis Results

						Location ID	C-50	C-51	C-51	C-52	C-52	C-53	C-53	C-54	C-54	C-57	C-57
						Sample Depth	40-60 cm	0-5 cm	20-40 cm	0-5 cm	20-40 cm	0-5 cm	20-40 cm	0-5 cm	20-40 cm	0-5 cm	0-20 cm
						Sample Type	N	N	N	N	N	N	N	N	N	N	N
						Sample Description	Core	Grab	Core	Grab	Core	Grab	Core	Grab	Core	Grab	Core
						Year	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994
						Major Remediation Area	BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**											
Conventionals																	
Total organic carbon	%	--	--	--	--	--	**0.07**	**0.11**	**0.08**	**0.24**	**0.09**	**0.211**	**0.08**	**0.078**	**0.07**	**0.084**	**0.07**
Metal																	
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	na
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																	
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	0.01 U	0.01 U	0.01 U	**0.05**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	0.01 U	0.01 U	0.01 U	**0.27**	0.01 U	**0.06**	0.01 U	0.01 U	0.01 U	**0.03**	0.01 U
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	0.01 U	0.01 U	0.01 U	**0.62**	0.01 U	**0.23**	0.01 U	**0.19**	0.01 U	**0.13**	0.01 U
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	0.01 U	**0.05**	0.01 U	**1.1**	0.01 U	**0.34**	0.01 U	**0.27**	0.01 U	**0.2**	0.01 U
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	0.01 U	**0.15**	0.01 U	**1.15**	0.01 U	**0.32**	0.01 U	**0.3**	0.01 U	**0.19**	0.01 U
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	0.01 U	0.01 U	0.01 U	**0.11**	0.01 U	**0.06**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	0.01 U	**0.09**	0.01 U	**1.58**	0.01 U	**0.51**	0.01 U	**0.41**	0.01 U	**0.25**	0.01 U
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	0.01 U	0.01 U	0.01 U	**0.43**	0.01 U	**0.17**	0.01 U	**0.04**	0.01 U	**0.08**	0.01 U
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	0.01 U	**0.08**	0.01 U	**1.4**	0.01 U	**0.46**	0.01 U	**0.34**	0.01 U	**0.23**	0.01 U
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	ND	**0.37**	ND	**6.71**	ND	**2.15**	ND	**1.55**	ND	**1.11**	ND
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																	
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.01 U	na	0.01 U	na	0.01 U	na	0.01 U	na	0.01 U	na	0.01 U
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.01 U	na	0.01 U	na	0.01 U	na	0.01 U	na	0.01 U	na	0.01 U
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	0.01 U	**0.11**	0.01 U	**1.88**	0.01 U	**0.64**	0.01 U	**0.57**	0.01 U	**0.36**	0.01 U
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	0.01 U	na	0.01 U	na	0.01 U	na	0.01 U	na	0.01 U	na	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	**0.71**	0.01 U	**0.2**	0.01 U	**0.23**	0.01 U	**0.15**	0.01 U
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	0.01 U	na	0.01 U	na	0.01 U	na	0.01 U	na	0.01 U	na	0.01 U
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	0.01 U	na	0.01 U	na	0.01 U	na	0.01 U	na	0.01 U	na	0.01 U
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	0.01 U	na	0.01 U	na	0.01 U	na	0.01 U	na	0.01 U	na	0.01 U
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	**0.62**	0.01 U	**0.25**	0.01 U	**0.19**	0.01 U	**0.13**	0.01 U
Polychlorinated Biphenyls (Aroclor)																	
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	**0.15**

Table 3-1
Summary of 1994 Sediment Sampling and Laboratory Analysis Results

Location ID							C-57	C-58	C-58	C-59	C-59	C-60	C-60	C-60	C-60	C-61	C-61
Sample Depth							20-40 cm	0-5 cm	20-40 cm	0-5 cm	20-40 cm	0-5 cm	0-20 cm	20-40 cm	80-100 cm	0-5 cm	0-20 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Grab	Core	Grab	Core	Grab	Core	Core	Core	Grab	Core
Year							1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994
Major Remediation Area							BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**											
Conventionals																	
Total organic carbon	%	--	--	--	--	--	**0.09**	**0.1**	**0.069**	**0.13**	**0.07**	**0.39**	**0.61**	**0.27**	**0.2**	**0.69**	**0.17**
Metal																	
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	na
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																	
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	0.01 U	**0.08**	0.01 U	**0.06**	0.01 U	**0.34**	**0.5**	0.01 U	0.01 U	**0.42**	0.01 U
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	0.01 U	**0.19**	0.01 U	**0.07**	0.01 U	**1.64**	**1.6**	0.01 U	0.01 U	**2.1**	0.01 U
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**1.17**	**0.48**	0.01 U	**0.37**	0.01 U	**3.99**	**3.2**	0.01 U	0.01 U	**3.75**	0.01 U
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**0.51**	**0.89**	0.01 U	**0.8**	0.01 U	**5.7**	**3.6**	0.01 U	0.01 U	**5.88**	0.01 U
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	0.01 U	**0.89**	0.01 U	**0.83**	0.01 U	**6.56**	**5.2**	0.01 U	0.01 U	**5.44**	0.01 U
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	0.01 U	**0.07**	0.01 U	**0.15**	0.01 U	**1.42**	**0.7**	0.01 U	0.01 U	**0.98**	0.01 U
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**1.38**	**1.26**	0.01 U	**0.9**	0.01 U	**6.74**	**10.9**	0.01 U	0.01 U	**9.33**	0.01 U
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.28**	0.1 U	0.01 U	0.01 U	**0.33**	0.01 U
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.12**	0.1 U	0.01 U	0.01 U	**0.1**	0.01 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	0.01 U	**0.37**	0.01 U	**0.23**	0.01 U	**2.11**	**6**	0.01 U	0.01 U	**3.01**	0.01 U
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**1.37**	**1.08**	0.01 U	**0.79**	0.01 U	**5.96**	**8.9**	0.01 U	0.01 U	**8.47**	0.01 U
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**4.43**	**5.31**	ND	**4.2**	ND	**34.9**	**40.6**	ND	ND	**39.8**	ND
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																	
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.01 U	na	0.01 U	na	0.01 U	na	0.1 U	0.01 U	0.01 U	na	0.01 U
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.01 U	na	0.01 U	na	0.01 U	na	0.1 U	0.01 U	0.01 U	na	0.01 U
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**1.39**	**1.45**	0.01 U	**1.33**	0.01 U	**10.4**	**9**	0.01 U	0.01 U	**10.1**	0.01 U
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	0.01 U	na	0.01 U	na	0.01 U	na	**0.4**	0.01 U	0.01 U	na	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	0.01 U	**0.48**	0.01 U	**0.51**	0.01 U	**3.73**	**3.2**	0.01 U	0.01 U	**4.16**	0.01 U
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	0.01 U	na	0.01 U	na	0.01 U	na	0.1 U	0.01 U	0.01 U	na	0.01 U
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	0.01 U	na	0.01 U	na	0.01 U	na	0.1 U	0.01 U	0.01 U	na	0.01 U
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	0.01 U	na	0.01 U	na	0.01 U	na	0.1 U	0.01 U	0.01 U	na	0.01 U
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	0.01 U	**0.51**	0.01 U	**0.53**	0.01 U	**3.83**	**2.7**	0.01 U	0.01 U	**4.3**	0.01 U
Polychlorinated Biphenyls (Aroclor)																	
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	**0.09**	**0.54**	na	na	na	na	**0.31**	na	na	**0.46**	na

Table 3-1

Summary of 1994 Sediment Sampling and Laboratory Analysis Results

Location ID							C-61	C-61	C-62	C-62	F-1	F-1	F-1	F-1	F-1	F-3	F-3
Sample Depth							20-40 cm	80-100 cm	0-5 cm	20-40 cm	0-5 cm	60-120 cm	160-240 cm	160-240 cm	240-300 cm	0-5 cm	60-120 cm
Sample Type							N	N	N	N	N	N	FD	N	N	N	N
Sample Description							Core	Core	Grab	Core	Grab	Core	Core	Core	Core	Grab	Core
Year							1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994
Major Remediation Area							BDA	BDA	BDA	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**											
Conventionals																	
Total organic carbon	%	--	--	--	--	--	**0.14**	**0.28**	**0.12**	**0.09**	**2.68**	**7.36**	na	**2.09**	**3.74**	**0.48**	**4.59**
Metal																	
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	na
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																	
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	0.01 U	0.01 U	0.01 U	0.01 U	1 U	1 U	na	**32**	**1**	0.1 U	0.1 U
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.01 U	0.01 U	0.01 U	1 U	1 U	na	1 U	1 U	0.1 U	0.1 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	0.01 U	0.01 U	0.01 U	0.01 U	**150**	**35**	na	**63**	**2**	0.1 U	0.1 U
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**0.21**	0.01 U	**0.1**	0.01 U	**547**	**155**	na	**227**	**9**	**8.8**	0.1 U
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**0.24**	0.01 U	**0.25**	0.01 U	**697**	**306**	na	**372**	**14**	**18.1**	**5.6**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**0.43**	0.01 U	**0.41**	0.01 U	**612**	**260**	na	**279**	**12**	**18.4**	**8.9**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	0.01 U	0.01 U	0.01 U	0.01 U	**174**	**35**	na	**69**	**1**	0.1 U	0.1 U
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**0.44**	0.01 U	**0.37**	0.01 U	**695**	**495**	na	**357**	**18**	**28.1**	**10.4**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	0.01 U	0.01 U	0.01 U	0.01 U	**25**	1 U	na	**12**	1 U	**2.5**	0.1 U
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.01 U	0.01 U	0.01 U	0.01 U	**10**	**11**	na	**10**	1 U	**1.3**	0.1 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	0.01 U	0.01 U	**0.11**	0.01 U	**249**	**45**	na	**129**	**7**	**6.4**	**1.9**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**0.33**	0.01 U	**0.31**	0.01 U	**653**	**489**	na	**341**	**17**	**27.1**	**0.6**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**1.65**	ND	**1.55**	ND	**3810**	**1830**	na	**1890**	**81**	**111**	**27.4**
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																	
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	na	0.01 U	na	na	na	na	1 U	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	na	0.01 U	na	na	na	na	1 U	na	na
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**0.62**	0.01 U	**0.48**	0.01 U	**1060**	**492**	na	**575**	**25**	**31.5**	**11.2**
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	na	0.01 U	na	na	na	na	**1**	na	na
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	**0.09**	0.01 U	**487**	**232**	na	**276**	**13**	**12.6**	**4.4**
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	na	0.01 U	na	na	na	na	1 U	na	na
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	na	0.01 U	na	na	na	na	1 U	na	na
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	na	0.01 U	na	na	na	na	**3**	na	na
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	**0.1**	0.01 U	**541**	**217**	na	**269**	**12**	**10.7**	**3.3**
Polychlorinated Biphenyls (Aroclor)																	
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	**0.41**	na	**0.017**	na	ND	na	**10.8**	**7.2**	**1**	**0.8**	**0.7**

Table 3-1
Summary of 1994 Sediment Sampling and Laboratory Analysis Results

						Location ID	F-3	F-3	F-3	F-7	F-7	F-7	F-7	F-9	F-9	F-9	F-9
						Sample Depth	180-240 cm	240-300 cm	300-360 cm	0-5 cm	60-120 cm	180-240 cm	240-300 cm	0-5 cm	60-120 cm	120-180 cm	180-240 cm
						Sample Type	N	N	N	N	N	N	N	N	N	N	N
						Sample Description	Core	Core	Core	Grab	Core	Core	Core	Grab	Core	Core	Core
						Year	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**											
Conventionals																	
Total organic carbon	%	--	--	--	--	--	**0.21**	**0.07**	**0.03**	**0.514**	**0.201**	**0.068**	**0.05**	**10.9**	**0.67**	**0.07**	**0.06**
Metal																	
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	na
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																	
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**1.01**	0.01 U	0.01 U	**1.9**	**1.4**	**0.33**	0.01 U	**1.9**	**11.5**	0.01 U	0.01 U
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.01 U	0.01 U	0.1 U	0.1 U	0.01 U	0.01 U	0.1 U	0.1 U	0.01 U	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**3.77**	0.01 U	0.01 U	**3.7**	**3.6**	**1.34**	0.01 U	**1.9**	**34.6**	0.01 U	0.01 U
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**4.82**	0.01 U	0.01 U	**14.9**	**9.6**	**4.14**	0.01 U	**11.6**	**58.1**	0.01 U	0.01 U
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**6.73**	0.01 U	0.01 U	**26**	**16.6**	**6.23**	0.01 U	**22.9**	**73.3**	0.01 U	0.01 U
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**7.02**	0.01 U	0.01 U	**20.5**	**14.1**	**4.82**	0.01 U	**19**	**70.8**	0.01 U	0.01 U
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**1.78**	0.01 U	0.01 U	**5.6**	**1.7**	**1.42**	0.01 U	**5.8**	**21.3**	0.01 U	0.01 U
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**11.9**	0.01 U	0.01 U	**27.4**	**21.7**	**6.15**	0.01 U	**26.6**	**123**	0.01 U	**0.05**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**1.02**	0.01 U	0.01 U	**1.1**	**0.8**	**0.23**	0.01 U	0.1 U	**9.1**	0.01 U	0.01 U
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	**1.02**	0.01 U	0.01 U	0.1 U	0.1 U	**0.07**	0.01 U	0.1 U	**1.3**	0.01 U	0.01 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**6.5**	0.01 U	0.01 U	**9.6**	**8**	**2.21**	0.01 U	**3.6**	**48.5**	0.01 U	0.01 U
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**10.6**	0.01 U	0.01 U	**23.5**	**18.9**	**5.55**	0.01 U	**25.7**	**104**	0.01 U	**0.05**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**56.2**	ND	ND	**134**	**96.4**	**32.5**	ND	**119**	**555**	ND	**0.1**
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																	
3-Methylcholanthrene	mg/kg	--	--	--	--	--	na	0.01 U	na	na	na	na	0.01 U	na	na	0.01 U	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	na	0.01 U	na	na	na	na	0.01 U	na	na	0.01 U	na
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**11.2**	0.01 U	0.01 U	**43.3**	**28.3**	**9.82**	0.01 U	**37.4**	**117**	0.01 U	0.01 U
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	na	0.01 U	na	na	na	na	0.01 U	na	na	0.01 U	na
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**4.77**	0.01 U	0.01 U	**16.6**	**7.5**	**4.8**	0.01 U	**15.8**	**48.1**	0.01 U	0.01 U
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	na	0.01 U	na	na	na	na	0.01 U	na	na	0.01 U	na
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	na	0.01 U	na	na	na	na	0.01 U	na	na	0.01 U	na
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	na	0.01 U	na	na	na	na	0.01 U	na	na	0.01 U	na
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**4.59**	0.01 U	0.01 U	**15.3**	**10.4**	**4.99**	0.01 U	**15.6**	**52.5**	0.01 U	0.01 U
Polychlorinated Biphenyls (Aroclor)																	
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	**0.21**	na	na	ND	na	na	na	**1.3**	**0.23**	na	na

Table 3-1
Summary of 1994 Sediment Sampling and Laboratory Analysis Results

						Location ID	F-10	F-10	F-10	F-10	F-10	F-10	F-10	F-10	F-11	F-11	F-11
						Sample Depth		0-5 cm	0-5 cm	60-120 cm	180-240 cm	240-300 cm	300-360 cm	420-480 cm	0-5 cm	60-120 cm	120-180 cm
						Sample Type	N	FD	N	N	N	N	N	N	N	N	N
						Sample Description	Grab	Grab	Grab	Core	Core	Core	Core	Core	Grab	Core	Core
						Year	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**											
Conventionals																	
Total organic carbon	%	--	--	--	--	--	**0.083**	na	**5.15**	**9.54**	**9.52**	**0.02**	**0.031**	**0.04**	**5.34**	**0.432**	**0.51**
Metal																	
Arsenic	mg/kg	4.3	7.2	19	42	150	**4.3**	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	**0.38**	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	**15**	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	**28**	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	**20**	na	na	na	na	na	na	na	na	na	na
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	**0.02**	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	**7**	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	**210**	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																	
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**6.3**	na	**11**	0.1 U	**28**	0.01 U	0.01 U	0.01 U	**4**	**0.61**	0.1 U
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.1 U	na	1 U	0.1 U	1 U	0.01 U	0.01 U	0.01 U	0.1 U	0.01 U	0.1 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**25.7**	na	**25**	**2.9**	**125**	0.01 U	0.01 U	0.01 U	**13.6**	**3.44**	0.1 U
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**60.3**	na	**110**	**14.1**	**258**	0.01 U	0.01 U	0.01 U	**29.1**	**7.17**	**1.9**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**86.8**	na	**189**	**26.2**	**363**	0.01 U	0.01 U	0.01 U	**48.4**	**9.18**	**2.6**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**76.2**	na	**160**	**27**	**327**	0.01 U	0.01 U	0.01 U	**43.9**	**11**	**4.7**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**26.4**	na	**40**	**2.4**	**108**	0.01 U	0.01 U	0.01 U	**8.8**	**2.61**	**0.5**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**113**	na	**214**	**33.5**	**414**	0.01 U	0.01 U	0.01 U	**54.9**	**13.6**	**4.2**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**4.5**	na	**7**	0.1 U	**21**	0.01 U	0.01 U	0.01 U	**2.9**	**0.57**	0.1 U
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	**2.6**	na	1 U	**1**	**11**	0.01 U	0.01 U	0.01 U	**0.7**	**0.15**	0.1 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**39.7**	na	**72**	**13.6**	**162**	0.01 U	0.01 U	0.01 U	**17.6**	**4.23**	**0.5**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**104**	na	**198**	**32.7**	**369**	0.01 U	0.01 U	0.01 U	**50.8**	**11.4**	**3.6**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**546**	na	**1030**	**153**	**2190**	ND	ND	ND	**275**	**64**	**18**
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																	
3-Methylcholanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	0.01 U	na	0.01 U	na	na	0.1 U
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	na	na	na	na	na	0.01 U	na	0.01 U	na	na	0.1 U
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**141**	na	**327**	**44.3**	**584**	0.01 U	0.01 U	0.01 U	**80.1**	**17.2**	**7.9**
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	0.01 U	na	0.01 U	na	na	0.1 U
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**57.5**	na	**107**	**16.4**	**246**	0.01 U	0.01 U	0.01 U	**26.3**	**6.83**	**2.7**
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	0.01 U	na	0.01 U	na	na	0.1 U
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	0.01 U	na	0.01 U	na	na	0.1 U
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	0.01 U	na	0.01 U	na	na	0.1 U
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**60.2**	na	**104**	**16.7**	**254**	0.01 U	0.01 U	0.01 U	**28.9**	**6.88**	**1.7**
Polychlorinated Biphenyls (Aroclor)																	
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	**2.4**	**5.3**	**3.7**	**10.7**	**2.1**	na	na	na	**0.15**	**0.68**	**0.36**

Table 3-1
Summary of 1994 Sediment Sampling and Laboratory Analysis Results

						Location ID	F-11	F-11	F-11	F-13	F-13	F-13	F-13	F-17	F-17	F-17	F-17
						Sample Depth	180-240 cm	300-360 cm	420-480 cm	0-5 cm	0-60 cm	60-120 cm	180-240 cm	0-5 cm	60-120 cm	120-180 cm	180-240 cm
						Sample Type	N	N	N	N	N	N	N	N	N	N	N
						Sample Description	Core	Core	Core	Grab	Core	Core	Core	Grab	Core	Core	Core
						Year	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**											
Conventionals																	
Total organic carbon	%	--	--	--	--	--	**0.49**	**0.25**	**0.04**	**1.02**	**0.15**	**0.1**	**0.04**	**1.85**	**0.28**	**0.07**	**0.05**
Metal																	
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	**1.8**	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	**0.07**	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	**9**	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	**6**	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	**10**	na	na	na	na	na	na	na
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	0.02 U	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	**6**	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	**26**	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																	
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**0.07**	na	0.01 U	**0.57**	0.01 U	0.01 U	0.01 U	**3.3**	0.1 U	0.01 U	0.01 U
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	na	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.1 U	0.01 U	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**0.24**	na	0.01 U	**2.27**	0.01 U	**0.01**	0.01 U	**12.1**	0.1 U	0.01 U	0.01 U
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**1.15**	na	0.01 U	**4.42**	0.01 U	**0.13**	0.01 U	**25.2**	**9.9**	0.01 U	0.01 U
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**1.91**	na	0.01 U	**7.27**	0.01 U	**0.23**	0.01 U	**39.5**	**14.5**	0.01 U	0.01 U
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**4.28**	na	0.01 U	**6.36**	0.01 U	**0.13**	0.01 U	**39.6**	**21**	0.01 U	0.01 U
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**0.36**	na	0.01 U	**1.76**	0.01 U	0.01 U	0.01 U	**5.3**	**0.6**	0.01 U	0.01 U
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**4.61**	na	0.01 U	**10.9**	**0.51**	**0.26**	0.01 U	**58**	**37.8**	0.01 U	0.01 U
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**0.06**	na	0.01 U	**0.44**	0.01 U	0.01 U	0.01 U	**2.5**	**3.4**	0.01 U	0.01 U
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.01 U	na	0.01 U	**0.14**	0.01 U	0.01 U	0.01 U	**0.7**	0.1 U	0.01 U	0.01 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**0.38**	na	0.01 U	**3.86**	0.01 U	**0.04**	0.01 U	**23**	**31.2**	0.01 U	0.01 U
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**3.66**	na	0.01 U	**9.9**	**0.39**	**0.22**	0.01 U	**50.4**	**33.5**	0.01 U	0.01 U
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**16.7**	na	ND	**47.9**	**0.9**	**1.02**	ND	**260**	**152**	ND	ND
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																	
3-Methylcholanthrene	mg/kg	--	--	--	--	--	na	na	0.01 U	na	0.01 U	na	na	na	na	0.01 U	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	na	na	0.01 U	na	**0.72**	na	na	na	na	0.01 U	na
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**5.25**	na	0.01 U	**12**	0.01 U	**0.33**	0.01 U	**68.2**	**28**	0.01 U	0.01 U
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	na	na	0.01 U	na	0.01 U	na	na	na	na	0.01 U	na
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**1.04**	na	0.01 U	**4.59**	0.01 U	0.01 U	0.01 U	**23.9**	**5.6**	0.01 U	0.01 U
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	na	na	0.01 U	na	0.01 U	na	na	na	na	0.01 U	na
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	na	na	0.01 U	na	0.01 U	na	na	na	na	0.01 U	na
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	na	na	0.01 U	na	0.01 U	na	na	na	na	0.01 U	na
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**1.03**	na	0.01 U	**5.12**	0.01 U	0.01 U	0.01 U	**18.4**	**6.3**	0.01 U	0.01 U
Polychlorinated Biphenyls (Aroclor)																	
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	**4.1**	**1.7**	na	**0.52**	na	na	na	**4.8**	**0.85**	na	na

Table 3-1
Summary of 1994 Sediment Sampling and Laboratory Analysis Results

						Location ID	F-17	F-19	F-19	F-19	F-20	F-20	F-20	F-20	F-20	F-20	F-22
						Sample Depth	300-360 cm	0-5 cm	60-120 cm	180-240 cm	0-5 cm	60-120 cm	120-180 cm	180-240 cm	360-420 cm	420-480 cm	0-5 cm
						Sample Type	N	N	N	N	N	N	N	N	N	N	N
						Sample Description	Core	Grab	Core	Core	Grab	Core	Core	Core	Core	Core	Grab
						Year	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**											
Conventionals																	
Total organic carbon	%	--	--	--	--	--	**0.05**	na	na	na	**11.5**	**0.39**	**0.03**	**0.09**	**0.04**	**0.03**	**2.24**
Metal																	
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	na
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																	
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	0.01 U	0.01 U	0.01 U	0.01 U	**5.7**	**6.7**	0.01 U	0.01 U	0.01 U	0.01 U	na
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	na
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	0.01 U	**0.07**	0.01 U	0.01 U	**9.9**	**19.5**	0.01 U	**0.1**	0.01 U	0.01 U	na
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	0.01 U	**0.51**	0.01 U	0.01 U	**31.1**	**60.7**	0.01 U	**0.55**	0.01 U	0.01 U	na
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	0.01 U	**0.59**	0.01 U	0.01 U	**51.2**	**89.1**	0.01 U	**1.09**	0.01 U	0.01 U	na
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	0.01 U	**0.51**	0.01 U	0.01 U	**44.5**	**76.9**	0.01 U	**0.55**	0.01 U	0.01 U	na
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	0.01 U	0.01 U	0.01 U	0.01 U	**9.1**	**22.7**	0.01 U	**0.06**	0.01 U	0.01 U	na
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	0.01 U	**1.15**	**0.06**	0.01 U	**57.2**	**108**	0.01 U	**1.4**	0.01 U	0.01 U	na
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	0.01 U	0.01 U	0.01 U	0.01 U	**3.1**	**4.3**	0.01 U	0.01 U	0.01 U	0.01 U	na
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.01 U	0.01 U	0.01 U	0.01 U	**1.1**	**3.7**	0.01 U	0.01 U	0.01 U	0.01 U	na
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	0.01 U	**0.32**	0.01 U	0.01 U	**16.6**	**34.1**	0.01 U	**0.21**	0.01 U	0.01 U	na
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	0.01 U	**1**	**0.05**	0.01 U	**54.2**	**100**	0.01 U	**1.29**	0.01 U	0.01 U	na
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	ND	**4.15**	**0.11**	ND	**284**	**526**	ND	**5.25**	ND	ND	na
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																	
3-Methylcholanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	0.01 U	na	na	0.01 U	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	0.01 U	na	na	0.01 U	na
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	0.01 U	**1.16**	0.01 U	0.01 U	**84.7**	**139**	0.01 U	**2.13**	0.01 U	0.01 U	na
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	0.01 U	na	na	0.01 U	na
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	0.01 U	**0.29**	0.01 U	0.01 U	**31.5**	**59.3**	0.01 U	**0.25**	0.01 U	0.01 U	na
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	0.01 U	na	na	0.01 U	na
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	0.01 U	na	na	0.01 U	na
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	0.01 U	na	na	0.01 U	na
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	0.01 U	**0.33**	0.01 U	0.01 U	**32.9**	**63.5**	0.01 U	**0.55**	0.01 U	0.01 U	na
Polychlorinated Biphenyls (Aroclor)																	
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	**0.11**	na	na	**2.5**	**0.11**	na	na	na	na	**8**

Table 3-1
Summary of 1994 Sediment Sampling and Laboratory Analysis Results

						Location ID	F-22	F-22	F-22	F-22	F-24	F-24	F-24	F-24	F-24	F-27	F-27
						Sample Depth	60-120 cm	180-240 cm	240-300 cm	300-360 cm	0-5 cm	0-60 cm	60-120 cm	180-240 cm	300-360 cm	0-5 cm	60-120 cm
						Sample Type	N	N	N	N	N	N	N	N	N	N	N
						Sample Description	Core	Core	Core	Core	Grab	Core	Core	Core	Core	Grab	Core
						Year	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**											
Conventionals																	
Total organic carbon	%	--	--	--	--	--	**1.49**	**0.64**	**0.18**	**0.04**	**0.37**	**0.19**	**0.36**	**0.19**	**0.16**	**1.56**	**0.028**
Metal																	
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	**1.1**	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	**0.14**	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	**4**	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	**8**	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	**10**	na
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na	0.02 U	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	**6**	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	**19**	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																	
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	na	na	**0.4**	na	**0.4**	0.01 U	0.01 U	0.01 U	0.01 U	na	0.01 U
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	na	na	0.1 U	na	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	na	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	na	na	**0.4**	na	**2.01**	0.01 U	**0.08**	0.01 U	0.01 U	na	0.01 U
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	na	na	**4**	na	**4.04**	**0.68**	**0.32**	0.01 U	0.01 U	na	0.01 U
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	na	na	**5.9**	na	**6.32**	**0.74**	**0.52**	0.01 U	0.01 U	na	0.01 U
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	na	na	**5.3**	na	**5.82**	**0.92**	**0.32**	0.01 U	0.01 U	na	0.01 U
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	na	na	**1.4**	na	**1.02**	0.01 U	0.01 U	0.01 U	0.01 U	na	0.01 U
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	na	na	**7.8**	na	**9**	**1.14**	**0.76**	0.01 U	0.01 U	na	**0.07**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	na	na	0.1 U	na	**0.34**	0.01 U	0.01 U	0.01 U	0.01 U	na	0.01 U
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	na	na	0.1 U	na	**0.08**	0.01 U	0.01 U	0.01 U	0.01 U	na	0.01 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	na	na	**3.2**	na	**3.16**	0.01 U	**0.21**	0.01 U	0.01 U	na	0.01 U
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	na	na	**6.8**	na	**8.16**	**0.98**	**0.69**	0.01 U	0.01 U	na	**0.05**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	na	na	**35.2**	na	**40.4**	**4.46**	**2.9**	ND	ND	na	**0.12**
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																	
3-Methylcholanthrene	mg/kg	--	--	--	--	--	na	na	0.1 U	na	na	0.01 U	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	na	na	0.1 U	na	na	0.01 U	na	na	na	na	na
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	na	na	**10.9**	na	**10.4**	**1.63**	**0.87**	0.01 U	0.01 U	na	**0.07**
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	na	na	**0.4**	na	na	0.01 U	na	na	na	na	na
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	na	na	**4.9**	na	**3.88**	**0.71**	0.01 U	0.01 U	0.01 U	na	0.01 U
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	na	na	0.1 U	na	na	0.01 U	na	na	na	na	na
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	na	na	0.1 U	na	na	0.01 U	na	na	na	na	na
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	na	na	**1.5**	na	na	0.01 U	na	na	na	na	na
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	na	na	**4.5**	na	**4.29**	**0.59**	0.01 U	0.01 U	0.01 U	na	0.01 U
Polychlorinated Biphenyls (Aroclor)																	
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	**1.6**	**0.25**	**0.62**	na	**0.35**	na	na	na	na	na	na

Table 3-1
Summary of 1994 Sediment Sampling and Laboratory Analysis Results

Location ID							**F-27**	**F-29**	**F-29**	**F-29**	**F-29**	**F-29**	**F-31**	**F-31**	**F-31**	**F-32**	**F-32**
Sample Depth							**160-240 cm**	**0-5 cm**	**0-60 cm**	**60-120 cm**	**160-240 cm**	**240-300 cm**	**0-5 cm**	**60-120 cm**	**180-240 cm**	**0-5 cm**	**0-60 cm**
Sample Type							**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Sample Description							**Core**	**Grab**	**Core**	**Core**	**Core**	**Core**	**Grab**	**Core**	**Core**	**Grab**	**Core**
Year							**1994**	**1994**	**1994**	**1994**	**1994**	**1994**	**1994**	**1994**	**1994**	**1994**	**1994**
Major Remediation Area							**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**											
Conventionals																	
Total organic carbon	%	--	--	--	--	--	**0.015**	**1.31**	**1.3**	**0.064**	**0.16**	**0.16**	**0.208**	**0.092**	**0.212**	**0.807**	**0.07**
Metal																	
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	na
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																	
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	0.01 U	**1.01**	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**1.14**	0.01 U
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	0.01 U	**5.15**	**16.4**	**0.14**	**0.19**	0.01 U	**0.03**	0.01 U	0.01 U	**4.06**	0.01 U
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**0.04**	**7.42**	**3.4**	**0.28**	**0.48**	0.01 U	**0.1**	0.01 U	0.01 U	**4.93**	0.01 U
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**0.05**	**8.84**	**3.1**	**0.37**	**0.73**	0.01 U	**0.13**	0.01 U	0.01 U	**4.71**	0.01 U
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**0.09**	**8.32**	**5.4**	**0.44**	**0.69**	0.01 U	**0.15**	0.01 U	0.01 U	**5.61**	0.01 U
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	0.01 U	**2.73**	**0.9**	**0.05**	**0.11**	0.01 U	0.01 U	0.01 U	0.01 U	**0.96**	0.01 U
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**0.11**	**7.98**	**7.1**	**0.63**	**1.04**	0.01 U	**0.29**	0.01 U	**0.05**	**9.78**	0.01 U
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	0.01 U	**1.15**	**3**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**1.55**	0.01 U
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.01 U	**0.28**	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.29**	0.01 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**0.04**	**6.61**	**12.9**	**0.21**	**0.33**	0.01 U	**0.09**	0.01 U	0.01 U	**9.87**	0.01 U
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**0.09**	**7.24**	**4.8**	**0.47**	**0.89**	0.01 U	**0.24**	0.01 U	**0.03**	**8.82**	0.01 U
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**0.42**	**56.7**	**57**	**2.59**	**4.46**	ND	**1.03**	ND	**0.08**	**51.7**	ND
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																	
3-Methylcholanthrene	mg/kg	--	--	--	--	--	na	na	0.1 U	na	na	0.01 U	na	na	na	na	0.01 U
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	na	na	0.1 U	na	na	0.01 U	na	na	na	na	0.01 U
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**0.11**	**13.4**	**6.1**	**0.69**	**1.29**	0.01 U	**0.28**	0.01 U	0.01 U	**8.09**	0.01 U
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	na	na	0.1 U	na	na	0.01 U	na	na	na	na	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	0.01 U	**8.31**	**1.3**	**0.25**	**0.39**	0.01 U	**0.03**	0.01 U	0.01 U	**2.97**	0.01 U
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	na	na	0.1 U	na	na	0.01 U	na	na	na	na	0.01 U
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	na	na	0.1 U	na	na	0.01 U	na	na	na	na	0.01 U
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	na	na	0.1 U	na	na	0.01 U	na	na	na	na	0.01 U
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	0.01 U	**8.83**	**2.2**	**0.24**	**0.42**	0.01 U	**0.07**	0.01 U	0.01 U	**3.17**	0.01 U
Polychlorinated Biphenyls (Aroclor)																	
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	**2**	**0.34**	na	na	na	**0.11**	na	**0.79**	**0.42**	na

Table 3-1
Summary of 1994 Sediment Sampling and Laboratory Analysis Results

Location ID							F-32	F-32	F-32	F-34	F-34	F-34	F-34	F-34	F-36	F-36	F-36
Sample Depth							60-120 cm	180-240 cm	300-360 cm	0-5 cm	60-120 cm	180-240 cm	240-300 cm	300-360 cm	0-5 cm	0-60 cm	60-120 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Grab	Core	Core	Core	Core	Grab	Core	Core
Year							1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**											
Conventionals																	
Total organic carbon	%	--	--	--	--	--	**0.034**	**0.022**	**0.017**	**1.1**	**0.56**	**0.14**	**0.46**	**0.14**	**0.116**	**0.2**	**0.056**
Metal																	
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	**1.8**	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	**0.11**	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	**10**	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	**10**	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	**10**	na	na	na	na	na	na	na
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	0.02 U	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	**2**	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	**39**	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																	
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	0.01 U	0.01 U	0.01 U	na	**0.58**	0.01 U	0.1 U	0.01 U	0.01 U	0.1 U	0.01 U
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.01 U	0.01 U	na	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	0.1 U	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	0.01 U	0.01 U	0.01 U	na	**2.55**	**0.67**	0.1 U	0.01 U	**1.62**	0.1 U	0.01 U
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	0.01 U	0.01 U	0.01 U	na	**4.01**	**1.3**	**1.1**	0.01 U	**3.99**	**0.8**	0.01 U
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	0.01 U	0.01 U	0.01 U	na	**5.15**	**1.38**	**1.7**	0.01 U	**5.68**	**1.5**	0.01 U
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	0.01 U	0.01 U	0.01 U	na	**6.37**	**1.3**	**2.4**	0.01 U	**6.13**	**1.6**	0.01 U
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	0.01 U	0.01 U	0.01 U	na	**1.17**	**0.04**	0.1 U	0.01 U	**1.24**	0.1 U	0.01 U
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	0.01 U	**0.03**	0.01 U	na	**8.12**	**2.36**	**3.7**	0.01 U	**8.29**	**2.4**	0.01 U
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	0.01 U	0.01 U	0.01 U	na	**0.51**	**0.13**	0.1 U	0.01 U	**0.24**	0.1 U	0.01 U
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.01 U	0.01 U	0.01 U	na	**0.23**	**0.08**	0.1 U	0.01 U	0.01 U	0.1 U	0.01 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	0.01 U	0.01 U	0.01 U	na	**3.81**	**1.27**	**1.5**	0.01 U	**3.18**	**0.9**	0.01 U
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	0.01 U	**0.03**	0.01 U	na	**6.98**	**2.23**	**3.1**	0.01 U	**7.02**	**2**	0.01 U
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	ND	**0.06**	ND	na	**39.5**	**10.8**	**13.5**	ND	**37.4**	**9.2**	ND
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																	
3-Methylcholanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	0.1 U	na	na	0.1 U	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	0.1 U	na	na	0.1 U	na
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	na	**9.37**	**2.66**	**3.9**	0.01 U	**10.4**	**3**	0.01 U
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	0.1 U	na	na	0.1 U	na
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	na	**2.99**	**0.76**	**1.4**	0.01 U	**4.21**	**1.2**	0.01 U
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	0.1 U	na	na	0.1 U	na
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	0.1 U	na	na	0.1 U	na
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	0.1 U	na	na	0.1 U	na
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	na	**3.01**	**0.84**	**1.4**	0.01 U	**4.07**	**1**	0.01 U
Polychlorinated Biphenyls (Aroclor)																	
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	**1.4**	**3.6**	na	na	na	**0.13**	na	na

Table 3-1
Summary of 1994 Sediment Sampling and Laboratory Analysis Results

						Location ID	F-36	F-55	F-55	F-55	F-55	F-56	F-56	F-56	F-56
						Sample Depth	180-240 cm	0-5 cm	0-60 cm	60-120 cm	180-240 cm	0-5 cm	60-120 cm	120-180 cm	240-300 cm
						Sample Type	N	N	N	N	N	N	N	N	N
						Sample Description	Core	Grab	Core	Core	Core	Grab	Core	Core	Core
						Year	1994	1994	1994	1994	1994	1994	1994	1994	1994
						Major Remediation Area	ADM	BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**									
Conventionals															
Total organic carbon	%	--	--	--	--	--	**0.066**	**0.143**	**0.48**	**0.052**	**0.073**	**0.13**	**0.45**	**0.08**	**0.12**
Metal															
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)															
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	0.01 U	**0.12**	0.01 U	0.01 U	0.01 U	**2.6**	0.01 U	**0.04**	0.01 U
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	0.01 U	**1.53**	0.01 U	0.01 U	0.01 U	**19.2**	0.01 U	**0.06**	0.01 U
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**0.06**	**1.72**	0.01 U	0.01 U	0.01 U	**13.2**	0.01 U	**0.32**	0.01 U
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**0.1**	**2.04**	**0.35**	0.01 U	0.01 U	**14.3**	0.01 U	**0.56**	0.01 U
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**0.13**	**2.42**	**0.89**	0.01 U	0.01 U	**18.6**	0.01 U	**0.55**	0.01 U
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	0.01 U	**0.53**	0.01 U	0.01 U	0.01 U	**2.8**	0.01 U	0.01 U	0.01 U
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**0.25**	**3.4**	**0.95**	0.01 U	0.01 U	**36.9**	0.01 U	**0.79**	0.01 U
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	0.01 U	**0.18**	0.01 U	0.01 U	0.01 U	**3.2**	0.01 U	0.01 U	0.01 U
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.4**	0.01 U	0.01 U	0.01 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**0.07**	**1.38**	0.01 U	0.01 U	0.01 U	**16.7**	0.01 U	**0.25**	0.01 U
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**0.21**	**2.8**	**0.89**	0.01 U	0.01 U	**31.9**	0.01 U	**0.6**	0.01 U
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**0.82**	**16.1**	**3.08**	ND	ND	**160**	ND	**3.17**	ND
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)															
3-Methylcholanthrene	mg/kg	--	--	--	--	--	na	na	0.01 U	na	na	na	0.01 U	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	na	na	0.01 U	na	na	na	0.01 U	na	na
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**0.19**	**3.65**	**0.86**	0.01 U	0.01 U	**24.1**	0.01 U	**0.91**	0.01 U
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	na	na	0.01 U	na	na	na	0.01 U	na	na
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	0.01 U	**1.38**	0.01 U	0.01 U	0.01 U	**6.2**	0.01 U	**0.35**	0.01 U
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	na	na	0.01 U	na	na	na	0.01 U	na	na
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	na	na	0.01 U	na	na	na	0.01 U	na	na
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	na	na	0.01 U	na	na	na	0.01 U	na	na
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	0.01 U	**1.42**	0.01 U	0.01 U	0.01 U	**6.1**	0.01 U	**0.33**	0.01 U
Polychlorinated Biphenyls (Aroclor)															
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	**0.02**	na	na	na

Table 3-1
Summary of 1994 Sediment Sampling and Laboratory Analysis Results

Notes:
⬜ Detected concentration is greater than REL (rare effect level)
🟦 Detected concentration is greater than TEL (threshold effect level)
🟨 Detected concentration is greater than OEL (occasional effect level)
🟧 Detected concentration is greater than PEL (probably effect level)
🟥 Detected concentration is greater than FEL (frequent effect level)
🟩 Non-detected concentration is above one or more identified screening levels
Bold = Detected result

J = Estimated value
FD = field duplicate
mg/kg = milligrams per kilogram
MS = matrix spike
N = normal sample
ND = Compound analyzed, but not detected above detection limit
na = Compound not analyzed
PAH = polynuclear aromatic hydrocarbon
PCB = polychlorinated biphenyl
U = Compound analyzed, but not detected above detection limit

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							BC_04	BC_06	BC_07	BC_09	BC_12	BC_13	BC_14	BC_15	BC_18	BC_19	BC_21	BC_22	SB01
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-5 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006
Major Remediation Area							ADM	ADM	BDA	ADM	ADM	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Ammonia-Nitrogen	mg/kg	--	--	--	--	--	**75.8**	**43.2**	**35.5**	**31.3**	**20.4**	**27.1**	**67**	**10.9**	**107**	**37**	**53.5**	**16.8**	na
Cyanide + Thiocyanate	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Fluoride, Leachable	mg/L	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**20**
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
pH	pH Units	--	--	--	--	--	**7.2**	**7.7**	**7.5**	**7.3**	**7.8**	**7.2**	**7.7**	**7.3**	**7.4**	**7.3**	**7.2**	**7.5**	na
Phosphorus	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Saturation	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SOC	%	--	--	--	--	--	**0.16**	**0.54**	**0.03**	**0.63**	**0.44**	**0.17**	**0.19**	**1.46**	**0.36**	**0.49**	**1.16**	**0.54**	na
Soluble Conductivity	µS/cm	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	**0.36**	**3.05**	**0.18**	**0.84**	**0.5**	**0.51**	**0.53**	**2.48**	**0.58**	**0.88**	**1.64**	**1.03**	**0.61**
Total solids	%	--	--	--	--	--	**69**	**69.8**	**65.3**	**69.1**	**70.6**	**68.3**	**76**	**65.2**	**66.9**	**77.9**	**70.6**	**78.5**	na
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	**1.3**	**0.9**	**2.2**	**2.8**	**3.2**	**3.1**	**1.1**	**3**	**2.7**	**0.8**	**2.8**	**1.9**	**0.9**
Gravel (2mm-26mm)	%	--	--	--	--	--	**0.6**	**1.3**	0	**1.3**	**13.7**	**1.3**	**9.5**	**1.4**	0	**46.8**	**0.9**	**14.7**	**18.1**
Sand (63µm-2mm)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**75.2**
Sand, Coarse	%	--	--	--	--	--	**0.3**	**0.6**	0	**1.2**	**7.9**	**0.4**	**13.6**	**0.8**	**0.2**	**8**	**1.5**	**16.5**	na
Sand, Fine	%	--	--	--	--	--	**82.6**	**77.4**	**87.7**	**79.7**	**34.8**	**84.4**	**17.7**	**75.2**	**90.3**	**18.3**	**68.6**	**34.1**	na
Sand, Medium	%	--	--	--	--	--	**14.7**	**18.7**	**9.4**	**13.3**	**39**	**8.6**	**55.7**	**7.7**	**1.8**	**20**	**15.3**	**29.2**	na
Silt (2um-63um)	%	--	--	--	--	--	**0.5**	**1.1**	**0.8**	**1.7**	**1.4**	**2.3**	**2.5**	**12**	**5**	**6.1**	**10.9**	**3.6**	**5.9**
Metal																			
Aluminum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Antimony	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	na	na	na
Barium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Beryllium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Bismuth	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	na	na	na
Calcium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	na	na	na
Cobalt	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	na	na	na
Iron	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	na	na	na
Lithium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Magnesium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Manganese	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							BC_04	BC_06	BC_07	BC_09	BC_12	BC_13	BC_14	BC_15	BC_18	BC_19	BC_21	BC_22	SB01
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-5 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006
Major Remediation Area							ADM	ADM	BDA	ADM	ADM	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na	na	na	na	**0.01**
Molybdenum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Potassium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Selenium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Silver	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sodium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Strontium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Thallium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Tin	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Titanium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Uranium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Vanadium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	na	na	na
Zirconium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Metal - AVS/SEM																			
Cadmium	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sulfide	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SEM-AVS	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	**0.02**	**0.62**	**0.01**	**0.15**	**0.08**	**0.07**	**0.05**	**0.35**	**0.1**	**0.28**	**0.44**	**0.69**	0.2 U
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**0.33**	**7.95**	**0.06**	**1.2**	**0.99**	**0.41**	**0.49**	**3.16**	**0.96**	**2.1**	**4.21**	**4.69**	**0.87**
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	**0.01**	**0.14**	ND	**0.04**	**0.04**	**0.02**	**0.01**	**0.08**	**0.02**	**0.22**	**0.07**	**0.07**	0.2 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**0.88**	**21.8**	**0.13**	**3.91**	**2.15**	**0.94**	**1.13**	**9.68**	**2.09**	**8.86**	**12.2**	**12.7**	**1.4**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**1.99**	**57.2**	**0.29**	**7.23**	**12**	**2.16**	**4.21**	**32.3**	**5.78**	**23.8**	**50.8**	**37.6**	**5.6**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**3.57**	**72.2**	**0.54**	**11.4**	**16.6**	**3.61**	**6.04**	**40.1**	**7.52**	**32.1**	**83.7**	**56.8**	**7.1**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**2.68**	**60.1**	**0.42**	**9.53**	**10**	**3.08**	**4.64**	**38.1**	**7.35**	**24.1**	**52.2**	**38.5**	**8.6**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**0.88**	**25.2**	**0.11**	**3.23**	**4.19**	**0.83**	**1.48**	**9.83**	**1.93**	**10.2**	**27.9**	**17.8**	**1.3**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**4.14**	**74.5**	**0.54**	**13.3**	**12.8**	**4.44**	**5.5**	**47.3**	**9.52**	**32.8**	**55.3**	**48.3**	**9.4**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**0.22**	**4.65**	**0.04**	**1.02**	**0.54**	**0.31**	**0.28**	**2.2**	**0.54**	**1.72**	**2.73**	**3.29**	**0.7**
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	**0.06**	**2.45**	**0.04**	**0.32**	**0.41**	**0.24**	**0.18**	**1.24**	**0.25**	**1.14**	**1.98**	**2.97**	**0.84**
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**2.95**	**43.2**	**0.35**	**9.57**	**5.41**	**2.8**	**2.88**	**21.4**	**5.61**	**18.5**	**26.3**	**28.3**	**5.6**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**3.33**	**68.2**	**0.48**	**11.9**	**11.6**	**3.73**	**4.91**	**39.2**	**8.32**	**30.3**	**52.9**	**44.8**	**7.8**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**21.1**	**438**	**3.01**	**72.8**	**76.8**	**22.6**	**31.8**	**245**	**50**	**186**	**371**	**297**	**49.2**

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

						Location ID	BC_04	BC_06	BC_07	BC_09	BC_12	BC_13	BC_14	BC_15	BC_18	BC_19	BC_21	BC_22	SB01
						Sample Depth	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-5 cm
						Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N
						Sample Description	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
						Year	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006
						Major Remediation Area	ADM	ADM	BDA	ADM	ADM	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	0.2 U
1-Methylnaphthalene	mg/kg	--	--	--	--	--	**0.01**	**0.35**	**0.01**	**0.1**	**0.05**	**0.05**	**0.03**	**0.2**	**0.08**	**0.15**	**0.25**	**0.38**	0.2 U
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	0.2 U
3-Methylcholanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	0.2 U
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	0.3 U
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	0.3 U
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	0.2 U
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**12**
Benzo(b+j)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b+k)fluoranthene	mg/kg	--	--	--	--	--	**4.1**	**93.8**	**0.66**	**12.3**	**21.2**	**4.37**	**7.14**	**58**	**9.27**	**39.1**	**109**	**70.1**	na
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**0.72**
Benzo(e)pyrene	mg/kg	--	--	--	--	--	**1.58**	**33.9**	**0.27**	**4.53**	**7.3**	**1.7**	**2.62**	**21.2**	**3.47**	**13.8**	**38.2**	**24.4**	**4.9**
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**2.59**	**65.7**	**0.41**	**8.21**	**10.4**	**2.58**	**4.64**	**31.9**	**6.23**	**24.5**	**52.8**	**37.8**	**5**
Benzo(k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Chrysenes	mg/kg	--	--	--	--	--	**2.8**	**66.4**	**0.47**	**10.5**	**10.9**	**3.17**	**4.36**	**34.5**	**6.93**	**25.4**	**55.9**	**46.3**	na
C1-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	**2.32**	**54.2**	**0.36**	**11.9**	**6.6**	**3.26**	**3.44**	**33.8**	**6.37**	**22**	**43.4**	**39.3**	na
C1-Fluorenes	mg/kg	--	--	--	--	--	**0.25**	**2.8**	**0.07**	**0.86**	**0.29**	**0.27**	**0.2**	**1.6**	**0.48**	**1.18**	**1.81**	**2.12**	na
C1-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	**0.97**	**17.5**	**0.16**	**4.68**	**1.67**	**1.22**	**1.04**	**9.6**	**2.44**	**6.42**	**10.3**	**11.3**	na
C2-Chrysenes	mg/kg	--	--	--	--	--	ND	**29**	ND	**5.09**	**4.19**	**1.54**	**2.09**	**14.7**	**3.39**	**11.8**	**26.5**	**22.3**	na
C2-Fluorenes	mg/kg	--	--	--	--	--	**0.12**	**1.37**	**0.05**	**0.45**	**0.11**	**0.16**	**0.11**	**0.99**	**0.29**	**0.52**	**0.97**	**0.97**	na
C2-Naphthalenes	mg/kg	--	--	--	--	--	**0.19**	**1.19**	**0.19**	**0.51**	**0.28**	**0.26**	**0.16**	**0.86**	**0.37**	**0.62**	**0.85**	**1.14**	na
C2-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	**1.08**	**20.8**	**0.28**	**6.26**	**1.71**	**1.58**	**1.3**	**12.8**	**3.11**	**7.04**	**12.4**	**12.7**	na
C3-Chrysenes	mg/kg	--	--	--	--	--	ND	**17.1**	ND	**2.65**	**2.31**	ND	**1.03**	**8.13**	**1.67**	**6.32**	**15.9**	**10.7**	na
C3-Fluorenes	mg/kg	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na
C3-Naphthalenes	mg/kg	--	--	--	--	--	**0.13**	**0.7**	**0.07**	**0.26**	**0.1**	**0.12**	**0.07**	**0.48**	**0.19**	**0.32**	**0.54**	**0.51**	na
C3-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	**0.44**	**9.58**	**0.1**	**2.74**	**0.93**	**0.78**	**0.72**	**6.68**	**1.36**	**3.73**	**6.93**	**6.51**	na
C4-Chrysenes	mg/kg	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na
C4-Naphthalenes	mg/kg	--	--	--	--	--	**0.09**	**0.42**	ND	**0.19**	**0.04**	**0.08**	ND	**0.41**	**0.14**	**0.24**	**0.7**	**0.31**	na
C4-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	ND	**2.55**	ND	**0.76**	**0.16**	ND	**0.15**	**1.46**	**0.34**	**1.02**	**1.96**	**1.79**	na
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**1.1**
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**0.34**
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**1.4**
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**2**
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**7.35**	**173**	**0.96**	**24.9**	**34.7**	**6.88**	**12.3**	**73.5**	**15.5**	**62.2**	**191**	**101**	**4.4**
Perylene	mg/kg	--	--	--	--	--	**1.1**	**28.6**	**0.16**	**3.54**	**4.93**	**1.07**	**2.02**	**12.9**	**2.62**	**11**	**23.7**	**16.8**	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							BC_04	BC_06	BC_07	BC_09	BC_12	BC_13	BC_14	BC_15	BC_18	BC_19	BC_21	BC_22	SB01
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-5 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006
Major Remediation Area							ADM	ADM	BDA	ADM	ADM	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	0.01 U
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	0.01 U
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**0.17**
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**0.07**
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**0.06**
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**0.3**
Total Petroleum Hydrocarbons																			
F2 (C10-C16 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F3 (C16-C34 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4 (C34-C50 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4G-SG (Heavy Hydrocarbons-Grav.)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							SB02	SB03	SB04	SB05	SB06A	SB08	SB09	SB10	SB11	SB12	SB15	SB16	SB17
Sample Depth							0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	FD
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Ammonia-Nitrogen	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Cyanide + Thiocyanate	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Fluoride, Leachable	mg/L	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	**22**	**17**	**16**	**20**	**23**	**21**	**20**	**17**	**21**	**25**	**17**	**26**	**30**
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
pH	pH Units	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Phosphorus	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Saturation	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SOC	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Soluble Conductivity	µS/cm	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	**2.73**	**0.25**	0.01 U	**0.49**	**1.41**	**0.39**	**0.26**	**1.55**	**0.5**	**0.42**	**0.16**	**0.47**	**1.08**
Total solids	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	**1.3**	**0.3**	**0.1**	**0.4**	**0.3**	**0.2**	**0.4**	**0.6**	**0.4**	**0.9**	**1.1**	**1**	na
Gravel (2mm-26mm)	%	--	--	--	--	--	**5.6**	**15.8**	**25**	**44**	**1.2**	**0.9**	**0.6**	**23**	**0.3**	0	**18.2**	0	na
Sand (63µm-2mm)	%	--	--	--	--	--	**81.4**	**82.7**	**74.7**	**52.4**	**97.4**	**98.3**	**97.2**	**74.5**	**96.8**	**93.2**	**74.2**	**93.4**	na
Sand, Coarse	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sand, Fine	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sand, Medium	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Silt (2um-63um)	%	--	--	--	--	--	**11.7**	**1.1**	**0.3**	**3.1**	**1.1**	**0.6**	**1.8**	**1.9**	**2.5**	**5.8**	**6.5**	**5.6**	na
Metal																			
Aluminum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Antimony	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	na	na	na
Barium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Beryllium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Bismuth	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	na	na	na
Calcium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	na	na	na
Cobalt	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	na	na	na
Iron	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	na	na	na
Lithium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Magnesium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Manganese	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							SB02	SB03	SB04	SB05	SB06A	SB08	SB09	SB10	SB11	SB12	SB15	SB16	SB17
Sample Depth							0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	FD
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	**0.02**	na	0.01 U	na	0.01 U	**0.09**	0.01 U	na	na	na	**0.01**
Molybdenum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Potassium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Selenium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Silver	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sodium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Strontium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Thallium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Tin	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Titanium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Uranium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Vanadium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	na	na	na
Zirconium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Metal - AVS/SEM																			
Cadmium	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sulfide	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SEM-AVS	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	**0.38**	0.1 U	2 U	**1.4**	0.3 U	0.1 U	0.01 U	0.2 U	0.07 U	2 U	0.2 U	**0.2**	**0.08**
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**3.7**	**0.65**	2 U	**15**	**3**	**0.54**	**0.13**	**1.9**	**0.48**	2 U	**0.85**	**0.99**	**0.81**
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.2 U	0.1 U	2 U	1 U	0.3 U	0.1 U	0.01 U	0.2 U	0.07 U	2 U	0.2 U	0.2 U	0.07 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**5.2**	**1.4**	**2**	**21**	**5.2**	**1.1**	**0.24**	**2.5**	**0.95**	2 U	**1.5**	**2.1**	**1.9**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**19**	**4.9**	**8.7**	**76**	**19**	**4.8**	**1.4**	**13**	**4**	**5.4**	**7.3**	**7.4**	**7.4**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**24**	**6**	**15**	**120**	**20**	**6.5**	**1.8**	**17**	**5.1**	**7.5**	**10**	**9.9**	**9**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**19**	**5.1**	**10**	**90**	**19**	**5**	**1.6**	**12**	**4.3**	**6**	**8**	**8.4**	**7.7**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**3.8**	**1**	**2.5**	**20**	**3.3**	**1.2**	**0.37**	**2.8**	**1.1**	2 U	**1.8**	**1.9**	**1.8**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**35**	**8**	**15**	**120**	**33**	**7.1**	**2.2**	**20**	**6.2**	**10**	**12**	**13**	**12**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**2.5**	**0.58**	2 U	**8.9**	**2.1**	**0.35**	**0.09**	**1.1**	**0.34**	2 U	**0.63**	**0.84**	**0.71**
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	**1.2**	0.1 U	2 U	**4.4**	**0.5**	0.1 U	**0.02**	**0.46**	**0.1**	2 U	**0.46**	**0.37**	**0.18**
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**21**	**5.1**	**7.3**	**68**	**19**	**3.5**	**0.92**	**9.3**	**3.3**	**5.3**	**5.8**	**7.4**	**6.3**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**29**	**6.7**	**13**	**110**	**26**	**5.9**	**1.8**	**17**	**5.1**	**8.1**	**9.7**	**10**	**9.9**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**164**	**39.4**	**73.5**	**655**	**150**	**36**	**10.6**	**97.1**	**31**	**42.3**	**58**	**62.5**	**57.8**

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							SB02	SB03	SB04	SB05	SB06A	SB08	SB09	SB10	SB11	SB12	SB15	SB16	SB17
Sample Depth							0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	FD
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	0.2 U	0.1 U	2 U	1 U	0.3 U	0.1 U	0.01 U	0.2 U	0.07 U	2 U	0.2 U	0.2 U	0.07 U
1-Methylnaphthalene	mg/kg	--	--	--	--	--	**0.26**	0.1 U	2 U	1 U	0.3 U	0.1 U	0.01 U	0.2 U	0.07 U	2 U	0.2 U	0.2 U	0.07 U
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	0.2 U	0.1 U	2 U	1 U	0.3 U	0.1 U	0.01 U	0.2 U	0.07 U	2 U	0.2 U	0.2 U	0.07 U
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.2 U	0.1 U	2 U	1 U	0.3 U	0.1 U	0.01 U	0.2 U	0.07 U	2 U	0.2 U	0.2 U	0.07 U
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	0.3 U	0.2 U	3 U	2 U	0.6 U	0.2 U	0.02 U	0.3 U	0.2 U	3 U	0.3 U	0.3 U	0.2 U
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.3 U	0.2 U	3 U	2 U	0.6 U	0.2 U	0.02 U	0.3 U	0.2 U	3 U	0.3 U	0.3 U	0.2 U
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	**0.41**	0.1 U	2 U	**2.3**	0.3 U	0.1 U	**0.05**	**0.3**	**0.16**	2 U	**0.22**	**0.22**	**0.29**
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**35**	**9.6**	**24**	**190**	**32**	**10**	**2.8**	**25**	**8.4**	**13**	**17**	**17**	**14**
Benzo(b+j)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b+k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	**2.7**	**0.62**	2 U	**10**	**2.6**	**0.56**	**0.16**	**1.6**	**0.5**	2 U	**0.93**	**1**	**0.91**
Benzo(e)pyrene	mg/kg	--	--	--	--	--	**13**	**3.9**	**10**	**76**	**12**	**4.1**	**1.2**	**9.6**	**3.4**	**5.5**	**6.8**	**6.8**	**6**
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**13**	**4**	**11**	**80**	**11**	**4.6**	**1.5**	**9.9**	**4**	**5.6**	**7.1**	**7.2**	**6.8**
Benzo(k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	**2.8**	**1.2**	3 U	**14**	**2.3**	**1.2**	**0.42**	**2**	**1.2**	3 U	**1.4**	**1.7**	**2.2**
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	**0.97**	**0.3**	3 U	**6.2**	**0.76**	**0.44**	**0.16**	**0.86**	**0.45**	3 U	**0.5**	**0.52**	**0.79**
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	**4.1**	**1.3**	3 U	**19**	**3.3**	**1.8**	**0.6**	**3.1**	**1.7**	3 U	**2.1**	**2.2**	**3.1**
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	**6.3**	**1.6**	**3.9**	**37**	**4.7**	**2.1**	**0.76**	**4.5**	**2.1**	3 U	**3**	**3.2**	**3.4**
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**12**	**3.6**	**9.4**	**68**	**11**	**4.2**	**1.2**	**9**	**3.5**	**4.4**	**6.2**	**6.2**	**5.9**
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

						Location ID	**SB02**	**SB03**	**SB04**	**SB05**	**SB06A**	**SB08**	**SB09**	**SB10**	**SB11**	**SB12**	**SB15**	**SB16**	**SB17**
						Sample Depth	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**
						Sample Type	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**FD**
						Sample Description	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
						Year	**2006**	**2006**	**2006**	**2006**	**2006**	**2006**	**2006**	**2006**	**2006**	**2006**	**2006**	**2006**	**2006**
						Major Remediation Area	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--		na	na	na	na	na	na	na	na	na	na	na	na	na
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--		na	na	na	na	na	na	na	na	na	na	na	na	na
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--		na	na	na	na	na	na	na	na	na	na	na	na	na
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--		na	na	na	na	na	na	na	na	na	na	na	na	na
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--		na	na	na	na	na	na	na	na	na	na	na	na	na
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--		na	na	na	na	na	na	na	na	na	na	na	na	na
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--		na	na	na	na	na	na	na	na	na	na	na	na	na
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--		na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49		na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.05 U	0.04 U	0.01 U	0.01 U	0.05 U
Aroclor 1242	mg/kg	--	--	--	--	--		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.05 U	0.04 U	0.01 U	0.01 U	0.05 U
Aroclor 1248	mg/kg	--	--	--	--	--		**2.7**	**0.23**	**0.83**	**1.2**	**2.1**	**0.16**	**0.12**	**0.5**	**0.72**	**0.29**	**0.13**	**1.2**	**0.5**
Aroclor 1254	mg/kg	--	--	--	--	--		0.01 U	0.01 U	**0.48**	**0.56**	**0.7**	**0.03**	**0.05**	0.01 U	**0.24**	**0.19**	**0.3**	**0.49**	0.05 U
Aroclor 1260	mg/kg	--	--	--	--	--		**0.12**	**0.05**	**0.04**	**0.22**	**0.07**	**0.01**	**0.02**	**0.07**	**0.1**	**0.07**	**0.07**	**0.08**	**0.08**
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--		**2.8**	**0.28**	**1.4**	**2**	**2.9**	**0.2**	**0.19**	**0.57**	**1.1**	**0.55**	**0.5**	**1.8**	**0.58**
Total Petroleum Hydrocarbons																			
F2 (C10-C16 Hydrocarbons)	mg/kg	--	--	--	--	--		na	na	na	na	na	na	na	na	na	na	na	na	na
F3 (C16-C34 Hydrocarbons)	mg/kg	--	--	--	--	--		na	na	na	na	na	na	na	na	na	na	na	na	na
F4 (C34-C50 Hydrocarbons)	mg/kg	--	--	--	--	--		na	na	na	na	na	na	na	na	na	na	na	na	na
F4G-SG (Heavy Hydrocarbons-Grav.)	mg/kg	--	--	--	--	--		na	na	na	na	na	na	na	na	na	na	na	na	na
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--		na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

						Location ID	SB17	SB17	SB17	SB21	SB22	SB22	SB22	SB22	SB23	SB28	SB33	SB56	SB58
						Sample Depth	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm
						Sample Type	FD	FD	N	N	FD	FD	FD	N	N	N	N	N	FD
						Sample Description	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
						Year	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	BDA	BDA
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Ammonia-Nitrogen	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Cyanide + Thiocyanate	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Fluoride, Leachable	mg/L	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	**31**	**28**	**30**	**20**	**24**	**26**	**25**	**25**	**20**	**22**	**22**	**19**	**20**
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
pH	pH Units	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Phosphorus	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Saturation	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SOC	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Soluble Conductivity	µS/cm	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	**0.6**	**0.85**	**0.84**	**0.86**	**1.12**	**5.77**	**1.69**	**2.86**	**1.28**	**0.58**	**2.22**	**0.12**	**0.13**
Total solids	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	na	na	**0.8**	**0.5**	na	na	na	**1.2**	**0.6**	**0.5**	**1.4**	**0.7**	na
Gravel (2mm-26mm)	%	--	--	--	--	--	na	na	0	**13**	na	na	na	0	0	0	**20.3**	**4.9**	na
Sand (63µm-2mm)	%	--	--	--	--	--	na	na	**92.7**	**80.9**	na	na	na	**87.6**	**96.3**	**96.6**	**73.2**	**89.9**	na
Sand, Coarse	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sand, Fine	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sand, Medium	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Silt (2um-63um)	%	--	--	--	--	--	na	na	**6.4**	**5.6**	na	na	na	**11.2**	**3.1**	**2.9**	**5.1**	**4.6**	na
Metal																			
Aluminum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Antimony	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	na	na	na
Barium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Beryllium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Bismuth	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	na	na	na
Calcium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	na	na	na
Cobalt	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	na	na	na
Iron	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	na	na	na
Lithium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Magnesium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Manganese	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

						Location ID	SB17	SB17	SB17	SB21	SB22	SB22	SB22	SB22	SB23	SB28	SB33	SB56	SB58
						Sample Depth	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm
						Sample Type	FD	FD	N	N	FD	FD	FD	N	N	N	N	N	FD
						Sample Description	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
						Year	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	BDA	BDA
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	0.01 U	**0.02**	**0.01**	**0.04**	na	na	na	na	na	**0.04**	na	0.01 U	0.01 U
Molybdenum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Potassium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Selenium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Silver	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sodium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Strontium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Thallium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Tin	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Titanium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Uranium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Vanadium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	na	na	na
Zirconium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Metal - AVS/SEM																			
Cadmium	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sulfide	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SEM-AVS	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	**0.1**	0.07 U	**0.0717**	**0.55**	1 U	2 U	2 U	2 U	0.2 U	**0.09**	2 U	0.06 U	0.01 U
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**0.88**	**0.71**	**0.8**	**5**	**4.4**	**4.6**	**3.4**	**4.13**	**0.64**	**0.95**	**6.3**	**0.2**	**0.01**
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.08 U	0.07 U	0.08 U	0.2 U	1 U	2 U	2 U	2 U	0.2 U	0.07 U	2 U	0.06 U	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**2.6**	**1.6**	**2.03**	**6.4**	**10**	**34**	**8.4**	**17.5**	**1.3**	**2**	**9.3**	**0.5**	**0.03**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**7.5**	**6.2**	**7.03**	**28**	**26**	**42**	**30**	**32.7**	**5.5**	**8.6**	**47**	**2.1**	**0.14**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**8.9**	**6.7**	**8.2**	**37**	**42**	**50**	**39**	**43.7**	**7.8**	**12**	**59**	**2.6**	**0.19**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**8.6**	**6.4**	**7.57**	**31**	**35**	**43**	**35**	**37.7**	**5.8**	**9.9**	**49**	**2.4**	**0.16**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**1.8**	**1.3**	**1.63**	**5.9**	**6.3**	**8.5**	**6.8**	**7.2**	**1.4**	**2.3**	**11**	**0.49**	**0.04**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**15**	**11**	**12.7**	**54**	**48**	**69**	**56**	**57.7**	**9.2**	**14**	**71**	**3.6**	**0.19**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**1**	**0.62**	**0.777**	**3.3**	**3.3**	**4.1**	**2.9**	**3.43**	**0.49**	**0.76**	**4.3**	**0.18**	0.01 U
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	**0.26**	**0.13**	**0.19**	**2.1**	**1.7**	2 U	2 U	2 U	0.2 U	**0.27**	**2.4**	0.06 U	0.01 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**9**	**5.8**	**7.03**	**31**	**25**	**35**	**26**	**28.7**	**4.9**	**6.6**	**38**	**1.7**	**0.08**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**13**	**8.9**	**10.6**	**44**	**39**	**54**	**42**	**45**	**7.7**	**12**	**61**	**2.9**	**0.16**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**68.6**	**49.4**	**58.6**	**248**	**241**	**344**	**250**	**278**	**44.7**	**69.5**	**358**	**16.7**	**1**

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

						Location ID	SB17	SB17	SB17	SB21	SB22	SB22	SB22	SB22	SB23	SB28	SB33	SB56	SB58
						Sample Depth	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm
						Sample Type	FD	FD	N	N	FD	FD	FD	N	N	N	N	N	FD
						Sample Description	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
						Year	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	BDA	BDA
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	0.08 U	0.07 U	0.08 U	0.2 U	1 U	2 U	2 U	2 U	0.2 U	0.07 U	2 U	0.06 U	0.01 U
1-Methylnaphthalene	mg/kg	--	--	--	--	--	0.08 U	0.07 U	0.08 U	**0.33**	1 U	2 U	2 U	2 U	0.2 U	0.07 U	2 U	0.06 U	0.01 U
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	0.08 U	0.07 U	0.08 U	0.2 U	1 U	2 U	2 U	2 U	0.2 U	0.07 U	2 U	0.06 U	0.01 U
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.08 U	0.07 U	0.08 U	0.2 U	1 U	2 U	2 U	2 U	0.2 U	0.07 U	2 U	0.06 U	0.01 U
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	0.2 U	0.2 U	0.2 U	0.3 U	2 U	3 U	3 U	3 U	0.3 U	0.2 U	3 U	0.2 U	0.02 U
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.2 U	0.2 U	0.2 U	0.3 U	2 U	3 U	3 U	3 U	0.3 U	0.2 U	3 U	0.2 U	0.02 U
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	**0.27**	**0.18**	**0.247**	**0.7**	1 U	2 U	2 U	2 U	0.2 U	**0.39**	2 U	**0.08**	0.01 U
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**15**	**11**	**13.3**	**64**	**69**	**85**	**67**	**73.7**	**13**	**18**	**96**	**4.3**	**0.34**
Benzo(b+j)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b+k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	**0.92**	**0.81**	**0.88**	**3.3**	**3.2**	**5.1**	**3.7**	**4**	**0.71**	**1**	**5.4**	**0.27**	**0.02**
Benzo(e)pyrene	mg/kg	--	--	--	--	--	**6.1**	**4.5**	**5.53**	**26**	**27**	**33**	**27**	**29**	**5.2**	**8.1**	**39**	**1.7**	**0.15**
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**6.5**	**4.5**	**5.93**	**25**	**30**	**32**	**29**	**30.3**	**5.7**	**9.3**	**44**	**1.9**	**0.16**
Benzo(k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	**1.9**	**1.3**	**1.8**	**5.1**	**4.9**	**6.3**	**5.9**	**5.7**	**1.1**	**2.7**	**10**	**0.51**	**0.04**
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	**0.75**	**0.48**	**0.673**	**1.6**	2 U	3 U	3 U	3 U	**0.48**	**1.2**	**3.2**	**0.21**	0.02 U
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	**2.7**	**1.7**	**2.5**	**7.1**	**6.6**	**8.1**	**8.1**	**7.6**	**1.7**	**1.7**	**14**	**0.3**	**0.06**
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	**3.4**	**2.3**	**3.03**	**10**	**12**	**13**	**12**	**12.3**	**2.3**	**5**	**19**	**0.95**	**0.07**
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**5.7**	**4.1**	**5.23**	**22**	**25**	**29**	**24**	**26**	**4.8**	**8**	**38**	**1.6**	**0.13**
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a

Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							SB17	SB17	SB17	SB21	SB22	SB22	SB22	SB22	SB23	SB28	SB33	SB56	SB58
Sample Depth							0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm
Sample Type							FD	FD	N	N	FD	FD	FD	N	N	N	N	N	FD
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	BDA	BDA
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	0.1 U	0.05 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.05 U	0.05 U	0.05 U	0.01 U
Aroclor 1242	mg/kg	--	--	--	--	--	0.1 U	0.05 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.05 U	0.05 U	0.05 U	0.01 U
Aroclor 1248	mg/kg	--	--	--	--	--	**1.4**	**0.86**	**0.92**	**3.4**	**6.8**	**3.7**	**3.8**	**4.77**	**0.37**	**0.66**	**0.96**	**0.2**	**0.04**
Aroclor 1254	mg/kg	--	--	--	--	--	**0.5**	**0.31**	**0.278**	0.01 U	0.01 U	**1.3**	**0.81**	**0.705**	**0.13**	0.05 U	**0.24**	**0.06**	0.01 U
Aroclor 1260	mg/kg	--	--	--	--	--	**0.12**	**0.08**	**0.0933**	**0.17**	**0.15**	**0.15**	**0.1**	**0.133**	**0.03**	**0.99**	**0.07**	**0.61**	**0.56**
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	**2**	**1.3**	**1.29**	**3.6**	**7**	**5.2**	**4.7**	**5.63**	**0.53**	**1.7**	**1.3**	**0.87**	**0.6**
Total Petroleum Hydrocarbons																			
F2 (C10-C16 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F3 (C16-C34 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4 (C34-C50 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4G-SG (Heavy Hydrocarbons-Grav.)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							SB58	SB58	SB58	SB60	SB61	BC_24	BC_24	BC_24	BC_24	BC_24	BC_25	BC_25	BC_25
Sample Depth							0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	FD	N	N	N	FD	N	N	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2006	2006	2006	2006	2006	2007	2007	2007	2007	2007	2007	2007	2007
Major Remediation Area							BDA	BDA	BDA	BDA	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Ammonia-Nitrogen	mg/kg	--	--	--	--	--	na	na	na	na	na	**85.8**	**87.1**	na	na	na	**50**	na	na
Cyanide + Thiocyanate	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Fluoride, Leachable	mg/L	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	**25**	**19**	**21**	**19**	**17**	na	na	na	na	na	na	na	na
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
pH	pH Units	--	--	--	--	--	na	na	na	na	na	**7.4**	**7.3**	na	na	na	**7.3**	na	na
Phosphorus	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Saturation	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SOC	%	--	--	--	--	--	na	na	na	na	na	na	**1.06**	na	na	na	**1.02**	na	na
Soluble Conductivity	µS/cm	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	**0.21**	**0.15**	**0.16**	**0.25**	**0.24**	na	**1.48**	na	na	na	**1.04**	na	na
Total solids	%	--	--	--	--	--	na	na	na	na	na	**74.7**	**78.7**	na	na	na	**72.3**	na	na
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	na	na	**0.3**	**0.6**	**0.3**	**0.3**	**0.3**	na	na	na	**0.3**	na	na
Gravel (2mm-26mm)	%	--	--	--	--	--	na	na	0	0	0	0	0	na	na	na	0	na	na
Sand (63µm-2mm)	%	--	--	--	--	--	na	na	**98.2**	**96.9**	**98.5**	na	na	na	na	na	na	na	na
Sand, Coarse	%	--	--	--	--	--	na	na	na	na	na	**33.5**	**25.1**	na	na	na	**0.2**	na	na
Sand, Fine	%	--	--	--	--	--	na	na	na	na	na	**7**	**8.1**	na	na	na	**92.7**	na	na
Sand, Medium	%	--	--	--	--	--	na	na	na	na	na	**59.3**	**65.2**	na	na	na	**8.4**	na	na
Silt (2um-63um)	%	--	--	--	--	--	na	na	**1.4**	**2.5**	**1.2**	0	**1.4**	na	na	na	0	na	na
Metal																			
Aluminum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Antimony	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	na	na	na
Barium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Beryllium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Bismuth	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	na	na	na
Calcium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	na	na	na
Cobalt	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	na	na	na
Iron	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	na	na	na
Lithium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Magnesium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Manganese	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							SB58	SB58	SB58	SB60	SB61	BC_24	BC_24	BC_24	BC_24	BC_24	BC_25	BC_25	BC_25
Sample Depth							0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	FD	N	N	N	FD	N	N	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2006	2006	2006	2006	2006	2007	2007	2007	2007	2007	2007	2007	2007
Major Remediation Area							BDA	BDA	BDA	BDA	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	0.01 U	0.01 U	0.01 U	0.01 U	**0.03**	na	na	na	na	na	na	na	na
Molybdenum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Potassium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Selenium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Silver	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sodium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Strontium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Thallium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Tin	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Titanium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Uranium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Vanadium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	na	na	na
Zirconium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Metal - AVS/SEM																			
Cadmium	µmol/g	--	--	--	--	--	na	na	na	na	na	na	0.00031 U	na	na	na	na	na	na
Copper	µmol/g	--	--	--	--	--	na	na	na	na	na	na	**0.037**	na	na	na	na	na	na
Lead	µmol/g	--	--	--	--	--	na	na	na	na	na	na	0.0034 U	na	na	na	na	na	na
Nickel	µmol/g	--	--	--	--	--	na	na	na	na	na	na	0.012 U	na	na	na	na	na	na
Zinc	µmol/g	--	--	--	--	--	na	na	na	na	na	na	**0.2**	na	na	na	na	na	na
Sulfide	µmol/g	--	--	--	--	--	na	na	na	na	na	na	0.22 U	na	na	na	na	na	na
SEM-AVS	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na U R	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	na	**0.0631**	**0.978**	**1.12**	**1.74**	**0.237**	**0.249**	**0.257**
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**0.02**	**0.03**	**0.02**	**0.06**	**0.06**	na	**0.824**	**9.26**	**9.67**	**17.9**	**1.77**	**2.12**	**2.54**
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	na	**0.0412 J**	**0.123**	**0.155**	**0.186**	**0.344**	**0.381**	**0.384**
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**0.03**	**0.05**	**0.0367**	**0.1**	**0.13**	na	**2.43**	**27**	**33.1**	**45.6**	**4.15**	**5.22**	**5.31**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**0.14**	**0.24**	**0.173**	**0.57**	**0.53**	na	**10.7**	**70.7**	**87.1 E**	**114 E**	**12.2**	**14.9**	**17.3**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**0.17**	**0.34**	**0.233**	**0.7**	**0.64**	na	**14.5**	**99.7 E**	**114 E**	**165 E**	**19.9**	**24.4**	**25.2**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**0.15**	**0.29**	**0.2**	**0.66**	**0.53**	na	**11.5**	**72.0 E**	**87.8 E**	**118 E**	**13.5**	**16.8**	**19.2**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**0.04**	**0.07**	**0.05**	**0.15**	**0.13**	na	**3.4**	**35**	**54.8 E**	**71.8 E**	**4.15**	**5.39**	**6.33**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**0.25**	**0.35**	**0.263**	**0.75**	**0.81**	na	**15.1**	**83.3**	**101**	**131 E**	**17.3**	**21.1**	**23.6**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**0.02**	**0.02**	**0.015**	**0.04**	**0.05**	na	**0.546**	**5.92**	**6.94**	**10.2**	**1.1**	**1.32**	**1.33**
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.01 U	**0.01**	**0.01**	**0.02**	**0.03**	na	**0.25**	**4.71**	**5.28**	**7.89**	**0.564**	**0.673**	**0.756**
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**0.14**	**0.16**	**0.127**	**0.36**	**0.47**	na	**4.4**	**47.8**	**57.5**	**78.3**	**10.1**	**12.8**	**12.9**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**0.2**	**0.3**	**0.22**	**0.64**	**0.67**	na	**12.2**	**76.8**	**93.4**	**122 E**	**15.8**	**19.5**	**21.7**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**1.16**	**1.86**	**1.32**	**4.05**	**4.05**	na	**76**	**533**	**652**	**883**	**101**	**125**	**137**

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							SB58	SB58	SB58	SB60	SB61	BC_24	BC_24	BC_24	BC_24	BC_24	BC_25	BC_25	BC_25
Sample Depth							0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	FD	N	N	N	FD	N	N	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2006	2006	2006	2006	2006	2007	2007	2007	2007	2007	2007	2007	2007
Major Remediation Area							BDA	BDA	BDA	BDA	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	na	na	na	na	na	na	na	na
1-Methylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	na	**0.0390 J**	**0.517**	**0.608**	**0.902**	**0.138**	**0.15**	**0.159**
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	na	na	na	na	na	na	na	na
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	na	na	na	na	na	na	na	na
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	na	na	na	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	na	na	na	na	na	na	na	na
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	0.01 U	**0.01**	0.01 U	**0.02**	**0.02**	na	na	na	na	na	na	na	na
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**0.33**	**0.57**	**0.413**	**1.2**	**1**	na	na	na	na	na	na	na	na
Benzo(b+j)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b+k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	**16.1**	**104 E**	**120 E**	**171 E**	**24.5**	**29.2**	**31.6**
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	**0.02**	**0.03**	**0.0233**	**0.06**	**0.06**	na	na	na	na	na	na	na	na
Benzo(e)pyrene	mg/kg	--	--	--	--	--	**0.14**	**0.24**	**0.177**	**0.48**	**0.43**	na	**5.4**	**36.1 E**	**42.3 E**	**59.2 E**	**9.91**	**12.3**	**12.7**
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**0.15**	**0.28**	**0.197**	**0.56**	**0.5**	na	**9.03**	**74.6 E**	**93.7 E**	**122 E**	**13.5**	**17**	**17.9**
Benzo(k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	**17.3**	**112**	**143**	**183 E**	**16.7**	**20.9**	**24**
C1-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	**10.9 E**	**68.0 E**	**86.0 E**	**112 E**	**12.6 E**	**15.7 E**	**15.7 E**
C1-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	**0.452**	**2.83**	**3.26**	**4.72**	**1.43**	**1.65**	**1.76**
C1-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	**2.32**	**17.9**	**22.2**	**29.9**	**3.93**	**4.46**	**5.32**
C2-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	**7.34**	**40.2**	**51.8**	**65.6**	**6.59**	**8.6**	**8.73**
C2-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	**1.45**	**3.56**	**3.93**	**5.86**	**1.36**	**1.4**	**1.63**
C2-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	**0.18**	**1.25**	**1.37**	**2.21**	**1.19**	**1.3**	**1.6**
C2-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	**4.84**	**25.2 E**	**30.6 E**	**42.3 E**	**6.2**	**6.82**	**8.2**
C3-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	**7.23**	**37.9**	**43**	**60.5**	ND	ND	ND
C3-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	ND	ND	ND	ND	ND	ND	ND
C3-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	**0.215**	**0.724**	**0.753**	**1.17**	**2.12**	**2.17**	**2.21**
C3-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	**3.44**	**9.77**	**11.6**	**15.7**	**2.16**	**2.42**	**2.72**
C4-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	ND	ND	ND	ND	ND	ND	ND
C4-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	**0.358 J**	**0.575**	**0.607**	**0.785**	**1.82**	**2.31**	**2.53**
C4-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	**0.456**	**2.85**	**3.62**	**4.75**	ND	ND	ND
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	**0.04**	**0.08**	**0.0533**	**0.18**	**0.16**	na	na	na	na	na	na	na	na
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	0.02 U	**0.03**	**0.03**	**0.06**	**0.06**	na	na	na	na	na	na	na	na
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	**0.05**	**0.05**	**0.05**	**0.1**	**0.08**	na	na	na	na	na	na	na	na
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	**0.07**	**0.15**	**0.0967**	**0.31**	**0.27**	na	na	na	na	na	na	na	na
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**0.12**	**0.24**	**0.163**	**0.49**	**0.43**	na	**22.6 E**	**195 E**	**246 E**	**323 E**	**36.0 E**	**45.7 E**	**49.0 E**
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	**4.76**	**36.2 E**	**48.4 E**	**56.3 E**	**6.08**	**7.76**	**8.13**

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							SB58	SB58	SB58	SB60	SB61	BC_24	BC_24	BC_24	BC_24	BC_24	BC_25	BC_25	BC_25
Sample Depth							0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	FD	N	N	N	FD	N	N	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2006	2006	2006	2006	2006	2007	2007	2007	2007	2007	2007	2007	2007
Major Remediation Area							BDA	BDA	BDA	BDA	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	na	na	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	**0.03**	**0.03**	**0.0333**	**0.09**	**0.04**	na	na	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	na	na	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	**0.27**	**0.19**	**0.34**	**0.03**	**0.09**	na	na	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	**0.3**	**0.22**	**0.373**	**0.12**	**0.13**	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																			
F2 (C10-C16 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F3 (C16-C34 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4 (C34-C50 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4G-SG (Heavy Hydrocarbons-Grav.)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							BC_25	BC_26	BC_26	BC_26	BC_26	BC_27	BC_27	BC_27	BC_27	BC_28	BC_28	BC_28	BC_28
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
Major Remediation Area							ADM	BDA	BDA	BDA	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Ammonia-Nitrogen	mg/kg	--	--	--	--	--	na	**25.1**	na	na	na	**32.3**	na	na	na	**43.8**	na	na	na
Cyanide + Thiocyanate	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Fluoride, Leachable	mg/L	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
pH	pH Units	--	--	--	--	--	na	**7.6**	na	na	na	**7.4**	na	na	na	**7.6**	na	na	na
Phosphorus	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Saturation	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SOC	%	--	--	--	--	--	na	**0.0499**	na	na	na	**0.189**	na	na	na	**0.923**	na	na	na
Soluble Conductivity	µS/cm	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	na	**0.125**	na	na	na	**0.446**	na	na	na	**1.56**	na	na	na
Total solids	%	--	--	--	--	--	na	**67.5**	na	na	na	**68.2**	na	na	na	**61**	na	na	na
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	na	**0.3**	na	na	na	**0.3**	na	na	na	**16.7**	na	na	na
Gravel (2mm-26mm)	%	--	--	--	--	--	na	0	na	na	na	0	na	na	na	0	na	na	na
Sand (63µm-2mm)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sand, Coarse	%	--	--	--	--	--	na	**0.2**	na	na	na	**0.1**	na	na	na	**2.4**	na	na	na
Sand, Fine	%	--	--	--	--	--	na	**89.5**	na	na	na	**90.9**	na	na	na	**53.6**	na	na	na
Sand, Medium	%	--	--	--	--	--	na	**12.9**	na	na	na	**8.7**	na	na	na	**13.1**	na	na	na
Silt (2um-63um)	%	--	--	--	--	--	na	0	na	na	na	0	na	na	na	**14.1**	na	na	na
Metal																			
Aluminum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Antimony	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	na	na	na
Barium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Beryllium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Bismuth	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	na	na	na
Calcium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	na	na	na
Cobalt	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	na	na	na
Iron	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	na	na	na
Lithium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Magnesium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Manganese	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							BC_25	BC_26	BC_26	BC_26	BC_26	BC_27	BC_27	BC_27	BC_27	BC_28	BC_28	BC_28	BC_28
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
Major Remediation Area							ADM	BDA	BDA	BDA	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na	na	na	na	na
Molybdenum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Potassium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Selenium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Silver	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sodium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Strontium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Thallium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Tin	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Titanium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Uranium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Vanadium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	na	na	na
Zirconium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Metal - AVS/SEM																			
Cadmium	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sulfide	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SEM-AVS	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	**0.35**	**0.0825**	**0.0835**	**0.0846**	**0.0928**	**0.0456 J**	**0.0495**	**0.0624**	**0.0633**	**0.499**	**0.578**	**1.11**	**3.12**
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**2.73**	**0.204**	**0.273**	**0.353**	**0.382**	**0.476**	**0.491**	**0.492**	**0.559**	**3.31**	**4.91**	**7.19**	**18.2**
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	**0.393**	**0.348**	**0.357**	**0.359**	**0.36**	**0.00955 J**	**0.0117 J**	**0.0128 J**	**0.0129 J**	**0.0593 J**	**0.0626 J**	**0.0815 J**	**0.141**
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**7.43**	**0.0238 J**	**0.0368 J**	**0.0511 J**	**0.102 J**	**1.21**	**1.38**	**1.48**	**1.51**	**9.54**	**14.3**	**20.9**	**51.5**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**18.5**	**0.0250 J**	**0.0486 J**	**0.0658 J**	**0.226**	**2.85**	**3.46**	**3.89**	**3.96**	**33**	**47.2**	**62.1**	**137 E**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**31.1**	**0.0475**	**0.0736**	**0.0971**	**0.311**	**4.73**	**5.61**	**6.4**	**6.48**	**48.0 E**	**74.3 E**	**83**	**167 E**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**20.1**	**0.0312 J**	**0.0576 J**	**0.0708**	**0.268**	**3.32**	**4.11**	**4.39**	**4.43**	**33.4**	**47.8**	**63.1**	**136 E**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**6.33**	**0.0588**	ND	ND	ND	**0.688**	**0.931**	**1.04**	**1.05**	**8.43**	**14.4**	**19.2**	**46.3 E**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**27.4**	**0.0834 J**	**0.132**	**0.157**	**0.425**	**5.29**	**5.56**	**6.18**	**6.23**	**45.7**	**65.6**	**85.7**	**190 E**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**1.85**	**0.108**	**0.109**	**0.112**	**0.148**	**0.257**	**0.315**	**0.333**	**0.347**	**2.25**	**3.26**	**5.98**	**16.7**
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	**0.859**	**0.0703 J**	**0.0742 J**	**0.0756 J**	**0.0952 J**	**0.161**	**0.164**	**0.232**	**0.29**	**2.56**	**2.87**	**4.29**	**10.7**
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**18.8**	**0.322**	**0.366**	**0.405**	**0.536**	**2.76**	**3.17**	**3.41**	**3.5**	**21.6**	**33**	**49.9**	**128**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**24.4**	**0.0514 J**	**0.0975**	**0.105**	**0.33**	**4.51**	**4.9**	**5.43**	**5.49**	**41.8**	**61.4**	**77.9**	**172 E**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**160**	**1.4**	**1.64**	**1.88**	**3.22**	**26.2**	**30.1**	**33.3**	**33.9**	**250**	**370**	**480**	**1080**

Table 3-2a

Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

						Location ID	BC_25	BC_26	BC_26	BC_26	BC_26	BC_27	BC_27	BC_27	BC_27	BC_28	BC_28	BC_28	BC_28
						Sample Depth	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
						Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N
						Sample Description	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
						Year	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
						Major Remediation Area	ADM	BDA	BDA	BDA	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
1-Methylnaphthalene	mg/kg	--	--	--	--	--	0.204	0.0520 J	0.0530 J	0.0539 J	0.0578 J	0.0312 J	0.0332 J	0.0413 J	0.0450 J	0.3	0.337	0.654	1.82
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
3-Methylcholanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b+j)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b+k)fluoranthene	mg/kg	--	--	--	--	--	37.5	0.0680 J	0.106	0.139	0.412	5.44	6.39	7.13	7.14	52.8	76.6	90.6	181 E
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(e)pyrene	mg/kg	--	--	--	--	--	15.4	0.0262	0.0399	0.0517	0.154	1.87	2.2	2.43	2.46	18.1 E	26.3 E	30.9 E	61.3 E
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	22.4 E	0.0284	0.0406	0.0557	0.169	2.99	3.59	4.12	4.17	33.0 E	56.2 E	61.2 E	129 E
Benzo(k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Chrysenes	mg/kg	--	--	--	--	--	26.1	0.0842 J	0.123 J	0.21	0.368	3.75	4.8	5.39	5.59	45.2	64.8	95.1	226 E
C1-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	22.0 E	0.0732	0.102	0.108	0.334	3.01	3.66	3.94	3.97	28.6 E	39.6 E	68.2 E	177 E
C1-Fluorenes	mg/kg	--	--	--	--	--	2.44	0.678	0.689	0.701	0.721	0.241	0.275	0.282	0.294	1.49	2	3.78	10.5 E
C1-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	7.11	0.587	0.595	0.61	0.707	1.24	1.41	1.5	1.59	7.84	10.3	20.9	58.6 E
C2-Chrysenes	mg/kg	--	--	--	--	--	10.9	ND	ND	ND	ND	1.55	2.02	2.25	2.35	15.6	21.1	35.7	90.9
C2-Fluorenes	mg/kg	--	--	--	--	--	2.04	0.798	0.862	0.908	0.964	0.383	0.422	0.429	0.443	1.56	2.38	4.32	12
C2-Naphthalenes	mg/kg	--	--	--	--	--	1.61	0.574	0.596	0.606	0.981	0.124	0.152	0.168	0.184	0.663	0.899	1.59	4.33
C2-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	10.1	1.05	1.07	1.18	1.31	2.45	2.87	2.98	3.25	11.6 E	14.9 E	29	78.8 E
C3-Chrysenes	mg/kg	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.97E-07	3.85E-07	3.94E-07	4.19E-07
C3-Fluorenes	mg/kg	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3-Naphthalenes	mg/kg	--	--	--	--	--	2.33	1.73	1.74	1.75	1.77	0.135	0.136	0.162	0.176	0.776	0.788	1.2	2.65
C3-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	3.9	0.373 J	0.441 J	0.471 J	0.527 J	0.673 J	0.817 J	0.87	0.981	3.97	5.31	9.67	25.8
C4-Chrysenes	mg/kg	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4-Naphthalenes	mg/kg	--	--	--	--	--	2.65	1.4	ND	ND	ND	0.174 J	0.207 J	0.223 J	0.250 J	0.279 J	0.582	0.847	1.88
C4-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.28	1.66	3.24	8.83
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	56.3 E	0.0503	0.0659	0.108	0.335	5.6	7.28	8.30 E	8.33 E	66.7 E	118 E	133 E	294 E
Perylene	mg/kg	--	--	--	--	--	9.89	0.0118 J	0.0214 J	0.026	0.0884	1.35	1.65	1.83	1.83	15.9	25.2 E	30.1	65.7 E

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							BC_25	BC_26	BC_26	BC_26	BC_26	BC_27	BC_27	BC_27	BC_27	BC_28	BC_28	BC_28	BC_28
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
Major Remediation Area							ADM	BDA	BDA	BDA	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																			
F2 (C10-C16 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F3 (C16-C34 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4 (C34-C50 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4G-SG (Heavy Hydrocarbons-Grav.)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							**BC_29**	**BC_29**	**BC_29**	**BC_29**	**BC_30**	**BC_30**	**BC_30**	**BC_30**	**BC_31**	**BC_31**	**BC_31**	**BC_31**	**BC_32**
Sample Depth							**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**
Sample Type							**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Sample Description							**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
Year							**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**
Major Remediation Area							**BDA**	**BDA**	**BDA**	**BDA**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Ammonia-Nitrogen	mg/kg	--	--	--	--	--	**17.8**	na	na	na	**30.4**	na	na	na	**62.8**	na	na	na	**38.4**
Cyanide + Thiocyanate	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Fluoride, Leachable	mg/L	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
pH	pH Units	--	--	--	--	--	**7.4**	na	na	na	**8.1**	na	na	na	**7.4**	na	na	na	**7.5**
Phosphorus	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Saturation	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SOC	%	--	--	--	--	--	**0.193**	na	na	na	**0.46**	na	na	na	**1.91**	na	na	na	**0.243**
Soluble Conductivity	µS/cm	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	**0.289**	na	na	na	**0.788**	na	na	na	**2.6**	na	na	na	**0.421**
Total solids	%	--	--	--	--	--	**73.9**	na	na	na	**96.1**	na	na	na	**57.8**	na	na	na	**63.1**
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	**0.3**	na	na	na	**0.3**	na	na	na	**1**	na	na	na	**0.9**
Gravel (2mm-26mm)	%	--	--	--	--	--	0	na	na	na	0	na	na	na	0	na	na	na	0
Sand (63µm-2mm)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sand, Coarse	%	--	--	--	--	--	**2.3**	na	na	na	**10.7**	na	na	na	**2.1**	na	na	na	**0.2**
Sand, Fine	%	--	--	--	--	--	**70.7**	na	na	na	**16.6**	na	na	na	**74**	na	na	na	**94.6**
Sand, Medium	%	--	--	--	--	--	**26.6**	na	na	na	**63.1**	na	na	na	**6.5**	na	na	na	**2.4**
Silt (2um-63um)	%	--	--	--	--	--	**0.1**	na	na	na	**9.3**	na	na	na	**16.4**	na	na	na	**2**
Metal																			
Aluminum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Antimony	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	na	na	na
Barium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Beryllium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Bismuth	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	na	na	na
Calcium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	na	na	na
Cobalt	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	na	na	na
Iron	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	na	na	na
Lithium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Magnesium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Manganese	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							BC_29	BC_29	BC_29	BC_29	BC_30	BC_30	BC_30	BC_30	BC_31	BC_31	BC_31	BC_31	BC_32
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
Major Remediation Area							BDA	BDA	BDA	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na	na	na	na	na
Molybdenum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Potassium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Selenium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Silver	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sodium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Strontium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Thallium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Tin	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Titanium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Uranium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Vanadium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	na	na	na
Zirconium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Metal - AVS/SEM																			
Cadmium	µmol/g	--	--	--	--	--	na	na	na	na	0.0003 U	na	na	na	na	na	na	na	na
Copper	µmol/g	--	--	--	--	--	na	na	na	na	**0.036**	na	na	na	na	na	na	na	na
Lead	µmol/g	--	--	--	--	--	na	na	na	na	**0.005**	na	na	na	na	na	na	na	na
Nickel	µmol/g	--	--	--	--	--	na	na	na	na	**0.017**	na	na	na	na	na	na	na	na
Zinc	µmol/g	--	--	--	--	--	na	na	na	na	**0.16**	na	na	na	na	na	na	na	na
Sulfide	µmol/g	--	--	--	--	--	na	na	na	na	0.21 U	na	na	na	na	na	na	na	na
SEM-AVS	µmol/g	--	--	--	--	--	na	na	na	na	na U R	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	ND	ND	ND	ND	**0.0283 J**	**0.0767**	**0.55**	**0.574**	**0.821**	**0.921**	**0.521**	**0.649**	**0.189**
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**0.0313 J**	**0.0317 J**	**0.0474 J**	**0.165**	**0.412**	**1.08**	**5.03**	**6.68**	**7.11**	**8.32**	**9.29**	**5.44**	**1**
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	ND	ND	ND	ND	**0.00766 J**	**0.0146 J**	**0.0500 J**	**0.0560 J**	**0.117**	**0.133**	**0.135**	**0.15**	**0.364**
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**0.0482 J**	**0.0557 J**	**0.0911 J**	**0.18**	**0.745**	**1.86**	**11.4**	**17.4**	**14.7**	**24.9**	**28.4**	**30.9**	**1.37**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**0.178**	**0.225**	**0.322**	**0.744**	**2.73**	**8.62**	**40.7**	**52.2**	**52.8**	**65.4**	**72.6 E**	**82.6 E**	**3.94**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**0.27**	**0.412**	**0.507**	**1.31**	**5.03**	**17**	**69.2 E**	**103 E**	**73.5 E**	**83.7 E**	**96.1 E**	**109 E**	**5.93**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**0.218**	**0.29**	**0.368**	**0.865**	**3.24**	**9.2**	**42.7**	**52.9**	**58**	**69.7 E**	**77.7 E**	**84.1 E**	**4.36**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**0.047**	**0.0602**	**0.077**	**0.218**	**0.833**	**3.32**	**13.8**	**22.3 E**	**14.4**	**17.9**	**21.0 E**	**24.1 E**	**1.14**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**0.318**	**0.326**	**0.676**	**0.996**	**4.14**	**11.2**	**50.8**	**65.4**	**71.8**	**95.9**	**101 E**	**111 E**	**5.95**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**0.0238 J**	**0.0261 J**	**0.0302 J**	**0.0619 J**	**0.211**	**0.51**	**2.97**	**3.97**	**6.78**	**3.27**	**5.3**	**6.49**	**0.386**
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	ND	ND	ND	ND	**0.114**	**0.369**	**1.8**	**2.23**	**2.03**	**2.37**	**3.01**	**1.71**	**0.292**
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**0.201**	**0.237**	**0.265**	**0.576**	**2.15**	**5.47**	**26.2**	**37.1**	**32.8**	**50.8**	**57.8**	**64.3**	**3.6**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**0.26**	**0.306**	**0.518**	**0.92**	**3.74**	**10.1**	**46.9**	**59.9**	**62.7**	**82.3**	**89.7 E**	**101 E**	**5.12**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**1.53**	**1.92**	**2.85**	**6**	**23.3**	**68.7**	**312**	**423**	**397**	**506**	**563**	**621**	**33.6**

Table 3-2a

Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

						Location ID	BC_29	BC_29	BC_29	BC_29	BC_30	BC_30	BC_30	BC_30	BC_31	BC_31	BC_31	BC_31	BC_32
						Sample Depth	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
						Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N
						Sample Description	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
						Year	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
						Major Remediation Area	BDA	BDA	BDA	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
1-Methylnaphthalene	mg/kg	--	--	--	--	--	0.00444 J	0.00484 J	0.00525 J	0.00690 J	0.0156 J	0.0414 J	0.307	0.313	0.534	0.3	0.389	0.47	0.0829
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
3-Methylcholanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b+j)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b+k)fluoranthene	mg/kg	--	--	--	--	--	0.41	0.727	0.758	1.82	6.65	21.8	88.6 E	134 E	120 E	85.2 E	96.2 E	107 E	7.64
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(e)pyrene	mg/kg	--	--	--	--	--	0.164	0.312	0.349	0.752	2.79	9.01	36.2 E	53.4 E	36.4 E	40.2 E	29.2 E	31.9 E	4.6
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	0.172	0.289	0.319	0.934	3.51	14.2	49.3 E	69.0 E	59.3 E	69.6 E	81.4 E	50.8 E	4.91
Benzo(k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Chrysenes	mg/kg	--	--	--	--	--	0.26	0.269	0.391	1.09	3.85	9.63	48.3	74.5	72.6	98.2	108	121	5.35
C1-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	0.18	0.207	0.33	0.829	2.68	5.93	30.5 E	50.3 E	46.7 E	68.3 E	73.8 E	81.3 E	3.98
C1-Fluorenes	mg/kg	--	--	--	--	--	0.0613	0.0694	0.0731	0.0981	0.178	0.244	1.15	1.88	2.16	3.84	4.31	4.84	0.95
C1-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	0.0913	0.13	0.131	0.292	0.757	1.4	6.8	13.2	13.4	23.8	26.0 E	29.7	1.83
C2-Chrysenes	mg/kg	--	--	--	--	--	0.245 J	0.245 J	0.298	0.674	1.58	2.75	15.1	25.7	43.9	24.5	34.2	40.1	2.26
C2-Fluorenes	mg/kg	--	--	--	--	--	ND	ND	ND	ND	2.22	ND	ND	ND	6.13	7.31	2.7	5.87	1.56
C2-Naphthalenes	mg/kg	--	--	--	--	--	0.0273 J	0.0294 J	0.0347 J	0.0516 J	0.0765	0.126	0.681	0.905	1.45	1.83	1.99	0.975	1.18
C2-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	0.698	0.708	0.712	1.04	1.5	2.1	9.06	17.2 E	21.5 E	38.2 E	40.1 E	46.1 E	3.08
C3-Chrysenes	mg/kg	--	--	--	--	--	ND	ND	ND	ND	14.5	ND	ND	ND	0.00000036	3.71E-07	3.94E-07	3.94E-07	ND
C3-Fluorenes	mg/kg	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3-Naphthalenes	mg/kg	--	--	--	--	--	ND	ND	ND	ND	0.612	ND	ND	ND	0.938	1.31	1.46	1.6	1.68
C3-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	0.105 J	0.130 J	0.136 J	0.261 J	0.503 J	0.742 J	3.45	6.75	16.3	8.19	13.1	14	1.12
C4-Chrysenes	mg/kg	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4-Naphthalenes	mg/kg	--	--	--	--	--	ND	ND	ND	ND	0.437	ND	ND	ND	1.45	1.53	1.7	1.11	2.28
C4-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	ND	ND	ND	ND	2.06	ND	ND	ND	2.14	3.44	3.98	4.49	ND
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	0.295	0.5	0.522	1.95	6.55	26.4 E	103 E	151 E	152 E	180 E	107 E	129 E	12.7 E
Perylene	mg/kg	--	--	--	--	--	0.0809	0.13	0.148	0.383	1.54	5.51	24.2 E	28.1 E	26.9 E	26.9 E	34.5 E	41.0 E	1.88

Table 3-2a

Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							BC_29	BC_29	BC_29	BC_29	BC_30	BC_30	BC_30	BC_30	BC_31	BC_31	BC_31	BC_31	BC_32
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
Major Remediation Area							BDA	BDA	BDA	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																			
F2 (C10-C16 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F3 (C16-C34 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4 (C34-C50 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4G-SG (Heavy Hydrocarbons-Grav.)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							BC_32	BC_32	BC_32	BC_33	BC_33	BC_33	BC_33	BC_34	BC_34	BC_34	BC_34	BC_35	BC_35
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Ammonia-Nitrogen	mg/kg	--	--	--	--	--	na	na	na	**19.4**	na	na	na	**31.2**	na	na	na	**29.3**	na
Cyanide + Thiocyanate	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Fluoride, Leachable	mg/L	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
pH	pH Units	--	--	--	--	--	na	na	na	**7.5**	na	na	na	**7.3**	na	na	na	**7.4**	na
Phosphorus	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Saturation	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SOC	%	--	--	--	--	--	na	na	na	**0.539**	na	na	na	**1.22**	na	na	na	**0.564**	na
Soluble Conductivity	µS/cm	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	na	na	na	**2.57**	na	na	na	**1.59**	na	na	na	**0.585**	na
Total solids	%	--	--	--	--	--	na	na	na	**71.8**	na	na	na	**67.1**	na	na	na	**74.7**	na
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	na	na	na	**0.8**	na	na	na	**1.7**	na	na	na	**2.3**	na
Gravel (2mm-26mm)	%	--	--	--	--	--	na	na	na	**0.4**	na	na	na	0	na	na	na	0	na
Sand (63µm-2mm)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sand, Coarse	%	--	--	--	--	--	na	na	na	**26.5**	na	na	na	**1.7**	na	na	na	**11.4**	na
Sand, Fine	%	--	--	--	--	--	na	na	na	**26.4**	na	na	na	**65.3**	na	na	na	**46.1**	na
Sand, Medium	%	--	--	--	--	--	na	na	na	**47**	na	na	na	**21.1**	na	na	na	**40.3**	na
Silt (2um-63um)	%	--	--	--	--	--	na	na	na	0	na	na	na	**10.3**	na	na	na	0	na
Metal																			
Aluminum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Antimony	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	na	na	na
Barium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Beryllium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Bismuth	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	na	na	na
Calcium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	na	na	na
Cobalt	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	na	na	na
Iron	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	na	na	na
Lithium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Magnesium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Manganese	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							BC_32	BC_32	BC_32	BC_33	BC_33	BC_33	BC_33	BC_34	BC_34	BC_34	BC_34	BC_35	BC_35
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na	na	na	na	na
Molybdenum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Potassium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Selenium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Silver	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sodium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Strontium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Thallium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Tin	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Titanium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Uranium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Vanadium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	na	na	na
Zirconium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Metal - AVS/SEM																			
Cadmium	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sulfide	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SEM-AVS	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	**0.134**	**0.136**	**0.186**	**0.561**	**1.67**	**2.43**	**6.11**	**0.142**	**0.185**	**0.213**	**0.276**	**0.0639**	**0.0669**
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**1.11**	**0.584**	**0.648**	**40.8**	**3.42**	**8.25**	**17.3**	**1.22**	**1.81**	**1.87**	**2.04**	**0.461**	**0.596**
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	**0.367**	**0.367**	**0.344**	**0.128**	**0.272**	**0.0436 J**	**0.0712 J**	**0.0743 J**	**0.0496 J**	**0.0600 J**	**0.0622 J**	**0.0105 J**	**0.0239 J**
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**1.42**	**2.89**	**3.04**	**28**	**49.2**	**113 E**	**9.71**	**5.19**	**5.25**	**3.39**	**4.82**	**1.45**	**1.48**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**4.04**	**6**	**7.22**	**25.1**	**55.9**	**85.6 E**	**129 E**	**20.5**	**21.5**	**23.8**	**15.1**	**15.5**	**4.78**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**6.3**	**8.12**	**9.92**	**33.7**	**79.4 E**	**119 E**	**165 E**	**26.8**	**41**	**44.1**	**50.8 E**	**12.6**	**23.4**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**4.48**	**6.39**	**7.77**	**59.1**	**84.6 E**	**126 E**	**27.1**	**24**	**17**	**21.8**	**23.3**	**5.14**	**5.22**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**1.18**	**1.61**	**1.85**	**6.53**	**18**	**26.3 E**	**37.0 E**	**5.32**	**5.98**	**3.37**	**4.84**	**1.23**	**1.25**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**6.14**	**10.7**	**11.5**	**42.6**	**82.3**	**126 E**	**210 E**	**28.8**	**29.1**	**29.7**	**20.9**	**21.6**	**6.7**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**0.42**	**0.753**	**0.863**	**2.66**	**6.9**	**14**	**37.6**	**0.772**	**1.09**	**1.29**	**1.34**	**0.775**	**1.77**
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	**0.358**	**0.215**	**0.27**	**25.2**	**2.57**	**7.08**	**10.1**	**0.596**	**0.823**	**0.904**	**1.15**	**0.189**	**0.355**
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**3.82**	**7.61**	**7.7**	**53**	**89.6**	**191 E**	**26.3**	**13.8**	**8.68**	**11.8**	**13.2**	**3.25**	**3.34**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**5.41**	**9.15**	**9.99**	**36.1**	**72.9**	**117 E**	**192 E**	**26.3**	**26.7**	**18.2**	**25.4**	**5.9**	**5.91**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**35.1**	**54.5**	**61.2**	**353**	**547**	**935**	**868**	**153**	**159**	**160**	**163**	**68.2**	**54.8**

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

						Location ID	BC_32	BC_32	BC_32	BC_33	BC_33	BC_33	BC_33	BC_34	BC_34	BC_34	BC_34	BC_35	BC_35
						Sample Depth	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
						Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N
						Sample Description	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
						Year	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
1-Methylnaphthalene	mg/kg	--	--	--	--	--	0.0882	0.115	0.12	0.336	0.937	1.36	3.43	0.0955	0.103	0.144	0.156	0.0403 J	0.0915
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
3-Methylcholanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b+j)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b+k)fluoranthene	mg/kg	--	--	--	--	--	7.8	10.1	12.5	37.8	85.3 E	123 E	179 E	33.7	47.7	51.5	55.3	8.45	13.9
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(e)pyrene	mg/kg	--	--	--	--	--	2.9	2.98	3.73	12.5	28.3 E	40.3 E	59.5 E	11.6	16.8 E	18.3 E	19.6 E	2.77	2.83
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	5.74	3.65	4.02	109 E	21.5 E	53.1 E	75.5 E	13.7	19.8	22.1 E	24.3 E	4.61	4.75
Benzo(k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Chrysenes	mg/kg	--	--	--	--	--	8.48	9.91	5.26	125 E	198 E	37.2	88.2	20.1	27	29.1	29.7	6.72	7.46
C1-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	4.17	7.55	8.55	65.0 E	97.5 E	176 E	29.6 E	18.0 E	12.5 E	16.1 E	16.6 E	4.33	4.66
C1-Fluorenes	mg/kg	--	--	--	--	--	1.01	1.23	1.37	2.02	4.34	6.56	14.6 E	0.977	1.01	0.613	0.685	0.259	0.278
C1-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	1.86	3.68	3.92	9.92	20	30.9	63.8 E	3.98	4.86	4.88	3.27	4.26	1.34
C2-Chrysenes	mg/kg	--	--	--	--	--	2.28	3.77	4.3	13.7	34.7	39.6	56.4	5.65	8.28	8.48	9.07	4.85	8.23
C2-Fluorenes	mg/kg	--	--	--	--	--	1.09	1.18	1.38	1.92	3.84	6.21	13	0.71	0.967	1.27	1.38	0.44	0.588
C2-Naphthalenes	mg/kg	--	--	--	--	--	1.33	1.09	1.18	7.67	0.879	1.96	3.11	0.367	0.372	0.483	0.58	0.167	0.183
C2-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	5.45	6.17	2.96	37.5 E	68.2 E	13.5 E	26.9 E	5.78	6.75	7.85	8.02 E	2.78	2.83
C3-Chrysenes	mg/kg	--	--	--	--	--	ND	ND	ND	4.64E-07	5.03E-07	5.27E-07	4.11E-07	0.00000049	4.03E-07	4.59E-07	4.87E-07	6.36E-08	7.25E-08
C3-Fluorenes	mg/kg	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3-Naphthalenes	mg/kg	--	--	--	--	--	1.8	1.82	1.96	0.596	1.13	1.73	3.86	0.547	0.694	0.734	0.462	0.343	0.146
C3-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	1.21	1.91	2.03	4.99	9.85	12.8	21.6	2.02	2.26	2.75	2.77	1.46	2.26
C4-Chrysenes	mg/kg	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4-Naphthalenes	mg/kg	--	--	--	--	--	2.45	2.13	2.24	3.52E-07	2.98E-07	3.22E-07	3.23E-07	0.721	0.739	0.961	1.08	0.141 J	0.173 J
C4-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	ND	ND	ND	3.72	6.62	1.06	2.77	0.426	0.563	0.774	0.829	0.292	0.301
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	7.87	8.61 E	10.9 E	46.2 E	120 E	180 E	245 E	26.3 E	39.4 E	42.9 E	49.8 E	9.63 E	17.3 E
Perylene	mg/kg	--	--	--	--	--	2.38	2.89	1.7	37.5 E	48.9 E	10.3	25.8 E	7.46	11.2	12.9	14.4	2.42	2.48

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							BC_32	BC_32	BC_32	BC_33	BC_33	BC_33	BC_33	BC_34	BC_34	BC_34	BC_34	BC_35	BC_35
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																			
F2 (C10-C16 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F3 (C16-C34 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4 (C34-C50 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4G-SG (Heavy Hydrocarbons-Grav.)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a

Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							**BC_35**	**BC_35**	**BC_36**	**BC_36**	**BC_36**	**BC_36**	**BC_38**	**BC_38**	**BC_38**	**BC_38**	**BC_39**	**BC_39**	**BC_39**
Sample Depth							**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**
Sample Type							**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Sample Description							**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
Year							**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**
Major Remediation Area							**ADM**	**ADM**	**BDA**	**BDA**	**BDA**	**BDA**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Ammonia-Nitrogen	mg/kg	--	--	--	--	--	na	na	**22.8**	na	na	na	**15.9**	na	na	na	**8.3**	na	na
Cyanide + Thiocyanate	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Fluoride, Leachable	mg/L	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
pH	pH Units	--	--	--	--	--	na	na	**7.5**	na	na	na	**8.3**	na	na	na	**8.4**	na	na
Phosphorus	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Saturation	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SOC	%	--	--	--	--	--	na	na	**0.365**	na	na	na	**1.48**	na	na	na	**1.1**	na	na
Soluble Conductivity	µS/cm	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	na	na	**0.494**	na	na	na	**2.16**	na	na	na	**1.7**	na	na
Total solids	%	--	--	--	--	--	na	na	**71**	na	na	na	**79.5**	na	na	na	**96.6**	na	na
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	na	na	**2.2**	na	na	na	**0.6**	na	na	na	**0.1**	na	na
Gravel (2mm-26mm)	%	--	--	--	--	--	na	na	0	na	na	na	0	na	na	na	0	na	na
Sand (63µm-2mm)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sand, Coarse	%	--	--	--	--	--	na	na	**2.3**	na	na	na	**9.7**	na	na	na	**16.2**	na	na
Sand, Fine	%	--	--	--	--	--	na	na	**75.4**	na	na	na	**23.3**	na	na	na	**1**	na	na
Sand, Medium	%	--	--	--	--	--	na	na	**20.9**	na	na	na	**65.5**	na	na	na	**81.6**	na	na
Silt (2um-63um)	%	--	--	--	--	--	na	na	0	na	na	na	**0.9**	na	na	na	**1.1**	na	na
Metal																			
Aluminum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Antimony	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	na	na	na
Barium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Beryllium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Bismuth	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	na	na	na
Calcium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	na	na	na
Cobalt	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	na	na	na
Iron	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	na	na	na
Lithium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Magnesium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Manganese	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							BC_35	BC_35	BC_36	BC_36	BC_36	BC_36	BC_38	BC_38	BC_38	BC_38	BC_39	BC_39	BC_39
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
Major Remediation Area							ADM	ADM	BDA	BDA	BDA	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na	na	na	na	na
Molybdenum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Potassium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Selenium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Silver	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sodium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Strontium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Thallium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Tin	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Titanium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Uranium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Vanadium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	na	na	na
Zirconium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Metal - AVS/SEM																			
Cadmium	µmol/g	--	--	--	--	--	na	na	na	na	na	na	0.00035 U	na	na	na	0.00034 U	na	na
Copper	µmol/g	--	--	--	--	--	na	na	na	na	na	na	**0.032**	na	na	na	**0.16**	na	na
Lead	µmol/g	--	--	--	--	--	na	na	na	na	na	na	**0.0043**	na	na	na	0.0037 U	na	na
Nickel	µmol/g	--	--	--	--	--	na	na	na	na	na	na	**0.015**	na	na	na	**0.014**	na	na
Zinc	µmol/g	--	--	--	--	--	na	na	na	na	na	na	**0.21**	na	na	na	**0.15**	na	na
Sulfide	µmol/g	--	--	--	--	--	na	na	na	na	na	na	0.25 U	na	na	na	0.24 U	na	na
SEM-AVS	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na U R	na	na	na	na U R	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	**0.167**	**0.422**	ND	ND	**0.0351**	**0.0592**	**0.343**	**0.363**	**0.382**	**0.506**	**0.0917**	**0.11**	**0.168**
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**1.05**	**2.29**	**0.0927**	**0.358**	**0.422**	**0.0704 J**	**8.81**	**5.3**	**5.79**	**5.8**	**1.12**	**1.75**	**2.11**
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	ND	ND	**0.00567 J**	**0.0118 J**	ND	ND	**0.11**	**0.115**	**0.0959**	**0.0987 J**	**0.0159 J**	**0.0227 J**	**0.0232 J**
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**2.91**	**5.78**	**0.182**	**0.264**	**0.809**	**1.63**	**15.3**	**16.8**	**22.1**	**12.4**	**10.3**	**2.77**	**4.75**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**4.94**	**8.52**	**0.409**	**0.493**	**2.05**	**2.85**	**45.4**	**53.4**	**57.6**	**76.1 E**	**17.4**	**26**	**9.5**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**7.31**	**7.41**	**0.605**	**0.755**	**3.55**	**4.19**	**80.8 E**	**88.0 E**	**93.4 E**	**123 E**	**27.6**	**27.9**	**41.8**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**8.92**	**15.3**	**0.501**	**0.602**	**2.37**	**3.16**	**58.4**	**78.9 E**	**46.1**	**54.8**	**11.1**	**18.4**	**20.5**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**2.29**	**4.3**	**0.129**	**0.136**	**0.587**	**0.668**	**20.3**	**21.7 E**	**30.7 E**	**16.7**	**15.5**	**3.72**	**6.8**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**6.75**	**11.7**	**0.746**	**0.917**	**3.28**	**5.11**	**52.6**	**63.9**	**70.2**	**92.7**	**23.3**	**33.6**	**12.4**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**0.328**	**0.359**	**0.0548 J**	**0.0721 J**	**0.222**	**0.426**	**2.46**	**2.82**	**2.88**	**4.09**	**0.937**	**1.25**	**1.7**
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	**0.908**	**2.69**	**0.116**	**0.135**	**0.0276 J**	**0.0344 J**	**1.34**	**1.42**	**1.42**	**1.79**	**0.267**	**0.432**	**0.607**
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**6.6**	**13.8**	**0.475**	**0.656**	**2.1**	**4.09**	**33.2**	**46**	**25.2**	**30.8**	**6.73**	**10.2**	**12.4**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**10.3**	**19**	**0.62**	**0.792**	**3.04**	**4.53**	**59.7**	**63.4**	**87.3**	**50.2**	**31.8**	**11.6**	**19**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**52.5**	**91.5**	**3.88**	**5.14**	**18.5**	**26.8**	**379**	**442**	**443**	**469**	**146**	**138**	**132**

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							**BC_35**	**BC_35**	**BC_36**	**BC_36**	**BC_36**	**BC_36**	**BC_38**	**BC_38**	**BC_38**	**BC_38**	**BC_39**	**BC_39**	**BC_39**
Sample Depth							**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**
Sample Type							**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Sample Description							**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
Year							**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**
Major Remediation Area							**ADM**	**ADM**	**BDA**	**BDA**	**BDA**	**BDA**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
1-Methylnaphthalene	mg/kg	--	--	--	--	--	**0.219**	**0.0369 J**	**0.0371 J**	**0.00659 J**	**0.00930 J**	**0.0261 J**	**0.186**	**0.197**	**0.205**	**0.271**	**0.0485 J**	**0.0574 J**	**0.0925**
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
3-Methylcholanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b+j)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b+k)fluoranthene	mg/kg	--	--	--	--	--	**24.7**	**8.11**	**4.66**	**0.81**	**0.98**	**3.84**	**79.6**	**88.9**	**95.8 E**	**124 E**	**22.3**	**36.2**	**37.2**
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(e)pyrene	mg/kg	--	--	--	--	--	**4.67**	**8.3**	**1.33**	**1.54**	**0.281**	**0.344**	**27.6 E**	**30.0 E**	**32.1 E**	**41.6 E**	**9.08**	**15.2**	**15.3**
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**8.06**	**14.8**	**0.421**	**2.33**	**2.59**	**0.355**	**84.5 E**	**51.7 E**	**58.3 E**	**61.3 E**	**12.3**	**19.6**	**21.1 E**
Benzo(k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Chrysenes	mg/kg	--	--	--	--	--	**12.4**	**22.1**	**0.648**	**0.767**	**2.92**	**4.24**	**84.1**	**113**	**67.3**	**78.6**	**12.7**	**21.7**	**26.2**
C1-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	**8.06**	**13.9 E**	**0.46**	**0.597**	**2.24**	**3.66**	**42.1 E**	**44.5 E**	**63.2 E**	**34.1 E**	**30.6 E**	**8.84**	**14.6 E**
C1-Fluorenes	mg/kg	--	--	--	--	--	**0.518**	**0.996**	**0.0757**	**0.0933**	**0.189**	**0.348**	**1.32**	**1.53**	**1.55**	**2.33**	**0.734**	**1.05**	**0.522**
C1-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	**1.4**	**2.49**	**0.233**	**0.339**	**0.935**	**2.01**	**8.97**	**10.9**	**12**	**15.7**	**3.28**	**5**	**7.65**
C2-Chrysenes	mg/kg	--	--	--	--	--	**2.73**	**3.16**	**1.07**	**2.04**	ND	ND	**33.3**	**34.2**	**36.1**	**47.2**	**4.53**	**7.7**	**9.76**
C2-Fluorenes	mg/kg	--	--	--	--	--	**0.851**	**0.374**	ND	**0.202**	**0.506**	ND	**1.88**	**2.2**	**2.35**	**3.05**	**0.491**	**0.675**	**0.967**
C2-Naphthalenes	mg/kg	--	--	--	--	--	**0.3**	**0.504**	**0.113**	**0.175**	**0.0525 J**	**0.0570 J**	**0.699**	**0.705**	**0.728**	**0.898**	**0.181**	**0.188**	**0.285**
C2-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	**4.46**	**6.67**	**1.07**	**1.94**	**3.62**	**0.941**	**23.7 E**	**17.7**	**18.0 E**	**18.3 E**	**3.2**	**4.55**	**7.2**
C3-Chrysenes	mg/kg	--	--	--	--	--	**7.64E-08**	**1.04E-07**	**0.406**	**0.78**	ND	ND	**4.12E-07**	**0.00000047**	**3.79E-07**	**4.07E-07**	**3.85**	**4.71**	**6.68**
C3-Fluorenes	mg/kg	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3-Naphthalenes	mg/kg	--	--	--	--	--	**0.148**	**0.232**	**0.0705**	**0.146**	ND	ND	**0.56**	**0.57**	**0.57**	**0.738**	**0.239**	**0.242**	**0.13**
C3-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	**0.838 J**	**0.853 J**	**0.154 J**	**0.200 J**	**0.512 J**	**1.15**	**6.61**	**8.14**	**9.71**	**9.81**	**1.78**	**2.7**	**3.84**
C4-Chrysenes	mg/kg	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4-Naphthalenes	mg/kg	--	--	--	--	--	**0.239 J**	**0.328 J**	ND	ND	**0.0899 J**	**0.174 J**	**2.88E-07**	**3.06E-07**	**3.23E-07**	**3.45E-07**	**0.145 J**	**0.243 J**	**0.258 J**
C4-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	**0.464**	**0.619**	**0.357**	ND	ND	**0.135**	**4.04E-07**	**3.35E-07**	**0.00000036**	**3.72E-07**	**0.587**	**0.917**	**1.26**
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**32.4 E**	**9.48 E**	**5.05**	**0.7**	**0.811**	**4.58 E**	**121 E**	**139 E**	**147 E**	**205 E**	**26.1 E**	**42.9 E**	**45.4 E**
Perylene	mg/kg	--	--	--	--	--	**4.32**	**8.46**	**0.177**	**0.997**	**1.12**	**0.15**	**43.7 E**	**27.9 E**	**30.3**	**31.1 E**	**5.7**	**9.01**	**9.71**

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							BC_35	BC_35	BC_36	BC_36	BC_36	BC_36	BC_38	BC_38	BC_38	BC_38	BC_39	BC_39	BC_39
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
Major Remediation Area							ADM	ADM	BDA	BDA	BDA	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																			
F2 (C10-C16 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F3 (C16-C34 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4 (C34-C50 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4G-SG (Heavy Hydrocarbons-Grav.)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							BC_39	BC_40	BC_40	BC_40	BC_40	BC_41	BC_41	BC_41	BC_41	BC_42	BC_42	BC_42	BC_42
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	BDA	BDA	BDA	BDA
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Ammonia-Nitrogen	mg/kg	--	--	--	--	--	na	**13.1**	na	na	na	**19.5**	na	na	na	**19.6**	na	na	na
Cyanide + Thiocyanate	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Fluoride, Leachable	mg/L	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
pH	pH Units	--	--	--	--	--	na	**7.6**	na	na	na	**7.5**	na	na	na	**7.4**	na	na	na
Phosphorus	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Saturation	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SOC	%	--	--	--	--	--	na	**2.91**	na	na	na	**0.164**	na	na	na	**0.107**	na	na	na
Soluble Conductivity	µS/cm	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	na	**3.99**	na	na	na	**0.318**	na	na	na	**0.293**	na	na	na
Total solids	%	--	--	--	--	--	na	**80.1**	na	na	na	**74.3**	na	na	na	**72.4**	na	na	na
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	na	**1.5**	na	na	na	**1.3**	na	na	na	**1.7**	na	na	na
Gravel (2mm-26mm)	%	--	--	--	--	--	na	**0.2**	na	na	na	0	na	na	na	0	na	na	na
Sand (63µm-2mm)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sand, Coarse	%	--	--	--	--	--	na	**32.9**	na	na	na	**0.7**	na	na	na	**0.2**	na	na	na
Sand, Fine	%	--	--	--	--	--	na	**4.2**	na	na	na	**79.9**	na	na	na	**90**	na	na	na
Sand, Medium	%	--	--	--	--	--	na	**60**	na	na	na	**22.6**	na	na	na	**9.1**	na	na	na
Silt (2um-63um)	%	--	--	--	--	--	na	**1.1**	na	na	na	0	na	na	na	0	na	na	na
Metal																			
Aluminum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Antimony	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	na	na	na
Barium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Beryllium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Bismuth	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	na	na	na
Calcium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	na	na	na
Cobalt	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	na	na	na
Iron	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	na	na	na
Lithium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Magnesium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Manganese	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							BC_39	BC_40	BC_40	BC_40	BC_40	BC_41	BC_41	BC_41	BC_41	BC_42	BC_42	BC_42	BC_42
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	BDA	BDA	BDA	BDA
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na	na	na	na	na
Molybdenum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Potassium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Selenium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Silver	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sodium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Strontium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Thallium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Tin	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Titanium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Uranium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Vanadium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	na	na	na
Zirconium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Metal - AVS/SEM																			
Cadmium	µmol/g	--	--	--	--	--	na	0.00034 U	na	na	na	na	na	na	na	na	na	na	na
Copper	µmol/g	--	--	--	--	--	na	**0.079**	na	na	na	na	na	na	na	na	na	na	na
Lead	µmol/g	--	--	--	--	--	na	0.0036 U	na	na	na	na	na	na	na	na	na	na	na
Nickel	µmol/g	--	--	--	--	--	na	0.013 U	na	na	na	na	na	na	na	na	na	na	na
Zinc	µmol/g	--	--	--	--	--	na	**0.081**	na	na	na	na	na	na	na	na	na	na	na
Sulfide	µmol/g	--	--	--	--	--	na	**0.27**	na	na	na	na	na	na	na	na	na	na	na
SEM-AVS	µmol/g	--	--	--	--	--	na	**0.6**	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	**0.207**	**0.957**	**0.965**	**1.72**	**0.562**	ND	**0.0221 J**	**0.0224 J**	ND	**0.0247 J**	**0.0475**	**0.0652**	ND
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**3.3**	**7.62**	**7.89**	**11.2**	**21.8**	**0.166**	**0.169**	**0.0737 J**	**0.157**	**0.0925**	**0.187**	**0.187**	**0.485**
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	**0.0363 J**	**0.12**	**0.126**	**0.165**	**0.273**	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**6.07**	**20.8**	**27.7**	**36.8**	**72.5**	**0.205**	**0.287**	**0.292**	**0.354**	**0.503**	**1.06**	**0.268**	**0.474**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**15.8**	**65.2**	**84.8 E**	**107 E**	**199 E**	**0.49**	**1.06**	**1.09**	**1.32**	**1.2**	**1.59**	**2.68**	**0.659**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**17**	**301 E**	**102 E**	**116 E**	**157 E**	**0.683**	**1.52**	**1.84**	**2.25**	**0.979**	**1.9**	**2.47**	**4.33**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**32.2**	**62.1**	**77.4 E**	**100 E**	**184 E**	**1.3**	**1.54**	**1.93**	**0.617**	**3.37**	**0.823**	**1.59**	**2.01**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**6.85**	**22.7 E**	**26.1 E**	**39.5 E**	**81.1 E**	**0.116**	**0.293**	**0.299**	**0.382**	**0.41**	**0.781**	**0.159**	**0.317**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**19.9**	**80.9**	**111 E**	**131**	**235 E**	**1.17**	**1.83**	**1.87**	**1.87**	**2.4**	**2.93**	**4.81**	**1.46**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**0.558**	**13.8**	**4.31**	**6.1**	**7.24**	**0.0683 J**	**0.0752 J**	**0.0802 J**	**0.118**	**0.0577 J**	**0.131**	**0.139**	**0.336**
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	**0.625**	**4.18**	**4.33**	**8.09**	**2.47**	ND	**0.0418 J**	**0.0463 J**	**0.0485 J**	**0.0406 J**	**0.0867 J**	**0.264**	**0.276**
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**17.2**	**42**	**62**	**72.1**	**134 E**	**0.911**	**0.914**	**1.11**	**0.702**	**2.73**	**0.534**	**1.18**	**1.22**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**21.2**	**73.9**	**95.5 E**	**119**	**216 E**	**0.895**	**1.57**	**1.59**	**1.7**	**2.5**	**4.04**	**1.12**	**1.93**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**141**	**695**	**604**	**749**	**1310**	**5.95**	**9.26**	**10.2**	**9.47**	**14.3**	**14.1**	**14.8**	**13.4**

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

						Location ID	BC_39	BC_40	BC_40	BC_40	BC_40	BC_41	BC_41	BC_41	BC_41	BC_42	BC_42	BC_42	BC_42
						Sample Depth	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
						Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N
						Sample Description	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
						Year	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	BDA	BDA	BDA	BDA
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
1-Methylnaphthalene	mg/kg	--	--	--	--	--	**0.12**	**0.556**	**0.944**	**0.298**	**0.531**	**0.00965 J**	**0.00975 J**	**0.0122 J**	**0.0129 J**	**0.00613 J**	**0.0158 J**	**0.0287 J**	**0.0399 J**
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
3-Methylcholanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b+j)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b+k)fluoranthene	mg/kg	--	--	--	--	--	**56.2**	**157 E**	**301 E**	**102 E**	**115 E**	**1.16**	**2.57**	**2.61**	**3.16**	**1.58**	**2.89**	**3.73**	**6.17**
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(e)pyrene	mg/kg	--	--	--	--	--	**23.0 E**	**40.0 E**	**53.5 E**	**102 E**	**35.1 E**	**1.33**	**0.492**	**1.09**	**1.11**	**0.668**	**1.19**	**1.54**	**2.47**
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**33.6 E**	**73.5 E**	**81.5 E**	**112 E**	**211 E**	**1.26**	**1.53**	**0.463**	**1.11**	**0.647**	**1.25**	**1.58**	**2.87**
Benzo(k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Chrysenes	mg/kg	--	--	--	--	--	**38.8**	**83.5**	**128**	**149**	**272 E**	**1.33**	**1.58**	**1.71**	**0.706**	**4.04**	**0.925**	**1.71**	**2.21**
C1-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	**19.5 E**	**45.5 E**	**67.7 E**	**83.3 E**	**159 E**	**0.594**	**1**	**1.07**	**1.27**	**2.2**	**3.82**	**0.894**	**1.55**
C1-Fluorenes	mg/kg	--	--	--	--	--	**0.658**	**1.89**	**3.12**	**3.29**	**5.86**	**0.0932**	**0.106**	**0.108**	**0.136**	**0.126**	**0.132**	**0.268**	**0.092**
C1-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	**2.12**	**42.4 E**	**12.1**	**23.6**	**23.8**	**0.317**	**0.337**	**0.374**	**0.476**	**0.267**	**0.448**	**0.537**	**1.05**
C2-Chrysenes	mg/kg	--	--	--	--	--	**14**	**76.7**	**95.9**	**27.6**	**60.4**	**0.375**	**0.684**	**0.856**	**0.892**	**0.591**	**0.857**	**1.05**	**1.79**
C2-Fluorenes	mg/kg	--	--	--	--	--	**1.44**	**4.05**	**4.22**	**7.36**	**2.02**	ND	ND	ND	ND	ND	ND	ND	ND
C2-Naphthalenes	mg/kg	--	--	--	--	--	**0.365**	**0.815**	**1.47**	**1.7**	**2.43**	**0.0727**	**0.0771**	**0.0455 J**	**0.0651**	**0.0422 J**	**0.0569 J**	**0.0706**	**0.117**
C2-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	**10.5**	**16.9 E**	**36.3 E**	**47.4 E**	**57.5 E**	**0.919**	**1.01**	**1.11**	**0.868**	**1.77**	**0.877**	**0.98**	**1.19**
C3-Chrysenes	mg/kg	--	--	--	--	--	ND	**0.00000045**	**5.45E-07**	**5.68E-07**	**5.83E-07**	ND	ND	ND	ND	ND	ND	ND	ND
C3-Fluorenes	mg/kg	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3-Naphthalenes	mg/kg	--	--	--	--	--	**0.132**	**0.657**	**1.06**	**1.25**	**1.58**	**0.0561**	**0.0676**	**0.0707**	**0.0921**	ND	ND	ND	ND
C3-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	**1.17**	**24.3**	**6.16**	**15.1**	**21.2**	**0.190 J**	**0.238 J**	**0.271 J**	**0.292 J**	**0.264 J**	**0.277 J**	**0.354 J**	**0.604 J**
C4-Chrysenes	mg/kg	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4-Naphthalenes	mg/kg	--	--	--	--	--	ND	**3.65E-07**	**3.77E-07**	**3.83E-07**	**3.45E-07**	ND	ND	ND	ND	ND	ND	ND	ND
C4-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	ND	**1.86**	**4.77**	**6.16**	**8.5**	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**72.8 E**	**273 E**	**531 E**	**174 E**	**190 E**	**0.918**	**2.38**	**2.75**	**3.5**	**1.18**	**2.2**	**2.89**	**5.54**
Perylene	mg/kg	--	--	--	--	--	**15**	**35.6 E**	**40.9 E**	**56.5 E**	**106 E**	**0.567**	**0.669**	**0.198**	**0.465**	**0.297**	**0.544**	**0.693**	**1.31**

Table 3-2a

Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

						Location ID	BC_39	BC_40	BC_40	BC_40	BC_40	BC_41	BC_41	BC_41	BC_41	BC_42	BC_42	BC_42	BC_42
						Sample Depth	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
						Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N
						Sample Description	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
						Year	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	BDA	BDA	BDA	BDA
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																			
F2 (C10-C16 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F3 (C16-C34 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4 (C34-C50 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4G-SG (Heavy Hydrocarbons-Grav.)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							C-21	C-21	ST1	ST1	ST2	ST4	ST4	ST5	ST5	ST5	ST6A	ST8	ST12
Sample Depth							0-5 cm	0-10 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm
Sample Type							N	N	FD	N	N	N	N	N	N	N	N	N	N
Sample Description							Grab	Core	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Ammonia-Nitrogen	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Cyanide + Thiocyanate	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Fluoride, Leachable	mg/L	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	**24**	**57**	**16**	**18**	**22**	**4**	na	**17**	na	na	**19**	**16**	**19**
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
pH	pH Units	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Phosphorus	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Saturation	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SOC	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Soluble Conductivity	µS/cm	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	**1.08**	**22**	**0.29**	**0.86**	**2.48**	**0.87**	**0.73**	**1.73**	**0.82**	**4.08**	**2.14**	**2.09**	**0.72**
Total solids	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	**1**	**1.8**	**0.9**	**0.6**	**0.9**	**0**	na	**0.44**	na	na	**0.4**	**0.1**	**0.5**
Gravel (2mm-26mm)	%	--	--	--	--	--	**16.4**	0	**40.9**	**32.9**	0	**33.5**	na	**42.2**	na	na	0	**17.4**	0
Sand (63µm-2mm)	%	--	--	--	--	--	**64**	**63.1**	**53.3**	**60.7**	**89**	**66.5**	na	**53.3**	na	na	**98.5**	**81.6**	**96.6**
Sand, Coarse	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sand, Fine	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sand, Medium	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Silt (2um-63um)	%	--	--	--	--	--	**18.6**	**35.1**	**5**	**5.9**	**10.1**	**0**	na	**4.1**	na	na	**1.1**	**0.9**	**2.9**
Metal																			
Aluminum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Antimony	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	na	na	na
Barium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Beryllium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Bismuth	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	na	na	na
Calcium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	na	na	na
Cobalt	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	na	na	na
Iron	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	na	na	na
Lithium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Magnesium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Manganese	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							C-21	C-21	ST1	ST1	ST2	ST4	ST4	ST5	ST5	ST5	ST6A	ST8	ST12
Sample Depth							0-5 cm	0-10 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm
Sample Type							N	N	FD	N	N	N	N	N	N	N	N	N	N
Sample Description							Grab	Core	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na	na	na	na	na
Molybdenum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Potassium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Selenium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Silver	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sodium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Strontium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Thallium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Tin	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Titanium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Uranium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Vanadium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	na	na	na
Zirconium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Metal - AVS/SEM																			
Cadmium	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sulfide	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SEM-AVS	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	2	ND	ND	ND	ND	0.01 U	0.01 U	0.01 U
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	5.5	47	0.01 U	1.6	1.6	5.2	ND	20	5.6	7.9	1.7	3.8	1.5
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	ND	ND	ND	ND	ND	0.01 U	0.01 U	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	12	140	2.9	3	3	8.1	3.6	35	8.7	14	2.7	5.2	4.1
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	31	320	13	13	15	28	12	150	34	62	12	26	16
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	38	380	17	16	20	35	17	170	48	81	16	38	20
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	38	420	15	14	17	31	13	160	37	75	12	28	17
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	6.2	67	3	2.6	3.1	6.9	2.6	29	7.4	14	3.3	6.8	3.4
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	52	570	21	21	22	38	20	240	52	96	17	34	26
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	5.3	40	0.01 U	1.1	1.2	2.5	ND	16	4	5.9	1.1	1.9	1.4
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	2	ND	9.6	3.1	3.6	0.32	0.64	0.01 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	35	260	9.6	9.7	9.7	20	12	130	30	47	8.7	16	14
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	41	460	17	18	19	32	17	210	45	79	14	30	21
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	264	2700	98.5	100	112	211	97.2	1170	275	485	88.8	190	124

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							C-21	C-21	ST1	ST1	ST2	ST4	ST4	ST5	ST5	ST5	ST6A	ST8	ST12
Sample Depth							0-5 cm	0-10 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm
Sample Type							N	N	FD	N	N	N	N	N	N	N	N	N	N
Sample Description							Grab	Core	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	ND	ND	6 U	ND	ND	0.01 U	0.01 U	0.01 U
1-Methylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**1.4**	ND	6 U	ND	ND	0.01 U	0.01 U	0.01 U
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	ND	ND	6 U	ND	ND	0.01 U	0.01 U	0.01 U
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	ND	ND	6 U	ND	ND	0.01 U	0.01 U	0.01 U
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	ND	ND	20 U	ND	ND	0.01 U	0.01 U	0.01 U
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	ND	ND	20 U	ND	ND	0.02 U	0.02 U	0.02 U
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	ND	ND	6 U	ND	ND	0.01 U	0.01 U	0.01 U
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**73**	**790**	**31**	**29**	**35**	**62**	**29**	**310**	**82**	**150**	**27**	**64**	**35**
Benzo(b+j)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b+k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	**4.6**	**49**	0.01 U	**1.8**	**2.1**	**3.8**	ND	**21**	**4.6**	**8.4**	**1.6**	**3.3**	**2.3**
Benzo(e)pyrene	mg/kg	--	--	--	--	--	**29**	**320**	**13**	**12**	**14**	**24**	**12**	**120**	**33**	**63**	**11**	**26**	**14**
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**25**	**260**	**13**	**12**	**15**	**27**	**13**	**120**	**36**	**67**	**12**	**30**	**15**
Benzo(k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	**3.9**	**39**	0.02 U	**2.4**	**3.5**	**6.4**	ND	**26**	**7.6**	**12**	**3.1**	**7.7**	**3.4**
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**2.2**	ND	20 U	**3.4**	**6.1**	**0.99**	**2.4**	0.01 U
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	**7.3**	**61**	0.01 U	**2.3**	**2.4**	**4.8**	ND	20 U	**7.3**	**13**	**2.3**	**5.1**	**2.3**
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	**7.5**	**77**	**5.4**	**5.3**	**7.3**	**14**	**4.2**	**58**	**14**	**23**	**6.6**	**16**	**7.4**
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**27**	**280**	**14**	**14**	**17**	**32**	**15**	**140**	**43**	**76**	**14**	**34**	**17**
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

						Location ID	C-21	C-21	ST1	ST1	ST2	ST4	ST4	ST5	ST5	ST5	ST6A	ST8	ST12
						Sample Depth	0-5 cm	0-10 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm
						Sample Type	N	N	FD	N	N	N	N	N	N	N	N	N	N
						Sample Description	Grab	Core	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
						Year	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	ND	ND	ND	ND	ND	0.01 U	0.01 U	0.01 U
Aroclor 1242	mg/kg	--	--	--	--	--	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	ND	ND	ND	ND	ND	0.02 U	0.02 U	0.02 U
Aroclor 1248	mg/kg	--	--	--	--	--	**8.1**	**110**	**0.45**	**0.26**	**1**	**0.5**	**4.6**	**0.5**	**0.48**	**3.7**	**1.5**	**0.68**	**0.64**
Aroclor 1254	mg/kg	--	--	--	--	--	**1.8**	0.02 U	**0.16**	**0.21**	**0.36**	**1.2**	ND	**1.4**	**0.38**	**0.96**	**0.54**	**0.48**	**0.54**
Aroclor 1260	mg/kg	--	--	--	--	--	0.02 U	0.02 U	**0.17**	0.02 U	0.02 U	ND	ND	ND	**0.21**	**0.75**	0.02 U	0.02 U	0.02 U
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	**9.9**	**110**	**0.39**	**0.47**	**1.4**	**1.7**	**4.6**	**1.9**	**5.4**	**1.1**	**2**	**1.2**	**1.2**
Total Petroleum Hydrocarbons																			
F2 (C10-C16 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F3 (C16-C34 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4 (C34-C50 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4G-SG (Heavy Hydrocarbons-Grav.)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							**ST22**	**ST23**	**ST33**	**ST33**	**ST33**	**ST33**	**ST33**	**ST56**	**ST58**	**ST80**	**ST81**	**ST82**	**ST83**
Sample Depth							**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**
Sample Type							**N**	**N**	**FD**	**LR**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Sample Description							**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
Year							**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**
Major Remediation Area							**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**BDA**	**BDA**	**BDA**	**BDA**	**ADM**	**ADM**
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Ammonia-Nitrogen	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Cyanide + Thiocyanate	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Fluoride, Leachable	mg/L	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	**24**	**17**	**24**	**31**	**24**	na	na	**17**	**19**	**16**	**17**	**17**	**3**
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
pH	pH Units	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Phosphorus	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Saturation	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SOC	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Soluble Conductivity	µS/cm	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	**5.29**	**0.43**	**0.89**	**0.62**	**0.52**	**5.47**	**0.2**	**0.22**	**0.09**	**0.83**	**2.15**	**3.1**	0.02 U
Total solids	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	**0.9**	**0.6**	**19.7**	na	**20.8**	na	na	**0.6**	**0.3**	**0.7**	**0.3**	**0.2**	0
Gravel (2mm-26mm)	%	--	--	--	--	--	0	0	0	na	0	na	na	0	0	0	**37.9**	**41.6**	**24.1**
Sand (63µm-2mm)	%	--	--	--	--	--	**85.8**	**95.8**	**34.6**	na	**30.7**	na	na	**96.1**	**98.2**	**95.7**	**60.5**	**57.2**	**75.9**
Sand, Coarse	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sand, Fine	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sand, Medium	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Silt (2um-63um)	%	--	--	--	--	--	**13.3**	**3.6**	**45.7**	na	**48.4**	na	na	**3.3**	**1.5**	**3.6**	**1.3**	**1**	0
Metal																			
Aluminum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Antimony	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	na	na	na
Barium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Beryllium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Bismuth	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	na	na	na
Calcium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	na	na	na
Cobalt	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	na	na	na
Iron	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	na	na	na
Lithium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Magnesium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Manganese	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

						Location ID	**ST22**	**ST23**	**ST33**	**ST33**	**ST33**	**ST33**	**ST33**	**ST56**	**ST58**	**ST80**	**ST81**	**ST82**	**ST83**
						Sample Depth	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**
						Sample Type	**N**	**N**	**FD**	**LR**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
						Sample Description	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
						Year	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**
						Major Remediation Area	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**BDA**	**BDA**	**BDA**	**BDA**	**ADM**	**ADM**
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na	na	na	na	na
Molybdenum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Potassium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Selenium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Silver	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sodium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Strontium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Thallium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Tin	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Titanium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Uranium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Vanadium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	na	na	na
Zirconium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Metal - AVS/SEM																			
Cadmium	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sulfide	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SEM-AVS	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	0.01 U	0.01 U	**1.1**	**1**	0.01 U	0.01 U	0.01 U	**0.01**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**11**	**0.85**	**6.4**	**4.6**	**9.7**	**7.4**	0.01 U	**0.09**	**0.01**	**0.52**	**0.17**	**5.9**	**2.5**
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**23**	**1.7**	**11**	**10**	**15**	**15**	**7.5**	**0.17**	**0.02**	**0.63**	**0.46**	**9.5**	**4.5**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**70**	**6.4**	**38**	**36**	**62**	**51**	**32**	**0.62**	**0.09**	**2.8**	**1.4**	**41**	**23**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**82**	**8**	**47**	**43**	**82**	**73**	**38**	**0.83**	**0.11**	**3.6**	**1.6**	**55**	**32**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**78**	**6.9**	**43**	**45**	**70**	**55**	**45**	**0.69**	**0.09**	**3.2**	**1.5**	**42**	**23**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**14**	**1.4**	**8.9**	**1.4**	**14**	**11**	0.01 U	**0.16**	**0.02**	**0.59**	**0.28**	**9.8**	**5.2**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**110**	**9.4**	**61**	**58**	**93**	**76**	**61**	**0.94**	**0.13**	**4.1**	**2.4**	**57**	**30**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**9.8**	**0.72**	**5.7**	**3.9**	**6.5**	**6.3**	0.01 U	**0.08**	0.01 U	**0.29**	**0.21**	**3.6**	0.01 U
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.01 U	**0.24**	**3.5**	**3.2**	**2.4**	**3**	0.01 U	**0.04**	**0.01**	0.01 U	0.01 U	0.01 U	0.01 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**70**	**5.2**	**37**	**34**	**50**	**42**	**21**	**0.55**	**0.07**	**2.1**	**1.6**	**30**	**13**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**94**	**8.1**	**51**	**50**	**81**	**65**	**44**	**0.82**	**0.11**	**3.6**	**2**	**50**	**26**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**562**	**48.9**	**314**	**290**	**486**	**405**	**248**	**5**	**0.66**	**21.4**	**11.6**	**304**	**159**

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

						Location ID	**ST22**	**ST23**	**ST33**	**ST33**	**ST33**	**ST33**	**ST33**	**ST56**	**ST58**	**ST80**	**ST81**	**ST82**	**ST83**
						Sample Depth	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**
						Sample Type	**N**	**N**	**FD**	**LR**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
						Sample Description	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
						Year	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**
						Major Remediation Area	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**BDA**	**BDA**	**BDA**	**BDA**	**ADM**	**ADM**
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	**0.2**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
1-Methylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	**0.5**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	**0.9**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	na	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	na	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**150**	**14**	**84**	**71**	**150**	**130**	**85**	**1.5**	**0.22**	**6.5**	**3**	**96**	**55**
Benzo(b+j)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b+k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	**11**	**0.94**	**5.8**	**3.2**	**8.9**	**6.6**	**4.4**	**0.09**	**0.01**	**0.38**	**0.22**	**5.5**	**2.9**
Benzo(e)pyrene	mg/kg	--	--	--	--	--	**58**	**5.7**	**34**	**29**	**57**	**51**	**36**	**0.6**	**0.1**	**2.6**	**1.2**	**38**	**22**
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**58**	**6**	**32**	**30**	**58**	**56**	**35**	**0.67**	**0.1**	**2.9**	**1.1**	**41**	**23**
Benzo(k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	**12**	**1.5**	**7.9**	na	**14**	**9.8**	0.02 U	**0.15**	**0.02**	**0.58**	**0.25**	**8.7**	**5.3**
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	0.01 U	**0.5**	**2.5**	**5.9**	**4.4**	**5**	0.01 U	**0.05**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	**5.7**	**1.1**	**5**	**2.3**	**10**	**11**	0.01 U	**0.11**	0.01 U	**0.56**	0.01 U	**6.9**	**4**
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	**29**	**3.3**	**17**	**16**	**31**	**20**	**9.9**	**0.33**	**0.04**	**1.3**	**0.54**	**19**	**11**
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**67**	**7**	**38**	**28**	**67**	**65**	**38**	**0.74**	**0.1**	**3.2**	**1.3**	**48**	**27**
Perylene	mg/kg	--	--	--	--	--	na	na	na	**3**	na	na	na	na	na	na	na	na	na

Table 3-2a

Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

						Location ID	ST22	ST23	ST33	ST33	ST33	ST33	ST33	ST56	ST58	ST80	ST81	ST82	ST83
						Sample Depth	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm
						Sample Type	N	N	FD	LR	N	N	N	N	N	N	N	N	N
						Sample Description	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
						Year	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	BDA	BDA	BDA	BDA	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Aroclor 1242	mg/kg	--	--	--	--	--	0.02 U	0.02 U	0.02 U	0.02 U	0.01 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Aroclor 1248	mg/kg	--	--	--	--	--	**3.1**	**4.3**	**0.74**	**1**	**0.75**	**2**	**0.51**	**0.03**	0.01 U	**0.08**	**0.08**	**0.48**	**0.63**
Aroclor 1254	mg/kg	--	--	--	--	--	**0.87**	**1.3**	0.02 U	0.02 U	0.02 U	0.02 U	**0.16**	**0.02**	0.02 U	**0.04**	**0.04**	**0.2**	0.02 U
Aroclor 1260	mg/kg	--	--	--	--	--	0.02 U	0.02 U	0.02 U	na	0.02 U	0.02 U	0.02 U	0.02 U	**0.26**	0.02 U	0.02 U	0.02 U	0.02 U
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	**4**	**5.6**	**0.74**	**1**	**0.75**	**2.7**	**0.67**	**0.05**	**0.26**	**0.12**	**0.12**	**0.68**	**0.63**
Total Petroleum Hydrocarbons																			
F2 (C10-C16 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F3 (C16-C34 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4 (C34-C50 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4G-SG (Heavy Hydrocarbons-Grav.)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a

Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							**ST84**	**ST85**	**ST86**	**B-3A**	**B-14**	**B-18**	**B-19**	**B-21**	**B-22**	**B-24**	**B-25**	**B-28A**	**B-29**
Sample Depth							**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**
Sample Type							**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Sample Description							**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
Year							**2007**	**2007**	**2007**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**
Major Remediation Area							**ADM**	**ADM**	**BDA**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Ammonia-Nitrogen	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Cyanide + Thiocyanate	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Fluoride, Leachable	mg/L	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	**16**	**17**	**17**	**25**	**18**	**32**	**15**	**16**	**22**	**13**	**12**	**20**	**17**
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
pH	pH Units	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Phosphorus	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Saturation	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SOC	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Soluble Conductivity	µS/cm	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	**0.06**	**0.23**	**0.55**	**1.8**	**3.57**	**0.72**	**0.12**	**0.52**	**0.93**	**0.48**	**0.11**	**2.23**	**0.31**
Total solids	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	**0.4**	**0.3**	**0.5**	**0.6**	**0.3**	**44.6**	**0.2**	**0.4**	**0.9**	**0.1**	**0.1**	**0.6**	**0.3**
Gravel (2mm-26mm)	%	--	--	--	--	--	0	0	0	**7.1**	**3.1**	0	**5.1**	**22**	0	**58**	**32.3**	0	0
Sand (63µm-2mm)	%	--	--	--	--	--	**97.5**	**98.7**	**97**	**84.2**	**95.5**	0	**93.9**	**74.1**	**91.4**	**40.5**	**67.1**	**95.8**	**98.4**
Sand, Coarse	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sand, Fine	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sand, Medium	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Silt (2um-63um)	%	--	--	--	--	--	**2.1**	**1**	**2.5**	**8**	**1.1**	**55.4**	**0.8**	**3.5**	**7.7**	**1.4**	**0.6**	**3.7**	**1.3**
Metal																			
Aluminum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Antimony	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	**0.7**	**1.2**	**1.6**	**0.9**	**1.5**	**1**	**1.5**	**1**	**0.9**	**0.8**
Barium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Beryllium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Bismuth	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	**0.09**	**0.08**	**0.05**	**0.18**	**0.11**	**0.1**	**0.04**	**0.04**	**0.05**	**0.06**
Calcium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	**5**	**5**	**55**	**6**	**8**	**5**	**6**	**5**	**6**	**5**
Cobalt	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	**7**	**3**	**22**	**6**	**7**	**4**	**5**	**2**	**5**	**3**
Iron	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	**7**	5 U	**10**	5 U	**7**	5 U	5 U	5 U	5 U	5 U
Lithium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Magnesium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Manganese	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							ST84	ST85	ST86	B-3A	B-14	B-18	B-19	B-21	B-22	B-24	B-25	B-28A	B-29
Sample Depth							0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2007	2007	2007	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008
Major Remediation Area							ADM	ADM	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	**0.1**	**0.01**	**0.17**	**0.02**	**0.03**	**0.21**	**0.02**	**0.03**	**0.02**	**0.19**
Molybdenum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	**6**	**3**	**29**	**12**	**6**	**6**	**4**	**3**	**4**	**3**
Potassium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Selenium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Silver	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sodium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Strontium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Thallium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Tin	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Titanium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Uranium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Vanadium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	**33**	**28**	**61**	**48**	**54**	**35**	**23**	**16**	**24**	**14**
Zirconium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Metal - AVS/SEM																			
Cadmium	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sulfide	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SEM-AVS	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	0.01 U	0.01 U	0.01 U	2 U	0.6 U	0.2 U	0.01 U	0.5 U	**0.21**	0.1 U	0.05 U	0.2 U	0.06 U
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**10**	**0.34**	0.01 U	**3.4**	**3.8**	**0.94**	**0.03**	**3.2**	**1.9**	**0.53**	**0.07**	**1.3**	**0.29**
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.01 U	0.01 U	2 U	0.6 U	0.2 U	0.01 U	0.5 U	0.2 U	0.1 U	0.05 U	0.2 U	0.06 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**18**	**0.45**	**0.35**	**39**	**7.4**	**2.7**	**0.07**	**6.6**	**4.5**	**1.2**	**0.19**	**3**	**0.6**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**74**	**2**	**1.4**	**27**	**32**	**7.7**	**0.39**	**21**	**12**	**4.1**	**0.83**	**11**	**2.6**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**90**	**2.6**	**1.6**	**30**	**40**	**8.6**	**0.46**	**19**	**13**	**4.6**	**1**	**16**	**3.4**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**74**	**2.1**	**1.6**	**29**	**32**	**7.8**	**0.4**	**20**	**13**	**4.4**	**0.85**	**11**	**2.7**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**14**	**0.41**	**0.26**	**6.8**	**12**	**1.9**	**0.15**	**4.5**	**3.2**	**1.4**	**0.33**	**3.6**	**0.9**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**110**	**3.3**	**2.7**	**55**	**44**	**14**	**0.59**	**34**	**22**	**6.8**	**1.3**	**23**	**3.9**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**6.1**	**0.2**	0.01 U	**11**	**2.4**	**0.96**	**0.03**	**2.5**	**1.7**	**0.5**	**0.06**	**1.2**	**0.24**
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.01 U	0.01 U	0.01 U	2 U	**0.9**	0.2 U	0.01 U	**0.7**	**0.52**	**0.13**	0.05 U	**0.33**	**0.07**
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**55**	**1.6**	**1.1**	**59**	**25**	**8.8**	**0.25**	**22**	**14**	**4.5**	**0.71**	**10**	**2.2**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**95**	**2.7**	**2.1**	**45**	**40**	**11**	**0.48**	**31**	**19**	**6**	**1.1**	**20**	**3.5**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**546**	**15.7**	**11.1**	**305**	**240**	**64.4**	**2.85**	**165**	**105**	**34.2**	**6.44**	**100**	**20.4**

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							ST84	ST85	ST86	B-3A	B-14	B-18	B-19	B-21	B-22	B-24	B-25	B-28A	B-29
Sample Depth							0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2007	2007	2007	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008
Major Remediation Area							ADM	ADM	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	2 U	0.6 U	0.2 U	0.01 U	0.5 U	0.2 U	0.1 U	0.05 U	0.2 U	0.06 U
1-Methylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	2 U	0.6 U	0.2 U	0.01 U	0.5 U	0.2 U	0.1 U	0.05 U	0.2 U	0.06 U
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	2 U	0.6 U	0.2 U	0.01 U	0.5 U	0.2 U	0.1 U	0.05 U	0.2 U	0.06 U
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	2 U	0.6 U	0.2 U	0.01 U	0.5 U	0.2 U	0.1 U	0.05 U	0.2 U	0.06 U
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	3 U	2 U	0.3 U	0.02 U	1 U	0.3 U	0.2 U	0.1 U	0.3 U	0.2 U
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.02 U	0.02 U	0.02 U	3 U	2 U	0.3 U	0.02 U	1 U	0.3 U	0.2 U	0.1 U	0.3 U	0.2 U
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	2 U	0.6 U	0.2 U	0.01 U	0.5 U	0.2 U	0.1 U	0.05 U	0.2 U	0.06 U
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**160**	**4.7**	**3.2**	**51**	**65**	**14**	**0.78**	**32**	**23**	**7.9**	**1.7**	**20**	**5.4**
Benzo(b+j)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b+k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	**10**	**0.27**	0.01 U	2 U	0.6 U	0.2 U	0.01 U	0.5 U	0.2 U	0.1 U	0.05 U	0.2 U	0.06 U
Benzo(e)pyrene	mg/kg	--	--	--	--	--	**62**	**1.9**	**1.3**	**20**	**25**	**5.4**	**0.31**	**11**	**8.8**	**3.2**	**0.69**	**7.6**	**2.2**
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**61**	**2**	**1.2**	**21**	**29**	**5.8**	**0.36**	**9**	**9.4**	**3.5**	**0.78**	**8.2**	**2.8**
Benzo(k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	**12**	**0.38**	0.02 U	**3.6**	**6**	**1**	**0.09**	**1.3**	**2**	**0.77**	**0.18**	**1.7**	**0.58**
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	3 U	**3.7**	**0.75**	**0.05**	1 U	**1.5**	**0.48**	**0.12**	**1.2**	**0.34**
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	**9**	**0.36**	0.01 U	**4.5**	**6.4**	**1.4**	**0.09**	**1.3**	**2.7**	**0.79**	**0.18**	**1.8**	**0.76**
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	**27**	**0.84**	**0.46**	3 U	**3.3**	**0.75**	**0.04**	1 U	**1.3**	**0.4**	0.1 U	**1**	**0.37**
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**73**	**2.3**	**1.4**	**20**	**28**	**5.6**	**0.32**	**9.6**	**9.4**	**3.2**	**0.7**	**7.9**	**2.6**
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							ST84	ST85	ST86	B-3A	B-14	B-18	B-19	B-21	B-22	B-24	B-25	B-28A	B-29
Sample Depth							0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2007	2007	2007	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008
Major Remediation Area							ADM	ADM	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	0.018 U	0.005 U	0.005 U	0.005 U	0.006 U	0.018 U	0.005 U	0.005 U	0.005 U	0.017 U
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	0.018 U	0.005 U	0.005 U	0.005 U	0.006 U	0.018 U	**0.007**	0.005 U	0.005 U	0.017 U
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	**0.078**	**0.008**	0.005 U	**0.006**	**0.025**	**0.028**	**0.025**	0.005 U	**0.045**	**0.028**
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	0.018 U	0.005 U	0.005 U	0.005 U	0.006 U	0.018 U	0.005 U	0.005 U	0.005 U	0.017 U
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	0.018 U	0.005 U	0.005 U	0.005 U	0.006 U	0.018 U	0.005 U	0.005 U	0.005 U	0.017 U
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	**0.571**	**0.07**	**0.389**	**0.188**	**0.148**	**0.462**	**0.058**	**0.021**	**0.145**	**0.068**
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	**2.48**	**0.213**	**0.162**	**0.772**	**0.601**	**1.32**	**0.147**	**0.06**	**0.43**	**0.041**
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	**1.3**	**0.118**	**0.057**	**0.224**	**0.205**	**0.427**	**0.058**	**0.025**	**0.123**	**0.02**
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	na	na	na	**4.43**	**0.409**	**0.608**	**1.19**	**0.979**	**2.23**	**0.295**	**0.106**	**0.743**	**0.157**
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	0.02 U	0.02 U	0.02 U	na	na	na	na	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	**0.64**	**0.44**	**0.09**	na	na	na	na	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	0.02 U	**0.16**	**0.04**	na	na	na	na	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	0.02 U	0.02 U	**0.05**	na	na	na	na	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	**0.64**	**0.6**	**0.18**	na	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																			
F2 (C10-C16 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F3 (C16-C34 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4 (C34-C50 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4G-SG (Heavy Hydrocarbons-Grav.)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	na	na	na	**150**	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

						Location ID	**B-30**	**B-31**	**B-34**	**B-35**	**B-36**	**BC_48**	**BC_49**	**BC_50**	**BC_51**	**BC_52**	**BC_53**	**BC_54**	**BC_55**
						Sample Depth	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**
						Sample Type	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**FD**
						Sample Description	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
						Year	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**
						Major Remediation Area	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Ammonia-Nitrogen	mg/kg	--	--	--	--	--	na	na	na	na	na	**7.1**	**13.3**	**18.2**	ND	ND	**35.5**	ND	ND
Cyanide + Thiocyanate	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Fluoride, Leachable	mg/L	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	**14**	**12**	**16**	**17**	**15**	na	na	na	na	na	na	na	na
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
pH	pH Units	--	--	--	--	--	na	na	na	na	na	**7.7**	**7.6**	**7.2**	**7.9**	**7.5**	**7.6**	**7.5**	na
Phosphorus	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Saturation	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SOC	%	--	--	--	--	--	na	na	na	na	na	**1.79**	**0.56**	**0.39**	**0.06**	**0.68**	**0.52**	**0.05**	na
Soluble Conductivity	µS/cm	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	**0.07**	0.01 U	**0.04**	**0.15**	0.01 U	**4.4**	**1.32**	**0.45**	**0.12**	**0.98**	**0.54**	**0.72**	na
Total solids	%	--	--	--	--	--	na	na	na	na	na	**78.3**	**76.4**	**60.7**	**82.2**	**79.3**	**70.7**	**80.2**	na
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	**0.2**	**0.2**	**0.5**	**0.3**	**0.2**	**1.6**	**1.4**	**42.7**	**0.8**	**1.5**	**0.9**	**0.2**	na
Gravel (2mm-26mm)	%	--	--	--	--	--	**11.9**	**39.1**	0	0	**7.5**	0	0	0	0	0	0	0	na
Sand (63µm-2mm)	%	--	--	--	--	--	**87.3**	**59.8**	**97**	**98.5**	**91.4**	na	na	na	na	na	na	na	na
Sand, Coarse	%	--	--	--	--	--	na	na	na	na	na	**3.4**	**2.3**	**2.6**	**3.6**	**8.6**	**1.2**	**37.3**	na
Sand, Fine	%	--	--	--	--	--	na	na	na	na	na	**49**	**56.8**	**32.3**	**42.1**	**41.4**	**77.1**	**12**	na
Sand, Medium	%	--	--	--	--	--	na	na	na	na	na	**24.7**	**39.1**	**5.8**	**52.9**	**48**	**7.2**	**49.8**	na
Silt (2um-63um)	%	--	--	--	--	--	**0.6**	**0.9**	**2.6**	**1.2**	**0.9**	**21.2**	**0.4**	**16.6**	**0.6**	**0.6**	**13.6**	**0.7**	na
Metal																			
Aluminum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Antimony	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Arsenic	mg/kg	4.3	7.2	19	42	150	**0.8**	**0.8**	**1.6**	**0.7**	**0.5**	na	na	na	na	na	na	na	na
Barium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Beryllium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Bismuth	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	0.03 U	**0.04**	**0.07**	**0.04**	0.03 U	na	na	na	na	na	na	na	na
Calcium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	**4**	**6**	**6**	**4**	**4**	na	na	na	na	na	na	na	na
Cobalt	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	**2**	1 U	**4**	**2**	**2**	na	na	na	na	na	na	na	na
Iron	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	5 U	5 U	5 U	5 U	5 U	na	na	na	na	na	na	na	na
Lithium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Magnesium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Manganese	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a

Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							B-30	B-31	B-34	B-35	B-36	BC_48	BC_49	BC_50	BC_51	BC_52	BC_53	BC_54	BC_55
Sample Depth							0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	FD
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	**0.21**	**0.16**	**0.16**	**0.2**	**0.2**	na	na	na	na	na	na	na	na
Molybdenum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	**3**	**3**	**5**	**3**	**3**	na	na	na	na	na	na	na	na
Potassium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Selenium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Silver	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sodium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Strontium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Thallium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Tin	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Titanium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Uranium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Vanadium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	**9**	**14**	**25**	**12**	**8**	na	na	na	na	na	na	na	na
Zirconium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Metal - AVS/SEM																			
Cadmium	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sulfide	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SEM-AVS	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	0.01 U	0.05 U	2 U	0.01 U	0.01 U	**0.71**	**0.829**	**0.943**	0.001 U	**0.229**	**0.122**	0.001 U	na
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**0.04**	**0.16**	**0.57**	**0.03**	**0.02**	**5.56**	**5.49**	**6.75**	**0.088 J**	**2**	**1.04**	**0.466**	na
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.05 U	2 U	0.01 U	0.01 U	**0.0651 J**	**0.0938 J**	**0.0399 J**	0.001 U	**0.0284 J**	**0.0316 J**	0.001 U	na
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**0.11**	**0.43**	**1.5**	**0.24**	**0.06**	**14.4**	**83**	**26.1**	**0.176**	**5.37**	**3.21**	**1.37**	na
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**0.41**	**1.5**	**5.1**	**0.66**	**0.21**	**30.3**	**46.9**	**28.5**	**0.389**	**13.1**	**9.18**	**3.63**	na
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**0.5**	**1.7**	**5.8**	**0.54**	**0.24**	**46.5 E**	**58.3 E**	**33.4**	**0.614**	**19.4**	**13.8**	**4.75**	na
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**0.42**	**1.6**	**5.3**	**0.73**	**0.21**	**33.1**	**54.4**	**30.4**	**0.492**	**13.8**	**12.5**	**4.51**	na
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**0.13**	**0.45**	**1.4**	**0.12**	**0.06**	**8.38**	**12**	**6.26**	**0.112**	**3.52**	**2.54**	**0.727**	na
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**0.63**	**2.5**	**8.3**	**0.69**	**0.38**	**52.7**	**71.2**	**57.2**	**0.714**	**20.3**	**15.7**	**7.78**	na
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**0.04**	**0.17**	**0.57**	**0.04**	**0.02**	**3.97**	**13.5**	**7.46**	**0.0622 J**	**1.45**	**0.778**	**0.328**	na
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.01 U	0.05 U	2 U	**0.01**	0.01 U	**2.59**	**1.91**	**1.55**	0.001 U	**0.609**	**0.359**	**0.138**	na
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**0.39**	**1.6**	**5.4**	**0.37**	**0.23**	**37**	**68.3**	**61**	**0.496**	**13.3**	**7.98**	**4.86**	na
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**0.55**	**2.2**	**7.2**	**0.55**	**0.33**	**47.8**	**60.4**	**51.9**	**0.618**	**18.3**	**13.6**	**6.74**	na
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**3.22**	**12.3**	**41.1**	**3.98**	**1.76**	**283**	**476**	**311**	**3.71**	**111**	**80.8**	**35.2**	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							B-30	B-31	B-34	B-35	B-36	BC_48	BC_49	BC_50	BC_51	BC_52	BC_53	BC_54	BC_55
Sample Depth							0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-5 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	FD
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	0.01 U	0.05 U	2 U	0.01 U	0.01 U	na	na	na	na	na	na	na	na
1-Methylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.05 U	2 U	0.01 U	0.01 U	**0.406**	**0.303**	**0.559**	0.001 U	**0.125**	**0.0683**	**0.0355 J**	na
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.05 U	0.2 U	0.01 U	0.01 U	na	na	na	na	na	na	na	na
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.01 U	0.05 U	0.2 U	0.01 U	0.01 U	na	na	na	na	na	na	na	na
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	0.02 U	0.1 U	0.3 U	0.02 U	0.02 U	na	na	na	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.02 U	0.1 U	0.3 U	0.02 U	0.02 U	na	na	na	na	na	na	na	na
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	0.01 U	0.05 U	0.2 U	0.01 U	0.01 U	na	na	na	na	na	na	na	na
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**0.83**	**2.9**	**9.4**	**0.96**	**0.41**	na	na	na	na	na	na	na	na
Benzo(b+j)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b+k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	**63.2**	**79.2**	**44.4**	**0.893**	**26**	**21.2**	**7.21**	na
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	0.01 U	0.05 U	0.2 U	0.01 U	0.01 U	na	na	na	na	na	na	na	na
Benzo(e)pyrene	mg/kg	--	--	--	--	--	**0.33**	**1.2**	**3.6**	**0.35**	**0.16**	**24.2 E**	**29.3 E**	**16.3 E**	**0.364**	**9.78**	**8.26**	**2.66**	na
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**0.43**	**1.4**	**4.2**	**0.36**	**0.18**	**30.8 E**	**39.7 E**	**19.2**	**0.402**	**11.8**	**9.48**	**2.62**	na
Benzo(k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	**45**	**66.4**	**59.3**	**0.689**	**22.6**	**14**	**5.78**	na
C1-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	na	na	na	na	na	**44.2 E**	**68.6 E**	**66.2 E**	**0.527**	**18.6 E**	**12.6 E**	**6.07**	na
C1-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	**2.96**	**4.39**	**6.8**	**0.122**	**1.19**	**0.745**	**0.46**	na
C1-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	**15.7**	**24.4**	**41.9 E**	**0.25**	**6.48**	**3.66**	**2.18**	na
C2-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	**19.1**	**26**	**34.5**	**0.337**	**11.2**	**5.69**	**2.74**	na
C2-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	**4.02**	**4.56**	**10.3**	0.01 U	**1.67**	**0.95**	**0.549**	na
C2-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	**1.4**	**1.55**	**2.5**	**0.162**	**0.478**	**0.339**	**0.197**	na
C2-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	**18.8 E**	**24.8 E**	**51.4 E**	**0.817**	**8.44**	**4.86**	**3.02**	na
C3-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	**6.3**	**9.41**	**15.3**	ND	**3.96**	**1.77**	ND	na
C3-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	na
C3-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	**0.919**	**1.07**	**2.09**	**0.166**	**0.422**	**0.328**	**0.232**	na
C3-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	**11**	**12.6**	**23.8**	**0.0895 J**	**4.28**	**2.68**	**1.3**	na
C4-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	ND	ND	ND	ND	ND	ND	ND	na
C4-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	**0.55**	**0.612**	**1.17**	ND	**0.252 J**	**0.292 J**	ND	na
C4-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	**1.46**	**2.01**	**3.76**	0.03 U	**0.801**	**0.421**	0.03 U	na
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	**0.09**	**0.3**	**0.82**	**0.07**	**0.04**	na	na	na	na	na	na	na	na
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	**0.06**	**0.17**	**0.44**	**0.04**	**0.02**	na	na	na	na	na	na	na	na
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	**0.11**	**0.35**	**1**	**0.09**	**0.05**	na	na	na	na	na	na	na	na
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	**0.06**	**0.2**	**0.54**	**0.05**	**0.03**	na	na	na	na	na	na	na	na
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**0.38**	**1.3**	**4**	**0.34**	**0.16**	**54.2 E**	**70.3 E**	**33.6 E**	**0.638**	**20.5 E**	**15.7 E**	**4.48**	na
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	**14.4**	**18.4**	**8.84**	**0.178**	**5.66**	**4.11**	**1.28**	na

Table 3-2a

Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

						Location ID	**B-30**	**B-31**	**B-34**	**B-35**	**B-36**	**BC_48**	**BC_49**	**BC_50**	**BC_51**	**BC_52**	**BC_53**	**BC_54**	**BC_55**
						Sample Depth	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-5 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**
						Sample Type	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**FD**
						Sample Description	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
						Year	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**
						Major Remediation Area	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.015 U	0.017 U	0.005 U	0.005 U	na	na	na	na	na	na	na	na
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.015 U	0.017 U	0.005 U	**0.157**	na	na	na	na	na	na	na	na
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.015 U	0.017 U	0.005 U	**0.103**	na	na	na	na	na	na	na	na
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.015 U	0.017 U	0.005 U	0.005 U	na	na	na	na	na	na	na	na
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.015 U	0.017 U	0.005 U	**0.057**	na	na	na	na	na	na	na	na
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.015 U	0.017 U	0.005 U	0.005 U	na	na	na	na	na	na	na	na
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	**0.08**	**0.122**	0.005 U	0.005 U	na	na	na	na	na	na	na	na
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	**0.007**	**0.051**	**0.048**	0.005 U	0.005 U	na	na	na	na	na	na	na	na
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	**0.007**	**0.131**	**0.169**	ND	**0.316**	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																			
F2 (C10-C16 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F3 (C16-C34 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4 (C34-C50 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4G-SG (Heavy Hydrocarbons-Grav.)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	100 U	100 U	100 U	100 U	100 U	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							**BC_55**	**BC_56**	**BC_57**	**BC_58**	**BC_59**	**BC_60**	**BC_61**	**BC_62**	**BC_62**	**BC_63**	**CAP-1M**	**CAP-2**	**CAP-3**
Sample Depth							**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**
Sample Type							**N**	**N**	**N**	**N**	**N**	**N**	**N**	**FD**	**N**	**N**	**N**	**N**	**N**
Sample Description							**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Core**	**Core**	**Core**
Year							**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2009**	**2009**	**2009**
Major Remediation Area							**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Ammonia-Nitrogen	mg/kg	--	--	--	--	--	ND	**11.8**	ND	ND	**8.3**	**23.2**	ND	ND	ND	**33.6**	na	na	na
Cyanide + Thiocyanate	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	**6.96**	**6.36**	**3.96**
Fluoride, Leachable	mg/L	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	**23**	**17**	**36**
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	**29.2**	**20.4**	**57**
pH	pH Units	--	--	--	--	--	**7.8**	**7.5**	**7.7**	**7.7**	**7.7**	**7.7**	**7.6**	na	**7.7**	**7.5**	na	na	na
Phosphorus	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Saturation	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SOC	%	--	--	--	--	--	**0.02**	**0.17**	**0.2**	**0.1**	**0.04**	**0.1**	**0.09**	na	**0.05**	**0.05**	na	na	na
Soluble Conductivity	µS/cm	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	**0.12**	**0.59**	**0.76**	**0.24**	**0.13**	**0.22**	**0.16**	na	**0.1**	**0.2**	**0.9**	**0.15**	**0.13**
Total solids	%	--	--	--	--	--	**79.7**	**72.5**	**77**	**78.6**	**80.8**	**77.9**	**78.3**	na	**77.4**	**73.2**	na	na	na
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	**0.2**	**1**	**0.8**	**0.8**	**0.8**	**2**	**1**	na	**0.9**	**2.3**	**1.3**	**4.6**	**55**
Gravel (2mm-26mm)	%	--	--	--	--	--	0	0	0	0	0	0	0	na	0	0	**2.2**	**1.9**	**2.2**
Sand (63µm-2mm)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	**96**	**91**	**10**
Sand, Coarse	%	--	--	--	--	--	**12**	**0.3**	**1.1**	**3.2**	**14.2**	**0.4**	**0.3**	na	**2.3**	**0.3**	na	na	na
Sand, Fine	%	--	--	--	--	--	**30.2**	**83.8**	**72.7**	**50.7**	**39.8**	**64.9**	**87.2**	na	**76.9**	**91.6**	na	na	na
Sand, Medium	%	--	--	--	--	--	**56.7**	**12.2**	**25.5**	**44.9**	**45**	**30.3**	**9.6**	na	**19.5**	**5.6**	na	na	na
Silt (2um-63um)	%	--	--	--	--	--	**0.9**	**2.7**	0	**0.4**	**0.2**	**2.3**	**1.9**	na	**0.4**	**0.2**	**0.7**	**3**	**32**
Metal																			
Aluminum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Antimony	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	1 U	1 U	1 U
Barium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Beryllium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Bismuth	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	0.2 U	0.2 U	0.2 U
Calcium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	**5**	**7**	**69**
Cobalt	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	**6**	**4**	**37**
Iron	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	5 U	5 U	**6**
Lithium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Magnesium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Manganese	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							BC_55	BC_56	BC_57	BC_58	BC_59	BC_60	BC_61	BC_62	BC_62	BC_63	CAP-1M	CAP-2	CAP-3
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	FD	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Core	Core	Core
Year							2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2009	2009	2009
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na	na	**0.03**	**0.02**	0.01 U
Molybdenum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	**5**	**5**	**41**
Potassium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Selenium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Silver	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sodium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Strontium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Thallium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Tin	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Titanium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Uranium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Vanadium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	**26**	**30**	**70**
Zirconium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Metal - AVS/SEM																			
Cadmium	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sulfide	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SEM-AVS	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	0.001 U	**0.187**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	na	0.001 U	0.001 U	**0.47**	0.01 U	0.01 U
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**0.278**	**1.49**	**0.111**	**0.112**	**0.108**	**0.484**	0.001 U	na	0.001 U	0.001 U	**6.4**	**0.75**	0.01 U
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.001 U	**0.0338 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	na	0.001 U	0.001 U	**0.06**	0.01 U	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**0.846**	**3.64**	**0.238**	**0.159**	**0.25**	**1.26**	**0.0794 J**	na	**0.0385 J**	0.001 U	**14**	**1.6**	0.01 U
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**1.11**	**10**	**0.606**	**0.286**	**0.535**	**3.45**	**0.158**	na	**0.118**	**0.00260 J**	**71**	**9.6**	0.01 U
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**1.48**	**15.1**	**0.944**	**0.399**	**0.804**	**5.24**	**0.221**	na	**0.182**	0.002 U	**83**	**13**	0.01 U
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**1.24**	**10.4**	**0.681**	**0.327**	**0.586**	**3.65**	**0.202**	na	**0.129**	**0.00532 J**	**60**	**8.1**	0.01 U
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**0.22**	**2.51**	**0.147**	**0.0586**	**0.117**	**0.782**	**0.0414**	na	**0.024**	0.002 U	**14**	**0.32**	0.01 U
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**2.69**	**18**	**1.11**	**0.633**	**0.985**	**5.43**	**0.26**	na	**0.196**	**0.00936 J**	**91**	**13**	**0.01**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**0.239**	**0.926**	**0.0719 J**	**0.0787 J**	**0.0812 J**	**0.322**	0.001 U	na	0.001 U	0.001 U	**5**	**0.53**	0.01 U
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	**0.13**	**0.638**	0.001 U	0.001 U	0.001 U	**0.199**	0.001 U	na	0.001 U	0.001 U	**1.8**	**0.25**	0.01 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**2.33**	**9.21**	**0.691**	**0.547**	**0.737**	**3.3**	**0.179**	na	**0.137**	0.001 U	**50**	**5.9**	0.01 U
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**2.36**	**15.2**	**0.93**	**0.527**	**0.855**	**4.8**	**0.213**	na	**0.175**	**0.0114 J**	**81**	**12**	0.01 U
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**12.9**	**87.4**	**5.49**	**3.06**	**5**	**28.9**	**1.31**	na	**0.95**	**0.0273**	**478**	**65.1**	**0.01**

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							**BC_55**	**BC_56**	**BC_57**	**BC_58**	**BC_59**	**BC_60**	**BC_61**	**BC_62**	**BC_62**	**BC_63**	**CAP-1M**	**CAP-2**	**CAP-3**
Sample Depth							**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**
Sample Type							**N**	**N**	**N**	**N**	**N**	**N**	**N**	**FD**	**N**	**N**	**N**	**N**	**N**
Sample Description							**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Core**	**Core**	**Core**
Year							**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2009**	**2009**	**2009**
Major Remediation Area							**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																			
1,3-Dimethylnaphthalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	**0.11**	0.01 U	0.01 U
1-Methylnaphthalene	mg/kg	--	--	--	--	--	0.001 U	**0.108**	0.001 U	0.001 U	0.001 U	**0.0314 J**	0.001 U	na	0.001 U	0.001 U	**0.3**	0.01 U	0.01 U
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	0.01 U	0.01 U	0.01 U
3-Methylcholanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	**2.4**	0.01 U	0.01 U
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	0.3 U	0.3 U	0.3 U
5-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	**0.32**	0.01 U	0.01 U
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	**2.3**	0.1 U	0.1 U
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	**130**	**20**	**0.01**
Benzo(b+j)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b+k)fluoranthene	mg/kg	--	--	--	--	--	**2.08**	**20.1**	**1.39**	**0.62**	**1.16**	**6.99**	**0.336**	na	**0.283**	0.002 U	na	na	na
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	**6.8**	**0.85**	0.01 U
Benzo(e)pyrene	mg/kg	--	--	--	--	--	**0.803**	**8.05**	**0.565**	**0.26**	**0.479**	**2.77**	**0.141**	na	**0.121**	0.002 U	**46**	**7.7**	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**0.864**	**9.87**	**0.613**	**0.233**	**0.493**	**3.24**	**0.134**	na	**0.111**	0.002 U	**56**	**8**	0.01 U
Benzo(k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Chrysenes	mg/kg	--	--	--	--	--	**1.84**	**12.9**	**0.914**	**0.395**	**0.77**	**4.4**	**0.192**	na	**0.128 J**	ND	na	na	na
C1-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	**1.71**	**10.6 E**	**0.632**	**0.31**	**0.639**	**3.31**	**0.16**	na	**0.135**	0.005 U	na	na	na
C1-Fluorenes	mg/kg	--	--	--	--	--	**0.276**	**0.741**	**0.133**	**0.133**	**0.142**	**0.35**	**0.113**	na	0.005 U	0.005 U	na	na	na
C1-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	**0.968**	**3.81**	**0.336**	**0.207**	**0.385**	**1.27**	**0.114**	na	**0.0993**	**0.0787**	na	na	na
C2-Chrysenes	mg/kg	--	--	--	--	--	**0.813**	**5.48**	ND	ND	ND	**2.22**	ND	na	ND	ND	na	na	na
C2-Fluorenes	mg/kg	--	--	--	--	--	0.01 U	**1.03**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	na	0.01 U	0.01 U	na	na	na
C2-Naphthalenes	mg/kg	--	--	--	--	--	**0.146**	**0.439**	**0.0864**	**0.109**	**0.158**	**0.203**	**0.0669**	na	**0.0654**	**0.188**	na	na	na
C2-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	**1.52**	**4.98**	**0.946**	**0.643**	**1.02**	**1.82**	0.01 U	na	0.01 U	0.01 U	na	na	na
C3-Chrysenes	mg/kg	--	--	--	--	--	ND	ND	ND	ND	ND	**0.289 J**	ND	na	ND	ND	na	na	na
C3-Fluorenes	mg/kg	--	--	--	--	--	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	na	0.03 U	0.03 U	na	na	na
C3-Naphthalenes	mg/kg	--	--	--	--	--	**0.198**	**0.427**	**0.114**	**0.106**	**0.174**	**0.122**	0.01 U	na	0.01 U	0.01 U	na	na	na
C3-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	**0.420 J**	**2.37**	**0.254 J**	**0.0615 J**	**0.315 J**	**0.800 J**	0.02 U	na	0.02 U	0.02 U	na	na	na
C4-Chrysenes	mg/kg	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	na	ND	ND	na	na	na
C4-Naphthalenes	mg/kg	--	--	--	--	--	ND	**0.326 J**	ND	ND	ND	ND	ND	na	ND	ND	na	na	na
C4-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	na	0.03 U	0.03 U	na	na	na
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	**20**	**2.2**	0.1 U
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	**3.7**	**0.34**	0.01 U
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	**14**	**1.4**	0.01 U
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	**28**	**2.5**	0.01 U
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**1.39**	**18.1 E**	**0.927**	**0.347**	**0.812**	**5.78**	**0.187**	na	**0.155**	0.002 U	**52**	**7**	0.01 U
Perylene	mg/kg	--	--	--	--	--	**0.403**	**4.38**	**0.27**	**0.112**	**0.219**	**1.48**	**0.0665**	na	**0.0575**	0.002 U	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							BC_55	BC_56	BC_57	BC_58	BC_59	BC_60	BC_61	BC_62	BC_62	BC_63	CAP-1M	CAP-2	CAP-3
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	FD	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Core	Core	Core
Year							2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2009	2009	2009
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	0.01 U	0.01 U	0.01 U
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	**0.05**	**0.07**	0.01 U
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	**0.09**	**0.4**	0.01 U
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	0.01 U	0.01 U	0.01 U
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	**0.01**	0.01 U	0.01 U
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	**0.75**	**0.74**	0.01 U
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	**2.5**	**0.22**	0.01 U
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	**1.2**	**0.04**	0.01 U
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	na	na	na	na	na	na	na	na	na	na	**4.6**	**1.5**	ND
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																			
F2 (C10-C16 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F3 (C16-C34 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4 (C34-C50 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4G-SG (Heavy Hydrocarbons-Grav.)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	**190**	100 U	100 U

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

						Location ID	CAP-4	CAP-5	CAP-6	CAP-7	CAP-8	CAP-9	CAP-10	CAP-11	DA-1	DA-2	DA-3	DA-4	DA-5
						Sample Depth	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
						Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N
						Sample Description	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
						Year	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	BDA	BDA	BDA	BDA
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Ammonia-Nitrogen	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Cyanide + Thiocyanate	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dry weight	g	--	--	--	--	--	5.49	5.25	6.32	6.65	5.22	6.88	6.74	4.57	na	na	na	na	na
Fluoride, Leachable	mg/L	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	43	33	30	23	19	12	6.6	45	28	35	31	19	9.3
Moisture Content (ASTM D2216)	%	--	--	--	--	--	76.8	48.9	42.7	29.9	23.4	13.7	7.12	82.3	na	na	na	na	na
pH	pH Units	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Phosphorus	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Saturation	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SOC	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Soluble Conductivity	µS/cm	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	8.2	0.17	0.97	0.81	0.05	0.43	1.9	7	3.3	2.7	0.2 U	0.23	0.07
Total solids	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	5.2	16	3.1	3.1	1.4	1.6	1.5	6.2	5.3	7.1	1.6	2.3	1.8
Gravel (2mm-26mm)	%	--	--	--	--	--	6.5	0.7	1.1	2.5	0.2	0.3	1.7	3.6	3.8	0.8	0.2	0.3	0.1
Sand (63µm-2mm)	%	--	--	--	--	--	61	22	89	83	76	97	95	50	80	74	94	95	96
Sand, Coarse	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sand, Fine	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sand, Medium	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Silt (2um-63um)	%	--	--	--	--	--	28	61	6.6	12	22	0.7	1.8	40	11	19	3.8	2.1	2
Metal																			
Aluminum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Antimony	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Arsenic	mg/kg	4.3	7.2	19	42	150	1 U	1 U	1 U	1 U	1 U	1 U	2	1 U	1 U	1 U	1 U	1 U	1 U
Barium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Beryllium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Bismuth	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Calcium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	9	57	6	7	7	4	5	9	25	14	5	4	4
Cobalt	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	14	28	9	7	6	7	8	20	16	10	2	3	2
Iron	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	15	7	5 U	13	5 U	5 U	6	17	7	8	5 U	5 U	5 U
Lithium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Magnesium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Manganese	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							CAP-4	CAP-5	CAP-6	CAP-7	CAP-8	CAP-9	CAP-10	CAP-11	DA-1	DA-2	DA-3	DA-4	DA-5
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	BDA	BDA	BDA	BDA
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	0.03	0.01 U	0.03	0.01	0.02	0.01	0.03	0.01 U	0.01	0.02	0.01 U	0.01 U	0.01 U
Molybdenum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	18	33	6	6	5	4	6	16	17	11	3	3	4
Potassium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Selenium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Silver	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sodium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Strontium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Thallium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Tin	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Titanium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Uranium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Vanadium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	64	57	31	32	15	24	37	55	47	39	10	11	10
Zirconium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Metal - AVS/SEM																			
Cadmium	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sulfide	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SEM-AVS	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	4.3	0.01 U	0.19	0.31	0.01 U	0.06	1.7	4.4	0.75	1.3	0.01 U	0.01 U	0.01 U
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	35	0.02	1.6	2.5	0.05	0.83	19	28	6.7	12	0.03	0.33	0.02
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.26	0.01 U	0.03	0.03	0.01 U	0.01	0.2	0.3	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	88	0.06	3.3	5.5	0.12	2.3	95	65	12	29	0.09	0.72	0.16
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	270	0.16	23	30	0.72	14	180	280	71	110	0.32	5.1	0.43
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	290	0.23	29	33	0.93	18	270	280	95	110	0.41	6.3	0.48
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	250	0.18	24	28	0.77	12	200	280	68	97	0.41	4.8	0.44
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	54	0.05	4.9	6	0.11	2.8	55	50	16	16	0.06	0.87	0.07
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	440	0.33	31	38	0.91	20	260	430	97	180	0.46	7	0.49
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	32	0.02	1.3	2.2	0.03	0.63	16	24	5.5	13	0.01 U	0.23	0.02
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	14	0.01 U	0.93	1.5	0.02	0.26	6.4	20	3.1	4.6	0.01	0.16	0.01
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	270	0.16	14	22	0.34	8.1	150	210	56	130	0.24	2.9	0.23
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	390	0.27	27	35	0.75	16	230	380	89	160	0.4	6.2	0.44
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	2140	1.48	160	204	4.75	95	1480	2050	520	863	2.43	34.6	2.79

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

						Location ID	CAP-4	CAP-5	CAP-6	CAP-7	CAP-8	CAP-9	CAP-10	CAP-11	DA-1	DA-2	DA-3	DA-4	DA-5
						Sample Depth	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
						Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N
						Sample Description	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
						Year	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	BDA	BDA	BDA	BDA
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	**1.2**	0.01 U	**0.03**	**0.05**	0.01 U	**0.01**	**0.4**	**1.3**	**0.2**	**0.4**	0.01 U	0.01 U	0.01 U
1-Methylnaphthalene	mg/kg	--	--	--	--	--	**2.8**	0.01 U	**0.13**	**0.21**	0.01 U	**0.04**	**1**	**2.7**	**0.52**	**1**	0.01 U	0.01 U	0.01 U
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	**0.54**	0.01 U	**0.02**	**0.02**	0.01 U	0.01 U	**0.2**	**0.6**	**0.06**	**0.1**	0.01 U	0.01 U	0.01 U
3-Methylcholanthrene	mg/kg	--	--	--	--	--	**8.9**	0.01 U	0.01 U	**0.93**	**0.02**	**0.48**	**8.2**	**7.9**	**2.7**	**2**	**0.01**	0.01 U	0.01 U
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	**6**	0.3 U	**0.5**	**0.7**	0.3 U	0.3 U	0.3 U	**6**	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
5-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	**1.6**	0.01 U	**0.08**	**0.11**	0.01 U	**0.06**	**0.8**	**0.6**	**0.42**	**0.9**	0.01 U	0.01 U	0.01 U
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	**7.3**	0.1 U	**0.7**	**0.9**	0.1 U	**0.4**	**6**	**8**	**2.4**	**3**	0.1 U	0.1 U	0.1 U
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**550**	**0.34**	**49**	**57**	**1.6**	**27**	**400**	**530**	**150**	**180**	**0.71**	**11**	**0.8**
Benzo(b+j)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b+k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	**33**	**0.02**	**2.2**	**3**	**0.06**	**1.3**	**17**	**29**	**7.3**	**12**	**0.03**	**0.47**	**0.03**
Benzo(e)pyrene	mg/kg	--	--	--	--	--	**210**	**0.14**	**19**	**23**	**0.58**	**9.9**	**150**	**200**	**55**	**62**	**0.27**	**4.3**	**0.28**
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**210**	**0.15**	**21**	**25**	**0.49**	**12**	**180**	**220**	**70**	**67**	**0.32**	**4.5**	**0.33**
Benzo(k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	**57**	0.1 U	**5.8**	**6.9**	0.1 U	**4**	**29**	**68**	**24**	**23**	0.1 U	**1.2**	0.1 U
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	**10**	0.01 U	**0.9**	**1.1**	0.01 U	**0.62**	**9.6**	**9.5**	**3.8**	**3.4**	**0.02**	**0.18**	**0.01**
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	**36**	**0.02**	**3.5**	**4.1**	0.01 U	**2.3**	**19**	**34**	**17**	**12**	**0.08**	**0.7**	**0.05**
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	**87**	**0.05**	**8.8**	**11**	0.01 U	**5.6**	**83**	**97**	**36**	**35**	**0.13**	**1.6**	**0.1**
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**190**	**0.12**	**19**	**22**	**0.45**	**11**	**160**	**200**	**64**	**60**	**0.26**	**3.9**	**0.27**
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							CAP-4	CAP-5	CAP-6	CAP-7	CAP-8	CAP-9	CAP-10	CAP-11	DA-1	DA-2	DA-3	DA-4	DA-5
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	BDA	BDA	BDA	BDA
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	**0.5**	0.01 U	**0.4**	**0.3**	0.01 U	0.01 U	0.01 U	**0.3**	0.01 U	**0.3**	0.01 U	**0.05**	0.01 U
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	**2.7**	0.01 U	**3.8**	**0.4**	0.01 U	0.01 U	0.01 U	**1**	**0.1**	**0.9**	0.01 U	**0.11**	0.01 U
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.01**	0.01 U
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	**25**	0.01 U	**6.6**	**1.1**	0.01 U	**0.3**	**0.8**	**5.4**	**0.4**	**5.8**	**0.01**	**0.16**	0.01 U
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	**34**	0.01 U	**3.1**	**2.2**	0.01 U	**0.4**	**1.4**	**15**	**1**	**15**	**0.09**	**0.24**	**0.04**
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	**24**	0.01 U	**1.7**	**1.2**	0.01 U	**0.2**	**1.2**	**9.2**	**0.5**	**7.4**	**0.05**	**0.11**	**0.02**
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	**87**	ND	**16**	**5.2**	ND	**0.9**	**3.4**	**31**	**2**	**30**	**0.15**	**0.68**	**0.06**
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																			
F2 (C10-C16 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F3 (C16-C34 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4 (C34-C50 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
F4G-SG (Heavy Hydrocarbons-Grav.)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	**1400**	**200**	**290**	**460**	100 U	**150**	**850**	**1600**	**270**	**600**	100 U	**150**	100 U

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							DA-7	DA-8	DA-9	DA-10	DA-11	MDDEP-1	MNR-1	MNR-2	MNR-3	MNR-4	MNR-5	MNR-6	11ECO1
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Grab
Year							2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2011
Major Remediation Area							BDA	BDA	BDA	BDA	BDA	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Ammonia-Nitrogen	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**3**
Cyanide + Thiocyanate	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**0.179**
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Fluoride, Leachable	mg/L	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**14**
Moisture	%	--	--	--	--	--	**20**	**22**	**20**	**27**	**13**	**33**	**17**	**19**	**18**	**21**	**18**	**18**	**17**
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
pH	pH Units	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**8.22**
Phosphorus	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**377**
Saturation	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**33.1**
SOC	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Soluble Conductivity	µS/cm	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**10900**
Total organic carbon	%	--	--	--	--	--	**0.1**	**0.18**	**0.12**	**0.23**	**0.1**	**0.5**	**0.1**	**0.16**	**0.2**	**0.1**	**0.09**	**0.07**	**0.38**
Total solids	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	**2.2**	**1.8**	**1.4**	**1.6**	**1.6**	**4.1**	**1.9**	**2.1**	**1.4**	**1.2**	**1.9**	**1.6**	**0.9**
Gravel (2mm-26mm)	%	--	--	--	--	--	**17**	**2**	**0.3**	0.1 U	**0.2**	**0.2**	**26**	**31**	**21**	**0.8**	**19**	**1**	**44**
Sand (63µm-2mm)	%	--	--	--	--	--	**52**	**95**	**74**	**96**	**97**	**90**	**72**	**67**	**77**	**98**	**78**	**97**	**55**
Sand, Coarse	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sand, Fine	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sand, Medium	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Silt (2um-63um)	%	--	--	--	--	--	**29**	**1.5**	**25**	**2.4**	**1.6**	**5.4**	**0.4**	**0.4**	**0.3**	**0.2**	**0.8**	**0.6**	0.1 U
Metal																			
Aluminum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**12400**
Antimony	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	0.1 U
Arsenic	mg/kg	4.3	7.2	19	42	150	**2**	**1**	**2**	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	**1.58**
Barium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**20.3**
Beryllium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**0.57**
Bismuth	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	0.1 U
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**0.078**
Calcium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**3780**
Chromium	mg/kg	30	52	96	160	290	**45**	**3**	**15**	**5**	**4**	**6**	**3**	**4**	**3**	**3**	**3**	**3**	**8.7**
Cobalt	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**1.7**
Copper	mg/kg	11	19	42	110	230	**23**	**4**	**11**	**3**	**2**	**4**	**5**	**2**	**3**	1 U	**2**	1 U	**8.27**
Iron	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**5670**
Lead	mg/kg	18	30	54	110	180	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	**3.91**
Lithium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**16.8**
Magnesium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**1890**
Manganese	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**71.4**

Table 3-2a

Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							DA-7	DA-8	DA-9	DA-10	DA-11	MDDEP-1	MNR-1	MNR-2	MNR-3	MNR-4	MNR-5	MNR-6	11ECO1
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Grab
Year							2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2011
Major Remediation Area							BDA	BDA	BDA	BDA	BDA	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	**0.02**	**0.04**	**0.02**	**0.04**	**0.03**	**0.01**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	0.05 U
Molybdenum	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**0.68**
Nickel	mg/kg	--	--	--	--	--	**26**	**3**	**11**	**4**	**3**	**4**	**3**	**3**	**3**	**2**	**2**	**2**	**5.94**
Potassium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**741**
Selenium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	0.5 U
Silver	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	0.05 U
Sodium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**1910**
Strontium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**21.5**
Thallium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**0.053**
Tin	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**0.3**
Titanium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**241**
Uranium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**0.236**
Vanadium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**11.7**
Zinc	mg/kg	70	120	180	270	430	**42**	**16**	**19**	**12**	**10**	**18**	**16**	5 U	5 U	5 U	**13**	5 U	**36.5**
Zirconium	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**1.13**
Metal - AVS/SEM																			
Cadmium	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sulfide	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SEM-AVS	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	0.01 U	**0.03**	0.01 U	**0.03**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.15**
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	0.01 U	**0.21**	**0.02**	**0.33**	**0.03**	**0.5**	0.01 U	**0.15**	**0.19**	**0.1**	**0.07**	**0.03**	**2.4**
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.05 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	0.01 U	**0.61**	**0.06**	**0.57**	**0.07**	**1.1**	**0.05**	**0.32**	**0.59**	**0.28**	**0.2**	**0.07**	**3.1**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**0.03**	**2.4**	**0.31**	**3.6**	**0.41**	**5.9**	**0.17**	**1.1**	**1.9**	**0.99**	**0.82**	**0.25**	**14**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**0.04**	**3.4**	**0.47**	**4.8**	**0.51**	**7.2**	**0.27**	**1.5**	**2.4**	**1.1**	**0.95**	**0.31**	**17**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**0.03**	**2.6**	**0.33**	**3.4**	**0.34**	**5.5**	**0.22**	**1**	**1.9**	**0.91**	**0.78**	**0.26**	**11**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	0.01 U	**0.67**	**0.06**	**0.59**	**0.07**	**1**	0.01 U	**0.19**	**0.31**	**0.14**	**0.14**	**0.05**	**2.2**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**0.05**	**3.7**	**0.47**	**4.7**	**0.6**	**9.3**	**0.42**	**2.1**	**3.7**	**1.7**	**1.3**	**0.44**	**19**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	0.01 U	**0.17**	**0.02**	**0.2**	**0.01**	**0.4**	0.01 U	**0.11**	0.01 U	**0.07**	**0.06**	**0.02**	**1.3**
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.01 U	**0.12**	**0.01**	**0.2**	**0.02**	**0.2**	0.01 U	**0.08**	**0.05**	**0.04**	**0.04**	**0.01**	**0.57**
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**0.02**	**1.6**	**0.13**	**2.1**	**0.27**	**4.2**	**0.19**	**1.2**	**1.8**	**0.84**	**0.69**	**0.22**	**11**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**0.04**	**3.1**	**0.4**	**4.4**	**0.49**	**8.3**	**0.34**	**1.8**	**3.3**	**1.5**	**1.2**	**0.38**	**17**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**0.21**	**18.6**	**2.28**	**24.9**	**2.82**	**43.6**	**1.66**	**9.55**	**16.1**	**7.67**	**6.25**	**2.04**	**98.7**

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

						Location ID	DA-7	DA-8	DA-9	DA-10	DA-11	MDDEP-1	MNR-1	MNR-2	MNR-3	MNR-4	MNR-5	MNR-6	11ECO1
						Sample Depth	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
						Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N
						Sample Description	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Grab
						Year	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2011
						Major Remediation Area	BDA	BDA	BDA	BDA	BDA	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	na
1-Methylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	**0.02**	0.01 U	**0.03**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.01**	**0.01**	0.01 U	na
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	na
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.01 U	**0.07**	0.01 U	**0.1**	**0.01**	**0.2**	0.01 U	**0.04**	0.01 U	**0.03**	0.01 U	0.01 U	na
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	na
5-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.01 U	**0.01**	0.01 U	**0.01**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	na
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	na
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**0.07**	**5.6**	**0.85**	**8**	**1**	**12**	**0.44**	**2.5**	**4.5**	**1.8**	**1.6**	**0.57**	na
Benzo(b+j)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**19**
Benzo(b+k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	0.01 U	**0.31**	**0.03**	**0.33**	**0.04**	**0.5**	0.01 U	**0.12**	**0.21**	**0.1**	**0.08**	**0.03**	na
Benzo(e)pyrene	mg/kg	--	--	--	--	--	**0.03**	**2.3**	**0.32**	**2.8**	**0.4**	**4.6**	**0.17**	**0.87**	**1.6**	**0.63**	**0.58**	**0.22**	na
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**0.02**	**2.4**	**0.29**	**2.6**	**0.33**	**5.6**	**0.19**	**0.93**	**1.6**	**0.71**	**0.63**	**0.23**	**9.5**
Benzo(k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**6.8**
C1-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	0.1 U	**0.3**	0.1 U	**0.6**	0.1 U	**2**	0.1 U	**0.2**	0.1 U	**0.1**	**0.2**	0.1 U	na
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	0.01 U	**0.09**	0.01 U	**0.11**	0.01 U	**0.2**	0.01 U	**0.04**	**0.05**	**0.03**	**0.02**	0.01 U	na
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	0.01 U	**0.18**	0.01 U	**0.4**	**0.05**	**0.9**	0.01 U	**0.13**	**0.23**	**0.09**	**0.09**	**0.03**	na
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	0.01 U	**0.91**	0.01 U	**0.88**	**0.11**	**1.9**	0.01 U	**0.25**	**0.45**	**0.12**	**0.2**	**0.06**	na
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**0.02**	**2**	**0.23**	**2.4**	**0.27**	**4.8**	**0.14**	**0.74**	**1.3**	**0.57**	**0.55**	**0.19**	**12**
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

						Location ID	DA-7	DA-8	DA-9	DA-10	DA-11	MDDEP-1	MNR-1	MNR-2	MNR-3	MNR-4	MNR-5	MNR-6	11ECO1
						Sample Depth	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
						Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N
						Sample Description	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Grab
						Year	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2011
						Major Remediation Area	BDA	BDA	BDA	BDA	BDA	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	na
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.06**	**0.01**	**0.01**	0.01 U	0.01 U	0.01 U	0.01 U	na
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	**0.03**	0.01 U	0.01 U	0.01 U	**0.22**	**0.03**	**0.02**	0.01 U	0.01 U	0.01 U	0.01 U	na
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	na
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.01**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	na
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	**0.04**	0.01 U	0.01 U	**0.03**	**0.32**	**0.04**	**0.06**	**0.1**	**0.01**	**0.03**	**0.01**	na
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	**0.08**	**0.02**	**0.03**	**0.09**	**0.3**	**0.03**	**0.16**	**0.2**	**0.03**	**0.1**	**0.05**	na
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	**0.04**	0.01 U	**0.01**	**0.04**	**0.13**	**0.01**	**0.08**	0.01 U	**0.01**	**0.04**	**0.03**	na
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	ND	**0.19**	**0.02**	**0.04**	**0.16**	**1**	**0.12**	**0.33**	**0.4**	**0.05**	**0.17**	**0.09**	**0.158**
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	0.03 U
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**0.22**
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	0.03 U
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	0.03 U
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**0.22**
Total Petroleum Hydrocarbons																			
F2 (C10-C16 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**20**
F3 (C16-C34 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**1100**
F4 (C34-C50 Hydrocarbons)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**370**
F4G-SG (Heavy Hydrocarbons-Grav.)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**2800**
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	100 U	100 U	100 U	**160**	**180**	**120**	100 U	100 U	100 U	100 U	100 U	100 U	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							11ECO2	11ECO3	11ECO4	11ECO5	11ECO6	11ECO7	11ECO8	11ECO9	11ECO10	11ECO10	11ECO11	11ECO12	11ECO13
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	N	N	FD	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Ammonia-Nitrogen	mg/kg	--	--	--	--	--	12	4.2	4	6.9	2.1	8.5	7.1	8	5.7	4.2	3.9	7.8	5.9
Cyanide + Thiocyanate	mg/kg	--	--	--	--	--	26.1	0.741	0.083	0.252	0.588	29.6	0.378	12.7	0.02 U	0.02 U	0.111	0.295	0.823
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Fluoride, Leachable	mg/L	--	--	--	--	--	1.2	3.6	2.5	2	3.2	3.7	2.2	1.2	0.15	0.21	0.31	1	0.57
Moisture	%	--	--	--	--	--	28	24	23	24	25	25	28	25	20	15	35	23	23
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
pH	pH Units	--	--	--	--	--	8.03	8.31	8.29	8.14	8.49	7.83	8.02	8.1	8.33	8.38	8.16	8.13	8.32
Phosphorus	mg/kg	--	--	--	--	--	647	262	416	825	566	635	937	503	377	274	708	489	656
Saturation	%	--	--	--	--	--	50.8	37.3	34.4	38.4	39.8	41.4	45.1	37.1	30.9	31.3	62.3	34.8	45.7
SOC	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Soluble Conductivity	µS/cm	--	--	--	--	--	25200	14700	10600	14800	7030	22200	20000	16800	13600	15700	32500	16900	18100
Total organic carbon	%	--	--	--	--	--	1.6	0.97	0.13	0.4	0.29	2.2	0.48	1.2	0.13	0.09	0.63	1.6	2.6
Total solids	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	4.3	2.9	1.6	1.4	2.2	3.1	2.9	3.6	1.6	na	6	2.3	5
Gravel (2mm-26mm)	%	--	--	--	--	--	6.9	5.2	1.1	0.6	0.4	1.7	0.1	4.7	21	na	2.4	1.9	21
Sand (63µm-2mm)	%	--	--	--	--	--	82	93	97	97	97	92	96	90	76	na	53	95	71
Sand, Coarse	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sand, Fine	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sand, Medium	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Silt (2um-63um)	%	--	--	--	--	--	6.7	0.1 U	0.6	0.7	0.6	3.6	1.1	2.1	0.7	na	38	1	2.9
Metal																			
Aluminum	mg/kg	--	--	--	--	--	13400	6340	4250	5760	7990	13200	10800	9510	2560	2670	14600	6690	11500
Antimony	mg/kg	--	--	--	--	--	0.27	0.1 U	0.1 U	0.1 U	0.1 U	0.25	0.1 U	0.18	0.1 U	0.1 U	0.13	0.14	0.22
Arsenic	mg/kg	4.3	7.2	19	42	150	4.33	1.64	1.22	1.26	1.11	2.66	1.52	2.41	1.11	0.93	1.47	2.03	3.63
Barium	mg/kg	--	--	--	--	--	27.6	19.7	11	15.3	20.6	19.3	21.4	17.6	9.41	13.6	96.9	18.9	26
Beryllium	mg/kg	--	--	--	--	--	0.43	0.45	0.4 U	0.4 U	0.42	0.4 U	0.51	0.4 U	0.4 U	0.4 U	0.4 U	ND	0.4 U
Bismuth	mg/kg	--	--	--	--	--	0.12	0.1 U	0.1 U	0.1 U	0.1 U	0.14	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	ND	0.12
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	0.306	0.085	0.057	0.111	0.103	0.342	0.145	0.278	0.05 U	0.05 U	0.137	0.074	0.188
Calcium	mg/kg	--	--	--	--	--	4240	3700	2770	3130	3010	2630	3410	3080	1990	1950	5640	2570	7300
Chromium	mg/kg	30	52	96	160	290	12.4	10.2	5.4	8.6	7.6	8.6	9.6	10.3	5.5	5.8	42.5	8	12.2
Cobalt	mg/kg	--	--	--	--	--	2.98	2.34	1.65	1.95	2.24	2.23	2.36	2.5	1.69	1.47	8.07	2.29	2.8
Copper	mg/kg	11	19	42	110	230	25	9.36	4.22	5.64	5.39	27.6	8	12.7	3.41	3.17	18.8	6.67	17.7
Iron	mg/kg	--	--	--	--	--	14200	6200	6110	9380	7950	9410	9140	9300	5460	4820	18400	8420	12400
Lead	mg/kg	18	30	54	110	180	9.52	2.09	1.35	1.89	2.22	8.05	3.33	7.51	0.92	0.76	4.48	1.84	5.22
Lithium	mg/kg	--	--	--	--	--	8.7	13.1	9.2	7.2	12.6	6.4	9.7	6.2	5 U	5	17.5	7.4	8.4
Magnesium	mg/kg	--	--	--	--	--	2830	2530	1780	1800	2410	2090	2390	2050	1730	1790	8270	2130	2660
Manganese	mg/kg	--	--	--	--	--	107	94	58.6	74.2	78.8	72.8	84.8	71.8	48.8	43.5	210	85.5	90.9

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							11ECO2	11ECO3	11ECO4	11ECO5	11ECO6	11ECO7	11ECO8	11ECO9	11ECO10	11ECO10	11ECO11	11ECO12	11ECO13
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	N	N	FD	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	ND	0.05 U
Molybdenum	mg/kg	--	--	--	--	--	**0.8**	**0.29**	**0.43**	**0.28**	**0.36**	**0.78**	**0.36**	**0.54**	**0.12**	**0.12**	**0.49**	**0.45**	**0.82**
Nickel	mg/kg	--	--	--	--	--	**8.25**	**6.08**	**4.91**	**5.17**	**6**	**5.84**	**6.3**	**6.46**	**3.72**	**3.92**	**21.5**	**5.6**	**7.98**
Potassium	mg/kg	--	--	--	--	--	**1230**	**1170**	**591**	**705**	**1020**	**822**	**1050**	**793**	**490**	**550**	**4740**	**952**	**1190**
Selenium	mg/kg	--	--	--	--	--	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	ND	0.5 U
Silver	mg/kg	--	--	--	--	--	**0.052**	0.05 U	0.05 U	0.05 U	0.05 U	**0.183**	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	ND	0.05 U
Sodium	mg/kg	--	--	--	--	--	**3140**	**1230**	**1020**	**1690**	**898**	**2580**	**2110**	**1990**	**823**	**1520**	**4730**	**1830**	**2950**
Strontium	mg/kg	--	--	--	--	--	**33.8**	**16.9**	**11.1**	**13.1**	**16.9**	**21.3**	**18.3**	**23**	**8.62**	**10.4**	**34.8**	**14.2**	**42.8**
Thallium	mg/kg	--	--	--	--	--	**0.095**	**0.094**	**0.055**	**0.072**	**0.111**	**0.075**	**0.11**	**0.067**	0.05 U	0.05 U	**0.205**	**0.081**	**0.095**
Tin	mg/kg	--	--	--	--	--	**1.55**	**0.35**	**0.33**	**0.34**	**0.35**	**0.9**	**0.47**	**0.97**	**0.18**	**0.17**	**0.57**	**0.57**	**1.23**
Titanium	mg/kg	--	--	--	--	--	**369**	**372**	**269**	**335**	**388**	**291**	**403**	**309**	**207**	**194**	**1370**	**337**	**399**
Uranium	mg/kg	--	--	--	--	--	**0.606**	**0.186**	**0.268**	**0.383**	**0.386**	**0.521**	**0.557**	**0.462**	**0.175**	**0.126**	**0.677**	**0.32**	**0.547**
Vanadium	mg/kg	--	--	--	--	--	**16.8**	**11.6**	**11.3**	**18.4**	**15.7**	**15.1**	**18.1**	**14.7**	**11.1**	**8**	**38.1**	**12.6**	**17**
Zinc	mg/kg	70	120	180	270	430	**120**	**71.2**	**22**	**30.7**	**37.6**	**131**	**52.6**	**95.1**	**15**	**14.4**	**52.9**	**28.8**	**148**
Zirconium	mg/kg	--	--	--	--	--	**0.69**	**0.74**	**0.71**	**0.69**	**0.6**	**0.63**	**0.75**	**0.54**	0.5 U	0.5 U	**3.86**	**0.61**	**0.63**
Metal - AVS/SEM																			
Cadmium	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sulfide	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SEM-AVS	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	**0.53**	**0.33**	0.05 U	0.05 U	**0.1**	**1.2**	**0.098**	**0.8**	0.05 U	0.05 U	**0.3**	**0.37**	**0.45**
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**4.4**	**3.4**	**0.16**	**0.45**	**1**	**7**	**0.89**	**4.8**	0.05 U	**0.078**	**2.1**	**2.9**	**3.8**
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**7.3**	**6.7**	**0.24**	**0.75**	**2.2**	**10**	**1.9**	**7.1**	0.05 U	**0.25**	**4.1**	**5.9**	**6.4**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**44**	**29**	**0.96**	**3.6**	**7.4**	**44**	**6.1**	**35**	**0.23**	**0.59**	**13**	**18**	**26**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**57**	**33**	**1.3**	**4.7**	**7.9**	**51**	**6.8**	**39**	**0.32**	**0.64**	**12**	**18**	**29**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**37**	**25**	**0.91**	**3.6**	**6.6**	**38**	**5.3**	**30**	**0.21**	**0.57**	**11**	**16**	**23**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**7.9**	**4.7**	**0.19**	**0.76**	**1.4**	**6**	**1**	**4.8**	**0.05**	**0.098**	**1.6**	**3**	**5.1**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**55**	**41**	**1.7**	**5.4**	**13**	**65**	**12**	**51**	**0.34**	**1.1**	**22**	**34**	**40**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**3.1**	**2.4**	**0.099**	**0.3**	**0.83**	**5.4**	**0.78**	**3.7**	0.05 U	**0.084**	**1.9**	**2.9**	**2.9**
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	**2.1**	**1.1**	**0.053**	**0.1**	**0.24**	**3.7**	**0.25**	**3**	0.05 U	0.05 U	**0.86**	**0.82**	**1.4**
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**25**	**23**	**0.97**	**2.8**	**8**	**39**	**7.2**	**28**	**0.17**	**0.7**	**15**	**24**	**23**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**51**	**37**	**1.4**	**4.7**	**11**	**59**	**10**	**46**	**0.29**	**0.96**	**19**	**30**	**36**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**294**	**207**	**7.97**	**27.2**	**59.7**	**329**	**52.3**	**253**	**1.61**	**5.05**	**103**	**156**	**197**

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

						Location ID	11ECO2	11ECO3	11ECO4	11ECO5	11ECO6	11ECO7	11ECO8	11ECO9	11ECO10	11ECO10	11ECO11	11ECO12	11ECO13
						Sample Depth	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
						Sample Type	N	N	N	N	N	N	N	N	N	FD	N	N	N
						Sample Description	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
						Year	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
1-Methylnaphthalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
3-Methylcholanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b+j)fluoranthene	mg/kg	--	--	--	--	--	**70**	**38**	**1.6**	**5.8**	**8.7**	**58**	**8.2**	**44**	**0.38**	**0.78**	**14**	**19**	**38**
Benzo(b+k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(e)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**35**	**19**	**0.82**	**3**	**5.3**	**26**	**3.8**	**20**	**0.22**	**0.38**	**5.3**	**10**	**18**
Benzo(k)fluoranthene	mg/kg	--	--	--	--	--	**17**	**15**	**0.5**	**1.5**	**3.5**	**20**	**3.2**	**17**	**0.13**	**0.32**	**3.8**	**10**	**10**
C1-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**44**	**25**	**1.1**	**3.5**	**6.5**	**34**	**4.8**	**26**	**0.28**	**0.47**	**7.5**	**13**	**23**
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a

Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

						Location ID	11ECO2	11ECO3	11ECO4	11ECO5	11ECO6	11ECO7	11ECO8	11ECO9	11ECO10	11ECO10	11ECO11	11ECO12	11ECO13
						Sample Depth	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
						Sample Type	N	N	N	N	N	N	N	N	N	FD	N	N	N
						Sample Description	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
						Year	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	**1.95**	**4.73**	**0.0304**	**0.269**	**1.19**	**1.37**	**1.98**	**2.72**	**0.112**	**0.109**	**2.43**	**6.48**	**1.29**
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	ND	0.03 U
Aroclor 1248	mg/kg	--	--	--	--	--	**0.83**	**3.9**	**0.31**	**0.56**	**1.3**	**0.73**	**2**	**0.92**	**0.053**	**0.051**	**1.6**	**1.7**	**1.2**
Aroclor 1254	mg/kg	--	--	--	--	--	**1.2**	**0.62**	0.03 U	**0.31**	**0.19**	**0.36**	**0.87**	**0.59**	**0.064**	**0.039**	0.03 U	**0.71**	**0.71**
Aroclor 1260	mg/kg	--	--	--	--	--	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	ND	0.03 U
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	**2**	**4.5**	**0.31**	**0.87**	**1.5**	**1.1**	**2.9**	**1.5**	**0.12**	**0.09**	**1.6**	**2.1**	**1.9**
Total Petroleum Hydrocarbons																			
F2 (C10-C16 Hydrocarbons)	mg/kg	--	--	--	--	--	**39**	**17**	10 U	10 U	10 U	**47**	10 U	**28**	10 U	10 U	10 U	ND	**28**
F3 (C16-C34 Hydrocarbons)	mg/kg	--	--	--	--	--	**1400**	**910**	**39**	**90**	**230**	**1500**	**270**	**950**	**17**	**28**	**360**	ND	**1600**
F4 (C34-C50 Hydrocarbons)	mg/kg	--	--	--	--	--	**460**	**330**	**23**	**47**	**80**	**350**	**86**	**230**	**32**	**29**	**64**	ND	**320**
F4G-SG (Heavy Hydrocarbons-Grav.)	mg/kg	--	--	--	--	--	**4300**	**3000**	**470**	**660**	**780**	**3500**	**1400**	**2500**	**590**	**440**	**2000**	**3500**	**2100**
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

						Location ID	11ECO14	11ECO15	11ECO16	11ECO17	11ECO18	11ECO19	11ECO20	11ECO20	11ECO21	11ECO22	11ECO23	11ECO24	11ECO25
						Sample Depth	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
						Sample Type	N	N	N	N	N	N	N	FD	N	N	N	N	N
						Sample Description	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
						Year	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Ammonia-Nitrogen	mg/kg	--	--	--	--	--	**3.2**	**8.1**	**7.6**	**8.7**	**2.4**	**2.9**	**6**	**5.1**	**4.6**	**2.9**	**4.4**	**8.7**	**5.8**
Cyanide + Thiocyanate	mg/kg	--	--	--	--	--	0.02 U	**0.075**	**0.394**	**0.711**	0.02 U	**0.03**	**0.112**	**0.148**	**0.255**	0.02 U	0.02 U	**0.082**	**0.079**
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Fluoride, Leachable	mg/L	--	--	--	--	--	**0.11**	**0.49**	**1.3**	**0.39**	**0.13**	**0.18**	**0.95**	**0.83**	**0.48**	**0.18**	**0.42**	**0.62**	**0.48**
Moisture	%	--	--	--	--	--	**18**	**24**	**28**	**22**	**18**	**21**	**26**	**27**	**18**	**17**	**22**	**27**	**23**
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
pH	pH Units	--	--	--	--	--	**8.34**	**8.09**	**8.13**	**8.33**	**8.43**	**8.21**	**8.17**	**8.18**	**8.29**	**8.41**	**8.28**	**8.08**	**8.27**
Phosphorus	mg/kg	--	--	--	--	--	**537**	**769**	**664**	**642**	**599**	**738**	**514**	**563**	**571**	**461**	**635**	**621**	**529**
Saturation	%	--	--	--	--	--	**28.8**	**32.2**	**44.3**	**40.9**	**31.9**	**35.3**	**39.8**	**39.3**	**41.4**	**29.6**	**31.6**	**40.6**	**35.1**
SOC	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Soluble Conductivity	µS/cm	--	--	--	--	--	**10600**	**17300**	**28900**	**18700**	**14400**	**12000**	**19800**	**22400**	**16800**	**17600**	**14500**	**17800**	**15500**
Total organic carbon	%	--	--	--	--	--	**0.09**	**0.24**	**1.3**	**1**	**0.06**	**0.08**	**0.62**	**0.45**	**0.92**	**0.08**	**0.07**	**0.33**	**0.57**
Total solids	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	**1.6**	**1.7**	**3.7**	**3.5**	**1.7**	**1**	**2.8**	**2.2**	**3.6**	**1.3**	**2.1**	**2.5**	**2.7**
Gravel (2mm-26mm)	%	--	--	--	--	--	**55**	**0.3**	**2.5**	**21**	**21**	**1**	**0.3**	**0.4**	**39**	**31**	**1.1**	**0.4**	**2.2**
Sand (63µm-2mm)	%	--	--	--	--	--	**43**	**97**	**91**	**74**	**78**	**98**	**96**	**95**	**55**	**68**	**97**	**96**	**93**
Sand, Coarse	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sand, Fine	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sand, Medium	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Silt (2um-63um)	%	--	--	--	--	--	0.1 U	**0.7**	**2.4**	**1.4**	0.1 U	**0.2**	**1.4**	**2.4**	**2.5**	0.1 U	0.1 U	**1.6**	**1.9**
Metal																			
Aluminum	mg/kg	--	--	--	--	--	**2970**	**5340**	**12500**	**8140**	**2660**	**3110**	**8860**	**7880**	**7030**	**3060**	**2680**	**7380**	**6240**
Antimony	mg/kg	--	--	--	--	--	0.1 U	0.1 U	0.1 U	**0.3**	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Arsenic	mg/kg	4.3	7.2	19	42	150	**1.05**	**1.79**	**1.32**	**4.42**	**1**	**1.14**	**1.1**	**1.19**	**1.42**	**1.17**	**1.09**	**1.2**	**1.24**
Barium	mg/kg	--	--	--	--	--	**13.4**	**15.1**	**27.1**	**22.5**	**13.1**	**20**	**25.5**	**21.7**	**24.8**	**13**	**10.2**	**23.9**	**25.4**
Beryllium	mg/kg	--	--	--	--	--	0.4 U	0.4 U	**0.47**	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Bismuth	mg/kg	--	--	--	--	--	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	0.05 U	**0.145**	**0.167**	**0.11**	**0.069**	**0.065**	**0.06**	**0.11**	**0.079**	0.05 U	**0.08**	**0.127**	**0.077**
Calcium	mg/kg	--	--	--	--	--	**2740**	**2760**	**3600**	**6720**	**2980**	**2560**	**2630**	**2620**	**5160**	**3460**	**2670**	**2580**	**3450**
Chromium	mg/kg	30	52	96	160	290	**6.4**	**7.3**	**9.2**	**13.7**	**6.5**	**7.3**	**6.8**	**6.8**	**8.7**	**6.4**	**7.6**	**7.2**	**8.1**
Cobalt	mg/kg	--	--	--	--	--	**2.01**	**1.71**	**2.51**	**2.56**	**1.49**	**1.49**	**1.92**	**1.87**	**2.47**	**1.86**	**1.51**	**1.93**	**2.13**
Copper	mg/kg	11	19	42	110	230	**3.51**	**3.17**	**5.57**	**19.1**	**2.33**	**2.47**	**7.11**	**4.87**	**10.7**	**2.52**	**2.14**	**6.86**	**6**
Iron	mg/kg	--	--	--	--	--	**6030**	**8060**	**8240**	**12900**	**6860**	**7770**	**6570**	**6330**	**8490**	**6960**	**6630**	**6580**	**6960**
Lead	mg/kg	18	30	54	110	180	**1.44**	**3.85**	**3.18**	**5.53**	**0.78**	**1.05**	**2.41**	**2.04**	**3.07**	**0.86**	**0.89**	**3.9**	**3.4**
Lithium	mg/kg	--	--	--	--	--	**5.3**	5 U	**8.6**	**6.9**	5 U	5 U	**7.4**	**6.7**	**7**	5 U	5 U	**6.8**	**6.6**
Magnesium	mg/kg	--	--	--	--	--	**1840**	**1710**	**2610**	**2370**	**1430**	**1500**	**2120**	**1960**	**2330**	**1800**	**1460**	**2120**	**2200**
Manganese	mg/kg	--	--	--	--	--	**55.5**	**59.5**	**78.8**	**88.4**	**51.8**	**53.5**	**60.8**	**58.1**	**85.9**	**57.2**	**49.4**	**63.1**	**66.7**

Table 3-2a

Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							11ECO14	11ECO15	11ECO16	11ECO17	11ECO18	11ECO19	11ECO20	11ECO20	11ECO21	11ECO22	11ECO23	11ECO24	11ECO25
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	FD	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	0.05 U	0.05 U	**0.342**	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Molybdenum	mg/kg	--	--	--	--	--	**0.13**	**0.28**	**0.46**	**0.97**	**0.24**	**0.2**	**0.35**	**0.3**	**0.39**	**0.17**	**0.32**	**0.36**	**0.26**
Nickel	mg/kg	--	--	--	--	--	**3.85**	**3.86**	**6**	**7.7**	**3.49**	**3.18**	**4.49**	**4.47**	**5.73**	**3.93**	**4.11**	**4.4**	**4.89**
Potassium	mg/kg	--	--	--	--	--	**654**	**639**	**1250**	**1040**	**503**	**469**	**987**	**876**	**1080**	**558**	**433**	**1010**	**1110**
Selenium	mg/kg	--	--	--	--	--	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Silver	mg/kg	--	--	--	--	--	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Sodium	mg/kg	--	--	--	--	--	**1130**	**2050**	**2100**	**2400**	**948**	**1270**	**2180**	**1870**	**1660**	**888**	**1380**	**1900**	**1380**
Strontium	mg/kg	--	--	--	--	--	**10.8**	**12.9**	**22.9**	**35.9**	**12.1**	**10.1**	**15.8**	**16.1**	**28.7**	**16.2**	**10.2**	**15**	**16.6**
Thallium	mg/kg	--	--	--	--	--	**0.058**	**0.066**	**0.116**	**0.084**	0.05 U	**0.058**	**0.094**	**0.084**	**0.084**	**0.061**	**0.064**	**0.105**	**0.093**
Tin	mg/kg	--	--	--	--	--	**0.2**	**0.25**	**0.48**	**1.88**	**0.19**	**0.23**	**0.39**	**0.32**	**0.64**	**0.18**	**0.23**	**0.35**	**0.73**
Titanium	mg/kg	--	--	--	--	--	**266**	**300**	**465**	**355**	**290**	**283**	**372**	**349**	**418**	**290**	**250**	**381**	**393**
Uranium	mg/kg	--	--	--	--	--	**0.183**	**0.38**	**0.539**	**0.484**	**0.255**	**0.343**	**0.343**	**0.415**	**0.359**	**0.224**	**0.335**	**0.36**	**0.313**
Vanadium	mg/kg	--	--	--	--	--	**11.9**	**16.5**	**16.7**	**15.3**	**14.7**	**16.1**	**14.1**	**13.1**	**15.5**	**14.1**	**14**	**14.2**	**13.7**
Zinc	mg/kg	70	120	180	270	430	**15.7**	**27.9**	**43.7**	**87.5**	**14.5**	**17.6**	**30**	**31.6**	**36.2**	**15.9**	**15.9**	**29.6**	**25.8**
Zirconium	mg/kg	--	--	--	--	--	0.5 U	**0.58**	**0.52**	0.5 U	0.5 U	0.5 U	**0.75**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Metal - AVS/SEM																			
Cadmium	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Sulfide	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
SEM-AVS	µmol/g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	0.05 U	0.05 U	**0.63**	**0.9**	0.05 U	0.05 U	**0.14**	**0.45**	**1.5**	0.05 U	0.05 U	0.05 U	**0.23**
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	0.05 U	**0.35**	**5**	**3.4**	0.05 U	**0.17**	**1.2**	**2.8**	**11**	0.05 U	0.05 U	**0.4**	**1.9**
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**0.12**	**0.86**	**11**	**10**	**0.087**	**0.28**	**2.6**	**5.3**	**25**	0.05 U	**0.069**	**0.79**	**4.1**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**0.35**	**2.6**	**32**	**17**	**0.34**	**0.96**	**11**	**16**	**68**	**0.15**	**0.24**	**3.1**	**22**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**0.4**	**3**	**30**	**15**	**0.46**	**1.1**	**12**	**19**	**70**	**0.18**	**0.31**	**3.7**	**20**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**0.32**	**2.5**	**28**	**16**	**0.31**	**1**	**9.5**	**17**	**59**	**0.14**	**0.22**	**2.6**	**20**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**0.063**	**0.42**	**4**	**2.6**	**0.074**	**0.11**	**1.4**	**2.8**	**9.6**	0.05 U	0.05 U	**0.61**	**2.7**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**0.64**	**4.6**	**52**	**32**	**0.57**	**1.8**	**17**	**29**	**130**	**0.25**	**0.42**	**5.6**	**41**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**0.051**	**0.35**	**4.9**	**3.2**	0.05 U	**0.14**	**1.1**	**2.5**	**12**	0.05 U	0.05 U	**0.33**	**1.5**
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.05 U	**0.1**	**1.4**	**3.9**	0.05 U	**0.061**	**0.37**	**1.6**	**2.6**	0.05 U	0.05 U	**0.12**	**0.58**
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**0.45**	**2.9**	**36**	**22**	**0.33**	**1.2**	**10**	**19**	**96**	**0.17**	**0.26**	**2.9**	**20**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**0.54**	**3.8**	**46**	**27**	**0.48**	**1.5**	**15**	**23**	**120**	**0.22**	**0.35**	**4.6**	**35**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**2.93**	**21.5**	**251**	**153**	**2.64**	**8.32**	**81.3**	**138**	**605**	**1.11**	**1.86**	**24.8**	**169**

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

						Location ID	11ECO14	11ECO15	11ECO16	11ECO17	11ECO18	11ECO19	11ECO20	11ECO20	11ECO21	11ECO22	11ECO23	11ECO24	11ECO25
						Sample Depth	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
						Sample Type	N	N	N	N	N	N	N	FD	N	N	N	N	N
						Sample Description	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
						Year	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
1-Methylnaphthalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
3-Methylcholanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b+j)fluoranthene	mg/kg	--	--	--	--	--	**0.52**	**3.7**	**35**	**21**	**0.55**	**1.4**	**14**	**23**	**87**	**0.23**	**0.42**	**4.4**	**25**
Benzo(b+k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(e)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**0.24**	**1.7**	**13**	**8.4**	**0.31**	**0.61**	**6.9**	**11**	**38**	**0.11**	**0.2**	**2.4**	**9.5**
Benzo(k)fluoranthene	mg/kg	--	--	--	--	--	**0.13**	**1.1**	**13**	**6.1**	**0.17**	**0.45**	**3.9**	**6.9**	**24**	**0.072**	**0.099**	**1.5**	**8.4**
C1-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C1-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C2-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C3-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
C4-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**0.32**	**2.3**	**18**	**11**	**0.4**	**0.74**	**8.5**	**10**	**50**	**0.12**	**0.26**	**3.2**	**13**
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

						Location ID	11ECO14	11ECO15	11ECO16	11ECO17	11ECO18	11ECO19	11ECO20	11ECO20	11ECO21	11ECO22	11ECO23	11ECO24	11ECO25
						Sample Depth	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
						Sample Type	N	N	N	N	N	N	N	FD	N	N	N	N	N
						Sample Description	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
						Year	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	**0.658**	**1.97**	**8.19**	**0.772**	**0.0317**	**0.0814**	**4.12**	**4.81**	**1.97**	**0.0204**	**0.034**	**0.594**	**1.36**
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	0.03 U	3 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	3 U	0.03 U	0.03 U	0.03 U	0.03 U
Aroclor 1248	mg/kg	--	--	--	--	--	**0.11**	**37**	**8.7**	**3.8**	**0.073**	**0.07**	**1.7**	**1.5**	**360**	**0.051**	**0.059**	**0.83**	**1.9**
Aroclor 1254	mg/kg	--	--	--	--	--	0.03 U	3 U	0.03 U	0.03 U	**0.16**	0.03 U	0.03 U	0.03 U	3 U	0.03 U	0.03 U	**0.48**	**0.3**
Aroclor 1260	mg/kg	--	--	--	--	--	0.03 U	3 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	3 U	0.03 U	0.03 U	0.03 U	0.03 U
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	**0.11**	**37**	**8.7**	**3.8**	**0.24**	**0.07**	**1.7**	**1.5**	**360**	**0.051**	**0.059**	**1.3**	**2.2**
Total Petroleum Hydrocarbons																			
F2 (C10-C16 Hydrocarbons)	mg/kg	--	--	--	--	--	10 U	10 U	**31**	**16**	10 U	10 U	10 U	**19**	**69**	10 U	10 U	10 U	10 U
F3 (C16-C34 Hydrocarbons)	mg/kg	--	--	--	--	--	**12**	**280**	**960**	**740**	**12**	**17**	**300**	**600**	**2600**	**14**	10 U	**140**	**380**
F4 (C34-C50 Hydrocarbons)	mg/kg	--	--	--	--	--	10 U	**98**	**160**	**310**	10 U	**16**	**95**	**150**	**530**	10 U	10 U	**42**	**120**
F4G-SG (Heavy Hydrocarbons-Grav.)	mg/kg	--	--	--	--	--	**290**	**340**	**3400**	**1900**	**310**	100 U	**990**	**860**	**2200**	**260**	**180**	**520**	**910**
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							**11ECO26**	**11ECO27**	**11ECO28**	**11ECO29**	**11ECO30**	**11ECO30**
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	FD
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab
Year							2011	2011	2011	2011	2011	2011
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**						
Conventionals												
Ammonia-Nitrogen	mg/kg	--	--	--	--	--	**4.7**	**3.8**	**2.7**	**2.5**	**3.3**	**3.6**
Cyanide + Thiocyanate	mg/kg	--	--	--	--	--	**0.129**	**0.029**	0.02 U	0.02 U	**0.02**	**0.025**
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na
Fluoride, Leachable	mg/L	--	--	--	--	--	**1.3**	**0.11**	**0.11**	**0.2**	**0.16**	**0.17**
Moisture	%	--	--	--	--	--	**19**	**17**	**15**	**24**	**17**	**16**
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na
pH	pH Units	--	--	--	--	--	**8.33**	**8.45**	**8.1**	**8.46**	**8.41**	**8.14**
Phosphorus	mg/kg	--	--	--	--	--	**458**	**548**	**458**	**643**	**537**	**397**
Saturation	%	--	--	--	--	--	**32.3**	**29.8**	**29.4**	**41.3**	**29.9**	**32.1**
SOC	%	--	--	--	--	--	na	na	na	na	na	na
Soluble Conductivity	µS/cm	--	--	--	--	--	**13500**	**12700**	**16900**	**23700**	**16800**	**13200**
Total organic carbon	%	--	--	--	--	--	**0.65**	**0.06**	**0.05**	**0.16**	**0.08**	**0.1**
Total solids	%	--	--	--	--	--	na	na	na	na	na	na
Grain Size												
Clay (<2 µm)	%	--	--	--	--	--	**1.8**	**2.4**	**1.3**	**4.1**	**2.3**	**2.3**
Gravel (2mm-26mm)	%	--	--	--	--	--	**40**	**23**	**23**	**2.2**	**16**	**26**
Sand (63µm-2mm)	%	--	--	--	--	--	**58**	**74**	**76**	**77**	**81**	**71**
Sand, Coarse	%	--	--	--	--	--	na	na	na	na	na	na
Sand, Fine	%	--	--	--	--	--	na	na	na	na	na	na
Sand, Medium	%	--	--	--	--	--	na	na	na	na	na	na
Silt (2um-63um)	%	--	--	--	--	--	**0.8**	**0.3**	0.1 U	**17**	**0.3**	**0.5**
Metal												
Aluminum	mg/kg	--	--	--	--	--	**3950**	**2750**	**2720**	**8610**	**3610**	**2950**
Antimony	mg/kg	--	--	--	--	--	**0.26**	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Arsenic	mg/kg	4.3	7.2	19	42	150	**5.61**	**1.03**	**1.19**	**1.11**	**2.25**	**0.81**
Barium	mg/kg	--	--	--	--	--	**15.9**	**15.2**	**12.2**	**67**	**20.1**	**15.7**
Beryllium	mg/kg	--	--	--	--	--	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Bismuth	mg/kg	--	--	--	--	--	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	**0.072**	0.05 U	**0.059**	**0.097**	0.05 U	0.05 U
Calcium	mg/kg	--	--	--	--	--	**6110**	**3650**	**2160**	**5230**	**4060**	**4550**
Chromium	mg/kg	30	52	96	160	290	**11.7**	**9.1**	**5.4**	**29.3**	**7.1**	**8**
Cobalt	mg/kg	--	--	--	--	--	**2.71**	**2.02**	**1.49**	**5.95**	**2.11**	**1.76**
Copper	mg/kg	11	19	42	110	230	**12.6**	**2.96**	**2.37**	**13.5**	**3.52**	**3.43**
Iron	mg/kg	--	--	--	--	--	**16400**	**8350**	**6020**	**15100**	**7600**	**6290**
Lead	mg/kg	18	30	54	110	180	**6.21**	**1.1**	**0.83**	**2.72**	**0.92**	**0.79**
Lithium	mg/kg	--	--	--	--	--	**5.9**	5 U	5 U	**11.9**	**5.9**	**5.5**
Magnesium	mg/kg	--	--	--	--	--	**2340**	**1800**	**1660**	**5480**	**2230**	**1720**
Manganese	mg/kg	--	--	--	--	--	**133**	**56.2**	**54.3**	**149**	**61.7**	**57.7**

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							11ECO26	11ECO27	11ECO28	11ECO29	11ECO30	11ECO30
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	FD
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab
Year							2011	2011	2011	2011	2011	2011
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**						
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Molybdenum	mg/kg	--	--	--	--	--	**0.96**	**0.23**	**0.26**	**0.61**	**0.29**	**0.27**
Nickel	mg/kg	--	--	--	--	--	**8.99**	**4.71**	**3.27**	**15.1**	**4.59**	**4.63**
Potassium	mg/kg	--	--	--	--	--	**647**	**585**	**502**	**3090**	**814**	**661**
Selenium	mg/kg	--	--	--	--	--	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Silver	mg/kg	--	--	--	--	--	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Sodium	mg/kg	--	--	--	--	--	**1270**	**1360**	**1040**	**2510**	**1170**	**958**
Strontium	mg/kg	--	--	--	--	--	**32.7**	**16.4**	**9.45**	**25.5**	**15.9**	**18.2**
Thallium	mg/kg	--	--	--	--	--	**0.053**	**0.062**	**0.062**	**0.139**	**0.082**	**0.061**
Tin	mg/kg	--	--	--	--	--	**1.14**	**0.22**	**0.17**	**0.37**	**0.2**	**0.2**
Titanium	mg/kg	--	--	--	--	--	**253**	**300**	**271**	**947**	**337**	**322**
Uranium	mg/kg	--	--	--	--	--	**0.281**	**0.241**	**0.226**	**0.521**	**0.286**	**0.248**
Vanadium	mg/kg	--	--	--	--	--	**11.6**	**17.4**	**12.5**	**30.8**	**14.5**	**12.5**
Zinc	mg/kg	70	120	180	270	430	**92**	**16.8**	**13.7**	**38.4**	**17.2**	**15.1**
Zirconium	mg/kg	--	--	--	--	--	0.5 U	0.5 U	0.5 U	**2.21**	0.5 U	0.5 U
Metal - AVS/SEM												
Cadmium	µmol/g	--	--	--	--	--	na	na	na	na	na	na
Copper	µmol/g	--	--	--	--	--	na	na	na	na	na	na
Lead	µmol/g	--	--	--	--	--	na	na	na	na	na	na
Nickel	µmol/g	--	--	--	--	--	na	na	na	na	na	na
Zinc	µmol/g	--	--	--	--	--	na	na	na	na	na	na
Sulfide	µmol/g	--	--	--	--	--	na	na	na	na	na	na
SEM-AVS	µmol/g	--	--	--	--	--	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)												
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	**0.56**	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**2.8**	0.05 U	0.05 U	0.05 U	0.05 U	**0.053**
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**3.5**	0.05 U	**0.069**	0.05 U	**0.091**	**0.11**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**16**	**0.17**	**0.4**	**0.16**	**0.28**	**0.52**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**21**	**0.24**	**0.57**	**0.21**	**0.35**	**0.57**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**16**	**0.17**	**0.35**	**0.16**	**0.25**	**0.46**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**3**	0.05 U	**0.096**	0.05 U	**0.057**	**0.094**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**28**	**0.27**	**0.54**	**0.3**	**0.53**	**0.82**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**2.5**	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	**1.6**	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**18**	**0.14**	**0.24**	**0.16**	**0.36**	**0.42**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**26**	**0.24**	**0.47**	**0.25**	**0.45**	**0.72**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**139**	**1.23**	**2.72**	**1.24**	**2.36**	**3.76**

Table 3-2a

Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

						Location ID	11ECO26	11ECO27	11ECO28	11ECO29	11ECO30	11ECO30
						Sample Depth	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
						Sample Type	N	N	N	N	N	FD
						Sample Description	Grab	Grab	Grab	Grab	Grab	Grab
						Year	2011	2011	2011	2011	2011	2011
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**						
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)												
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na
1-Methylnaphthalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na
3-Methylcholanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	na	na	na	na	na	na
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Benzo(b+j)fluoranthene	mg/kg	--	--	--	--	--	**25**	**0.28**	**0.72**	**0.26**	**0.45**	**0.71**
Benzo(b+k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Benzo(e)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**13**	**0.17**	**0.39**	**0.13**	**0.23**	**0.39**
Benzo(k)fluoranthene	mg/kg	--	--	--	--	--	**8.5**	**0.1**	**0.18**	**0.072**	**0.12**	**0.28**
C1-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na
C1-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na
C1-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na
C1-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na
C2-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na
C2-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na
C2-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na
C2-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na
C3-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na
C3-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na
C3-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na
C3-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na
C4-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na
C4-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na
C4-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**15**	**0.21**	**0.52**	**0.18**	**0.3**	**0.45**
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na

Table 3-2a

Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Location ID							11ECO26	11ECO27	11ECO28	11ECO29	11ECO30	11ECO30
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	FD
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab
Year							2011	2011	2011	2011	2011	2011
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**						
Polychlorinated Biphenyls (congeners)												
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	**1.27**	**0.0325**	**0.0438**	**0.0985**	**0.0566**	**0.247**
Polychlorinated Biphenyls (Aroclor)												
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U
Aroclor 1248	mg/kg	--	--	--	--	--	**0.2**	**0.11**	**0.051**	**5.8**	**0.15**	**0.053**
Aroclor 1254	mg/kg	--	--	--	--	--	**0.034**	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U
Aroclor 1260	mg/kg	--	--	--	--	--	0.03 U	**0.071**	0.03 U	0.03 U	0.03 U	0.03 U
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	**0.23**	**0.18**	**0.051**	**5.8**	**0.15**	**0.053**
Total Petroleum Hydrocarbons												
F2 (C10-C16 Hydrocarbons)	mg/kg	--	--	--	--	--	**20**	10 U	10 U	10 U	10 U	10 U
F3 (C16-C34 Hydrocarbons)	mg/kg	--	--	--	--	--	**550**	10 U	10 U	**19**	**13**	**16**
F4 (C34-C50 Hydrocarbons)	mg/kg	--	--	--	--	--	**190**	10 U	10 U	**39**	**13**	10 U
F4G-SG (Heavy Hydrocarbons-Grav.)	mg/kg	--	--	--	--	--	**1200**	**330**	**2400**	**630**	**790**	**250**
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	na	na	na	na	na	na

Table 3-2a
Summary of 2006-2011 Surface Sediment Sampling and Laboratory Analysis Results (0 - 10 cm)

Notes:

🟦 Detected concentration is greater than REL (rare effect level)
🟦 Detected concentration is greater than TEL (threshold effect level)
🟨 Detected concentration is greater than OEL (occasional effect level)
🟧 Detected concentration is greater than PEL (probably effect level)
🟥 Detected concentration is greater than FEL (frequent effect level)
🟩 Non-detected concentration is above one or more identified screening levels
Bold = Detected result

cm = centimetres
J = Estimated value
FD = field duplicate
LR = lab replicate
mg/kg = milligrams per kilogram
MS = matrix spike
N = normal sample
ND = Compound analyzed, but not detected above detection limit
na = Compound not analyzed
PCB = polychlorinated biphenyl
SEM/AVS = simultaneously extracted metals / acid volatile sulfide
U = Compound analyzed, but not detected above detection limit
µg/kg = micrograms per kilogram
µmol/g = micromoles per gram

Table 3-2b
Summary of 2006-2007 Surface Sediment Sampling and Laboratory Analysis Results for Alternate Extraction Methods (0 - 10 cm)

Location ID							BC_04	BC_06	BC_07	BC_09	BC_12	BC_13	BC_14	BC_15	BC_18	BC_19	BC_21
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006
Major Remediation Area							ADM	ADM	BDA	ADM	ADM	BDA	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**											
Organics																	
Biphenyl (1,1'-Biphenyl)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
Carbazole	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
Decalin	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
Dibenzofuran	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
Naphthobenzothiophene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13) (8270M Extraction Method)																	
2-Methylnaphthalene	mg/kg	0.016	0.02	0.063	0.2	0.38	na	na	na	na	na	na	na	na	na	na	na
Acenaphthene	mg/kg	0.0037	0.0067	0.021	0.089	0.94	na	na	na	na	na	na	na	na	na	na	na
Acenaphthylene	mg/kg	0.0033	0.0059	0.031	0.13	0.34	na	na	na	na	na	na	na	na	na	na	na
Anthracene	mg/kg	0.016	0.047	0.11	0.24	1.1	na	na	na	na	na	na	na	na	na	na	na
Benzo(a)anthracene	mg/kg	0.027	0.075	0.28	0.69	1.9	na	na	na	na	na	na	na	na	na	na	na
Benzo(a)pyrene	mg/kg	0.034	0.089	0.23	0.76	1.7	na	na	na	na	na	na	na	na	na	na	na
Chrysene	mg/kg	0.037	0.11	0.3	0.85	2.2	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,h)anthracene	mg/kg	0.0033	0.0062	0.043	0.14	0.2	na	na	na	na	na	na	na	na	na	na	na
Fluoranthene	mg/kg	0.027	0.11	0.5	1.5	4.2	na	na	na	na	na	na	na	na	na	na	na
Fluorene	mg/kg	0.01	0.021	0.061	0.14	1.2	na	na	na	na	na	na	na	na	na	na	na
Naphthalene	mg/kg	0.017	0.035	0.12	0.39	1.2	na	na	na	na	na	na	na	na	na	na	na
Phenanthrene	mg/kg	0.023	0.087	0.25	0.54	2.1	na	na	na	na	na	na	na	na	na	na	na
Pyrene	mg/kg	0.041	0.15	0.42	1.4	3.8	na	na	na	na	na	na	na	na	na	na	na
Total PAH13 (calculated)	mg/kg	0.2583	0.7628	2.429	7.069	21.26	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13) (8270M Extraction Method)																	
1-Methylnaphthalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
1-Methylphenanthrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
2,6-Dimethylnaphthalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
Benzo(b)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
Benzo(e)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
Benzo(k)fluoranthene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C1-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C1-Decalin	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C1-Dibenzothiophene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C1-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C1-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C1-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C1-Naphthobenzothiophene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na

Table 3-2b
Summary of 2006-2007 Surface Sediment Sampling and Laboratory Analysis Results for Alternate Extraction Methods (0 - 10 cm)

Location ID							BC_04	BC_06	BC_07	BC_09	BC_12	BC_13	BC_14	BC_15	BC_18	BC_19	BC_21
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006
Major Remediation Area							ADM	ADM	BDA	ADM	ADM	BDA	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**											
C1-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C2-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C2-Decalin	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C2-Dibenzothiophene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C2-Dibenzothiophenes/C2-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C2-Dibenzothiophenes/C2-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C2-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C2-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C2-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C2-Naphthobenzothiophene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C2-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C3-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C3-Decalins	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C3-Dibenzothiophene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C3-Dibenzothiophenes /C3-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C3-Dibenzothiophenes/C3-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C3-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C3-Fluorenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C3-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C3-Naphthobenzothiophene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C3-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C4-Chrysenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C4-Decalin	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C4-Dibenzothiophene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C4-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C4-Naphthalenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
C4-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13) (SFE Extraction)																	
2-Methylnaphthalene	mg/kg	0.016	0.02	0.063	0.2	0.38	ND	0.02	ND	0.011	0.005	0.02	0.002	0.031	0.01	0.036	0.05
Acenaphthene	mg/kg	0.0037	0.0067	0.021	0.089	0.94	0.088	0.186	0.007	0.051	0.026	0.062	0.017	0.187	0.06	0.126	0.17
Acenaphthylene	mg/kg	0.0033	0.0059	0.031	0.13	0.34	0.003	0.004	ND	ND	ND	0.002	0.001	0.004	0.002	0.016	0.004
Anthracene	mg/kg	0.016	0.047	0.11	0.24	1.1	0.288	0.384	0.016	0.13	0.062	0.17	0.028	0.888	0.164	0.343	0.51
Benzo(a)anthracene	mg/kg	0.027	0.075	0.28	0.69	1.9	0.073	0.347	0.009	0.102	0.09	0.133	0.029	1.82	0.096	0.717	0.971
Benzo(a)pyrene	mg/kg	0.034	0.089	0.23	0.76	1.7	0.072	0.195	0.014	0.084	0.06	0.11	0.035	1.13	0.082	0.516	0.652
Chrysene	mg/kg	0.037	0.11	0.3	0.85	2.2	0.111	0.396	0.02	0.176	0.114	0.207	0.05	2.78	0.151	0.827	1.51

Table 3-2b
Summary of 2006-2007 Surface Sediment Sampling and Laboratory Analysis Results for Alternate Extraction Methods (0 - 10 cm)

Location ID							BC_04	BC_06	BC_07	BC_09	BC_12	BC_13	BC_14	BC_15	BC_18	BC_19	BC_21
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006
Major Remediation Area							ADM	ADM	BDA	ADM	ADM	BDA	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**											
Dibenzo(a,h)anthracene	mg/kg	0.0033	0.0062	0.043	0.14	0.2	0.011	0.017	0.002	0.013	0.008	0.015	0.005	0.149	0.009	0.08	0.116
Fluoranthene	mg/kg	0.027	0.11	0.5	1.5	4.2	0.658	0.982	0.036	0.325	0.353	0.497	0.1	4.03	0.323	1.41	2.06
Fluorene	mg/kg	0.01	0.021	0.061	0.14	1.2	0.089	0.128	0.008	0.046	0.021	0.07	0.012	0.175	0.04	0.112	0.156
Naphthalene	mg/kg	0.017	0.035	0.12	0.39	1.2	0.016	0.104	0.019	0.04	0.024	0.066	0.016	0.156	0.041	0.147	0.197
Phenanthrene	mg/kg	0.023	0.087	0.25	0.54	2.1	1.35	0.891	0.035	0.388	0.156	0.429	0.092	1.22	0.317	0.811	1.13
Pyrene	mg/kg	0.041	0.15	0.42	1.4	3.8	0.353	0.6	0.021	0.206	0.137	0.317	0.064	2.43	0.196	0.967	1.49
Total PAH13 (calculated)	mg/kg	0.2583	0.7628	2.429	7.069	21.26	3.06	4.2	0.156	1.53	1.02	2.05	0.408	14.9	1.46	6.04	8.95
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13) (SFE Extraction)																	
1-Methylnaphthalene	mg/kg	--	--	--	--	--	ND	0.012	0.003	0.007	0.003	0.011	0.002	0.017	0.007	0.019	0.026
Benzo(b+k)fluoranthene	mg/kg	--	--	--	--	--	0.109	0.334	0.022	0.134	0.119	0.18	0.054	2.72	0.114	0.932	1.48
Benzo(e)pyrene	mg/kg	--	--	--	--	--	0.036	0.099	0.008	0.042	0.036	0.059	0.019	0.922	0.035	0.282	0.47
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	0.03	0.053	0.007	0.034	0.019	0.04	0.016	0.457	0.036	0.163	0.273
C1-Chrysenes	mg/kg	--	--	--	--	--	0.077	0.211	0.02	0.09	0.058	0.119	0.035	1.52	0.095	0.665	0.807
C1-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	0.138	0.312	0.018	0.172	0.08	0.234	0.041	2.34	0.121	0.875	1.15
C1-Fluorenes	mg/kg	--	--	--	--	--	0.098	0.071	0.007	0.027	0.012	0.034	0.007	0.105	0.034	0.069	0.104
C1-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	0.254	0.247	0.017	0.098	0.046	0.148	0.025	0.591	0.089	0.284	0.384
C2-Chrysenes	mg/kg	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5	ND
C2-Fluorenes	mg/kg	--	--	--	--	--	0.035	0.029	0.009	0.016	ND	0.02	ND	0.098	ND	0.05	0.101
C2-Naphthalenes	mg/kg	--	--	--	--	--	0.045	0.067	0.023	0.039	0.036	0.059	0.018	0.081	0.033	0.096	0.09
C2-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	0.127	0.21	0.035	0.104	0.049	0.148	0.032	0.914	0.128	0.438	0.548
C3-Chrysenes	mg/kg	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3-Fluorenes	mg/kg	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3-Naphthalenes	mg/kg	--	--	--	--	--	0.06	0.035	0.015	0.015	0.011	0.022	0.005	0.054	0.018	0.049	0.102
C3-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	0.059	0.253	0.026	0.231	0.019	0.087	ND	0.555	0.058	0.382	0.529
C4-Chrysenes	mg/kg	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4-Naphthalenes	mg/kg	--	--	--	--	--	0.033	ND	ND	0.008	ND	ND	ND	0.058	ND	0.056	0.221
C4-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.093	0.114
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	0.074	0.115	0.013	0.082	0.047	0.085	0.032	0.904	0.064	0.417	0.814
Perylene	mg/kg	--	--	--	--	--	0.018	0.052	0.003	0.02	0.014	0.025	0.01	0.264	0.021	0.128	0.156
Total Petroleum Hydrocarbons																	
Pristane	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
Phytane	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons (C9-C44)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na

Table 3-2b
Summary of 2006-2007 Surface Sediment Sampling and Laboratory Analysis Results for Alternate Extraction Methods (0 - 10 cm)

Location ID							**BC_22**	**BC_28**	**BC_28**	**BC_31**	**BC_31**	**BC_31**	**BC_33**	**BC_33**	**BC_34**	**BC_35**
Sample Depth							**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**
Sample Type							**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Sample Description							**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
Year							**2006**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**
Major Remediation Area							**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**										
Organics																
Biphenyl (1,1'-Biphenyl)	mg/kg	--	--	--	--	--	na	**0.13**	0.43 U	10 U	**2.4**	0.46 U	**0.39**	0.38 U	**0.099**	**0.066**
Carbazole	mg/kg	--	--	--	--	--	na	**5.6**	0.43 U	**370**	**160**	0.46 U	**20**	0.38 U	**3.3**	**1.3**
Decalin	mg/kg	--	--	--	--	--	na	0.043 U	0.43 U	10 U	0.46 U	0.46 U	0.038 U	0.38 U	0.085 U	0.041 U
Dibenzofuran	mg/kg	--	--	--	--	--	na	**1.6**	0.43 U	**73**	**36**	0.46 U	**4.4**	0.38 U	**0.84**	**0.45**
Naphthobenzothiophene	mg/kg	--	--	--	--	--	na	**4.1**	0.43 U	**300**	**120**	0.46 U	**18**	0.38 U	**3.6**	**1.6**
Polynuclear Aromatic Hydrocarbons (MDDEP 13) (8270M Extraction Method)																
2-Methylnaphthalene	mg/kg	0.016	0.02	0.063	0.2	0.38	na	**0.51**	0.43 U	**20**	**9.2**	0.46 U	**1.8**	0.38 U	**0.32**	**0.19**
Acenaphthene	mg/kg	0.0037	0.0067	0.021	0.089	0.94	na	**4**	0.43 U	**150**	**88**	0.46 U	**13**	0.38 U	**2.4**	**1.2**
Acenaphthylene	mg/kg	0.0033	0.0059	0.031	0.13	0.34	na	**0.062**	0.43 U	10 U	**1.3**	0.46 U	**0.11**	0.38 U	0.085 U	0.041 U
Anthracene	mg/kg	0.016	0.047	0.11	0.24	1.1	na	**8**	0.43 U	**1300**	**230**	0.46 U	**24**	0.38 U	**3.6**	**1.5**
Benzo(a)anthracene	mg/kg	0.027	0.075	0.28	0.69	1.9	na	**32**	0.43 U	**1600**	**900 E**	**99**	**150 E**	**150**	**25**	**10**
Benzo(a)pyrene	mg/kg	0.034	0.089	0.23	0.76	1.7	na	**46 E**	**46**	**1800**	**1200 E**	**130**	**210 E**	**210**	**35**	**13**
Chrysene	mg/kg	0.037	0.11	0.3	0.85	2.2	na	**35**	0.43 U	**2300**	**1000 E**	**110**	**160 E**	**160**	**29**	**12**
Dibenzo(a,h)anthracene	mg/kg	0.0033	0.0062	0.043	0.14	0.2	na	**8.8**	0.43 U	**290**	**250**	0.46 U	**43 E**	**34**	**6.4**	**3**
Fluoranthene	mg/kg	0.027	0.11	0.5	1.5	4.2	na	**61 E**	**68**	**3200**	**1700 E**	**180**	**230 E**	**250**	**43**	**18**
Fluorene	mg/kg	0.01	0.021	0.061	0.14	1.2	na	**3.6**	0.43 U	**230**	**78**	0.46 U	**9.3**	0.38 U	**1.8**	**0.94**
Naphthalene	mg/kg	0.017	0.035	0.12	0.39	1.2	na	**1.7**	0.43 U	**74**	**25**	0.46 U	**8**	0.38 U	**1.2**	**0.71**
Phenanthrene	mg/kg	0.023	0.087	0.25	0.54	2.1	na	**34**	0.43 U	**1600**	**860 E**	**96**	**100 E**	**110**	**19**	**8.7**
Pyrene	mg/kg	0.041	0.15	0.42	1.4	3.8	na	**53 E**	**58**	**2400**	**1500 E**	**150**	**220 E**	**220**	**37**	**15**
Total PAH13 (calculated)	mg/kg	0.2583	0.7628	2.429	7.069	21.26	na	**288**	**172**	**15000**	**7840**	**765**	**1170**	**1130**	**204**	**84.2**
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13) (8270M Extraction Method)																
1-Methylnaphthalene	mg/kg	--	--	--	--	--	na	**0.29**	0.43 U	**11**	**5.2**	0.46 U	**0.94**	0.38 U	**0.19**	**0.1**
1-Methylphenanthrene	mg/kg	--	--	--	--	--	na	**1.5**	0.43 U	**76**	**42**	0.46 U	**4**	0.38 U	**0.86**	**0.39**
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	na	0.043 U	0.43 U	10 U	**0.89**	0.46 U	**0.056**	0.38 U	0.085 U	0.041 U
2,6-Dimethylnaphthalene	mg/kg	--	--	--	--	--	na	**0.15**	0.43 U	10 U	**3.4**	0.46 U	**0.39**	0.38 U	**0.086**	**0.049**
Benzo(b)fluoranthene	mg/kg	--	--	--	--	--	na	**37**	0.43 U	**1800**	**1100 E**	**110**	**190 E**	**160**	**31**	**14**
Benzo(e)pyrene	mg/kg	--	--	--	--	--	na	**26**	0.43 U	**1300**	**710 E**	**79**	**120 E**	**120**	**22**	**10**
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	na	**29**	0.43 U	**1100**	**700 E**	**81**	**120 E**	**130**	**24**	**11**
Benzo(k)fluoranthene	mg/kg	--	--	--	--	--	na	**32**	0.43 U	**1500**	**750 E**	**96**	**120 E**	**150**	**26**	**12**
C1-Chrysenes	mg/kg	--	--	--	--	--	na	**9.2**	0.43 U	**440**	**240**	0.46 U	**37**	0.38 U	**7**	**3.2**
C1-Decalin	mg/kg	--	--	--	--	--	na	0.043 U	0.43 U	10 U	0.46 U	0.46 U	0.038 U	0.38 U	0.085 U	0.041 U
C1-Dibenzothiophene	mg/kg	--	--	--	--	--	na	**0.45**	0.43 U	**22**	**12**	0.46 U	**1.2**	0.38 U	**0.28**	**0.13**
C1-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	na	**21**	0.43 U	**1200**	**570**	0.46 U	**84**	0.38 U	**15**	**6.7**
C1-Fluorenes	mg/kg	--	--	--	--	--	na	**0.64**	0.43 U	**28**	**16**	0.46 U	**1.4**	0.38 U	**0.33**	**0.16**
C1-Naphthalenes	mg/kg	--	--	--	--	--	na	**0.49**	0.43 U	**20**	**8.8**	0.46 U	**1.7**	0.38 U	**0.31**	**0.18**
C1-Naphthobenzothiophene	mg/kg	--	--	--	--	--	na	**1.8**	0.43 U	**100**	**50**	0.46 U	**7.5**	0.38 U	**1.4**	**0.69**

Table 3-2b
Summary of 2006-2007 Surface Sediment Sampling and Laboratory Analysis Results for Alternate Extraction Methods (0 - 10 cm)

Location ID							BC_22	BC_28	BC_28	BC_31	BC_31	BC_31	BC_33	BC_33	BC_34	BC_35
Sample Depth							0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type							N	N	N	N	N	N	N	N	N	N
Sample Description							Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Year							2006	2007	2007	2007	2007	2007	2007	2007	2007	2007
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**										
C1-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	**6.6**	0.43 U	**310**	**190**	0.46 U	**19**	0.38 U	**3.8**	**1.6**
C2-Chrysenes	mg/kg	--	--	--	--	--	na	**2.8**	0.43 U	**120**	**69**	0.46 U	**11**	0.38 U	**2.2**	**1.1**
C2-Decalin	mg/kg	--	--	--	--	--	na	0.043 U	0.43 U	10 U	**1.3**	0.46 U	**0.064**	0.38 U	**0.14**	0.041 U
C2-Dibenzothiophene	mg/kg	--	--	--	--	--	na	**0.26**	0.43 U	**18**	**7.6**	0.46 U	**0.71**	0.38 U	**0.23**	**0.091**
C2-Dibenzothiophenes/C2-Chrysenes	mg/kg	--	--	--	--	--	na	**0.00009**	ND	**0.00015**	**0.00011**	ND	**0.00007**	ND	**0.00011**	**0.00008**
C2-Dibenzothiophenes/C2-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	**0.00009**	ND	**0.00015**	**0.0001**	ND	**0.0001**	ND	**0.00016**	**0.00014**
C2-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	na	**5.6**	0.43 U	**260**	**150**	0.46 U	**20**	0.38 U	**3.8**	**1.8**
C2-Fluorenes	mg/kg	--	--	--	--	--	na	**0.42**	0.43 U	**19**	**11**	0.46 U	**1**	0.38 U	**0.33**	**0.13**
C2-Naphthalenes	mg/kg	--	--	--	--	--	na	**0.34**	0.43 U	**15**	**7.4**	0.46 U	**0.81**	0.38 U	**0.21**	**0.1**
C2-Naphthobenzothiophene	mg/kg	--	--	--	--	--	na	**0.56**	0.43 U	**24**	**15**	0.46 U	**2.2**	0.38 U	**0.42**	**0.22**
C2-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	**2.8**	0.43 U	**120**	**77**	0.46 U	**7.2**	0.38 U	**1.4**	**0.64**
C3-Chrysenes	mg/kg	--	--	--	--	--	na	**2.3**	0.43 U	**90**	**58**	0.46 U	**8.5**	0.38 U	**1.7**	**1**
C3-Decalins	mg/kg	--	--	--	--	--	na	0.043 U	0.43 U	10 U	**0.94**	0.46 U	0.038 U	0.38 U	0.085 U	0.041 U
C3-Dibenzothiophene	mg/kg	--	--	--	--	--	na	**0.18**	0.43 U	**11**	**4.9**	0.46 U	**0.51**	0.38 U	**0.18**	**0.076**
C3-Dibenzothiophenes /C3-Chrysenes	mg/kg	--	--	--	--	--	na	**0.00008**	ND	**0.00012**	**0.00009**	ND	**0.00006**	ND	**0.0001**	**0.00008**
C3-Dibenzothiophenes/C3-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	**0.00019**	ND	**0.00024**	**0.00018**	ND	**0.00018**	ND	**0.00029**	**0.00029**
C3-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	na	**2.4**	0.43 U	**99**	**66**	0.46 U	**9.9**	0.38 U	**1.7**	**0.79**
C3-Fluorenes	mg/kg	--	--	--	--	--	na	**0.97**	0.43 U	**45**	**18**	0.46 U	**1.3**	0.38 U	**0.5**	**0.38**
C3-Naphthalenes	mg/kg	--	--	--	--	--	na	**0.22**	0.43 U	**10**	**5.5**	0.46 U	**0.39**	0.38 U	**0.19**	**0.096**
C3-Naphthobenzothiophene	mg/kg	--	--	--	--	--	na	**0.4**	0.43 U	**22**	**11**	0.46 U	**1.6**	0.38 U	**0.38**	**0.19**
C3-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	**0.92**	0.43 U	**45**	**27**	0.46 U	**2.8**	0.38 U	**0.62**	**0.26**
C4-Chrysenes	mg/kg	--	--	--	--	--	na	**0.75**	0.43 U	10 U	**19**	0.46 U	**2.8**	0.38 U	**0.64**	0.041 U
C4-Decalin	mg/kg	--	--	--	--	--	na	0.043 U	0.43 U	10 U	**0.69**	0.46 U	0.038 U	0.38 U	0.085 U	0.041 U
C4-Dibenzothiophene	mg/kg	--	--	--	--	--	na	**0.088**	0.43 U	10 U	**2.5**	0.46 U	**0.23**	0.38 U	**0.11**	**0.054**
C4-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	na	**1.7**	0.43 U	**81**	**43**	0.46 U	**6.1**	0.38 U	**1.2**	**0.64**
C4-Naphthalenes	mg/kg	--	--	--	--	--	na	**0.12**	0.43 U	10 U	**3.1**	0.46 U	**0.18**	0.38 U	**0.17**	**0.053**
C4-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	na	**0.31**	0.43 U	**15**	**8.7**	0.46 U	**1.1**	0.38 U	**0.23**	**0.091**
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	na	**33**	0.43 U	**1200**	**820 E**	**92**	**140 E**	**140**	**27**	**12**
Perylene	mg/kg	--	--	--	--	--	na	**12**	0.43 U	**440**	**290**	0.46 U	**52 E**	**55**	**9.6**	**3.9**
Polynuclear Aromatic Hydrocarbons (MDDEP 13) (SFE Extraction)																
2-Methylnaphthalene	mg/kg	0.016	0.02	0.063	0.2	0.38	**0.075**	na	na	na	na	na	na	na	na	na
Acenaphthene	mg/kg	0.0037	0.0067	0.021	0.089	0.94	**0.304**	na	na	na	na	na	na	na	na	na
Acenaphthylene	mg/kg	0.0033	0.0059	0.031	0.13	0.34	**0.004**	na	na	na	na	na	na	na	na	na
Anthracene	mg/kg	0.016	0.047	0.11	0.24	1.1	**0.812**	na	na	na	na	na	na	na	na	na
Benzo(a)anthracene	mg/kg	0.027	0.075	0.28	0.69	1.9	**0.94**	na	na	na	na	na	na	na	na	na
Benzo(a)pyrene	mg/kg	0.034	0.089	0.23	0.76	1.7	**0.651**	na	na	na	na	na	na	na	na	na
Chrysene	mg/kg	0.037	0.11	0.3	0.85	2.2	**1.1**	na	na	na	na	na	na	na	na	na

Table 3-2b
Summary of 2006-2007 Surface Sediment Sampling and Laboratory Analysis Results for Alternate Extraction Methods (0 - 10 cm)

Location ID							**BC_22**	**BC_28**	**BC_28**	**BC_31**	**BC_31**	**BC_31**	**BC_33**	**BC_33**	**BC_34**	**BC_35**
Sample Depth							**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**	**0-10 cm**
Sample Type							**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Sample Description							**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**
Year							**2006**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**
Major Remediation Area							**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**										
Dibenzo(a,h)anthracene	mg/kg	0.0033	0.0062	0.043	0.14	0.2	**0.094**	na	na	na	na	na	na	na	na	na
Fluoranthene	mg/kg	0.027	0.11	0.5	1.5	4.2	**1.98**	na	na	na	na	na	na	na	na	na
Fluorene	mg/kg	0.01	0.021	0.061	0.14	1.2	**0.263**	na	na	na	na	na	na	na	na	na
Naphthalene	mg/kg	0.017	0.035	0.12	0.39	1.2	**0.411**	na	na	na	na	na	na	na	na	na
Phenanthrene	mg/kg	0.023	0.087	0.25	0.54	2.1	**1.79**	na	na	na	na	na	na	na	na	na
Pyrene	mg/kg	0.041	0.15	0.42	1.4	3.8	**1.38**	na	na	na	na	na	na	na	na	na
Total PAH13 (calculated)	mg/kg	0.2583	0.7628	2.429	7.069	21.26	**9.75**	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13) (SFE Extraction)																
1-Methylnaphthalene	mg/kg	--	--	--	--	--	**0.036**	na	na	na	na	na	na	na	na	na
Benzo(b+k)fluoranthene	mg/kg	--	--	--	--	--	**1.15**	na	na	na	na	na	na	na	na	na
Benzo(e)pyrene	mg/kg	--	--	--	--	--	**0.339**	na	na	na	na	na	na	na	na	na
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**0.214**	na	na	na	na	na	na	na	na	na
C1-Chrysenes	mg/kg	--	--	--	--	--	**0.757**	na	na	na	na	na	na	na	na	na
C1-Fluoranthenes/Pyrenes	mg/kg	--	--	--	--	--	**1.04**	na	na	na	na	na	na	na	na	na
C1-Fluorenes	mg/kg	--	--	--	--	--	**0.137**	na	na	na	na	na	na	na	na	na
C1-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	**0.551**	na	na	na	na	na	na	na	na	na
C2-Chrysenes	mg/kg	--	--	--	--	--	**0.499**	na	na	na	na	na	na	na	na	na
C2-Fluorenes	mg/kg	--	--	--	--	--	**0.066**	na	na	na	na	na	na	na	na	na
C2-Naphthalenes	mg/kg	--	--	--	--	--	**0.108**	na	na	na	na	na	na	na	na	na
C2-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	**0.541**	na	na	na	na	na	na	na	na	na
C3-Chrysenes	mg/kg	--	--	--	--	--	ND	na	na	na	na	na	na	na	na	na
C3-Fluorenes	mg/kg	--	--	--	--	--	ND	na	na	na	na	na	na	na	na	na
C3-Naphthalenes	mg/kg	--	--	--	--	--	**0.05**	na	na	na	na	na	na	na	na	na
C3-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	**0.392**	na	na	na	na	na	na	na	na	na
C4-Chrysenes	mg/kg	--	--	--	--	--	ND	na	na	na	na	na	na	na	na	na
C4-Naphthalenes	mg/kg	--	--	--	--	--	**0.037**	na	na	na	na	na	na	na	na	na
C4-Phenanthrenes/Anthracenes	mg/kg	--	--	--	--	--	**0.066**	na	na	na	na	na	na	na	na	na
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**0.518**	na	na	na	na	na	na	na	na	na
Perylene	mg/kg	--	--	--	--	--	**0.17**	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																
Pristane	mg/kg	--	--	--	--	--	na	**0.11 J**	na	**0.31 J**	na	na	**0.25 J**	na	**0.031 J**	**0.019 J**
Phytane	mg/kg	--	--	--	--	--	na	**0.071 J**	na	0.46 U	na	na	**0.29 J**	na	0.43 U	0.41 U
Total Petroleum Hydrocarbons (C9-C44)	mg/kg	--	--	--	--	--	na	**1200**	na	**3700**	na	na	**4900**	na	**1100**	**520**

Table 3-2b
Summary of 2006-2007 Surface Sediment Sampling and Laboratory Analysis Results for Alternate Extraction Methods (0 - 10 cm)

Notes:

🟦 Detected concentration is greater than REL (rare effect level)
🟦 Detected concentration is greater than TEL (threshold effect level)
🟨 Detected concentration is greater than OEL (occasional effect level)
🟨 Detected concentration is greater than PEL (probably effect level)
🟧 Detected concentration is greater than FEL (frequent effect level)
🟩 Non-detected concentration is above one or more identified screening levels
Bold = Detected result

J = Estimated value
FD = field duplicate
LR = lab replicate
mg/kg = milligrams per kilogram
MS = matrix spike
N = normal sample
ND = Compound analyzed, but not detected above detection limit
na = Compound not analyzed
PAH = polynuclear aromatic hydrocarbon
U = Compound analyzed, but not detected above detection limit
µg/kg = micrograms per kilogram

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							C-4	C-4	C-4	C-8	C-8	C-8	C-12	C-12	C-12	C-12	C-21	C-21	C-21
Sample Depth							0-20 cm	20-40 cm	40-60 cm	0-20 cm	40-60 cm	60-70 cm	0-20 cm	40-60 cm	80-100 cm	140-154 cm	10-20 cm	40-60 cm	90-100 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	**4**	**8**	**9**	**5**	**19**	**15**	**20**	**21**	**19**	**16**	**35**	**18**	**2**
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	**2.78**	**0.69**	**4.29**	**2.5**	**1.97**	**0.73**	**0.29**	**0.69**	**0.15**	**0.06**	**2.32**	**0.37**	0.02 U
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	**0.3**	**0.5**	**0.6**	**0.3**	**0.7**	**0.4**	**0.6**	**0.6**	**1.1**	**6**	**1.1**	**0.6**	**0.1**
Gravel (2mm-26mm)	%	--	--	--	--	--	**49.1**	**57.9**	**42.1**	**3.3**	**1.7**	**4.6**	na U	**0.8**	**1.7**	**8.4**	na U	na U	**70.7**
Sand (63µm-2mm)	%	--	--	--	--	--	**48.7**	**39**	**51**	**95.3**	**84.3**	**92.7**	**96**	**95.1**	**92.4**	**57.4**	**77**	**92.8**	**28.2**
Silt (2um-63um)	%	--	--	--	--	--	**1.9**	**2.6**	**6.3**	**1.1**	**13.3**	**2.3**	**3.4**	**3.5**	**4.8**	**28.2**	**21.9**	**6.6**	**0.9**
Metal																			
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	na	na	na
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	0.01 U	**0.22**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**12**	**3.5**	**68**	**2.7**	**5.9**	**5**	**2**	0.01 U	0.01 U	0.01 U	**4.7**	0.01 U	0.01 U
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**20**	**4.6**	**160**	**9.7**	**42**	**36**	**3.6**	**3.2**	**0.01**	0.01 U	**11**	**5.5**	**0.19**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**69**	**22**	**360**	**19**	**39**	**36**	**13**	**11**	**0.05**	0.01 U	**31**	**12**	**0.72**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**83**	**34**	**430**	**24**	**40**	**37**	**20**	**17**	**0.05**	0.01 U	**36**	**15**	**0.91**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**70**	**23**	**370**	**20**	**42**	**38**	**15**	**11**	**0.04**	0.01 U	**37**	**15**	**0.87**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**16**	**7.5**	**74**	**4**	**6.9**	**6.7**	**3**	**2.2**	0.01 U	0.01 U	**5.2**	**2.3**	**0.13**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**90**	**31**	**540**	**41**	**86**	**75**	**23**	**19**	**0.13**	0.01 U	**59**	**23**	**1.3**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**8**	**1.9**	**51**	**4.2**	**14**	**15**	0.01 U	0.01 U	0.01 U	0.01 U	**4.1**	0.01 U	0.01 U
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	**3.5**	**0.68**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**57**	**13**	**340**	**26**	**74**	**72**	**11**	**9.2**	**0.03**	**0.01**	**33**	**8.9**	**0.66**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**80**	**27**	**450**	**30**	**63**	**59**	**19**	**16**	**0.13**	0.01 U	**46**	**17**	**1.1**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**509**	**168**	**2840**	**181**	**413**	**380**	**110**	**88.6**	**0.44**	**0.01**	**267**	**98.7**	**5.88**

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							C-4	C-4	C-4	C-8	C-8	C-8	C-12	C-12	C-12	C-12	C-21	C-21	C-21
Sample Depth							0-20 cm	20-40 cm	40-60 cm	0-20 cm	40-60 cm	60-70 cm	0-20 cm	40-60 cm	80-100 cm	140-154 cm	10-20 cm	40-60 cm	90-100 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	0.01 U	**0.01 U**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
1-Methylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	**0.13**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**150**	**60**	**790**	**43**	**75**	**71**	**36**	**29**	**0.12**	0.01 U	**69**	**29**	**1.7**
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	**10**	**2.4**	**51**	**2.7**	**5.9**	**5.4**	0.01 U	0.01 U	**0.01**	0.01 U	**4.6**	0.01 U	0.01 U
Benzo(e)pyrene	mg/kg	--	--	--	--	--	**56**	**24**	**300**	**17**	**29**	**28**	**15**	**12**	**0.05**	0.01 U	**28**	**12**	**0.72**
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**57**	**24**	**270**	**17**	**27**	**26**	**15**	**12**	**0.04**	0.01 U	**28**	**12**	**0.74**
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	**13**	**4.8**	**50**	**3.4**	**5.5**	**5.3**	0.02 U	0.02 U	0.02 U	0.02 U	**4.5**	0.02 U	0.02 U
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	**5.5**	**2.6**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	**14**	**2.9**	**70**	**5.3**	**8.8**	**6.4**	**4.3**	**3.3**	0.01 U	0.01 U	**4.4**	0.01 U	0.01 U
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	**26**	**11**	**90**	**5.3**	**9**	**8**	**4.2**	**3**	0.01 U	0.01 U	**9.2**	**3.7**	**0.21**
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**64**	**28**	**310**	**18**	**29**	**28**	**15**	**12**	**0.04**	0.01 U	**32**	**13**	**0.8**
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Aroclor 1242	mg/kg	--	--	--	--	--	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Aroclor 1248	mg/kg	--	--	--	--	--	**0.59**	**1.3**	**6**	**1.3**	**3.5**	**2.6**	**1**	**1.2**	0.01 U	0.01 U	**7.4**	**1.9**	**0.15**
Aroclor 1254	mg/kg	--	--	--	--	--	0.02 U	0.02 U	**1.3**	0.02 U	**1.3**	**0.86**	0.02 U	0.02 U	0.02 U	0.02 U	**5.6**	**0.47**	0.02 U
Aroclor 1260	mg/kg	--	--	--	--	--	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	**0.59**	**1.3**	**7.3**	**1.3**	**4.8**	**4.36**	**1**	**1.2**	ND	ND	**13**	**2.37**	**0.15**
Total Petroleum Hydrocarbons																			
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

						Location ID	**C23**	**C23**	**C23**	**C23**	**C23**	**C-33**	**C-33**	**C-33**	**C-33**	**C-33**	**101**	**101**	**102**
						Sample Depth	**0-20 cm**	**20-40 cm**	**40-60 cm**	**80-100 cm**	**100-114 cm**	**0-20 cm**	**20-40 cm**	**40-60 cm**	**80-100 cm**	**100-120 cm**	**0-50 cm**	**50-100 cm**	**0-50 cm**
						Sample Type	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
						Sample Description	**Core**	**Core**	**Core**	**Core**	**Core**	**Core**	**Core**	**Core**	**Core**	**Core**	**Core**	**Core**	**Core**
						Year	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2008**	**2008**	**2008**
						Major Remediation Area	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**BDA**
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	**20**	**18**	**20**	**21**	**20**	**21**	**19**	**22**	**17**	**15**	**17**	**17**	**9**
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	**0.31**	0.02 U	**0.22**	**0.21**	**0.21**	**0.14**	**1.62**	**0.23**	**0.1**	**0.06**	**1.58**	0.01 U	**0.01**
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	**0.5**	**1.3**	**19.1**	**8.2**	**6.4**	**13.5**	**14.1**	**8.2**	**4.9**	**6.2**	**10.1**	**12.2**	**0.8**
Gravel (2mm-26mm)	%	--	--	--	--	--	na U	na U	na U	na U	na U	na U	na U	na U	na U	na U	na U	na U	na U
Sand (63µm-2mm)	%	--	--	--	--	--	**97**	**92.4**	**43**	**70.2**	**75**	**49.5**	**49.3**	**72.1**	**82.7**	**76.8**	**71.3**	**41.3**	**95.5**
Silt (2um-63um)	%	--	--	--	--	--	**2.5**	**6.3**	**37.9**	**21.6**	**18.6**	**37.3**	**36.6**	**19.7**	**12.4**	**17**	**18.6**	**46.5**	**3.7**
Metal																			
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	**0.8**	**0.8**	0.5 U
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	**0.05**	0.03 U	0.03 U
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	**17**	**18**	**3**
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	**10**	**10**	**3**
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	5 U	5 U	5 U
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na	na	0.01 U	0.01 U	0.01 U
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	**11**	**12**	**3**
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	**36**	**43**	**7**
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.03**	0.01 U	0.2 U	0.01 U	0.01 U
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**0.42**	**0.62**	**2.9**	**0.02**	0.01 U	0.01 U	**0.93**	**2.5**	**0.14**	0.01 U	**0.48**	0.01 U	**0.02**
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.2 U	0.01 U	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**1**	**1.4**	**8.3**	**0.12**	0.01 U	0.01 U	**1.9**	**4**	**0.18**	0.01 U	**1.2**	0.01 U	**0.05**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**3.2**	**4.4**	**13**	**0.13**	0.01 U	**4.9**	**8**	**16**	**0.53**	**0.02**	**3.3**	**0.02**	**0.1**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**3.8**	**4.5**	**10**	**0.14**	0.01 U	**7.5**	**12**	**24**	**0.65**	**0.02**	**3.4**	**0.02**	**0.08**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**3.4**	**5.9**	**13**	**0.14**	0.01 U	**5.7**	**8.8**	**18**	**0.58**	**0.02**	**3.5**	**0.02**	**0.09**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**0.65**	**0.92**	**1.4**	**0.02**	0.01 U	0.01 U	**2.2**	**3.5**	**0.11**	0.01 U	**0.58**	0.01 U	**0.01**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**5.7**	**8.3**	**27**	**0.27**	0.01 U	**7.8**	**11**	**26**	**0.99**	**0.04**	**6.9**	**0.03**	**0.22**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**0.39**	**0.72**	**4**	**0.05**	0.01 U	0.01 U	**0.74**	0.01 U	**0.11**	0.01 U	**0.46**	0.01 U	**0.02**
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.29**	0.01 U	**0.1**	0.01 U	0.2 U	0.01 U	0.01 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**3**	**4.4**	**26**	**0.25**	0.01 U	**3**	**5.2**	**14**	**0.66**	**0.02**	**4.9**	**0.02**	**0.18**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**4.5**	**8.5**	**22**	**0.22**	0.01 U	**6.8**	**9.9**	**22**	**0.86**	**0.03**	**5.9**	**0.03**	**0.19**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**26.1**	**39.7**	**128**	**1.36**	ND	**35.7**	**61**	**130**	**4.94**	**0.15**	**30.6**	**0.14**	**0.96**

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							C23	C23	C23	C23	C23	C-33	C-33	C-33	C-33	C-33	101	101	102
Sample Depth							0-20 cm	20-40 cm	40-60 cm	80-100 cm	100-114 cm	0-20 cm	20-40 cm	40-60 cm	80-100 cm	100-120 cm	0-50 cm	50-100 cm	0-50 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2008	2008	2008
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	BDA
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.01 U**	0.01 U	0.2 U	0.01 U	0.01 U
1-Methylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.01**	0.01 U	0.2 U	0.01 U	0.01 U
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.2 U	0.01 U	0.01 U
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.2 U	0.01 U	0.01 U
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.4 U	0.02 U	0.02 U
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.4 U	0.02 U	0.02 U
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.2 U	0.01 U	0.01 U
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**7.3**	**9.6**	**19**	**0.27**	0.01 U	**13**	**21**	**41**	**1.1**	**0.04**	**5.7**	**0.03**	**0.13**
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	**0.5**	**0.73**	**2.5**	**0.02**	0.01 U	0.01 U	**1.1**	0.01 U	**0.07**	0.01 U	0.2 U	0.01 U	0.01 U
Benzo(e)pyrene	mg/kg	--	--	--	--	--	**2.9**	**3.8**	**6.8**	**0.11**	0.01 U	**5.4**	**8.2**	**17**	**0.47**	**0.02**	**2.3**	**0.02**	**0.05**
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**2.5**	**3.1**	**4.7**	**0.1**	0.01 U	**5.9**	**8.7**	**19**	**0.52**	**0.02**	**1.5**	**0.01**	**0.04**
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	**0.52**	**0.65**	0.02 U	0.02 U	0.02 U	0.02 U	**1.7**	**3.2**	**0.1**	0.02 U	0.4 U	0.02 U	0.02 U
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.91**	0.01 U	**0.05**	0.01 U	0.4 U	0.02 U	0.02 U
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	**0.71**	0.01 U	0.01 U	**0.03**	0.01 U	0.01 U	**1.1**	**3.7**	**0.1**	0.01 U	0.4 U	0.02 U	0.02 U
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	**0.79**	**1.5**	0.01 U	**0.03**	0.01 U	0.01 U	**4**	**6.2**	**0.22**	0.01 U	0.4 U	0.02 U	0.02 U
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**2.8**	**3.5**	**5.4**	**0.11**	0.01 U	**6.7**	**9.8**	**22**	**0.6**	**0.02**	**1.5**	**0.01**	**0.04**
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	0.005 U	0.005 U	0.005 U
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	0.005 U	0.005 U	0.005 U
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	0.005 U	0.005 U	0.005 U
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	0.005 U	0.005 U	0.005 U
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	0.005 U	0.005 U	0.005 U
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	0.005 U	0.005 U	0.005 U
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	**0.058**	0.005 U	**0.028**
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	**0.054**	0.005 U	**0.008**
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	na	na	na	na	na	na	na	na	na	na	**0.112**	ND	**0.036**
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	**0.38**	**1.6**	**12**	**0.07**	0.01 U	**0.15**	**0.29**	**0.38**	0.01 U	0.01 U	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	**0.15**	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	**0.17**	0.02 U	0.02 U	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	**0.53**	**1.6**	**12**	**0.07**	ND	**0.15**	**0.29**	**0.55**	ND	ND	na	na	na
Total Petroleum Hydrocarbons																			
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	100 U	100 U	100 U

Table 3-3

Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

						Location ID	102	102	103	103	104	104	105	105	105	106	106	107	107
						Sample Depth	50-100 cm	100-150 cm	0-50 cm	50-100 cm	0-50 cm	50-100 cm	0-50 cm	50-100 cm	100-150 cm	0-50 cm	50-100 cm	0-50 cm	50-100 cm
						Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N
						Sample Description	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
						Year	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008
						Major Remediation Area	BDA	BDA	BDA	BDA	BDA	BDA	ADM	ADM	ADM	BDA	BDA	BDA	BDA
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	**8**	**12**	**19**	**17**	**20**	**18**	**19**	**19**	**19**	**24**	**20**	**18**	**18**
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	**0.25**	**0.03**	**0.09**	0.01 U	**0.13**	**0.11**	**1.01**	0.01 U	**0.2**	**0.18**	**1.03**	**0.32**	**1.46**
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	**0.5**	**0.7**	**0.8**	**0.9**	**0.5**	na	**0.8**	na	na	**1.5**	**2**	**0.9**	**1**
Gravel (2mm-26mm)	%	--	--	--	--	--	**1.06**	na U	na U	na U	na U	na	na U	na	na	na U	na U	na U	na U
Sand (63µm-2mm)	%	--	--	--	--	--	**96**	**95**	**95.9**	**94.5**	**96.7**	na	**93.4**	na	na	**82.6**	**82.4**	**94.4**	**92.2**
Silt (2um-63um)	%	--	--	--	--	--	**2.45**	**4.3**	**3.4**	**4.5**	**2.8**	na	**5.8**	na	na	**16**	**15.6**	**4.7**	**6.8**
Metal																			
Arsenic	mg/kg	4.3	7.2	19	42	150	na	0.5 U	**0.9**	**0.7**	0.5 U	**0.5**	0.5 U	na	**0.7**	**1.1**	**1.1**	**0.8**	**0.8**
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	**0.04**	na	0.03 U	**0.04**	**0.04**	**0.04**	0.03 U
Chromium	mg/kg	30	52	96	160	290	na	**4**	**7**	**6**	**5**	**5**	**9**	na	**8**	**12**	**11**	**7**	**8**
Copper	mg/kg	11	19	42	110	230	na	**5**	**3**	**3**	**3**	**2**	**5**	na	**4**	**6**	**4**	**5**	**3**
Lead	mg/kg	18	30	54	110	180	na	5 U	5 U	5 U	5 U	5 U	5 U	na	5 U	5 U	5 U	5 U	5 U
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	na	0.01 U	**0.03**	0.01 U	0.01 U	0.01 U
Nickel	mg/kg	--	--	--	--	--	na	**3**	**5**	**4**	**4**	**4**	**6**	na	**5**	**8**	**7**	**5**	**5**
Zinc	mg/kg	70	120	180	270	430	na	**8**	**16**	**13**	**12**	**12**	**33**	na	**17**	**25**	**20**	**23**	**15**
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	0.05 U	**0.02**	**0.01**	0.01 U	0.01 U	0.01 U	0.2 U	0.3 U	0.01 U	0.2 U	0.01 U	0.1 U	0.01 U
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**0.06**	**0.09**	**0.06**	**0.03**	0.01 U	0.01 U	**1**	**0.75**	**0.02**	**0.51**	0.01 U	**0.39**	0.01 U
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.05 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.2 U	0.3 U	0.01 U	0.2 U	0.01 U	0.1 U	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**0.18**	**0.23**	**0.11**	**0.07**	0.01 U	0.01 U	**2**	**1.8**	**0.05**	**1.2**	0.01 U	**0.75**	0.01 U
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**0.44**	**0.5**	**0.47**	**0.33**	0.01 U	0.01 U	**11**	**8.1**	**0.17**	**2.6**	0.01 U	**2.9**	**0.03**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**0.42**	**0.43**	**0.6**	**0.39**	**0.01**	**0.01**	**15**	**10**	**0.19**	**2.8**	0.01 U	**3.7**	**0.04**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**0.45**	**0.48**	**0.53**	**0.36**	0.01 U	0.01 U	**12**	**10**	**0.21**	**2.7**	0.01 U	**3.4**	**0.04**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**0.07**	**0.08**	**0.15**	**0.08**	0.01 U	0.01 U	**3**	**1.7**	**0.04**	**0.6**	0.01 U	**0.79**	0.01 U
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**0.88**	**0.88**	**0.71**	**0.5**	**0.01**	**0.01**	**16**	**13**	**0.3**	**5.6**	**0.01**	**5.1**	**0.05**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**0.07**	**0.11**	**0.06**	**0.03**	0.01 U	0.01 U	**0.79**	**0.68**	**0.02**	**0.54**	0.01 U	**0.37**	0.01 U
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.05 U	**0.01**	**0.04**	**0.01**	0.01 U	0.01 U	**0.34**	**0.42**	0.01 U	0.2 U	0.01 U	**0.16**	0.01 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**0.69**	**0.8**	**0.45**	**0.27**	0.01 U	0.01 U	**8**	**6.7**	**0.18**	**4.7**	**0.01**	**3.3**	**0.03**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**0.74**	**0.78**	**0.6**	**0.41**	**0.01**	0.01 U	**16**	**10**	**0.25**	**4.7**	**0.01**	**4.4**	**0.04**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**4**	**4.41**	**3.79**	**2.48**	**0.03**	**0.02**	**85.1**	**63.2**	**1.43**	**26**	**0.03**	**25.3**	**0.23**

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							102	102	103	103	104	104	105	105	105	106	106	107	107
Sample Depth							50-100 cm	100-150 cm	0-50 cm	50-100 cm	0-50 cm	50-100 cm	0-50 cm	50-100 cm	100-150 cm	0-50 cm	50-100 cm	0-50 cm	50-100 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008
Major Remediation Area							BDA	BDA	BDA	BDA	BDA	BDA	ADM	ADM	ADM	BDA	BDA	BDA	BDA
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	0.05 U	0.01	0.01 U	0.01 U	0.01 U	0.01 U	0.2 U	0.3 U	0.01 U	0.2 U	0.01 U	0.1 U	0.01 U
1-Methylnaphthalene	mg/kg	--	--	--	--	--	0.05 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.2 U	0.3 U	0.01 U	0.2 U	0.01 U	0.1 U	0.01 U
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	0.05 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.2 U	0.3 U	0.01 U	0.2 U	0.01 U	0.1 U	0.01 U
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.05 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.2 U	0.3 U	0.01 U	0.2 U	0.01 U	0.1 U	0.01 U
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	0.09 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.4 U	0.5 U	0.02 U	0.3 U	0.02 U	0.2 U	0.02 U
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.09 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.4 U	0.5 U	0.02 U	0.3 U	0.02 U	0.2 U	0.02 U
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	0.05 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.2 U	0.3 U	0.01 U	0.2 U	0.01 U	0.1 U	0.01 U
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**0.66**	**0.77**	**1.1**	**0.75**	**0.02**	**0.02**	**22**	**17**	**0.33**	**4.8**	**0.02**	**6.5**	**0.08**
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	0.05 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.2 U	0.3 U	0.01 U	0.2 U	0.01 U	0.1 U	0.01 U
Benzo(e)pyrene	mg/kg	--	--	--	--	--	**0.27**	**0.28**	**0.44**	**0.3**	0.01 U	0.01 U	**9.4**	**7.5**	**0.14**	**1.8**	0.01 U	**2.6**	**0.04**
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**0.25**	**0.23**	**0.43**	**0.27**	0.01 U	0.01 U	**11**	**7.7**	**0.13**	**1.8**	0.01 U	**2.6**	**0.03**
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	0.09 U	**0.06**	**0.12**	**0.06**	0.02 U	0.02 U	**2.5**	**1.3**	**0.03**	**0.4**	0.02 U	**0.54**	0.02 U
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	0.09 U	**0.04**	**0.05**	**0.03**	0.02 U	0.02 U	**1.4**	**0.57**	0.02 U	0.3 U	0.02 U	**0.21**	0.02 U
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	0.09 U	**0.05**	**0.09**	**0.06**	0.02 U	0.02 U	**3.4**	**1.8**	**0.04**	**0.45**	0.02 U	**0.56**	0.02 U
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	0.09 U	**0.05**	**0.07**	**0.04**	0.02 U	0.02 U	**1.4**	**0.93**	0.02 U	0.3 U	0.02 U	**0.33**	0.02 U
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**0.21**	**0.21**	**0.36**	**0.22**	0.01 U	0.01 U	**10**	**6.9**	**0.12**	**1.7**	0.01 U	**2.3**	**0.03**
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	**0.023**	**0.042**	0.005 U	**0.054**	0.005 U	0.005 U	0.005 U
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	**0.045**	**0.097**	0.005 U	**0.096**	0.005 U	**0.007**	0.005 U
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	**0.057**	**0.189**	0.005 U	**0.067**	0.005 U	**0.069**	0.005 U
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	**0.026**	**0.031**	0.005 U	**0.007**	0.005 U	0.005 U	**0.149**	**0.362**	0.005 U	**0.164**	0.005 U	**0.267**	0.005 U
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	**0.021**	**0.026**	0.005 U	**0.008**	0.005 U	0.005 U	**0.053**	**0.152**	**0.086**	**0.038**	0.005 U	**0.092**	0.005 U
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	**0.047**	**0.057**	ND	**0.015**	ND	ND	**0.327**	**0.842**	**0.086**	**0.419**	ND	ND	ND
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																			
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	na	100 U	100 U	100 U	100 U	100 U	100 U	na	100 U	100 U	100 U	100 U	100 U

Table 3-3

Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							**108**	**108**	**109**	**109**	**109**	**110**	**110**	**110**	**111**	**111**	**111**	**112**	**112**
Sample Depth							**0-50 cm**	**50-100 cm**	**0-50 cm**	**50-100 cm**	**150-200 cm**	**0-50 cm**	**50-100 cm**	**150-200 cm**	**0-50 cm**	**50-100 cm**	**100-150 cm**	**0-50 cm**	**50-100 cm**
Sample Type							**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Sample Description							**Core**	**Core**	**Core**	**Core**	**Core**	**Core**	**Core**	**Core**	**Core**	**Core**	**Core**	**Core**	**Core**
Year							**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**
Major Remediation Area							**BDA**	**BDA**	**ADM**	**ADM**	**ADM**	**BDA**	**BDA**	**BDA**	**BDA**	**BDA**	**BDA**	**BDA**	**BDA**
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	**19**	**18**	**20**	**20**	**21**	**16**	**18**	**19**	**22**	**19**	**19**	**21**	**17**
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	**0.43**	**0.34**	**1.82**	**0.2**	**0.15**	**0.21**	**0.17**	**0.56**	**6.4**	**0.28**	**0.27**	**4.51**	**0.21**
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	**0.7**	na	**0.8**	**1.13**	**0.9**	**1.2**	**1.15**	**1**	**1.6**	**1.41**	**1.4**	**1.3**	**1.01**
Gravel (2mm-26mm)	%	--	--	--	--	--	na U	na	na U	na U	na U	na U	na U	na U	na U	na U	na U	na U	**4.05**
Sand (63µm-2mm)	%	--	--	--	--	--	**96.2**	na	**93**	**91.1**	**92.4**	**91.1**	**89.9**	**93.8**	**82.3**	**85.9**	**87.6**	**92.2**	**86.8**
Silt (2um-63um)	%	--	--	--	--	--	**3.1**	na	**6.1**	**7.75**	**6.7**	**7.7**	**8.97**	**5.2**	**16.1**	**12.7**	**10.9**	**6.5**	**8.11**
Metal																			
Arsenic	mg/kg	4.3	7.2	19	42	150	**0.6**	**0.7**	**0.6**	na	**0.9**	**1.1**	na	**1**	**1.5**	na	**1.1**	**1**	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	0.03 U	0.03 U	**0.03**	na	0.03 U	**0.05**	na	0.03 U	**0.04**	na	0.03 U	**0.03**	na
Chromium	mg/kg	30	52	96	160	290	**8**	**7**	**7**	na	**10**	**10**	na	**9**	**13**	na	**13**	**13**	na
Copper	mg/kg	11	19	42	110	230	**3**	**3**	**4**	na	**4**	**5**	na	**3**	**6**	na	**5**	**7**	na
Lead	mg/kg	18	30	54	110	180	5 U	5 U	5 U	na	5 U	5 U	na	5 U	5 U	na	5 U	5 U	na
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	0.01 U	0.01 U	0.01 U	na	0.01 U	0.01 U	na	0.01 U	**0.05**	na	0.01 U	0.01 U	na
Nickel	mg/kg	--	--	--	--	--	**5**	**4**	**5**	na	**6**	**6**	na	**6**	**9**	na	**9**	**8**	na
Zinc	mg/kg	70	120	180	270	430	**17**	**14**	**18**	na	**21**	**24**	na	**19**	**27**	na	**23**	**27**	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	0.01 U	0.01 U	**0.1**	0.01 U	0.01 U	0.05 U	0.01 U	0.01 U	0.06 U	0.01 U	0.01 U	**0.16**	0.01 U
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**0.03**	0.01 U	**0.57**	**0.02**	0.01 U	**0.36**	0.01 U	0.01 U	**0.12**	0.01 U	0.01 U	**0.84**	**0.01**
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.01 U	0.06 U	0.01 U	0.01 U	0.05 U	0.01 U	0.01 U	0.06 U	0.01 U	0.01 U	0.06 U	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**0.06**	0.01 U	**1.1**	**0.03**	0.01 U	**0.62**	0.01 U	0.01 U	**0.29**	0.01 U	0.01 U	**1.6**	**0.04**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**0.27**	**0.01**	**4.3**	**0.19**	0.01 U	**2.5**	**0.02**	0.01 U	**0.97**	0.01 U	0.01 U	**5.5**	**0.09**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**0.31**	**0.01**	**4.9**	**0.25**	0.01 U	**3.1**	**0.02**	0.01 U	**1.1**	0.01 U	0.01 U	**8**	**0.11**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**0.29**	**0.01**	**4.8**	**0.21**	0.01 U	**2.8**	**0.02**	0.01 U	**1.2**	0.01 U	0.01 U	**5.8**	**0.1**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**0.06**	0.01 U	**1.2**	**0.04**	0.01 U	**0.73**	0.01 U	0.01 U	**0.25**	0.01 U	0.01 U	**1.4**	**0.02**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**0.41**	**0.02**	**6.2**	**0.27**	0.01 U	**4.2**	**0.02**	0.01 U	**1.8**	0.01 U	0.01 U	**10**	**0.19**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**0.03**	0.01 U	**0.51**	**0.02**	0.01 U	**0.27**	0.01 U	0.01 U	**0.12**	0.01 U	0.01 U	**0.75**	**0.02**
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	**0.01**	0.01 U	**0.34**	0.01 U	0.01 U	**0.14**	0.01 U	0.01 U	0.06 U	0.01 U	0.01 U	**0.51**	0.01 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**0.24**	**0.01**	**3.9**	**0.13**	0.01 U	**2.6**	**0.01**	0.01 U	**1.2**	0.01 U	0.01 U	**5.5**	**0.16**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**0.35**	**0.02**	**5.6**	**0.24**	0.01 U	**3.6**	**0.02**	0.01 U	**1.5**	0.01 U	0.01 U	**9.4**	**0.16**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**2.06**	**0.08**	**33.5**	**1.4**	ND	**20.9**	**0.11**	ND	**8.55**	ND	ND	**49.5**	**0.9**

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							108	108	109	109	109	110	110	110	111	111	111	112	112
Sample Depth							0-50 cm	50-100 cm	0-50 cm	50-100 cm	150-200 cm	0-50 cm	50-100 cm	150-200 cm	0-50 cm	50-100 cm	100-150 cm	0-50 cm	50-100 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008
Major Remediation Area							BDA	BDA	ADM	ADM	ADM	BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.06 U	0.01 U	0.01 U	0.05 U	0.01 U	0.01 U	0.06 U	0.01 U	0.01 U	**0.06 U**	0.01 U
1-Methylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.06 U	0.01 U	0.01 U	0.05 U	0.01 U	0.01 U	0.06 U	0.01 U	0.01 U	**0.09**	0.01 U
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.06 U	0.01 U	0.01 U	0.05 U	0.01 U	0.01 U	0.06 U	0.01 U	0.01 U	0.06 U	0.01 U
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.06 U	0.01 U	0.01 U	0.05 U	0.01 U	0.01 U	0.06 U	0.01 U	0.01 U	0.06 U	0.01 U
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	0.02 U	0.02 U	0.2 U	0.02 U	0.02 U	0.1 U	0.02 U	0.02 U	0.2 U	0.02 U	0.02 U	0.2 U	0.02 U
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.02 U	0.02 U	0.2 U	0.02 U	0.02 U	0.1 U	0.02 U	0.02 U	0.2 U	0.02 U	0.02 U	0.2 U	0.02 U
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.06 U	0.01 U	0.01 U	0.05 U	0.01 U	0.01 U	0.06 U	0.01 U	0.01 U	0.06 U	0.01 U
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**0.52**	**0.02**	**8.7**	**0.4**	0.01 U	**5.4**	**0.04**	0.01 U	**2.1**	0.01 U	0.01 U	**11**	**0.16**
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.06 U	0.01 U	0.01 U	0.05 U	0.01 U	0.01 U	0.06 U	0.01 U	0.01 U	0.06 U	0.01 U
Benzo(e)pyrene	mg/kg	--	--	--	--	--	**0.22**	**0.01**	**3.6**	**0.18**	0.01 U	**2.2**	**0.02**	0.01 U	**0.85**	0.01 U	0.01 U	**4.3**	**0.07**
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**0.2**	0.01 U	**3.4**	**0.19**	0.01 U	**2.3**	**0.02**	0.01 U	**0.77**	0.01 U	0.01 U	**4.4**	**0.07**
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	**0.05**	0.02 U	**0.86**	**0.03**	0.02 U	**0.48**	0.02 U	0.02 U	0.2 U	0.02 U	0.02 U	**1.2**	0.02 U
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	**0.02**	0.02 U	**0.4**	0.02 U	0.02 U	**0.23**	0.02 U	0.02 U	0.2 U	0.02 U	0.02 U	**0.64**	0.02 U
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	**0.06**	0.02 U	**0.88**	**0.04**	0.02 U	**0.48**	0.02 U	0.02 U	0.2 U	0.02 U	0.02 U	**1.2**	**0.02**
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	**0.03**	0.02 U	**0.48**	**0.02**	0.02 U	**0.3**	0.02 U	0.02 U	0.2 U	0.02 U	0.02 U	**0.71**	0.02 U
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**0.19**	0.01 U	**3**	**0.16**	0.01 U	**2.1**	**0.01**	0.01 U	**0.7**	0.01 U	0.01 U	**3.9**	**0.06**
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	**0.039**	0.005 U	0.005 U	**0.023**	0.005 U	0.005 U	**0.011**	0.005 U	0.005 U	0.005 U	0.005 U
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	**0.035**	0.005 U	**0.126**	0.005 U	0.005 U	**0.099**	0.005 U	0.005 U	**0.06**	0.005 U	0.005 U	**0.053**	0.005 U
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	**0.104**	0.005 U	**0.257**	0.005 U	0.005 U	**0.313**	0.005 U	0.005 U	**0.104**	0.005 U	0.005 U	**0.17**	0.005 U
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	**0.027**	0.005 U	**0.135**	0.005 U	0.005 U	**0.11**	0.005 U	0.005 U	**0.023**	0.005 U	0.005 U	**0.105**	0.005 U
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	**0.166**	ND	**0.557**	ND	ND	**0.545**	ND	ND	**0.198**	ND	ND	**0.328**	ND
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																			
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	100 U	100 U	100 U	na	100 U	100 U	na	100 U	100 U	na	100 U	100 U	na

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							112	113	113	113	114	114	114	115	115	116	116	116	117
Sample Depth							150-200 cm	0-50 cm	50-100 cm	100-150 cm	0-50 cm	50-100 cm	100-150 cm	0-50 cm	50-100 cm	0-50 cm	50-100 cm	150-200 cm	0-50 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008
Major Remediation Area							BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	**18**	**9**	**17**	**13**	**21**	**19**	**20**	**13**	**14**	**15**	**26**	**28**	**11**
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	**0.24**	**0.16**	**0.18**	**0.17**	**0.12**	**0.33**	**0.45**	**0.36**	**0.18**	**0.25**	**0.25**	**0.38**	**0.31**
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	**1.5**	**0.5**	**0.35**	**0.5**	**1.3**	**1.06**	**1.9**	**0.3**	**0.3**	**25.1**	na	na	**0.5**
Gravel (2mm-26mm)	%	--	--	--	--	--	na U	na U	na U	na U	na U	na U	na U	na U	na U	na U	na	na	na U
Sand (63µm-2mm)	%	--	--	--	--	--	**89.6**	**97.3**	**98**	**96.8**	**88.4**	**90.5**	**85**	**98.5**	**98.5**	na U	na	na	**97.1**
Silt (2um-63um)	%	--	--	--	--	--	**8.9**	**2.2**	**1.67**	**2.7**	**10.2**	**8.47**	**13.1**	**1.2**	**1.2**	**74.9**	na	na	**2.4**
Metal																			
Arsenic	mg/kg	4.3	7.2	19	42	150	**0.8**	**0.6**	na	**0.7**	**1.2**	na	**1.3**	**1**	**0.9**	**0.6**	na	**1.3**	**0.9**
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	0.03 U	0.03 U	na	0.03 U	**0.05**	na	0.03 U	0.03 U	0.03 U	**0.03**	na	0.03 U	0.03 U
Chromium	mg/kg	30	52	96	160	290	**12**	**6**	na	**6**	**10**	na	**13**	**8**	**8**	**48**	na	**48**	**6**
Copper	mg/kg	11	19	42	110	230	**4**	**3**	na	**2**	**5**	na	**4**	**3**	**3**	**30**	na	**22**	**2**
Lead	mg/kg	18	30	54	110	180	5 U	5 U	na	5 U	5 U	na	5 U	5 U	5 U	**6**	na	**6**	5 U
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	0.01 U	0.01 U	na	0.01 U	**0.04**	na	0.01 U	0.01 U	0.01 U	0.01 U	na	0.01 U	0.01 U
Nickel	mg/kg	--	--	--	--	--	**7**	**4**	na	**4**	**7**	na	**9**	**5**	**5**	**30**	na	**25**	**4**
Zinc	mg/kg	70	120	180	270	430	**22**	**14**	na	**21**	**24**	na	**24**	**15**	**13**	**53**	na	**60**	**13**
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	0.01 U	0.01 U	0.01 U	0.01 U	**0.59**	0.01 U	0.01 U	0.01 U	0.01 U	**0.03**	0.01 U	0.01 U	0.01 U
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	0.01 U	0.01 U	0.01 U	**0.01**	**1.4**	0.01 U	0.01 U	0.01 U	0.01 U	**0.09**	0.01 U	0.01 U	**0.02**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	0.01 U	**0.01**	0.01 U	**0.03**	**3.7**	**0.04**	0.01 U	0.01 U	**0.02**	**0.19**	0.01 U	0.01 U	**0.1**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	0.01 U	**0.01**	0.01 U	**0.04**	**3.6**	**0.06**	0.01 U	**0.01**	**0.03**	**0.18**	0.01 U	0.01 U	**0.14**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	0.01 U	**0.01**	0.01 U	**0.03**	**4.1**	**0.05**	0.01 U	0.01 U	**0.02**	**0.19**	0.01 U	0.01 U	**0.14**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	0.01 U	0.01 U	0.01 U	0.01 U	**0.74**	**0.01**	0.01 U	0.01 U	0.01 U	**0.03**	0.01 U	0.01 U	**0.03**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	0.01 U	**0.03**	0.01 U	**0.06**	**7.3**	**0.07**	0.01 U	**0.01**	**0.03**	**0.39**	**0.01**	0.01 U	**0.15**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	0.01 U	0.01 U	0.01 U	0.01 U	**0.65**	0.01 U	0.01 U	0.01 U	0.01 U	**0.04**	0.01 U	0.01 U	0.01 U
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.01 U	0.01 U	0.01 U	0.01 U	**0.21**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	0.01 U	**0.02**	0.01 U	**0.04**	**5.6**	**0.05**	0.01 U	0.01 U	**0.02**	**0.32**	**0.01**	0.01 U	**0.06**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	0.01 U	**0.02**	0.01 U	**0.05**	**6.2**	**0.07**	0.01 U	**0.01**	**0.03**	**0.33**	**0.01**	0.01 U	**0.11**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	ND	**0.1**	ND	**0.26**	**34.1**	**0.35**	ND	**0.03**	**0.15**	**1.79**	**0.03**	ND	**0.75**

Table 3-3

Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							112	113	113	113	114	114	114	115	115	116	116	116	117
Sample Depth							150-200 cm	0-50 cm	50-100 cm	100-150 cm	0-50 cm	50-100 cm	100-150 cm	0-50 cm	50-100 cm	0-50 cm	50-100 cm	150-200 cm	0-50 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008
Major Remediation Area							BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
1-Methylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	0.02 U	0.02 U	0.02 U	0.02 U	0.2 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.02 U	0.02 U	0.02 U	0.02 U	0.2 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	0.01 U	**0.03**	0.01 U	**0.08**	**6.4**	**0.1**	0.01 U	**0.02**	**0.05**	**0.28**	**0.01**	0.01 U	**0.31**
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(e)pyrene	mg/kg	--	--	--	--	--	0.01 U	**0.01**	0.01 U	**0.03**	**2.5**	**0.05**	0.01 U	**0.01**	**0.02**	**0.12**	0.01 U	0.01 U	**0.14**
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	**0.03**	**2.2**	**0.05**	0.01 U	0.01 U	**0.02**	**0.1**	0.01 U	0.01 U	**0.11**
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	0.02 U	0.02 U	0.02 U	0.02 U	**0.46**	0.02 U	0.02 U	0.02 U	0.02 U	**0.02**	0.02 U	0.02 U	**0.02**
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	0.02 U	0.02 U	0.02 U	0.02 U	0.2 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	0.02 U	0.02 U	0.02 U	0.02 U	**0.49**	0.02 U	0.02 U	0.02 U	0.02 U	**0.03**	0.02 U	0.02 U	0.02 U
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	0.02 U	0.02 U	0.02 U	0.02 U	**0.27**	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	**0.02**	**2**	**0.04**	0.01 U	0.01 U	**0.02**	**0.09**	0.01 U	0.01 U	**0.09**
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.005 U	0.005 U	**0.008**	0.005 U	0.005 U	0.005 U	**0.03**	0.005 U	0.005 U	0.005 U	0.005 U
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.005 U	0.005 U	**0.464**	0.005 U	0.005 U	0.005 U	**0.226**	0.005 U	0.005 U	0.005 U	0.005 U
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.005 U	0.005 U	**0.042**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.005 U	0.005 U	**3.71**	0.005 U	0.005 U	0.005 U	**0.408**	0.005 U	0.005 U	0.005 U	0.005 U
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.005 U	0.005 U	**9.79**	0.005 U	0.005 U	0.005 U	**0.158**	0.005 U	0.005 U	0.005 U	0.005 U
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.005 U	0.005 U	**2.94**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	ND	ND	ND	ND	**16.9**	ND	ND	ND	**0.822**	ND	ND	ND	ND
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																			
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	100 U	100 U	na	100 U	100 U	na	100 U	100 U	100 U	100 U	na	100 U	100 U

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

						Location ID	117	117	121	121	123	123	124	124	126	126	C-3	C-3	C-6A
						Sample Depth	50-100 cm	100-150 cm	0-50 cm	50-100 cm	0-50 cm	50-100 cm	0-50 cm	50-100 cm	0-50 cm	50-100 cm	0-50 cm	50-100 cm	0-50 cm
						Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N
						Sample Description	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
						Year	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008
						Major Remediation Area	BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	**13**	**16**	**18**	**17**	**23**	**19**	**26**	**22**	**4**	**7**	**21**	**18**	**7**
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	**0.2**	**0.08**	**0.52**	**0.14**	**0.84**	**0.29**	**0.34**	**0.36**	**0.17**	**0.14**	**20**	**3.09**	**5.44**
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	**0.35**	**0.4**	**1.3**	**1.2**	**0.7**	**0.8**	**34.7**	**39.9**	**0.3**	na	**0.8**	**0.5**	**0.3**
Gravel (2mm-26mm)	%	--	--	--	--	--	na U	na U	na U	na U	na U	na U	na U	na U	na U	na	**10.4**	**19.9**	na U
Sand (63µm-2mm)	%	--	--	--	--	--	**98.2**	**97.8**	**89.8**	**92.3**	**94.5**	**94.6**	na U	na U	**98.2**	na	**80.5**	**73.4**	**97.4**
Silt (2um-63um)	%	--	--	--	--	--	**1.46**	**1.8**	**8.9**	**6.5**	**4.8**	**4.6**	**65.3**	**60.1**	**1.5**	na	**8.4**	**6.2**	**2.3**
Metal																			
Arsenic	mg/kg	4.3	7.2	19	42	150	na	**0.7**	**0.6**	**0.8**	**0.8**	**0.6**	**1.7**	**1.8**	**1.2**	**1.2**	**1**	**0.7**	**1.5**
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	**0.03**	**0.04**	0.03 U	0.03 U	**0.08**	**0.09**	**0.1**
Chromium	mg/kg	30	52	96	160	290	na	**8**	**9**	**9**	**7**	**5**	**34**	**24**	**7**	**7**	**7**	**6**	**7**
Copper	mg/kg	11	19	42	110	230	na	**3**	**4**	**3**	**2**	**2**	**16**	**14**	**3**	**2**	**13**	**9**	**11**
Lead	mg/kg	18	30	54	110	180	na	5 U	5 U	5 U	5 U	5 U	**6**	**5**	5 U	5 U	**7**	**8**	**9**
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**
Nickel	mg/kg	--	--	--	--	--	na	**3**	**6**	**6**	**4**	**4**	**21**	**16**	**4**	**4**	**6**	**5**	**6**
Zinc	mg/kg	70	120	180	270	430	na	**13**	**22**	**16**	**15**	**13**	**53**	**52**	**15**	**12**	**39**	**36**	**35**
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	0.01 U	0.01 U	**0.26**	0.01 U	0.3 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**1.4**	0.6 U	**0.2**
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	0.01 U	0.01 U	**1.5**	0.01 U	**1**	**0.01**	0.01 U	0.01 U	0.01 U	0.01 U	**9.5**	**2.3**	**1.9**
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.01 U	0.06 U	0.01 U	0.3 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.6 U	0.6 U	0.09 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	0.01 U	0.01 U	**3.7**	0.01 U	**1.8**	**0.03**	0.01 U	0.01 U	0.01 U	0.01 U	**20**	**4.8**	**3.6**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**0.03**	**0.01**	**7.6**	0.01 U	**7.2**	**0.14**	0.01 U	0.01 U	**0.03**	0.01 U	**48**	**15**	**13**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**0.04**	**0.01**	**6.9**	0.01 U	**10**	**0.21**	0.01 U	0.01 U	**0.04**	**0.01**	**42**	**16**	**16**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**0.03**	**0.02**	**8.1**	0.01 U	**7.7**	**0.15**	0.01 U	0.01 U	**0.03**	0.01 U	**47**	**17**	**14**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	0.01 U	0.01 U	**1.5**	0.01 U	**2.1**	**0.04**	0.01 U	0.01 U	0.01 U	0.01 U	**11**	**4.2**	**4.8**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**0.04**	**0.02**	**15**	0.01 U	**12**	**0.2**	0.01 U	0.01 U	**0.05**	**0.01**	**96**	**28**	**21**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	0.01 U	0.01 U	**1.8**	0.01 U	**0.77**	**0.01**	0.01 U	0.01 U	0.01 U	0.01 U	**8.6**	**1.8**	**1.3**
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.01 U	0.01 U	**0.39**	0.01 U	**1**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**4.5**	0.6 U	**0.6**
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**0.02**	0.01 U	**13**	0.01 U	**7.2**	**0.1**	0.01 U	0.01 U	**0.03**	0.01 U	**75**	**18**	**12**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**0.03**	**0.01**	**13**	0.01 U	**11**	**0.19**	0.01 U	0.01 U	**0.04**	0.01 U	**86**	**25**	**18**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**0.19**	**0.07**	**72.8**	ND	**61.8**	**1.08**	ND	ND	**0.22**	**0.02**	**449**	**132**	**106**

Table 3-3

Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							117	117	121	121	123	123	124	124	126	126	C-3	C-3	C-6A
Sample Depth							50-100 cm	100-150 cm	0-50 cm	50-100 cm	0-50 cm	50-100 cm	0-50 cm	50-100 cm	0-50 cm	50-100 cm	0-50 cm	50-100 cm	0-50 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008
Major Remediation Area							BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	**0.13**	0.01 U	0.3 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.6 U**	0.6 U	**0.2**
1-Methylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	**0.15**	0.01 U	0.3 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.74**	0.6 U	**0.11**
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.06 U	0.01 U	0.3 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.6 U	0.6 U	**0.14**
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.06 U	0.01 U	0.3 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.6 U	0.6 U	0.09 U
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	0.02 U	0.02 U	0.2 U	0.02 U	0.5 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	2 U	2 U	0.2 U
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.02 U	0.02 U	0.2 U	0.02 U	0.5 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	2 U	2 U	0.2 U
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.06 U	0.01 U	0.3 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.6 U	0.6 U	0.09 U
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**0.07**	**0.04**	**12**	0.01 U	**15**	**0.34**	**0.01**	0.01 U	**0.08**	**0.02**	**74**	**27**	**24**
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.06 U	0.01 U	0.3 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.6 U	0.6 U	0.09 U
Benzo(e)pyrene	mg/kg	--	--	--	--	--	**0.03**	**0.02**	**4.4**	0.01 U	**6.5**	**0.14**	0.01 U	0.01 U	**0.03**	**0.01**	**27**	**11**	**9.4**
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**0.03**	**0.01**	**3.6**	0.01 U	**8**	**0.16**	0.01 U	0.01 U	**0.04**	**0.01**	**26**	**11**	**12**
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	0.02 U	0.02 U	**0.97**	0.02 U	**1.4**	**0.03**	0.02 U	0.02 U	0.02 U	0.02 U	**3.6**	2 U	**2.3**
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	0.02 U	0.02 U	**0.51**	0.02 U	**0.71**	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	**2.1**	2 U	**1.8**
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	0.02 U	0.02 U	**1**	0.02 U	**2**	**0.04**	0.02 U	0.02 U	0.02 U	0.02 U	**3.6**	2 U	**2.5**
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	0.02 U	0.02 U	**0.63**	0.02 U	**0.95**	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	**2.6**	2 U	**0.89**
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**0.03**	**0.01**	**3.5**	0.01 U	**7.1**	**0.14**	0.01 U	0.01 U	**0.03**	0.01 U	**26**	**9.6**	**9.3**
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.07 U	0.005 U	0.005 U
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	**0.081**	**0.006**	**0.016**
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	**0.09**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	**2.6**	**0.069**	**0.116**
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.07 U	0.005 U	0.005 U
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.07 U	0.005 U	0.005 U
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	**0.591**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	**17.8**	**0.507**	**0.37**
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	**1.7**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	**47.6**	**1.39**	**0.904**
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	**0.659**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	**8.99**	**0.522**	**0.321**
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	ND	ND	**3.04**	ND	ND	ND	ND	ND	ND	ND	**77.1**	**2.5**	**1.73**
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																			
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	na	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	**140**	**140**	**220**

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

						Location ID	C-6A	C-7	C-7	C-11	C-11	C-16A	C-16A	C-18	C-18	C-20	C-20	C-22	C-22
						Sample Depth	100-150 cm	0-50 cm	50-100 cm	0-50 cm	100-150 cm	0-50 cm	100-150 cm	0-50 cm	100-150 cm	0-50 cm	50-100 cm	0-50 cm	100-150 cm
						Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N
						Sample Description	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
						Year	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	21	16	15	21	25	22	18	21	19	20	12	26	19
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	0.73	0.17	1.25	8.19	1.1	1.13	0.17	0.16	0.06	7.5	0.12	1.84	1.38
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	0.6	0.5	1.3	0.5	0.7	0.8	0.4	44.6	13.3	1	0.3	0.7	0.5
Gravel (2mm-26mm)	%	--	--	--	--	--	na U	na U	na U	na U	na U	na U	4.6	na U	na U	na U	19.4	na U	na U
Sand (63µm-2mm)	%	--	--	--	--	--	90.5	97.1	91.9	94	88.8	91.1	92.5	na U	54.7	88.4	77.6	88	95.6
Silt (2um-63um)	%	--	--	--	--	--	9	2.4	6.8	5.4	10.4	8.2	2.5	55.4	32	10.6	2.7	11.3	3.9
Metal																			
Arsenic	mg/kg	4.3	7.2	19	42	150	1.4	1.9	0.6	1.8	1.2	1	0.7	1.4	1.3	2.7	1.4	0.8	0.9
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	0.09	0.08	0.04	0.11	0.09	0.06	0.05	0.03 U	0.03 U	0.19	0.15	0.14	0.04
Chromium	mg/kg	30	52	96	160	290	5	5	6	7	6	5	5	32	21	14	8	5	7
Copper	mg/kg	11	19	42	110	230	9	8	6	9	6	7	5	11	7	23	12	5	4
Lead	mg/kg	18	30	54	110	180	18	5 U	5 U	9	14	10	5 U	5 U	5 U	17	9	7	7
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	0.04	0.02	0.02	0.01 U	0.01	0.02	0.03	0.01 U	0.01 U	0.03	0.02	0.01 U	0.01 U
Nickel	mg/kg	--	--	--	--	--	13	5	6	6	8	7	5	19	15	13	7	7	5
Zinc	mg/kg	70	120	180	270	430	28	30	17	36	37	33	14	44	42	73	52	43	18
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	0.1 U	0.1	0.1 U	0.6 U	0.2 U	0.2 U	1.6	0.01 U	0.01 U	0.93	0.2 U	0.7 U	0.6 U
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	0.84	1.3	0.7	4.6	0.59	1.6	9.4	0.01 U	0.01 U	6.3	1.1	1.9	2.7
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.1 U	0.1 U	0.1 U	0.6 U	0.2 U	0.2 U	1 U	0.01 U	0.01 U	0.7 U	0.2 U	0.7 U	0.6 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	1.7	3.3	2.1	7.6	1.3	2.9	20	0.01 U	0.01 U	9.1	2	11	7.4
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	8.1	8.2	4.9	29	7.7	9.2	33	0.03	0.01 U	35	9	21	15
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	8.9	9.9	5.2	33	7.3	10	22	0.04	0.01 U	39	10	20	12
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	14	8	4.8	29	11	10	31	0.03	0.01 U	37	9.2	28	15
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	2.9	3.1	1.5	9.6	2.1	2.9	4.9	0.01 U	0.01 U	11	2.5	5.1	2.9
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	17	16	8.7	42	15	19	83	0.04	0.01 U	58	14	34	32
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	0.74	1.1	0.7	2.5	0.44	1.2	10	0.01 U	0.01 U	4.7	0.74	2.4	3
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.2	0.31	0.1 U	1.3	0.2 U	0.41	2.7	0.01 U	0.01 U	3.4	0.28	0.7 U	0.73
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	6.6	8.8	5.7	24	4.8	9.9	79	0.02	0.01 U	37	7.2	20	27
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	14	14	7.2	39	11	17	73	0.04	0.01 U	52	13	29	27
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	75	74.1	41.5	222	61.2	84.1	370	0.2	ND	293	69	172	145

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							C-6A	C-7	C-7	C-11	C-11	C-16A	C-16A	C-18	C-18	C-20	C-20	C-22	C-22
Sample Depth							100-150 cm	0-50 cm	50-100 cm	0-50 cm	100-150 cm	0-50 cm	100-150 cm	0-50 cm	100-150 cm	0-50 cm	50-100 cm	0-50 cm	100-150 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	0.1 U	0.1 U	0.1 U	0.6 U	0.2 U	0.2 U	1 U	0.01 U	0.01 U	0.7 U	0.2 U	0.7 U	0.6 U
1-Methylnaphthalene	mg/kg	--	--	--	--	--	0.1 U	0.1 U	0.1 U	0.6 U	0.2 U	0.2 U	1 U	0.01 U	0.01 U	0.7 U	0.2 U	0.7 U	0.6 U
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	0.1 U	0.1 U	0.1 U	0.6 U	0.2 U	0.2 U	1 U	0.01 U	0.01 U	0.7 U	0.2 U	0.7 U	0.6 U
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.1 U	0.1 U	0.1 U	0.6 U	0.2 U	0.2 U	1 U	0.01 U	0.01 U	0.7 U	0.2 U	0.7 U	0.6 U
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	0.2 U	0.2 U	0.2 U	2 U	0.3 U	0.3 U	2 U	0.02 U	0.02 U	2 U	0.3 U	2 U	2 U
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.2 U	0.2 U	0.2 U	2 U	0.3 U	0.3 U	2 U	0.02 U	**0.02**	2 U	0.3 U	2 U	2 U
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	0.1 U	0.1 U	0.1 U	0.6 U	0.2 U	0.2 U	1 U	0.01 U	0.01 U	0.7 U	0.2 U	0.7 U	0.6 U
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**20**	**16**	**8.6**	**55**	**16**	**18**	**41**	**0.06**	0.01 U	**67**	**16**	**39**	**21**
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	0.1 U	0.1 U	0.1 U	0.6 U	0.2 U	0.2 U	1 U	0.01 U	0.01 U	0.7 U	0.2 U	0.7 U	0.6 U
Benzo(e)pyrene	mg/kg	--	--	--	--	--	**8.2**	**6.2**	**3.2**	**21**	**6.2**	**6.9**	**14**	**0.03**	0.01 U	**25**	**6.1**	**16**	**8**
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**7.9**	**7.4**	**3.3**	**22**	**5.4**	**7.4**	**9.3**	**0.03**	0.01 U	**24**	**6.1**	**13**	**6.7**
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	**1.3**	**1.5**	**0.59**	**3.7**	**0.91**	**1.3**	2 U	0.02 U	0.02 U	**3.5**	**0.78**	**2.1**	2 U
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	**0.69**	**1.1**	**0.44**	**2.2**	**0.4**	**0.91**	2 U	0.02 U	0.02 U	**2.3**	**0.56**	2 U	2 U
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	**1.5**	**2.1**	**0.79**	**3.5**	**0.76**	**1.6**	2 U	0.02 U	0.02 U	**4.3**	**1**	2 U	2 U
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	**0.48**	**0.64**	**0.24**	**2.4**	0.3 U	**0.58**	2 U	0.02 U	0.02 U	2 U	**0.43**	2 U	2 U
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**6.5**	**6.5**	**3.1**	**22**	**5.2**	**6.4**	**9.3**	**0.03**	0.01 U	**23**	**5.8**	**13**	**6.5**
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.006 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.006 U	0.005 U	0.005 U
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	**0.008**	**0.006**	0.006 U	**0.043**	**0.036**	**0.165**	**0.038**	0.005 U	0.005 U	**0.162**	**0.006**	**0.047**	**0.029**
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	**0.095**	**0.098**	**0.062**	**0.488**	**0.285**	**0.516**	**0.373**	0.005 U	0.005 U	**0.354**	**0.039**	**0.14**	**0.237**
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.006 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.006 U	0.005 U	0.005 U
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.006 U	0.005 U	0.005 U	**0.044**	0.005 U	0.005 U	0.005 U	**0.051**	0.006 U	0.005 U	0.005 U
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	**0.612**	**0.303**	**0.635**	**1.12**	**0.733**	**3.49**	**4.14**	0.005 U	0.005 U	**1.09**	**0.106**	**0.273**	**2.07**
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	**2.06**	**0.52**	**2.06**	**1.71**	**1.82**	**8.54**	**13.3**	0.005 U	0.005 U	**2.88**	**0.282**	**0.893**	**6.21**
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	**1.3**	**0.182**	**1.1**	**0.642**	**1.51**	**3.07**	**5.26**	0.005 U	0.005 U	**1.37**	**0.168**	**0.38**	**3.61**
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	**4.07**	**1.11**	**3.86**	**4.06**	**4.38**	**15.8**	**23.1**	ND	ND	**5.9**	**0.601**	**1.73**	**12.2**
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																			
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	**200**	**120**	100 U	100 U	**200**	**160**	**320**	100 U	100 U	**310**	**110**	**180**	**100**

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							C-26	C-26	C-27	C-27	C-30	C-30	C-32	C-32	CAP-1M	CAP-1M	CAP-1M	CAP-1M	CAP-1M
Sample Depth							0-50 cm	50-100 cm	0-50 cm	100-150 cm	0-50 cm	50-100 cm	0-50 cm	50-100 cm	0-50 cm	10-20 cm	50-100 cm	100-150 cm	150-200 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2008	2008	2008	2008	2008	2008	2008	2008	2009	2009	2009	2009	2009
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	**7.78**	**6.82**	**4.73**	**6.71**
Moisture	%	--	--	--	--	--	**13**	**9**	**10**	**11**	**15**	**18**	**12**	**9**	**16**	**13**	**21**	**23**	**14**
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	**14.9**	**25.9**	**29.2**	**15.7**
Total organic carbon	%	--	--	--	--	--	**2.63**	**0.13**	0.01 U	0.01 U	**0.06**	**0.19**	**0.33**	**0.04**	**0.98**	**0.4**	**0.08**	**0.06**	0.2 U
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	**0.5**	**0.2**	**1.5**	**0.4**	**0.6**	**1.1**	**0.6**	**0.2**	**1.7**	**1.1**	**21**	**21**	**2.7**
Gravel (2mm-26mm)	%	--	--	--	--	--	**7.3**	**23.5**	na U	**12**	**9.8**	na U	**14.8**	**32.1**	**1.8**	**1.7**	**0.5**	**0.2**	**0.2**
Sand (63µm-2mm)	%	--	--	--	--	--	**87.4**	**74.8**	**92.8**	**85.8**	**85.7**	**91.3**	**81.8**	**66.9**	**96**	**97**	**39**	**39**	**90**
Silt (2um-63um)	%	--	--	--	--	--	**4.7**	**1.4**	**5.7**	**1.8**	**3.9**	**7.6**	**2.8**	**0.8**	**0.8**	**0.3**	**40**	**40**	**7.1**
Metal																			
Arsenic	mg/kg	4.3	7.2	19	42	150	**1.3**	**1.7**	0.5 U	0.5 U	**1.1**	**0.9**	**0.9**	0.5 U	**1**	1 U	**1**	1 U	1 U
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	**0.06**	**0.04**	0.03 U	0.03 U	**0.03**	**0.03**	0.03 U	0.03 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Chromium	mg/kg	30	52	96	160	290	**6**	**8**	**4**	**5**	**7**	**8**	**7**	**5**	**5**	**5**	**14**	**15**	**6**
Copper	mg/kg	11	19	42	110	230	**11**	**14**	**5**	**6**	**3**	**3**	**8**	**8**	**9**	**5**	**11**	**11**	**6**
Lead	mg/kg	18	30	54	110	180	**49**	**20**	5 U	5 U	5 U	5 U	5 U	5 U	**7**	5 U	5 U	5 U	5 U
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	**0.02**	**0.01**	0.01 U	0.01 U	**0.02**	**0.01**	0.01 U	**1.8**	**0.03**	**0.04**	**0.03**	**0.02**	**0.03**
Nickel	mg/kg	--	--	--	--	--	**5**	**7**	**4**	**4**	**5**	**5**	**5**	**4**	**5**	**4**	**11**	**11**	**5**
Zinc	mg/kg	70	120	180	270	430	**36**	**31**	**15**	**10**	**15**	**16**	**27**	**15**	**26**	**25**	**35**	**38**	**8**
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	3 U	0.2 U	0.2 U	0.01 U	0.01 U	0.01 U	0.2 U	0.01 U	**0.24**	**0.26**	**0.06**	0.01 U	0.01 U
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**15**	**0.36**	**0.88**	0.01 U	**0.02**	0.01 U	**0.4**	0.01 U	**5**	**2.5**	**1.5**	**0.4**	0.01 U
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	3 U	0.2 U	0.2 U	0.01 U	0.01 U	0.01 U	0.2 U	0.01 U	0.01 U	**0.03**	**0.01**	0.01 U	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**30**	**1.1**	**3**	0.01 U	**0.05**	0.01 U	**1.1**	**0.01**	**26**	**4.6**	**2.8**	**0.39**	0.01 U
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**97**	**2.9**	**5.7**	0.01 U	**0.28**	0.01 U	**5.2**	**0.05**	**65**	**23**	**6.6**	**0.88**	0.01 U
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**100**	**2.5**	**4**	0.01 U	**0.39**	0.01 U	**6.3**	**0.05**	**71**	**29**	**6.9**	**0.83**	**0.01**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**110**	**3.1**	**5.4**	0.01 U	**0.31**	0.01 U	**5.6**	**0.06**	**58**	**19**	**5.4**	**0.63**	**0.01**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**23**	**0.51**	**1.1**	0.01 U	**0.12**	0.01 U	**1.5**	**0.01**	**11**	**4.7**	**0.27**	**0.1**	0.01 U
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**190**	**5.9**	**11**	0.01 U	**0.4**	0.01 U	**7.6**	**0.12**	**100**	**30**	**15**	**3.2**	**0.03**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**14**	**0.48**	**1.3**	0.01 U	**0.02**	0.01 U	**0.4**	0.01 U	**4.7**	**1.9**	**1.2**	**0.11**	0.01 U
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	**8.6**	0.2 U	0.2 U	0.01 U	0.01 U	0.01 U	0.2 U	0.01 U	**1.2**	**1.1**	**0.12**	0.01 U	0.01 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**130**	**4.3**	**11**	0.01 U	**0.19**	0.01 U	**3.8**	**0.06**	**62**	**18**	**13**	**2.3**	0.01 U
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**160**	**5**	**9.7**	0.01 U	**0.35**	0.01 U	**6.7**	**0.09**	**85**	**27**	**12**	**2.4**	**0.02**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**878**	**26.2**	**53.1**	ND	**2.13**	ND	**38.6**	**0.45**	**489**	**161**	**64.9**	**11.2**	**0.07**

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							C-26	C-26	C-27	C-27	C-30	C-30	C-32	C-32	CAP-1M	CAP-1M	CAP-1M	CAP-1M	CAP-1M
Sample Depth							0-50 cm	50-100 cm	0-50 cm	100-150 cm	0-50 cm	50-100 cm	0-50 cm	50-100 cm	0-50 cm	10-20 cm	50-100 cm	100-150 cm	150-200 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2008	2008	2008	2008	2008	2008	2008	2008	2009	2009	2009	2009	2009
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	3 U	0.2 U	0.2 U	0.01 U	0.01 U	0.01 U	0.2 U	0.01 U	**0.21**	**0.06**	**0.09**	0.01	0.01 U
1-Methylnaphthalene	mg/kg	--	--	--	--	--	3 U	0.2 U	0.2 U	0.01 U	0.01 U	0.01 U	0.2 U	0.01 U	**0.17**	**0.15**	**0.05**	0.01 U	0.01 U
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	3 U	0.2 U	0.2 U	0.01 U	0.01 U	0.01 U	0.2 U	0.01 U	**0.06**	**0.02**	**0.03**	0.01 U	0.01 U
3-Methylcholanthrene	mg/kg	--	--	--	--	--	3 U	0.2 U	0.2 U	0.01 U	0.01 U	0.01 U	0.2 U	0.01 U	**2**	**0.89**	**0.2**	**0.03**	0.01 U
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	0.3 U	**0.4**	0.3 U	0.3 U	0.3 U
5-Methylchrysene	mg/kg	--	--	--	--	--	6 U	0.3 U	0.3 U	0.02 U	0.02 U	0.02 U	0.3 U	0.02 U	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	6 U	0.3 U	0.3 U	0.02 U	0.02 U	0.02 U	0.3 U	0.02 U	**0.35**	**0.07**	**0.06**	0.01 U	0.01 U
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	3 U	0.2 U	0.2 U	0.01 U	0.01 U	0.01 U	0.2 U	0.01 U	**1.7**	**0.7**	**0.2**	0.1 U	0.1 U
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**170**	**4.5**	**7.7**	0.01 U	**0.65**	0.01 U	**11**	**0.11**	**110**	**46**	**7.9**	**1.4**	**0.02**
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	3 U	0.2 U	0.2 U	0.01 U	0.01 U	0.01 U	0.2 U	0.01 U	**6.5**	**2.2**	**0.13**	**0.1**	0.01 U
Benzo(e)pyrene	mg/kg	--	--	--	--	--	**70**	**1.7**	**2.6**	0.01 U	**0.26**	0.01 U	**4.2**	**0.04**	**41**	**16**	**3.9**	**0.49**	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**65**	**1.5**	**2.1**	0.01 U	**0.31**	0.01 U	**4.5**	**0.04**	**45**	**19**	**3.7**	**0.47**	0.01 U
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	**13**	**0.3**	**0.31**	0.02 U	**0.06**	0.02 U	**0.89**	0.02 U	**16**	**5.9**	0.1 U	**0.1**	0.1 U
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	**9.8**	0.3 U	0.3 U	0.02 U	**0.05**	0.02 U	**0.68**	0.02 U	**3.1**	**0.91**	**1.8**	**0.02**	0.01 U
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	**17**	**0.46**	0.3 U	0.02 U	**0.08**	0.02 U	**1.3**	0.02 U	**11**	**3.8**	**1.7**	**0.09**	0.01 U
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	**9**	**0.43**	0.3 U	0.02 U	**0.03**	0.02 U	**0.55**	0.02 U	**21**	**8.8**	**0.03**	**0.14**	0.01 U
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**59**	**1.3**	**2.2**	0.01 U	**0.27**	0.01 U	**4.1**	**0.03**	**41**	**18**	**0.17**	**0.42**	0.01 U
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.006 U	0.006 U	0.006 U	0.006 U	0.005 U	0.005 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	**0.021**	0.005 U	0.006 U	0.006 U	0.006 U	0.006 U	0.005 U	0.005 U	0.01 U	**0.03**	0.01 U	0.01 U	0.01 U
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	**0.166**	**0.027**	0.006 U	0.006 U	0.006 U	0.006 U	0.005 U	0.005 U	na U	**0.17**	0.01 U	0.01 U	0.01 U
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.006 U	0.006 U	0.006 U	0.006 U	0.005 U	0.005 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	0.005 U	0.005 U	0.006 U	0.006 U	0.006 U	0.006 U	0.005 U	0.005 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	**0.9**	**0.145**	0.006 U	0.006 U	0.006 U	0.006 U	**0.027**	0.005 U	**0.17**	**0.4**	**0.02**	0.01 U	0.01 U
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	**3.2**	**0.592**	0.006 U	0.006 U	0.006 U	0.006 U	**0.159**	0.005 U	**0.62**	**0.67**	**0.05**	0.01 U	0.01 U
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	**1.06**	**0.232**	0.006 U	0.006 U	0.006 U	0.006 U	**0.094**	0.005 U	**0.27**	**0.29**	**0.02**	0.01 U	0.01 U
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	**5.35**	**0.996**	ND	ND	ND	ND	**0.28**	ND	**1.1**	**1.6**	**0.09**	ND	ND
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																			
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	**160**	100 U	100 U	100 U	100 U	100 U	100 U	100 U	**250**	100 U	100 U	100 U	100 U

Table 3-3

Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							CAP-2	CAP-2	CAP-2	CAP-2	CAP-3	CAP-3	CAP-3	CAP-3	CAP-4	CAP-4	CAP-4	CAP-4	CAP-4
Sample Depth							10-20 cm	50-100 cm	100-200 cm	200-300 cm	10-20 cm	50-100 cm	100-200 cm	200-300 cm	0-50 cm	10-20 cm	50-100 cm	100-200 cm	200-270 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Dry weight	g	--	--	--	--	--	**8.26**	**6.99**	**6.72**	**6.25**	**4.28**	**7.65**	**5.74**	**5.65**	na	**5.49**	**6.83**	**6.43**	**6.5**
Moisture	%	--	--	--	--	--	**19**	**18**	**12**	**11**	**35**	**26**	**21**	**26**	**25**	**35**	**24**	**17**	**13**
Moisture Content (ASTM D2216)	%	--	--	--	--	--	**23.2**	**21.6**	**13.3**	**12.3**	**54**	**34.6**	**27.1**	**35.3**	na	**53.9**	**30.8**	**19.8**	**14.7**
Total organic carbon	%	--	--	--	--	--	**0.3**	**0.03**	0.2 U	0.2 U	**0.13**	**0.13**	**0.09**	**0.08**	**1.5**	**3**	**1.5**	**1.1**	**0.1**
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	**4.3**	**11**	**4.7**	**2.1**	**55**	**12**	**20**	**27**	**2.6**	**3.5**	**2.6**	**1.9**	**2.1**
Gravel (2mm-26mm)	%	--	--	--	--	--	**3.7**	**3.3**	**0.5**	**0.3**	**6.6**	**1.4**	**2.5**	**1.8**	**0.2**	**0.4**	**0.5**	**2**	0.1 U
Sand (63µm-2mm)	%	--	--	--	--	--	**77**	**73**	**83**	**92**	**9.7**	**51**	**60**	**33**	**84**	**72**	**81**	**86**	**93**
Silt (2um-63um)	%	--	--	--	--	--	**15**	**13**	**12**	**5.5**	**28**	**35**	**17**	**38**	**13**	**24**	**16**	**9.8**	**4.5**
Metal																			
Arsenic	mg/kg	4.3	7.2	19	42	150	**2**	1 U	1 U	1 U	1 U	1 U	1 U	**2**	1 U	1 U	1 U	1 U	1 U
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Chromium	mg/kg	30	52	96	160	290	**12**	**7**	**4**	**3**	**55**	**27**	**19**	**17**	**5**	**6**	**5**	**5**	**5**
Copper	mg/kg	11	19	42	110	230	**9**	**6**	**4**	**3**	**30**	**16**	**11**	**13**	**7**	**8**	**10**	**5**	**4**
Lead	mg/kg	18	30	54	110	180	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	**8**	**10**	**8**	5 U	5 U
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	**0.02**	0.01 U	0.01 U	**0.01**	0.01 U	0.01 U	**0.02**	0.01 U	**0.03**	0.01 U	**0.02**	0.01 U	0.01 U
Nickel	mg/kg	--	--	--	--	--	**9**	**6**	**4**	**3**	**35**	**18**	**12**	**13**	**5**	**12**	**9**	**5**	**4**
Zinc	mg/kg	70	120	180	270	430	**26**	**20**	**10**	**7**	**59**	**34**	**32**	**45**	**39**	**46**	**36**	**16**	5 U
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	**0.01**	**0.01**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.27**	**0.69**	**0.26**	**0.52**	0.01 U
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**0.25**	**0.14**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**3.9**	**5.3**	**2.5**	**4.4**	**0.07**
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.06**	**0.06**	0.01 U	0.01 U	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**0.5**	**0.4**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**14**	**15**	**7.4**	**14**	**0.3**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**2.9**	**0.84**	0.01 U	0.01 U	0.01 U	**0.01**	0.01 U	0.01 U	**62**	**61**	**31**	**45**	**1**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**4.1**	**0.67**	0.01 U	0.01 U	0.01 U	**0.02**	0.01 U	0.01 U	**66**	**60**	**31**	**38**	**0.88**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**2.4**	**0.67**	0.01 U	0.01 U	0.01 U	**0.01**	0.01 U	0.01 U	**57**	**68**	**33**	**44**	**1.1**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**0.64**	**0.09**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**10**	**9.3**	**4.9**	**6**	**0.13**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**3.7**	**1.7**	0.01 U	0.01 U	0.01 U	**0.02**	0.01 U	0.01 U	**120**	**110**	**53**	**85**	**1.9**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**0.17**	**0.18**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**3**	**4.8**	**2.2**	**5.4**	**0.11**
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	**0.04**	**0.02**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**1.3**	**2.9**	**1**	**1.5**	**0.03**
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**2.1**	**1.7**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**36**	**50**	**24**	**59**	**0.9**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**3.4**	**1.4**	0.01 U	0.01 U	0.01 U	**0.01**	0.01 U	0.01 U	**98**	**89**	**44**	**72**	**1.6**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**20.2**	**7.82**	ND	ND	ND	**0.07**	ND	ND	**472**	**476**	**234**	**375**	**8.02**

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

						Location ID	CAP-2	CAP-2	CAP-2	CAP-2	CAP-3	CAP-3	CAP-3	CAP-3	CAP-4	CAP-4	CAP-4	CAP-4	CAP-4
						Sample Depth	10-20 cm	50-100 cm	100-200 cm	200-300 cm	10-20 cm	50-100 cm	100-200 cm	200-300 cm	0-50 cm	10-20 cm	50-100 cm	100-200 cm	200-270 cm
						Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N
						Sample Description	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
						Year	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	**0.01 U**	**0.01 U**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.08**	**0.19**	**0.01 U**	**0.14**	0.01 U
1-Methylnaphthalene	mg/kg	--	--	--	--	--	**0.01**	**0.02**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.27**	**0.44**	**0.18**	**0.41**	0.01 U
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.06**	**0.11**	0.01 U	0.01 U	0.01 U
3-Methylcholanthrene	mg/kg	--	--	--	--	--	**0.09**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**1.8**	**1.4**	**0.75**	**0.59**	0.01 U
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
5-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	**0.02**	**0.01**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.35**	**0.25**	**0.17**	**0.33**	0.01 U
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	**1.4**	**1.5**	**0.7**	**0.9**	**0.2**
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**6.2**	**1.1**	0.01 U	0.01 U	0.01 U	**0.03**	0.01 U	0.01 U	**110**	**110**	**57**	**67**	**1.6**
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	**0.26**	**0.11**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**6.8**	**6.6**	**3.3**	**5.3**	**0.12**
Benzo(e)pyrene	mg/kg	--	--	--	--	--	**2.4**	**0.38**	0.01 U	0.01 U	0.01 U	**0.01**	0.01 U	0.01 U	**40**	**41**	**21**	**23**	**0.58**
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**3**	**0.33**	0.01 U	0.01 U	0.01 U	**0.01**	0.01 U	0.01 U	**43**	**41**	**21**	**22**	**0.52**
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	**1**	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	**12**	**13**	**6.2**	**6**	**0.2**
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	**0.15**	**0.02**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**2.2**	**1.7**	**0.77**	**0.9**	**0.02**
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	**0.65**	**0.07**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**7.9**	**6.8**	**3.4**	**3.3**	**0.08**
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	**1.1**	**0.16**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**18**	**18**	**8.8**	**9.9**	**0.23**
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**2.7**	**0.31**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**38**	**37**	**18**	**20**	**0.46**
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.01**	0.01 U	0.01 U	0.01 U	0.01 U
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.1**	**0.4**	**0.3**	**0.3**	0.01 U
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	**0.02**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.33**	**2.8**	**2.4**	**2.5**	**0.01**
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	**0.04**	**0.02**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**1**	**7.5**	**6.3**	**7.3**	0.01 U
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	**0.02**	**0.04**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.9**	**5.5**	**2.8**	**3.5**	**0.04**
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	**0.08**	**0.06**	ND	ND	ND	ND	ND	ND	**2.4**	**16**	**12**	**14**	**0.05**
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																			
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	100 U	100 U	**130**	100 U	**180**	100 U	100 U	**150**	**320**	**440**	**300**	**340**	100 U

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							CAP-5	CAP-5	CAP-5	CAP-5	CAP-6	CAP-6	CAP-6	CAP-6	CAP-6	CAP-7	CAP-7	CAP-7	CAP-7
Sample Depth							10-20 cm	50-100 cm	100-200 cm	200-285 cm	10-20 cm	50-100 cm	100-200 cm	140-155 cm	200-265 cm	10-20 cm	50-100 cm	100-200 cm	200-300 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Dry weight	g	--	--	--	--	--	**4.68**	**5.79**	**5.85**	**7.94**	**6.47**	**6.93**	**5.23**	**6.35**	**6.76**	**6.44**	**6.49**	**7.68**	**7.36**
Moisture	%	--	--	--	--	--	**31**	**33**	**30**	**23**	**22**	**16**	**18**	**23**	**18**	**15**	**12**	**13**	**13**
Moisture Content (ASTM D2216)	%	--	--	--	--	--	**44.4**	**49.6**	**42.9**	**29.5**	**27.7**	**19.6**	**22.5**	**29.2**	**22**	**18**	**14**	**15.6**	**14.9**
Total organic carbon	%	--	--	--	--	--	**0.16**	**0.13**	**0.14**	**0.12**	**0.74**	**0.38**	**0.07**	**0.45**	**0.03**	**0.31**	**0.02**	**0.03**	0.2 U
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	**18**	**42**	**39**	**18**	**4.2**	**2.2**	**4.2**	**2.5**	**10**	**2.9**	**7.8**	**6.8**	**8.4**
Gravel (2mm-26mm)	%	--	--	--	--	--	**2.9**	**4.9**	**3.7**	**0.6**	**2.1**	**1.2**	**1.7**	**1.4**	**0.3**	**2.1**	**1**	0.1 U	**0.4**
Sand (63µm-2mm)	%	--	--	--	--	--	**30**	**34**	**30**	**32**	**89**	**92**	**75**	**91**	**64**	**74**	**73**	**76**	**73**
Silt (2um-63um)	%	--	--	--	--	--	**49**	**19**	**27**	**50**	**4.7**	**4.9**	**19**	**5.3**	**25**	**21**	**18**	**17**	**18**
Metal																			
Arsenic	mg/kg	4.3	7.2	19	42	150	1 U	1 U	1 U	**1**	1 U	1 U	**1**	1 U	1 U	1 U	1 U	1 U	1 U
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Chromium	mg/kg	30	52	96	160	290	**58**	**56**	**46**	**32**	**5**	**6**	**12**	**4**	**8**	**8**	**5**	**4**	**7**
Copper	mg/kg	11	19	42	110	230	**28**	**26**	**25**	**21**	**6**	**4**	**7**	**3**	**7**	**6**	**5**	**5**	**5**
Lead	mg/kg	18	30	54	110	180	**5**	**5**	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	0.01 U	**0.02**	0.01 U	0.01 U	**0.02**	**0.01**	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U	**0.01**	0.01 U
Nickel	mg/kg	--	--	--	--	--	**34**	**32**	**29**	**21**	**5**	**5**	**8**	**3**	**6**	**6**	**4**	**4**	**6**
Zinc	mg/kg	70	120	180	270	430	**56**	**51**	**51**	**40**	**26**	**24**	**21**	**13**	**19**	**25**	**13**	**12**	**18**
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	0.01 U	0.01 U	0.01 U	0.01 U	**0.09**	**0.13**	0.01 U	**0.09**	0.01 U	**0.34**	0.01 U	0.01 U	0.01 U
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	0.01 U	**0.02**	0.01 U	**0.01**	**1.1**	**0.9**	**0.05**	**0.67**	**0.01**	**2.2**	0.01 U	0.01 U	0.01 U
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**	**0.01**	0.01 U	0.01 U	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	0.01 U	**0.05**	0.01 U	0.01 U	**2.5**	**2.2**	**0.16**	**2.3**	**0.04**	**3.1**	0.01 U	0.01 U	0.01 U
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**0.02**	**0.15**	0.01 U	0.01 U	**18**	**14**	**0.33**	**9.4**	**0.16**	**24**	**0.02**	0.01 U	0.01 U
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**0.04**	**0.22**	0.01 U	0.01 U	**23**	**17**	**0.33**	**8.3**	**0.17**	**30**	**0.04**	0.01 U	0.01 U
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**0.03**	**0.15**	0.01 U	0.01 U	**18**	**14**	**0.39**	**10**	**0.17**	**24**	**0.03**	0.01 U	0.01 U
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	0.01 U	**0.04**	0.01 U	0.01 U	**3.4**	**2.6**	**0.05**	**1.4**	**0.03**	**5.5**	0.01 U	0.01 U	0.01 U
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**0.05**	**0.26**	**0.01**	0.01 U	**24**	**19**	**0.75**	**20**	**0.26**	**31**	**0.04**	0.01 U	0.01 U
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	0.01 U	**0.01**	0.01 U	0.01 U	**1**	**0.96**	**0.06**	**1**	0.01 U	**1.9**	0.01 U	0.01 U	0.01 U
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.01 U	0.01 U	0.01 U	0.01 U	**0.4**	**0.55**	**0.01**	**0.32**	0.01 U	**1.1**	0.01 U	0.01 U	0.01 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**0.02**	**0.14**	0.01 U	0.01 U	**10**	**9.2**	**0.52**	**12**	**0.1**	**17**	**0.01**	0.01 U	0.01 U
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**0.04**	**0.22**	0.01 U	0.01 U	**21**	**16**	**0.61**	**16**	**0.22**	**29**	**0.03**	0.01 U	0.01 U
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**0.2**	**1.26**	**0.01**	**0.01**	**123**	**96.6**	**3.26**	**81.5**	**1.16**	**169**	**0.17**	ND	ND

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							CAP-5	CAP-5	CAP-5	CAP-5	CAP-6	CAP-6	CAP-6	CAP-6	CAP-6	CAP-7	CAP-7	CAP-7	CAP-7
Sample Depth							10-20 cm	50-100 cm	100-200 cm	200-285 cm	10-20 cm	50-100 cm	100-200 cm	140-155 cm	200-265 cm	10-20 cm	50-100 cm	100-200 cm	200-300 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**	**0.03**	0.01 U	**0.03**	0.01 U	**0.05**	0.01 U	0.01 U	0.01 U
1-Methylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	**0.07**	**0.09**	0.01 U	**0.08**	0.01 U	**0.24**	0.01 U	0.01 U	0.01 U
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	**0.01**	**0.01**	0.01 U	**0.02**	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	**0.55**	**0.42**	0.01 U	**0.12**	0.01 U	**0.57**	0.01 U	0.01 U	0.01 U
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	0.3 U	0.3 U	0.3 U	0.3 U	**0.3**	0.3 U	0.3 U	0.3 U	0.3 U	**0.6**	0.3 U	0.3 U	0.3 U
5-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	**0.07**	**0.07**	0.01 U	**0.05**	0.01 U	**0.09**	0.01 U	0.01 U	0.01 U
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	0.1 U	0.1 U	0.1 U	0.1 U	**0.5**	**0.4**	0.1 U	**0.2**	0.1 U	**0.8**	0.1 U	0.1 U	0.1 U
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**0.07**	**0.36**	0.01 U	0.01 U	**37**	**28**	**0.61**	**16**	**0.33**	**49**	**0.06**	0.01 U	0.01 U
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	0.01 U	**0.02**	0.01 U	0.01 U	**1.7**	**1.4**	**0.04**	**1.2**	**0.02**	**2.4**	0.01 U	0.01 U	0.01 U
Benzo(e)pyrene	mg/kg	--	--	--	--	--	**0.03**	**0.13**	0.01 U	0.01 U	**14**	**10**	**0.21**	**6**	**0.12**	**18**	**0.02**	0.01 U	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**0.03**	**0.15**	0.01 U	0.01 U	**16**	**11**	**0.2**	**5.3**	**0.12**	**22**	**0.02**	0.01 U	0.01 U
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	0.1 U	0.1 U	0.1 U	0.1 U	**4**	**3.3**	0.1 U	**1.6**	0.1 U	**6.1**	0.1 U	0.1 U	0.1 U
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	0.01 U	**0.01**	0.01 U	0.01 U	**0.64**	**0.47**	**0.02**	**0.24**	0.01 U	**0.89**	0.01 U	0.01 U	0.01 U
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	0.01 U	**0.03**	0.01 U	0.01 U	**3**	**2**	**0.05**	**0.92**	**0.02**	**3.7**	0.01 U	0.01 U	0.01 U
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	**0.01**	**0.06**	0.01 U	0.01 U	**6.6**	**4.7**	**0.08**	**2.2**	**0.05**	**8.9**	0.01 U	0.01 U	0.01 U
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**0.02**	**0.12**	0.01 U	0.01 U	**14**	**9.9**	**0.16**	**4.8**	**0.1**	**20**	**0.02**	0.01 U	0.01 U
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**	**0.02**	0.01 U	**0.02**	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	**0.1**	**0.08**	0.01 U	**0.08**	0.01 U	**0.04**	0.01 U	0.01 U	0.01 U
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	**0.32**	**0.25**	**0.02**	**0.34**	0.01 U	**0.22**	0.01 U	0.01 U	0.01 U
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	**0.8**	**0.76**	**0.12**	**0.99**	**0.02**	**0.71**	0.01 U	0.01 U	0.01 U
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	**0.71**	**0.61**	**0.1**	**0.92**	**0.02**	**0.53**	0.01 U	0.01 U	0.01 U
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	ND	ND	ND	ND	**2**	**1.7**	**0.24**	**2.4**	**0.04**	**1.5**	ND	ND	ND
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																			
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	**150**	**85**	**100**	100 U	**350**	**210**	**79**	**260**	100 U	**210**	100 U	100 U	100 U

Table 3-3

Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

						Location ID	CAP-7	CAP-8	CAP-8	CAP-8	CAP-8	CAP-9	CAP-9	CAP-9	CAP-9	CAP-10	CAP-10	CAP-10	CAP-10
						Sample Depth	300-346 cm	10-20 cm	50-100 cm	100-200 cm	200-250 cm	10-20 cm	50-100 cm	100-200 cm	200-265 cm	10-20 cm	50-100 cm	100-200 cm	200-240 cm
						Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N
						Sample Description	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
						Year	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Dry weight	g	--	--	--	--	--	6.5	6.13	4.43	5.66	5.38	6.47	6.36	6.47	6.13	6.89	5.25	7.41	4.98
Moisture	%	--	--	--	--	--	18	12	15	19	12	13	11	10	11	4.6	4.5	11	13
Moisture Content (ASTM D2216)	%	--	--	--	--	--	22.5	13.6	17.1	23.8	14.3	14.4	12.3	11.7	12.6	4.92	4.95	11.7	15.6
Total organic carbon	%	--	--	--	--	--	0.2 U	0.02	0.03	0.05	0.2 U	0.42	0.03	0.2 U	0.2 U	1.3	0.26	0.37	0.57
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	6.3	5.4	5.8	8.8	5.4	1.2	1.9	1.4	3.5	1.2	0.7	1.4	1.5
Gravel (2mm-26mm)	%	--	--	--	--	--	0.1 U	1.4	1.2	0.4	0.5	0.4	0.1 U	0.7	0.1 U	2.2	0.1 U	0.3	3
Sand (63µm-2mm)	%	--	--	--	--	--	86	81	78	48	81	98	93	94	90	96	98	96	95
Silt (2um-63um)	%	--	--	--	--	--	8.1	12	15	43	13	0.5	4.7	3.8	6.7	1	0.8	1.8	0.6
Metal																			
Arsenic	mg/kg	4.3	7.2	19	42	150	1 U	1 U	1	2	1 U	1 U	1 U	1 U	1 U	2	1	1 U	1 U
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Chromium	mg/kg	30	52	96	160	290	3	4	5	14	8	3	4	3	4	4	3	4	3
Copper	mg/kg	11	19	42	110	230	5	4	6	10	6	4	6	4	7	12	3	2	1
Lead	mg/kg	18	30	54	110	180	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	0.01 U	0.02	0.02	0.02	0.02	0.01	0.02	0.01 U	0.01 U	0.02	0.03	0.03	0.02
Nickel	mg/kg	--	--	--	--	--	3	3	4	10	6	3	3	3	4	4	3	4	3
Zinc	mg/kg	70	120	180	270	430	5 U	9	12	31	11	20	5 U	5 U	5 U	26	9	8	6
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1	0.02	0.01 U	0.01 U	0.8	0.02	0.06	1.7
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	2.3	0.36	0.01 U	0.01 U	11	0.18	0.37	11
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.08	0.01 U	0.01 U	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	0.01 U	0.01 U	0.01 U	0.05	0.01 U	14	1	0.01 U	0.01 U	21	0.68	2.7	28
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	0.01 U	0.01 U	0.01 U	0.07	0.01 U	32	5.9	0.05	0.01 U	95	2.7	6	61
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	0.01 U	0.01 U	0.01 U	0.12	0.01 U	36	8.4	0.09	0.01 U	150	4	5.5	68
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	0.01 U	0.01 U	0.01 U	0.09	0.01 U	28	5.2	0.05	0.01 U	93	3.6	9.8	61
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	5.6	1.3	0.01	0.01 U	32	0.82	1.2	14
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	0.01 U	0.01 U	0.01 U	0.16	0.01 U	53	7.3	0.07	0.01 U	130	4.7	16	130
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	2	0.18	0.01 U	0.01 U	7.2	0.15	0.53	13
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.57	0.1	0.01 U	0.01 U	3	0.06	0.15	3.6
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	0.01 U	0.01 U	0.01 U	0.07	0.01 U	24	2.9	0.02	0.01 U	66	1.3	6.6	120
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	0.01 U	0.01 U	0.01 U	0.14	0.01 U	44	6.9	0.07	0.01 U	120	3.9	12	120
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	ND	ND	ND	0.7	ND	242	39.6	0.36	ND	729	22.1	60.9	631

Table 3-3

Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							CAP-7	CAP-8	CAP-8	CAP-8	CAP-8	CAP-9	CAP-9	CAP-9	CAP-9	CAP-10	CAP-10	CAP-10	CAP-10
Sample Depth							300-346 cm	10-20 cm	50-100 cm	100-200 cm	200-250 cm	10-20 cm	50-100 cm	100-200 cm	200-265 cm	10-20 cm	50-100 cm	100-200 cm	200-240 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.01 U**	**0.01 U**	0.01 U	0.01 U	**0.2**	0.01 U	**0.02**	**0.64**
1-Methylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.08**	**0.02**	0.01 U	0.01 U	**0.44**	0.01 U	**0.04**	**1.1**
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.07**	0.01 U	**0.02**	**0.21**
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.97**	**0.22**	0.01 U	0.01 U	**4.7**	**0.09**	**0.1**	**1.7**
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
5-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.11**	**0.02**	0.01 U	0.01 U	**0.47**	**0.01**	**0.03**	**0.66**
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	**0.9**	**0.2**	0.1 U	0.1 U	**3.7**	0.1 U	**0.1**	**1.7**
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**0.01**	0.01 U	0.01 U	**0.22**	0.01 U	**55**	**13**	**0.13**	0.01 U	**220**	**7.1**	**13**	**110**
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**3.1**	**0.52**	0.01 U	0.01 U	**9**	**0.28**	**0.77**	**8.2**
Benzo(e)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	**0.07**	0.01 U	**20**	**4.7**	**0.05**	0.01 U	**86**	**2.9**	**4.8**	**40**
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	**0.06**	0.01 U	**24**	**6.3**	**0.06**	0.01 U	**100**	**2.9**	**3.7**	**38**
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	**7.5**	**1.7**	0.1 U	0.1 U	**17**	**3.3**	**0.5**	**6.1**
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**1.1**	**0.35**	0.01 U	0.01 U	**6.1**	**0.12**	**0.15**	**2.3**
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**4.7**	**1.2**	0.01 U	0.01 U	**12**	**0.16**	**0.26**	**4.3**
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**10**	**2.8**	**0.01**	0.01 U	**51**	**1.1**	**1.6**	**20**
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	**0.06**	0.01 U	**22**	**5.6**	**0.05**	0.01 U	**94**	**2.4**	**3.1**	**34**
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.01**	0.01 U
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.2**	**0.05**	**0.07**	**0.1**
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.3**	**0.03**	0.01 U	0.01 U	**0.5**	**0.23**	**0.52**	**1.5**
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.8**	**0.05**	0.01 U	0.01 U	**1**	**0.51**	**2.6**	**4.5**
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.4**	**0.02**	0.01 U	0.01 U	**0.7**	**0.31**	**1.1**	**3.3**
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	ND	ND	ND	ND	ND	**1.5**	**0.1**	ND	ND	**2.4**	**1.1**	**4.3**	**9.4**
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																			
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	100 U	100 U	100 U	100 U	**120**	**220**	100 U	100 U	100 U	**570**	100 U	**180**	**210**

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							CAP-11	CAP-11	CAP-11	DA-1	DA-1	DA-1	DA-1	DA-1	DA-1	DA-2	DA-2	DA-2	DA-3
Sample Depth							10-20 cm	50-100 cm	100-150 cm	0-270 cm	10-20 cm	50-100 cm	100-200 cm	200-300 cm	300-380 cm	10-20 cm	50-100 cm	100-200 cm	10-20 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	BDA	BDA	BDA	BDA
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Dry weight	g	--	--	--	--	--	**5.24**	**6.77**	**7.88**	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	**35**	**10**	**8.3**	**21**	**30**	**27**	**22**	**20**	**19**	**21**	**19**	**15**	**17**
Moisture Content (ASTM D2216)	%	--	--	--	--	--	**53.1**	**11.8**	**9.1**	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	**1.8**	**0.09**	0.2 U	**0.49**	**1**	**0.45**	**0.16**	**0.1**	**0.03**	**0.39**	**0.4**	**0.11**	**0.07**
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	**3.9**	**2**	**2**	**8**	**4.7**	**8.3**	**19**	**6**	**6.9**	**2.9**	**2**	**2.6**	**1.8**
Gravel (2mm-26mm)	%	--	--	--	--	--	**3.7**	**4.4**	**8.3**	**0.1**	**0.4**	**0.7**	**3.1**	**5.7**	0.1 U	**0.2**	**2.6**	**0.6**	**0.6**
Sand (63µm-2mm)	%	--	--	--	--	--	**68**	**87**	**86**	**73**	**80**	**59**	**39**	**60**	**64**	**85**	**87**	**93**	**96**
Silt (2um-63um)	%	--	--	--	--	--	**25**	**6.9**	**3.2**	**19**	**15**	**32**	**39**	**28**	**29**	**12**	**8.4**	**3.8**	**1.6**
Metal																			
Arsenic	mg/kg	4.3	7.2	19	42	150	1 U	1 U	**3**	1 U	1 U	1 U	**1**	**1**	1 U	1 U	1 U	1 U	1 U
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Chromium	mg/kg	30	52	96	160	290	**4**	**2**	**3**	**9**	**21**	**36**	**26**	**21**	**7**	**6**	**5**	**7**	**3**
Copper	mg/kg	11	19	42	110	230	**7**	**3**	**3**	**6**	**14**	**22**	**17**	**14**	**7**	**5**	**4**	**3**	**1**
Lead	mg/kg	18	30	54	110	180	**9**	5 U	5 U	**8**	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	0.01 U	0.01 U	0.01 U	**0.05**	**0.02**	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**	**0.01**	0.01 U	0.01 U
Nickel	mg/kg	--	--	--	--	--	**10**	**3**	**6**	**8**	**15**	**23**	**18**	**14**	**6**	**5**	**5**	**5**	**2**
Zinc	mg/kg	70	120	180	270	430	**44**	5 U	5 U	**29**	**47**	**48**	**37**	**35**	**20**	**20**	**18**	**12**	**8**
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	**0.2**	0.01 U	0.01 U	**0.58**	**0.26**	**0.02**	0.01 U	0.01 U	0.01 U	**0.2**	0.01 U	0.01 U	0.01 U
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**3.6**	**0.2**	0.01 U	**5.1**	**2.9**	**0.2**	0.01 U	0.01 U	0.01 U	**1.9**	**0.9**	0.01 U	0.01 U
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**9.2**	**0.5**	0.01 U	**9.6**	**5.5**	**0.57**	**0.01**	0.01 U	0.01 U	**5.6**	**2.4**	**0.02**	**0.01**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**55**	**3.1**	**0.04**	**27**	**31**	**3**	**0.05**	0.01 U	0.01 U	**15**	**9.7**	**0.05**	**0.04**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**69**	**3.9**	**0.06**	**33**	**43**	**3.6**	**0.09**	0.01 U	0.01 U	**16**	**9.9**	**0.05**	**0.08**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**58**	**3.2**	**0.05**	**28**	**32**	**2.9**	**0.07**	0.01 U	0.01 U	**14**	**9.9**	**0.05**	**0.04**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**11**	**0.53**	0.01 U	**4.6**	**6.7**	**0.6**	**0.02**	0.01 U	0.01 U	**2.1**	**1.5**	0.01 U	0.01 U
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**77**	**4.9**	**0.06**	**54**	**45**	**4.6**	**0.1**	0.01 U	0.01 U	**30**	**18**	**0.09**	**0.07**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**2.7**	**0.14**	0.01 U	**4.5**	**2.5**	**0.14**	0.01 U	0.01 U	0.01 U	**2**	**0.7**	0.01 U	0.01 U
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	**1.6**	**0.08**	0.01 U	**2.7**	**1.4**	**0.08**	0.01 U	0.01 U	0.01 U	**0.7**	**0.3**	0.01 U	0.01 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**30**	**1.6**	**0.02**	**39**	**23**	**1.6**	**0.03**	0.01 U	0.01 U	**22**	**9.5**	**0.05**	**0.02**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**68**	**4.2**	**0.05**	**46**	**40**	**3.8**	**0.08**	0.01 U	0.01 U	**25**	**15**	**0.08**	**0.05**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**385**	**22.4**	**0.28**	**254**	**233**	**21.1**	**0.45**	ND	ND	**135**	**77.8**	**0.39**	**0.31**

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							CAP-11	CAP-11	CAP-11	DA-1	DA-1	DA-1	DA-1	DA-1	DA-1	DA-2	DA-2	DA-2	DA-3
Sample Depth							10-20 cm	50-100 cm	100-150 cm	0-270 cm	10-20 cm	50-100 cm	100-200 cm	200-300 cm	300-380 cm	10-20 cm	50-100 cm	100-200 cm	10-20 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	BDA	BDA	BDA	BDA
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	**0.01 U**	0.01 U	0.01 U	**0.17**	**0.01 U**	**0.01 U**	0.01 U	0.01 U	0.01	**0.01 U**	**0.01 U**	0.01 U	0.01 U
1-Methylnaphthalene	mg/kg	--	--	--	--	--	**0.3**	0.01 U	0.01 U	**0.56**	**0.17**	**0.01**	0.01 U	0.01 U	0.01 U	**0.2**	**0.1**	0.01 U	0.01 U
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
3-Methylcholanthrene	mg/kg	--	--	--	--	--	**1.5**	**0.08**	0.01 U	0.01 U	**1**	**0.09**	0.01 U	0.01 U	0.01 U	0.01 U	**0.3**	0.01 U	0.01 U
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
5-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	**0.3**	0.01 U	0.01 U	**0.2**	**0.18**	**0.02**	0.01 U	0.01 U	0.01 U	**0.2**	0.01 U	0.01 U	0.01 U
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	**2**	0.1 U	0.1 U	0.1 U	**1**	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**120**	**7.4**	**0.11**	**57**	**67**	**5.9**	**0.14**	0.01 U	0.01 U	**28**	**19**	**0.09**	**0.12**
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	**5.5**	**0.29**	0.01 U	**3.2**	**3**	**0.3**	0.01 U	0.01 U	0.01 U	**1.9**	**1**	0.01 U	0.01 U
Benzo(e)pyrene	mg/kg	--	--	--	--	--	**45**	**2.8**	**0.05**	**22**	**26**	**2.2**	**0.06**	0.01 U	0.01 U	**9.7**	**6.8**	**0.03**	**0.05**
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**48**	**2.8**	**0.03**	**20**	**32**	**2.6**	**0.06**	0.01 U	0.01 U	**8.6**	**6.4**	**0.03**	**0.05**
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	**14**	**0.7**	0.1 U	**4.9**	**10**	**0.8**	0.1 U	0.1 U	0.1 U	**2**	**2**	0.1 U	0.1 U
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	**1.7**	**0.12**	0.01 U	**1**	**1.4**	**0.14**	0.01 U	0.01 U	0.01 U	**0.3**	**0.2**	0.01 U	0.01 U
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	**8.4**	**0.44**	0.01 U	**3.9**	**7.8**	**0.58**	0.01 U	0.01 U	0.01 U	**1.2**	**0.9**	0.01 U	**0.02**
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	**20**	**0.94**	0.01 U	**6.7**	**13**	**1.3**	**0.01**	0.01 U	0.01 U	**3.2**	**2.6**	0.01 U	**0.03**
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**42**	**2.4**	**0.03**	**17**	**28**	**2.4**	**0.05**	0.01 U	0.01 U	**7.5**	**5.4**	**0.03**	**0.05**
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	**0.1**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	**0.4**	**0.03**	0.01 U	**0.2**	0.01 U	**0.01**	0.01 U	0.01 U	0.01 U	**0.2**	0.01 U	0.01 U	0.01 U
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	**2.2**	**0.09**	0.01 U	**0.6**	**0.4**	**0.07**	0.01 U	0.01 U	0.01 U	**1**	**0.4**	0.01 U	0.01 U
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	**6.1**	**0.21**	0.01 U	**1.9**	**0.8**	**0.16**	0.01 U	0.01 U	0.01 U	**2.3**	**1**	**0.01**	0.01 U
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	**4**	**0.15**	0.01 U	**2**	**0.3**	**0.06**	0.01 U	0.01 U	0.01 U	**1.1**	**0.6**	0.01 U	0.01 U
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	**13**	**0.48**	ND	**4.7**	**1.5**	**0.3**	ND	ND	ND	**4.6**	**2**	**0.01**	ND
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																			
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	**580**	100 U	100 U	**290**	**170**	**150**	**110**	**110**	**100**	**270**	**160**	100 U	**160**

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							DA-3	DA-3	DA-4	DA-4	DA-4	DA-5	DA-5	DA-5	DA-6	DA-7	DA-7	DA-8	DA-9
Sample Depth							50-100 cm	100-150 cm	10-20 cm	50-100 cm	100-126 cm	10-20 cm	50-100 cm	100-115 cm	0-300 cm	50-100 cm	100-150 cm	50-100 cm	50-100 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009
Major Remediation Area							BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA	ADM	BDA	BDA	BDA	BDA
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	**17**	**15**	**16**	**14**	**15**	**10**	**15**	**17**	**22**	**39**	**37**	**22**	**22**
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	**0.05**	**0.07**	**0.11**	**0.07**	**0.07**	**0.06**	**0.08**	**0.06**	**0.14**	**0.13**	**0.45**	**0.17**	**0.11**
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	**1.9**	**2.2**	**1.6**	**1.6**	**1.7**	**1.2**	**1.8**	**1.6**	**13**	**66**	**19**	**2.6**	**3.3**
Gravel (2mm-26mm)	%	--	--	--	--	--	**0.1**	**0.8**	**3.2**	**2.9**	**1.7**	**0.1**	**0.3**	**0.2**	**3.1**	**3.2**	**3.8**	**3.3**	**6.4**
Sand (63µm-2mm)	%	--	--	--	--	--	**96**	**94**	**94**	**94**	**95**	**97**	**96**	**96**	**54**	**10**	**22**	**61**	**58**
Silt (2um-63um)	%	--	--	--	--	--	**1.7**	**2.9**	**0.9**	**1.7**	**1.6**	**1.9**	**2.2**	**2.6**	**30**	**21**	**54**	**33**	**32**
Metal																			
Arsenic	mg/kg	4.3	7.2	19	42	150	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	**2**	1 U	1 U	**2**	**2**
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Chromium	mg/kg	30	52	96	160	290	**4**	**7**	**4**	**5**	**6**	**3**	**5**	**6**	**19**	**71**	**59**	**18**	**29**
Copper	mg/kg	11	19	42	110	230	**1**	**2**	**2**	**2**	1 U	1 U	1 U	**2**	**11**	**39**	**30**	**11**	**17**
Lead	mg/kg	18	30	54	110	180	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	**6**	**5**	5 U	5 U
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	0.01 U	0.01 U	**0.01**	**0.01**	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**	**0.03**	**0.02**	**0.04**	**0.03**
Nickel	mg/kg	--	--	--	--	--	**3**	**4**	**3**	**4**	**4**	**3**	**4**	**4**	**14**	**42**	**33**	**12**	**17**
Zinc	mg/kg	70	120	180	270	430	**7**	**9**	5 U	5 U	5 U	5 U	5 U	5 U	**46**	**64**	**53**	**30**	**37**
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	0.01 U	0.01 U	**0.07**	**0.04**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.35**	0.01 U	**0.02**	0.01 U
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	0.01 U	0.01 U	**0.17**	**0.09**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.8**	0.01 U	**0.05**	**0.01**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	0.01 U	0.01 U	**0.87**	**0.34**	0.01 U	**0.03**	0.01 U	0.01 U	0.01 U	**3.3**	0.01 U	**0.16**	**0.06**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	0.01 U	0.01 U	**1.2**	**0.36**	0.01 U	**0.05**	0.01 U	0.01 U	0.01 U	**5**	0.01 U	**0.3**	**0.08**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	0.01 U	0.01 U	**0.77**	**0.33**	0.01 U	**0.04**	0.01 U	0.01 U	0.01 U	**2.9**	0.01 U	**0.18**	**0.07**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	0.01 U	0.01 U	**0.15**	**0.05**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.68**	0.01 U	**0.03**	0.01 U
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	0.01 U	0.01 U	**1.2**	**0.59**	**0.01**	**0.06**	0.01 U	0.01 U	**0.01**	**4.6**	0.01 U	**0.29**	**0.08**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	0.01 U	0.01 U	**0.05**	**0.03**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.23**	0.01 U	**0.01**	0.01 U
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.01 U	0.01 U	**0.07**	**0.02**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.12**	0.01 U	**0.01**	0.01 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	0.01 U	0.01 U	**0.52**	**0.34**	0.01 U	**0.03**	0.01 U	0.01 U	0.01 U	**2.2**	0.01 U	**0.11**	**0.03**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	0.01 U	0.01 U	**1**	**0.5**	0.01 U	**0.05**	0.01 U	0.01 U	0.01 U	**4.2**	0.01 U	**0.25**	**0.06**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	ND	ND	**6.07**	**2.69**	**0.01**	**0.26**	ND	ND	**0.01**	**24.4**	ND	**1.41**	**0.39**

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							DA-3	DA-3	DA-4	DA-4	DA-4	DA-5	DA-5	DA-5	DA-6	DA-7	DA-7	DA-8	DA-9
Sample Depth							50-100 cm	100-150 cm	10-20 cm	50-100 cm	100-126 cm	10-20 cm	50-100 cm	100-115 cm	0-300 cm	50-100 cm	100-150 cm	50-100 cm	50-100 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009
Major Remediation Area							BDA	BDA	BDA	BDA	BDA	BDA	BDA	BDA	ADM	BDA	BDA	BDA	BDA
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.01 U**	0.01 U	0.01 U	0.01 U
1-Methylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.13**	0.01 U	0.01 U	0.01 U
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
5-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	**0.1**	0.1 U	0.1 U	0.1 U
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	0.01 U	0.01 U	**2.2**	**0.73**	**0.02**	**0.09**	0.01 U	0.01 U	0.01 U	**7.8**	0.01 U	**0.5**	**0.14**
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	**0.08**	**0.03**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.3**	0.01 U	**0.02**	0.01 U
Benzo(e)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	**0.82**	**0.27**	0.01 U	**0.04**	0.01 U	0.01 U	0.01 U	**3**	0.01 U	**0.18**	**0.07**
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	**0.81**	**0.22**	0.01 U	**0.04**	0.01 U	0.01 U	0.01 U	**3.1**	0.01 U	**0.17**	**0.07**
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	0.1 U	0.1 U	**0.2**	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	**0.7**	0.1 U	0.1 U	0.1 U
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.15**	0.01 U	0.01 U	0.01 U
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	**0.11**	**0.02**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.49**	0.01 U	0.01 U	0.01 U
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	**0.27**	**0.08**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**1.1**	0.01 U	0.01 U	**0.03**
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	**0.68**	**0.19**	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U	**2.7**	0.01 U	**0.14**	**0.05**
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	**0.02**	**0.04**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	**0.03**	**0.05**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	**0.04**	**0.06**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	**0.08**	**0.09**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	**0.05**	**0.05**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.01**	0.01 U
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	ND	ND	**0.22**	**0.29**	ND	ND	ND	ND	ND	ND	ND	**0.01**	ND
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																			
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							DA-10	DA-10	DA-11	11AQC3	11AQC3	11AQC3	11AQC3	11AQC3	11AQC4	11AQC6A	11AQC7	11AQC7	11AQC7
Sample Depth							50-100 cm	100-120 cm	50-100 cm	90-105 cm	120-135 cm	150-165 cm	180-195 cm	210-225 cm	30-44 cm	124-134 cm	90-105 cm	120-135 cm	150-165 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2009	2009	2009	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011
Major Remediation Area							BDA	BDA	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	**18**	**16**	**12**	**13**	**11**	**8.2**	**9.3**	**12**	**11**	**16**	**17**	**15**	**14**
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	**0.06**	**0.06**	**0.11**	**0.35**	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	**0.72**	0.05 U	0.05 U	0.05 U
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	**1.4**	**1.7**	**1.4**	na	na	na	na	na	na	na	**6.9**	na	na
Gravel (2mm-26mm)	%	--	--	--	--	--	**0.7**	**0.5**	**0.9**	**1**	**2**	na	na	na	**1**	0	0	na	na
Sand (63µm-2mm)	%	--	--	--	--	--	**96**	**96**	**97**	**65**	**91**	na	na	na	**98**	**94**	**59**	na	na
Silt (2um-63um)	%	--	--	--	--	--	**2.4**	**2.1**	**1**	**34.6**	**7.4**	na	na	na	**1.4**	**5.5**	**34.1**	na	na
Metal																			
Arsenic	mg/kg	4.3	7.2	19	42	150	1 U	1 U	1 U	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	0.2 U	0.2 U	0.2 U	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	**6**	**6**	**5**	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	**3**	**3**	**2**	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	5 U	5 U	5 U	na	na	na	na	na	na	na	na	na	na
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	**0.04**	**0.04**	**0.03**	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	**4**	**4**	**3**	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	**9**	**9**	**7**	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.03**	**0.8**	0.01 U	0.01 U	0.01 U
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	0.01 U	0.01 U	0.01 U	**0.011**	0.003 U	**0.004**	0.003 U	**0.004**	**0.5**	**6**	**0.018**	0.003 U	0.003 U
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.01 U	0.01 U	0.01 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	**0.011**	0.03 U	0.003 U	0.003 U	0.003 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	0.01 U	0.01 U	0.01 U	**0.03**	0.01 U	**0.01**	0.01 U	0.01 U	**1.3**	**15**	**0.02**	0.01 U	0.01 U
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	0.01 U	0.01 U	0.01 U	**0.1**	**0.02**	**0.03**	0.01 U	**0.03**	**4.5**	**25**	**0.13**	0.01 U	0.01 U
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	0.01 U	0.01 U	0.01 U	**0.08**	**0.01**	**0.03**	0.01 U	**0.04**	**5.8**	**19**	**0.16**	0.01 U	0.01 U
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	0.01 U	0.01 U	0.01 U	**0.11**	**0.02**	**0.03**	0.01 U	**0.04**	**4.5**	**26**	**0.13**	0.01 U	0.01 U
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	0.01 U	0.01 U	0.01 U	**0.011**	0.003 U	**0.004**	0.003 U	**0.006**	**0.99**	**3.6**	**0.023**	0.003 U	0.003 U
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	0.01 U	0.01 U	0.01 U	**0.18**	**0.03**	**0.07**	0.01 U	**0.06**	**8.8**	**71**	**0.18**	0.01 U	0.01 U
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	0.01 U	0.01 U	0.01 U	**0.01**	0.01 U	0.01 U	0.01 U	0.01 U	**0.42**	**8.8**	0.01 U	0.01 U	0.01 U
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.09**	**1.3**	0.01 U	0.01 U	0.01 U
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	0.01 U	0.01 U	0.01 U	**0.11**	**0.02**	**0.05**	0.01 U	**0.03**	**3.6**	**58**	**0.07**	0.01 U	0.01 U
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	0.01 U	0.01 U	0.01 U	**0.15**	**0.03**	**0.05**	0.01 U	**0.05**	**6.9**	**58**	**0.16**	0.01 U	0.01 U
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	ND	ND	ND	**0.79**	**0.13**	**0.278**	ND	**0.26**	**37.4**	**292**	**0.88**	ND	ND

Table 3-3

Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							DA-10	DA-10	DA-11	11AQC3	11AQC3	11AQC3	11AQC3	11AQC3	11AQC4	11AQC6A	11AQC7	11AQC7	11AQC7
Sample Depth							50-100 cm	100-120 cm	50-100 cm	90-105 cm	120-135 cm	150-165 cm	180-195 cm	210-225 cm	30-44 cm	124-134 cm	90-105 cm	120-135 cm	150-165 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2009	2009	2009	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011
Major Remediation Area							BDA	BDA	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	na	na	na	na	na	na	na	na	na	na
1-Methylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	na	na	na	na	na	na	na	na	na	na
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	na	na	na	na	na	na	na	na	na	na
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	0.01 U
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	0.3 U	0.3 U	0.3 U	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	0.01 U
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	0.1 U	0.1 U	0.1 U	na	na	na	na	na	na	na	na	na	na
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	**0.14**	**0.03**	**0.05**	0.01 U	**0.07**	**9.3**	**39**	**0.27**	**0.01**	0.01 U
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	**0.01**	0.01 U	0.01 U	0.01 U	0.01 U	**0.54**	**4.5**	**0.01**	0.01 U	0.01 U
Benzo(e)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	na	na	na	na	na	na	na	na	na	na
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	**0.05**	0.01 U	**0.02**	0.01 U	**0.03**	**3.7**	**9.7**	**0.1**	0.01 U	0.01 U
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	0.1 U	0.1 U	0.1 U	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.23**	**0.5**	0.01 U	0.01 U	0.01 U
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.66**	**1.5**	**0.02**	0.01 U	0.01 U
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	0.01 U
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	**0.04**	0.01 U	**0.02**	0.01 U	**0.03**	**3.8**	**11**	**0.1**	0.01 U	0.01 U
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	0.01 U
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	0.01 U
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.03**	**0.2**	0.01 U	0.01 U	0.01 U
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	0.01 U
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	0.01 U
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.09**	**2.2**	0.01 U	0.01 U	0.01 U
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	**0.03**	0.01 U	0.01 U	0.01 U	0.01 U	**0.32**	**6.5**	0.01 U	0.01 U	0.01 U
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U	0.01 U	**0.13**	**3.2**	0.01 U	0.01 U	0.01 U
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	ND	ND	ND	**0.05**	ND	ND	ND	ND	**0.57**	**12**	ND	ND	ND
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																			
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	**140**	**110**	100 U	na	na	na	na	na	na	na	na	na	na

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							**11AQC7**	**11AQC8**	**11AQC8**	**11AQC8**	**11AQC8**	**11AQC16A**	**11AQC16A**	**11AQC20**	**11AQC20**	**11AQC20**	**11AQC20**	**11AQC22**	**11AQC22**
Sample Depth							**173-183 cm**	**90-105 cm**	**120-135 cm**	**150-165 cm**	**180-195 cm**	**180-195 cm**	**195-207 cm**	**90-105 cm**	**120-135 cm**	**150-165 cm**	**178-188 cm**	**180-195 cm**	**210-225 cm**
Sample Type							**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Sample Description							**Core**	**Core**	**Core**	**Core**	**Core**	**Core**	**Core**	**Core**	**Core**	**Core**	**Core**	**Core**	**Core**
Year							**2011**	**2011**	**2011**	**2011**	**2011**	**2011**	**2011**	**2011**	**2011**	**2011**	**2011**	**2011**	**2011**
Major Remediation Area							**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	**17**	**27**	**20**	**22**	**17**	**15**	**16**	**5.6**	**7.9**	**11**	**11**	**25**	**19**
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	**0.39**	**0.47**	**0.098**	0.05 U	0.05 U	0.05 U	**2**	0.05 U
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	na	**23.6**	na	na	na	na	na	na	na	na	na	**6.5**	na
Gravel (2mm-26mm)	%	--	--	--	--	--	na	0	na	na	na	**2**	na	**18**	**3**	na	na	**1**	na
Sand (63µm-2mm)	%	--	--	--	--	--	na	**11**	na	na	na	**90**	na	**79**	**95**	na	na	**73**	na
Silt (2um-63um)	%	--	--	--	--	--	na	**65.4**	na	na	na	**7.4**	na	**3.1**	**2.3**	na	na	**19.8**	na
Metal																			
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	na	na	na
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	0.01 U	0.01 U	0.01 U	**0.02**	0.01 U	**1.4**	**1**	**0.01**	0.01 U	0.01 U	0.01 U	2 U	**0.12**
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	0.003 U	**0.046**	**0.036**	**0.081**	0.003 U	**12**	**6.5**	**0.13**	0.003 U	0.003 U	**0.004**	**6**	**0.87**
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.06 U	**0.03**	0.003 U	0.003 U	0.003 U	0.003 U	0.6 U	**0.009**
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	0.01 U	**0.18**	**0.13**	**2.1**	0.01 U	**29**	**11**	**0.25**	0.01 U	0.01 U	0.01 U	**18**	**2.1**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	0.01 U	**0.23**	**0.12**	**0.47**	0.01 U	**65**	**22**	**1.5**	**0.02**	0.01 U	**0.04**	**31**	**4.3**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	0.01 U	**0.2**	**0.11**	**0.27**	0.01 U	**59**	**14**	**2.6**	**0.03**	**0.01**	**0.05**	**26**	**3.8**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	0.01 U	**0.23**	**0.13**	**0.63**	0.01 U	**66**	**19**	**1.4**	**0.02**	0.01 U	**0.04**	**33**	**4.2**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	0.003 U	**0.03**	**0.02**	**0.047**	0.003 U	**7.4**	**2.1**	**0.37**	**0.007**	0.003 U	**0.009**	**3.9**	**0.55**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	0.01 U	**0.46**	**0.3**	**0.75**	0.01 U	**140**	**55**	**2.2**	**0.04**	**0.02**	**0.07**	**98**	**9.4**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	0.01 U	**0.06**	**0.04**	**0.5**	0.01 U	**16**	**7.7**	**0.09**	0.01 U	0.01 U	0.01 U	**7**	**1.1**
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.01 U	0.01 U	0.01 U	**0.01**	0.01 U	**1.5**	**1.3**	**0.04**	0.01 U	0.01 U	0.01 U	2 U	**0.16**
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	0.01 U	**0.37**	**0.27**	**2**	0.01 U	**130**	**53**	**0.77**	**0.01**	0.01 U	**0.04**	**61**	**7.8**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	0.01 U	**0.37**	**0.24**	**0.52**	0.01 U	**110**	**47**	**2**	**0.03**	**0.01**	**0.05**	**77**	**7.8**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	ND	**2.17**	**1.39**	**7.39**	ND	**637**	**240**	**11.4**	**0.157**	**0.04**	**0.303**	**361**	**42.2**

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							11AQC7	11AQC8	11AQC8	11AQC8	11AQC8	11AQC16A	11AQC16A	11AQC20	11AQC20	11AQC20	11AQC20	11AQC22	11AQC22
Sample Depth							173-183 cm	90-105 cm	120-135 cm	150-165 cm	180-195 cm	180-195 cm	195-207 cm	90-105 cm	120-135 cm	150-165 cm	178-188 cm	180-195 cm	210-225 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	Unit	REL	TEL	OEL	PEL	FEL													
Polynuclear Aromatic Hydrocarbons (non MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
1-Methylnaphthalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.2 U	**0.8**	0.01 U	0.01 U	0.01 U	0.01 U	2 U	0.01 U
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.2 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	2 U	0.01 U
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	0.01 U	**0.34**	**0.2**	**0.5**	0.01 U	**100**	**25**	**3.3**	**0.06**	**0.02**	**0.08**	**54**	**6.4**
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	0.01 U	**0.03**	**0.01**	**0.04**	0.01 U	**8.9**	**3.5**	**0.17**	0.01 U	0.01 U	0.01 U	**5**	**0.82**
Benzo(e)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	0.01 U	**0.13**	**0.08**	**0.15**	0.01 U	**27**	**6.2**	**1.4**	**0.03**	0.01 U	**0.04**	**14**	**1.8**
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	**0.01**	0.01 U	**1.8**	**0.3**	**0.07**	0.01 U	0.01 U	0.01 U	2 U	**0.12**
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	0.01 U	**0.03**	**0.02**	**0.04**	0.01 U	**5.1**	**0.6**	**0.26**	0.01 U	0.01 U	0.01 U	2 U	**0.42**
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.2 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	2 U	0.01 U
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	0.01 U	**0.12**	**0.07**	**0.15**	0.01 U	**37**	**6.1**	**1.3**	**0.02**	0.01 U	**0.03**	**12**	**1.7**
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.01 U
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	**0.2**	0.01 U	0.01 U	0.01 U	0.01 U	**0.1**	**0.03**
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.4**	**0.7**	0.01 U	0.01 U	0.01 U	0.01 U	**0.7**	**0.13**
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.01 U
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.01 U
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**2.8**	**6.1**	**0.02**	0.01 U	0.01 U	0.01 U	**5.1**	**0.9**
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**9.4**	**17**	**0.03**	0.01 U	0.01 U	0.01 U	**15**	**2.4**
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**3.9**	**6.4**	**0.03**	0.01 U	0.01 U	0.01 U	**7.1**	**1.2**
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	ND	ND	ND	ND	ND	**17**	**30**	**0.08**	ND	ND	ND	**28**	**4.7**
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																			
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							11AQC26	11AQC26	11AQC26	11AQC26	11AQC26	11AQC27	11AQC27	11AQC27	11AQC32	11AQC32	11AQC32	11AQCAP6	11AQCAP6
Sample Depth							90-105 cm	120-135 cm	150-165 cm	180-195 cm	210-220 cm	45-60 cm	75-90 cm	120-130 cm	45-60 cm	75-90 cm	115-125 cm	60-75 cm	115-125 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	**8.7**	**8.9**	**11**	**9.9**	**10**	**5.9**	**8.2**	**13**	**15**	**11**	**15**	**24**	**23**
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	**0.11**	0.05 U	0.05 U	**0.35**	**0.16**
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	**2.8**	na	na	**0.8**	na
Gravel (2mm-26mm)	%	--	--	--	--	--	**7**	na	na	na	na	**3**	na	na	**4**	na	na	0	na
Sand (63µm-2mm)	%	--	--	--	--	--	**86**	na	na	na	na	**93**	na	na	**75**	na	na	**81**	na
Silt (2um-63um)	%	--	--	--	--	--	**6.9**	na	na	na	na	**4.1**	na	na	**18.4**	na	na	**17.8**	na
Metal																			
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	na	na	na
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.07**	0.01 U	**0.02**	**0.08**	**0.04**
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	**0.46**	**0.015**	**0.098**	**0.62**	**0.31**
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	**0.004**	0.003 U	0.003 U	**0.004**	**0.004**
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.94**	**0.03**	**0.18**	**1**	**0.49**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U	**2.2**	**0.09**	**0.48**	**4.9**	**2.5**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	0.01 U	0.01 U	0.01 U	0.01 U	**0.03**	0.01 U	0.01 U	0.01 U	**2**	**0.08**	**0.39**	**5.9**	**3**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U	**2.2**	**0.09**	**0.45**	**5.1**	**3.2**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	0.003 U	0.003 U	0.003 U	0.003 U	**0.004**	0.003 U	0.003 U	0.003 U	**0.28**	**0.012**	**0.058**	**1.3**	**0.49**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	0.01 U	0.01 U	0.01 U	0.01 U	**0.03**	0.01 U	0.01 U	0.01 U	**5.1**	**0.18**	**0.85**	**8.4**	**4.9**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.53**	**0.02**	**0.14**	**0.56**	**0.33**
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.09**	0.01 U	**0.03**	**0.27**	**0.12**
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U	**4.3**	**0.13**	**0.73**	**4**	**2.8**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U	**4.3**	**0.16**	**0.72**	**7.1**	**4.1**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	ND	ND	ND	ND	**0.144**	ND	ND	ND	**22.5**	**0.8**	**4.13**	**39.2**	**22.3**

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							11AQC26	11AQC26	11AQC26	11AQC26	11AQC26	11AQC27	11AQC27	11AQC27	11AQC32	11AQC32	11AQC32	11AQCAP6	11AQCAP6
Sample Depth							90-105 cm	120-135 cm	150-165 cm	180-195 cm	210-220 cm	45-60 cm	75-90 cm	120-130 cm	45-60 cm	75-90 cm	115-125 cm	60-75 cm	115-125 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
1-Methylnaphthalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.08**	0.01 U	**0.02**	0.01 U	**0.07**
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U	0.01 U
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**0.01**	0.01 U	0.01 U	0.01 U	**0.04**	0.01 U	0.01 U	0.01 U	**3.1**	**0.14**	**0.64**	**11**	**6.1**
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.32**	**0.01**	**0.06**	**0.57**	**0.32**
Benzo(e)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U	**1**	**0.04**	**0.19**	**4**	**1.9**
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.07**	0.01 U	**0.01**	**0.12**	**0.1**
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.18**	0.01 U	**0.04**	**0.39**	**0.35**
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U	**0.89**	**0.04**	**0.18**	**3.5**	**1.6**
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	**0.02**	**0.02**
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.2**	0.01 U	0.01 U	**0.04**	**0.04**
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**1.4**	**0.05**	**0.06**	**0.17**	**0.22**
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U	**3.7**	**0.21**	**0.17**	**0.35**	**0.95**
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	**0.01**	0.01 U	0.01 U	0.01 U	**1.6**	**0.1**	**0.09**	**0.52**	**0.82**
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	ND	ND	ND	ND	**0.03**	ND	ND	ND	**6.9**	**0.36**	**0.32**	**1.1**	**2.1**
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																			
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-3

Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

						Location ID	11AQCAP10	11AQCAP10	11AQCAPO2	11AQCAPO2	11AQCAPO2	11AQCAPO2	11AQMNR3	11AQMNR3	11AQMNR3	11AQMNR3	11AQMNR3	11AQMNR3	11AQSC1
						Sample Depth	45-60 cm	69-79 cm	15-30 cm	45-60 cm	75-90 cm	132-142 cm	15-30 cm	15-30 cm	15-30 cm	45-60 cm	75-90 cm	120-130 cm	30-45 cm
						Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N
						Sample Description	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
						Year	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	**18**	**20**	**16**	**17**	**19**	**15**	**10**	**6.9**	**6.5**	**16**	**16**	**19**	**31**
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	**0.16**	**0.16**	**0.13**	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	**1.8**
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	**3**
Gravel (2mm-26mm)	%	--	--	--	--	--	na	0	**1**	na	na	na	**9**	na	na	na	na	na	**0**
Sand (63µm-2mm)	%	--	--	--	--	--	na	**94**	**97**	na	na	na	**87**	na	na	na	na	na	**66**
Silt (2um-63um)	%	--	--	--	--	--	na	**6.2**	**2.5**	na	na	na	**4.1**	na	na	na	na	na	**31**
Metal																			
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	na	na	na
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	**0.02**	0.1 U	**0.2**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U	0.01 U	0.01 U	**1**
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**0.34**	**0.3**	**2.3**	**0.049**	**0.006**	**0.045**	0.003 U	**0.006**	0.006 U	0.003 U	0.003 U	0.003 U	**8.3**
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	**0.006**	0.03 U	0.03 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.006 U	0.003 U	0.003 U	0.003 U	**0.04**
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**0.86**	**0.7**	**3.2**	**0.1**	**0.01**	**0.09**	0.01 U	**0.02**	0.02 U	0.01 U	0.01 U	0.01 U	**13**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**3.1**	**2.2**	**21**	**0.29**	**0.08**	**0.3**	0.01 U	**0.04**	**0.04**	0.01 U	0.01 U	0.01 U	**66**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**3.6**	**2.9**	**27**	**0.27**	**0.09**	**0.25**	0.01 U	**0.05**	**0.02**	0.01 U	0.01 U	0.01 U	**55**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**3.9**	**2.5**	**20**	**0.27**	**0.08**	**0.28**	0.01 U	**0.04**	0.02 U	0.01 U	0.01 U	0.01 U	**65**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**0.72**	**0.53**	**4.3**	**0.043**	**0.015**	**0.038**	0.003 U	**0.009**	0.006 U	0.003 U	0.003 U	0.003 U	**10**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**5.3**	**4.5**	**30**	**0.48**	**0.1**	**0.5**	0.01 U	**0.08**	**0.05**	0.01 U	0.01 U	0.01 U	**91**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**0.36**	**0.3**	**1.4**	**0.06**	0.01 U	**0.05**	0.01 U	0.01 U	0.02 U	0.01 U	0.01 U	0.01 U	**6.4**
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	**0.09**	0.1 U	**0.6**	**0.01**	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U	0.01 U	0.01 U	**3.4**
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**2.4**	**2.3**	**11**	**0.38**	**0.04**	**0.37**	0.01 U	**0.06**	**0.02**	0.01 U	0.01 U	0.01 U	**41**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**4.3**	**3.5**	**26**	**0.41**	**0.09**	**0.43**	0.01 U	**0.07**	**0.04**	0.01 U	0.01 U	0.01 U	**82**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**25**	**19.7**	**147**	**2.35**	**0.506**	**2.34**	ND	**0.375**	**0.17**	ND	ND	ND	**442**

Table 3-3

Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							11AQCAP10	11AQCAP10	11AQCAPO2	11AQCAPO2	11AQCAPO2	11AQCAPO2	11AQMNR3	11AQMNR3	11AQMNR3	11AQMNR3	11AQMNR3	11AQMNR3	11AQSC1
Sample Depth							45-60 cm	69-79 cm	15-30 cm	45-60 cm	75-90 cm	132-142 cm	15-30 cm	15-30 cm	15-30 cm	45-60 cm	75-90 cm	120-130 cm	30-45 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
1-Methylnaphthalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.01 U	0.1 U	0.1 U	**0.01**	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U	0.01 U	0.01 U	0.1 U
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.01 U	0.1 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U	0.1 U
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**7.1**	**5.8**	**38**	**0.45**	**0.15**	**0.42**	0.01 U	**0.08**	**0.06**	0.01 U	0.01 U	**0.01**	**98**
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	**0.46**	**0.3**	**2.2**	**0.04**	0.01 U	**0.04**	0.01 U	0.01 U	0.02 U	0.01 U	0.01 U	0.01 U	**6.8**
Benzo(e)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**2.3**	**2.1**	**15**	**0.13**	**0.05**	**0.14**	0.01 U	**0.03**	**0.02**	0.01 U	0.01 U	0.01 U	**25**
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	**0.14**	0.1 U	**0.9**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U	0.01 U	0.01 U	**1**
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	**0.56**	**0.3**	**3.5**	**0.03**	**0.01**	**0.02**	0.01 U	0.01 U	0.02 U	0.01 U	0.01 U	0.01 U	**1.3**
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	0.01 U	0.1 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U	0.01 U	0.01 U	**3**
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**2.1**	**1.8**	**15**	**0.12**	**0.05**	**0.13**	0.01 U	**0.03**	0.02 U	0.01 U	0.01 U	0.01 U	**26**
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.14**
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	**0.03**	**0.03**	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.04**	0.01 U	0.01 U	0.01 U	0.01 U	**0.49**
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.01 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	**0.11**	**0.16**	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.27**	0.01 U	0.01 U	0.01 U	0.01 U	**1.2**
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	**0.26**	**0.46**	**0.1**	0.01 U	0.01 U	0.01 U	0.01 U	**0.45**	0.01 U	0.01 U	0.01 U	0.01 U	**1.8**
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	**0.18**	**0.28**	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.04**	0.01 U	0.01 U	0.01 U	0.01 U	**0.7**
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	**0.58**	**0.93**	**0.1**	ND	ND	ND	ND	**0.8**	ND	ND	ND	ND	**4.4**
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																			
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

						Location ID	11AQSC1	11AQSC1	11AQSC1	11AQSC1	11AQSC1	11AQSC1	11AQSC2	11AQSC2	11AQSC2	11AQSC2	11AQSC2	11AQSC2	11AQSC2A
						Sample Depth	60-75 cm	90-105 cm	120-135 cm	150-165 cm	180-195 cm	210-225 cm	30-45 cm	60-75 cm	90-105 cm	120-135 cm	150-165 cm	169-179 cm	30-45 cm
						Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N
						Sample Description	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
						Year	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011
						Major Remediation Area	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Conventionals																			
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	**28**	**12**	**11**	**11**	**14**	**13**	**27**	**21**	**15**	**15**	**15**	**12**	**25**
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	**2**	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	**2**	**0.76**	0.05 U	0.05 U	0.05 U	0.05 U	**1.7**
Grain Size																			
Clay (<2 µm)	%	--	--	--	--	--	na	na	**7.9**	na	na	na	**2.8**	**5.3**	na	na	na	na	na
Gravel (2mm-26mm)	%	--	--	--	--	--	na	na	**0**	na	na	na	**0**	**0**	na	na	na	na	na
Sand (63µm-2mm)	%	--	--	--	--	--	na	na	**62**	na	na	na	**75**	**74**	na	na	na	na	na
Silt (2um-63um)	%	--	--	--	--	--	na	na	**29.9**	na	na	na	**22.4**	**20.6**	na	na	na	na	na
Metal																			
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na	na	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na	na	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na	na	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na	na	na	na	na	na	na	na
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na	na	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																			
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	**1**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**3.2**	**1.3**	**1**	0.01 U	0.01 U	0.01 U	**1.7**
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**7**	**0.01**	**0.017**	0.003 U	**0.003**	0.003 U	**26**	**9**	**5.2**	**0.068**	**0.007**	**0.065**	**11**
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	**0.04**	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	**0.14**	0.03 U	0.03 U	0.003 U	0.003 U	0.003 U	0.03 U
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**8.9**	**0.02**	**0.02**	0.01 U	0.01 U	0.01 U	**34**	**16**	**4.9**	**0.14**	**0.01**	**0.13**	**23**
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**44**	**0.09**	**0.15**	**0.02**	**0.03**	0.01 U	**150**	**44**	**11**	**0.53**	**0.05**	**1.4**	**74**
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**48**	**0.13**	**0.17**	**0.03**	**0.04**	0.01 U	**180**	**41**	**9.8**	**0.66**	**0.06**	**1.4**	**65**
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**47**	**0.13**	**0.15**	**0.02**	**0.03**	0.01 U	**150**	**49**	**10**	**0.57**	**0.06**	**0.98**	**80**
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**7**	**0.023**	**0.034**	**0.004**	**0.007**	0.003 U	**30**	**7.3**	**1.6**	**0.12**	**0.011**	**0.24**	**15**
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**72**	**0.16**	**0.21**	**0.02**	**0.04**	0.01 U	**240**	**90**	**29**	**0.88**	**0.08**	**1.1**	**150**
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**4.9**	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U	**19**	**8.6**	**4.5**	**0.07**	0.01 U	**0.05**	**12**
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	**4**	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U	**12**	**3.9**	**4.3**	**0.02**	0.01 U	**0.03**	**5.8**
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**37**	**0.07**	**0.1**	0.01 U	**0.02**	0.01 U	**120**	**56**	**26**	**0.55**	**0.05**	**0.43**	**92**
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**64**	**0.14**	**0.18**	**0.02**	**0.04**	0.01 U	**210**	**78**	**25**	**0.76**	**0.07**	**1.1**	**130**
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**345**	**0.77**	**1.06**	**0.114**	**0.21**	ND	**1170**	**404**	**132**	**4.36**	**0.397**	**6.92**	**659**

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Location ID							11AQSC1	11AQSC1	11AQSC1	11AQSC1	11AQSC1	11AQSC1	11AQSC2	11AQSC2	11AQSC2	11AQSC2	11AQSC2	11AQSC2	11AQSC2A
Sample Depth							60-75 cm	90-105 cm	120-135 cm	150-165 cm	180-195 cm	210-225 cm	30-45 cm	60-75 cm	90-105 cm	120-135 cm	150-165 cm	169-179 cm	30-45 cm
Sample Type							N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description							Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core
Year							2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011
Major Remediation Area							ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**													
Polynuclear Aromatic Hydrocarbons (non MDDEP 13)																			
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
1-Methylnaphthalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
3-Methylcholanthrene	mg/kg	--	--	--	--	--	**1.2**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.1 U	**0.3**	**0.02**	0.01 U	**0.05**	**2.3**
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.1 U	0.1 U	0.01 U	0.01 U	0.01 U	0.1 U
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**85**	**0.25**	**0.31**	**0.05**	**0.07**	0.01 U	**300**	**80**	**17**	**1.1**	**0.1**	**2.1**	**120**
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	**4.9**	**0.01**	**0.02**	0.01 U	0.01 U	0.01 U	**18**	**6.9**	**1.6**	**0.07**	0.01 U	**0.12**	**11**
Benzo(e)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**23**	**0.1**	**0.12**	**0.02**	**0.03**	0.01 U	**93**	**20**	**4.9**	**0.5**	**0.03**	**0.94**	**34**
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	**0.6**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**4.6**	**1**	**0.2**	**0.03**	0.01 U	**0.05**	**1.3**
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	**1.9**	**0.02**	**0.02**	0.01 U	0.01 U	0.01 U	**14**	**3.8**	**0.5**	**0.11**	0.01 U	**0.22**	**5.7**
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.1 U	0.1 U	0.01 U	0.01 U	0.01 U	0.1 U
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**22**	**0.08**	**0.11**	**0.02**	**0.03**	0.01 U	**92**	**19**	**4.7**	**0.41**	**0.03**	**0.86**	**32**
Perylene	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Polychlorinated Biphenyls (congeners)																			
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.1 U	0.1 U	0.01 U	0.01 U	0.01 U	0.1 U
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	**0.2**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.2**	**0.1**	0.1 U	0.01 U	0.01 U	0.01 U	**0.2**
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	**0.9**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.4**	**0.3**	0.1 U	0.01 U	0.01 U	0.01 U	**0.5**
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.1 U	0.1 U	0.01 U	0.01 U	0.01 U	0.1 U
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1 U	0.1 U	0.1 U	0.01 U	0.01 U	0.01 U	0.1 U
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	**1.8**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.6**	**1.7**	**0.2**	0.01 U	0.01 U	0.01 U	**2.3**
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	**1.8**	0.01 U	0.01 U	**0.01**	0.01 U	0.01 U	**1.1**	**4.4**	**0.5**	**0.02**	0.01 U	0.01 U	**6.4**
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	**0.9**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.6**	**2.3**	**0.2**	**0.01**	0.01 U	0.01 U	**2.6**
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	**5.6**	ND	ND	**0.01**	ND	ND	**2.9**	**8.8**	**0.9**	**0.03**	ND	ND	**12**
Polychlorinated Biphenyls (Aroclor)																			
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na
Total Petroleum Hydrocarbons																			
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 3-3
Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

						Location ID	**11AQSC2A**	**11AQSC2B**	**11AQSC2C**	**11DW1**	**11DW2**	**11DW3**
						Sample Depth	**60-75 cm**	**30-45 cm**	**30-45 cm**			
						Sample Type	**N**	**N**	**N**	**N**	**N**	**N**
						Sample Description	**Core**	**Core**	**Core**	**Grab**	**Grab**	**Grab**
						Year	**2011**	**2011**	**2011**	**2011**	**2011**	**2011**
						Major Remediation Area	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**						
Conventionals												
Dry weight	g	--	--	--	--	--	na	na	na	na	na	na
Moisture	%	--	--	--	--	--	**11**	**24**	**24**	na	na	na
Moisture Content (ASTM D2216)	%	--	--	--	--	--	na	na	na	na	na	na
Total organic carbon	%	--	--	--	--	--	**0.07**	**1.1**	**0.95**	**0.64**	**1.4**	**0.66**
Grain Size												
Clay (<2 µm)	%	--	--	--	--	--	na	na	na	na	na	na
Gravel (2mm-26mm)	%	--	--	--	--	--	na	na	na	**4**	**1**	**2**
Sand (63µm-2mm)	%	--	--	--	--	--	na	na	na	**83**	**85**	**83**
Silt (2um-63um)	%	--	--	--	--	--	na	na	na	**13.6**	**14.2**	**14.9**
Metal												
Arsenic	mg/kg	4.3	7.2	19	42	150	na	na	na	na	na	na
Cadmium	mg/kg	0.32	0.67	2.1	4.2	7.2	na	na	na	na	na	na
Chromium	mg/kg	30	52	96	160	290	na	na	na	na	na	na
Copper	mg/kg	11	19	42	110	230	na	na	na	na	na	na
Lead	mg/kg	18	30	54	110	180	na	na	na	na	na	na
Mercury	mg/kg	0.051	0.13	0.29	0.7	1.4	na	na	na	na	na	na
Nickel	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Zinc	mg/kg	70	120	180	270	430	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)												
2-Methylnaphthalene	mg/kg	0.02	0.02	0.06	0.2	0.38	0.1 U	**1**	**1.4**	**0.33**	**0.2**	na
Acenaphthene	mg/kg	0	0.01	0.02	0.09	0.94	**0.53**	**6**	**7.3**	**3**	**2.7**	na
Acenaphthylene	mg/kg	0	0.01	0.03	0.13	0.34	0.03 U	**0.04**	**0.04**	**0.021**	0.06 U	na
Anthracene	mg/kg	0.02	0.05	0.11	0.24	1.1	**1.6**	**16**	**18**	**6.5**	**5.1**	na
Benzo(a)anthracene	mg/kg	0.03	0.08	0.28	0.69	1.9	**3.5**	**62**	**58**	**16**	**17**	na
Benzo(a)pyrene	mg/kg	0.03	0.09	0.23	0.76	1.7	**3.4**	**68**	**60**	**17**	**19**	na
Chrysene	mg/kg	0.04	0.11	0.3	0.85	2.2	**3.5**	**68**	**69**	**15**	**16**	na
Dibenzo(a,h)anthracene	mg/kg	0	0.01	0.04	0.14	0.2	**0.61**	**8.3**	**8.4**	**2.8**	**3**	na
Fluoranthene	mg/kg	0.03	0.11	0.5	1.5	4.2	**7.4**	**100**	**100**	**33**	**29**	na
Fluorene	mg/kg	0.01	0.02	0.06	0.14	1.2	**0.7**	**6.2**	**7.6**	**3**	**2.1**	na
Naphthalene	mg/kg	0.02	0.04	0.12	0.39	1.2	**0.1**	**3**	**4.4**	**0.88**	**0.7**	na
Phenanthrene	mg/kg	0.02	0.09	0.25	0.54	2.1	**6.2**	**64**	**66**	**22**	**16**	na
Pyrene	mg/kg	0.04	0.15	0.42	1.4	3.8	**6.1**	**87**	**88**	**26**	**24**	na
Total PAH13 (calculated)	mg/kg	0.26	0.76	2.43	7.07	21.3	**33.6**	**490**	**488**	na	na	na

Table 3-3

Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

						Location ID	**11AQSC2A**	**11AQSC2B**	**11AQSC2C**	**11DW1**	**11DW2**	**11DW3**
						Sample Depth	**60-75 cm**	**30-45 cm**	**30-45 cm**			
						Sample Type	**N**	**N**	**N**	**N**	**N**	**N**
						Sample Description	**Core**	**Core**	**Core**	**Grab**	**Grab**	**Grab**
						Year	**2011**	**2011**	**2011**	**2011**	**2011**	**2011**
						Major Remediation Area	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**
Analyte	**Unit**	**REL**	**TEL**	**OEL**	**PEL**	**FEL**						
Polynuclear Aromatic Hydrocarbons (non MDDEP 13)												
1,3-Dimethylnaphtalene	mg/kg	--	--	--	--	--	na	**0.2**	**0.3**	na	na	na
1-Methylnaphthalene	mg/kg	--	--	--	--	--	na	**0.5**	**0.8**	na	na	na
2,3,5-Trimethylnaphthalene	mg/kg	--	--	--	--	--	na	**0.1**	**0.1**	na	na	na
3-Methylcholanthrene	mg/kg	--	--	--	--	--	0.1 U	0.1 U	0.1 U	**0.47**	**0.7**	na
4+5+6-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na
5-Methylchrysene	mg/kg	--	--	--	--	--	na	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	mg/kg	--	--	--	--	--	0.1 U	0.1 U	0.1 U	0.02 U	0.2 U	na
7H-Dibenzo(c,g)carbazole	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Benzo(b,j,k)fluoranthenes	mg/kg	--	--	--	--	--	**6.2**	**120**	**120**	**29**	**33**	na
Benzo(c)phenanthrene	mg/kg	--	--	--	--	--	**0.5**	**6.7**	**7.6**	**1.9**	**2**	na
Benzo(e)pyrene	mg/kg	--	--	--	--	--	na	**46**	**45**	na	na	na
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	**1.9**	**38**	**33**	**9.5**	**11**	na
Dibenzo(a,e)pyrene	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Dibenzo(a,h)pyrene	mg/kg	--	--	--	--	--	**0.1**	**1.8**	**1.7**	**0.43**	**0.6**	na
Dibenzo(a,i)pyrene	mg/kg	--	--	--	--	--	**0.5**	**6.8**	**5.8**	**1.9**	**1.9**	na
Dibenzo(a,l)pyrene	mg/kg	--	--	--	--	--	0.1 U	0.1 U	0.1 U	0.02 U	0.2 U	na
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	**1.7**	**29**	**25**	**9**	**11**	na
Perylene	mg/kg	--	--	--	--	--	na	**15**	**14**	na	na	na
Polychlorinated Biphenyls (congeners)												
Total Decachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.1 U	0.1 U	0.01 U	0.01 U	na
Total Heptachlorobiphenyls	mg/kg	--	--	--	--	--	**0.04**	0.1 U	**0.1**	**0.04**	**0.04**	na
Total Hexachlorobiphenyls	mg/kg	--	--	--	--	--	**0.1**	**0.4**	**0.3**	**0.14**	**0.15**	na
Total Nonachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.1 U	0.1 U	0.01 U	0.01 U	na
Total Octachlorobiphenyls	mg/kg	--	--	--	--	--	0.01 U	0.1 U	0.1 U	0.01 U	0.01 U	na
Total Pentachlorobiphenyls	mg/kg	--	--	--	--	--	**0.65**	**1.6**	**1.3**	**0.45**	**0.68**	na
Total Tetrachlorobiphenyls	mg/kg	--	--	--	--	--	**1.9**	**3.6**	**3.4**	**1.7**	**2**	na
Total Trichlorobiphenyls	mg/kg	--	--	--	--	--	**0.72**	**1.6**	**1.6**	**0.9**	**1.1**	na
Total PCBs (congeners)	mg/kg	0.01	0.02	0.06	0.19	0.49	**3.4**	**7.2**	**6.7**	**4.5**	**3.9**	na
Polychlorinated Biphenyls (Aroclor)												
Aroclor 1016	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Aroclor 1242	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Aroclor 1248	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Aroclor 1254	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Aroclor 1260	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Total PCBs (Aroclor)	mg/kg	--	--	--	--	--	na	na	na	na	na	na
Total Petroleum Hydrocarbons												
Petroleum Hydrocarbons (C10-C50)	mg/kg	--	--	--	--	--	na	na	na	na	na	na

Table 3-3

Summary of 2007-2011 Subsurface Sediment Sampling and Laboratory Analysis Results

Notes:

🟦 Detected concentration is greater than REL (rare effect level)
🟦 Detected concentration is greater than TEL (threshold effect level)
🟨 Detected concentration is greater than OEL (occasional effect level)
🟧 Detected concentration is greater than PEL (probably effect level)
🟥 Detected concentration is greater than FEL (frequent effect level)
🟩 Non-detected concentration is above one or more identified screening levels
Bold = Detected result

g = grams
J = Estimated value
FD = field duplicate
LR = lab replicate
mg/kg = milligrams per kilogram
MS = matrix spike
N = normal sample
ND = Compound analyzed, but not detected above detection limit
na = Compound not analyzed
PAH = polynuclear aromatic hydrocarbon
PCB = polychlorinated biphenyl
U = Compound analyzed, but not detected above detection limit

Table 3-4
Summary of 2009 Surface Water Sampling and Laboratory Analysis Results

Location ID					DA-1	DA-6	SE1	SE2	SE3	SE4	SE5	SE6	SE7	SE8	SE9
Sample Type					N	N	N	N	N	N	N	N	N	N	N
Sample Description					Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
Year					2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009
Major Remediation Area					ADM	ADM	BDA	ADM	BDA	ADM	ADM	ADM	BDA	ADM	BDA
Analyte	**Unit**	**MDDEP Acute**	**MDDEP Chronic**	**CCME**											
Conventionals															
Hardness as CaCO3	mg/L	--	--	--	na	na	**4500**	**4700**	**4400**	**4600**	**4400**	**4600**	**4600**	**4400**	**4300**
Turbidity	UTN	8	2	--	na	na	**0.3**	**0.5**	**0.4**	**0.6**	**0.4**	**0.4**	**0.3**	**0.4**	**0.7**
Metal															
Aluminum	mg/L	--	--	--	na	na	**0.09**	**0.09**	**0.07**	**0.08**	**0.1**	**0.09**	**0.25**	**0.09**	**0.08**
Arsenic	mg/L	0.069	0.036	0.00125	0.002 U	0.002 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Barium	mg/L	--	--	--	na	na	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Beryllium	mg/L	--	--	--	na	na	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Bismuth	mg/L	--	--	--	na	na	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Boron	mg/L	--	--	--	na	na	**3.5**	**3.5**	**3.4**	**3.6**	**3.5**	**3.5**	**3.4**	**3.4**	**3.3**
Cadmium	mg/L	0.043	0.0093	0.00012	0.001 U	0.001 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Calcium	mg/L	--	--	--	na	na	**290**	**310**	**280**	**300**	**290**	**300**	**300**	**290**	**290**
Chromium	mg/L	1.1[a]	0.05[a]	0.056[b]	0.03 U	0.03 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Cobalt	mg/L	--	--	--	na	na	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Copper	mg/L	0.0058	0.0037	--	**0.004**	**0.005**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Iron	mg/L	0.22	0.085	--	na	na	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Lead	mg/L	--	--	--	0.001 U	0.001 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U
Lithium	mg/L	--	--	--	na	na	**0.19**	**0.22**	**0.18**	**0.19**	**0.19**	**0.19**	**0.18**	**0.18**	**0.17**
Magnesium	mg/L	--	--	--	na	na	**930**	**960**	**910**	**920**	**900**	**930**	**910**	**900**	**900**
Manganese	mg/L	--	--	--	na	na	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Mercury	mg/L	0.0021[c]	0.0011[c]	0.000016[c]	0.0001	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U
Molybdenum	mg/L	--	--	--	na	na	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Nickel	mg/L	0.075	0.0083	--	0.01 U	0.01 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Potassium	mg/L	--	--	--	na	na	**320**	**330**	**320**	**330**	**320**	**330**	**320**	**320**	**310**
Selenium	mg/L	0.03	0.071		na	na	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U	0.01 U	0.02 U	0.02 U	0.02 U
Silicon, Extractable	mg/L	--	--	--	na	na	**0.25**	**0.31**	**0.25**	**0.2**	**0.24**	**0.24**	**0.26**	**0.29**	**0.31**
Silver	mg/L	0.00115	--	--	na	na	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Sodium	mg/L	--	--	--	na	na	**7800**	**8100**	**7700**	**7900**	**7700**	**8000**	**7900**	**7600**	**7500**
Strontium	mg/L	--	--	--	na	na	**5.3**	**5.4**	**5.2**	**5.3**	**5.2**	**5.3**	**5.2**	**5.2**	**5.1**
Thallium	mg/L	--	--	--	na	na	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Tin	mg/L	--	--	--	na	na	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Titanium	mg/L	--	--	--	na	na	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Vanadium	mg/L	--	--	--	na	na	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Zinc	mg/L	0.095	0.086	--	0.003 U	**0.004**	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U

Table 3-4
Summary of 2009 Surface Water Sampling and Laboratory Analysis Results

Location ID					DA-1	DA-6	SE1	SE2	SE3	SE4	SE5	SE6	SE7	SE8	SE9
Sample Type					N	N	N	N	N	N	N	N	N	N	N
Sample Description					Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
Year					2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009
Major Remediation Area					ADM	ADM	BDA	ADM	BDA	ADM	ADM	ADM	BDA	ADM	BDA
Analyte	**Unit**	**MDDEP Acute**	**MDDEP Chronic**	**CCME**											
Polychlorinated Biphenyls (congeners)															
Total PCBs (congeners)	µg/L	--	--	--	na	na	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Polynuclear Aromatic Hydrocarbons (MDDEP 13)															
2-Methylnaphthalene	µg/L	--	--	--	0.1 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Acenaphthene	µg/L	--	--	--	0.05 U	0.05 U	0.01 U	0.01 U	0.01 U	**0.03**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Acenaphthylene	µg/L	--	--	--	0.1 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Anthracene	µg/L	--	--	--	0.03 U	0.03 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(a)anthracene	µg/L	--	--	--	0.02 U	0.02 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(a)pyrene	µg/L	--	--	--	0.008 U	0.008 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Chrysene	µg/L	--	--	--	0.03 U	0.03 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Dibenzo(a,h)anthracene	µg/L	--	--	--	0.02 U	0.02 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Fluoranthene	µg/L	--	--	--	0.01 U	0.01 U	**0.01**	**0.02**	0.01 U	**0.03**	**0.02**	**0.02**	**0.01**	0.01 U	0.01 U
Fluorene	µg/L	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Naphthalene	µg/L	--	--	1.4	**0.11**	0.03 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Phenanthrene	µg/L	7.7	4.6	--	0.01 U	0.01 U	0.02 U	0.02 U	0.02 U	**0.03**	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Pyrene	µg/L	--	--	--	0.01 U	0.01 U	0.01 U	**0.01**	0.01 U	**0.02**	**0.01**	**0.01**	0.01 U	0.01 U	0.01 U
Total PAH13 (calculated)	µg/L	--	--	--	**0.11**	ND	**0.01**	**0.02**	ND	**0.11**	**0.03**	**0.03**	**0.01**	ND	ND
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)															
1,3-Dimethylnaphtalene	µg/L	--	--	--	0.1 U	0.1 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	**0.02**	0.02 U	0.02 U
1-Methylnaphthalene	µg/L	--	--	--	0.1 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
2,3,5-Trimethylnaphthalene	µg/L	--	--	--	0.1 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
3-Methylcholanthrene	µg/L	--	--	--	0.1 U	0.1 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U
4+5+6-Methylchrysene	µg/L	--	--	--	0.3 U	0.3 U	na	na	na	na	na	na	na	na	na
7,12-Dimethylbenz(a)anthracene	µg/L	--	--	--	0.1 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
7H-Dibenzo(c,g)carbazole	µg/L	--	--	--	0.3 U	0.3 U	na	na	na	na	na	na	na	na	na
Benzo(b,j,k)fluoranthenes	µg/L	--	--	--	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Benzo(c)phenanthrene	µg/L	--	--	--	0.1 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(e)pyrene	µg/L	--	--	--	0.1 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(g,h,i)perylene	µg/L	--	--	--	0.1 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Dibenzo(a,e)pyrene	µg/L	--	--	--	0.1 U	0.1 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Dibenzo(a,h)pyrene	µg/L	--	--	--	0.1 U	0.1 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Dibenzo(a,i)pyrene	µg/L	--	--	--	0.1 U	0.1 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Dibenzo(a,l)pyrene	µg/L	--	--	--	0.1 U	0.1 U	na	na	na	na	na	na	na	na	na
Indeno(1,2,3-c,d)pyrene	µg/L	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Petroleum Hydrocarbons															
Petroleum Hydrocarbons (C10-C50)	µg/L	1800	200	--	100 U	100 U	na	na	na	na	na	na	na	na	na

Table 3-4

Summary of 2009 Surface Water Sampling and Laboratory Analysis Results

Notes:

■ Detected concentrations is greater than MDDEP acute effects guidance values for brackish and salt water.
▒ Detected concentrations is greater than MDDEP chronic effects guidance values for brackish and salt water.
▨ Detected concentrations is greater than CCME guidance values for brackish and salt water.
░ Non-detected concentration is above one or more identified screening levels
Bold = Detected result

J = Estimated value
mg/L = milligrams per liter
N = normal sample
ND = Compound analyzed, but not detected above detection limit
na = Compound not analyzed
PAH = polynuclear aromatic hydrocarbon
PCB = polychlorinated biphenyl
U = Compound analyzed, but not detected above detection limit
µg/L = micrograms per liter
UTN= unités de turbidité néphélométriques

Table 3-5
Summary of 2006-2008 Porewater Sampling and Laboratory Analysis Results

Location ID		BC_04	BC_06	BC_07	BC_09	BC_12	BC_13	BC_14	BC_15	BC_18	BC_19	BC_21	BC_22	BC_24	BC_24	BC_24	BC_24
Sample Type		N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description		Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater
Year		2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2007	2007	2007	2007
Major Remediation Area		ADM	ADM	BDA	ADM	ADM	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**																
Conventionals																	
Dissolved organic carbon	µg/L	na	na	na	na	na	na	na	na	na	na	na	na	**1**	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEP 13)																	
2-Methylnaphthalene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.0948 J**	**0.0950 J**	**0.0989 J**	**0.102 J**
Acenaphthene	µg/L	**4.67**	**0.301**	ND	**0.086**	ND	**0.036**	**0.041**	**0.048**	**0.056**	**0.234**	**0.076**	**0.214**	**1.15**	**1.15**	**1.15**	**1.25**
Acenaphthylene	µg/L	**0.453**	**0.033**	ND	ND	ND	ND	ND	ND	ND	**0.021**	ND	ND	ND	ND	ND	ND
Anthracene	µg/L	**1.99**	**0.093**	ND	**0.087**	**0.013**	**0.088**	**0.052**	**0.174**	**0.062**	**0.139**	**0.068**	**0.129**	**0.0923 J**	**0.0966 J**	**0.101 J**	**0.102 J**
Benzo(a)anthracene	µg/L	**0.017**	**0.024**	**0.002**	**0.031**	**0.04**	**0.086**	**0.015**	**0.416**	**0.02**	**0.048**	**0.182**	**0.043**	**0.0192 J**	**0.0204 J**	**0.0213 J**	**0.0219 J**
Benzo(a)pyrene	µg/L	**0.012**	**0.007**	**0.006**	**0.014**	**0.014**	**0.04**	**0.011**	**0.13**	**0.018**	**0.015**	**0.047**	**0.027**	**0.00817 J**	**0.0112 J**	**0.0113 J**	**0.0125 J**
Chrysene	µg/L	**0.044**	**0.04**	**0.005**	**0.051**	**0.072**	**0.098**	**0.037**	**0.506**	**0.057**	**0.081**	**0.244**	**0.078**	**0.0362 J**	**0.0364 J**	**0.0378 J**	**0.0391 J**
Dibenzo(a,h)anthracene	µg/L	ND	ND	ND	ND	ND	ND	ND	**0.025**	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	µg/L	**2.27**	**0.684**	ND	**0.454**	**0.659**	**1.22**	**0.245**	**8.26**	**0.264**	**0.719**	**3.24**	**0.519**	**0.339 J**	**0.344 J**	**0.351**	**0.358**
Fluorene	µg/L	**3**	**0.062**	ND	**0.038**	ND	**0.044**	**0.042**	**0.088**	**0.061**	**0.136**	ND	**0.083**	**0.299 J**	**0.308 J**	**0.321 J**	**0.337 J**
Naphthalene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.332 J**	**0.335 J**	**0.359 J**	**0.423 J**
Phenanthrene	µg/L	**6.98**	**0.135**	ND	**0.048**	ND	**0.058**	**0.067**	**0.133**	**0.074**	**0.184**	**0.052**	**0.074**	**0.256 J**	**0.259 J**	**0.267 J**	**0.276 J**
Pyrene	µg/L	**0.974**	**0.143**	ND	**0.153**	**0.049**	**0.603**	**0.092**	**4.29**	**0.103**	**0.344**	**2**	**0.169**	**0.0994 J**	**0.101 J**	**0.102 J**	**0.115 J**
Total PAH13 (calculated)	µg/L	**20.4**	**1.5**	**0.013**	**0.92**	**0.82**	**2.23**	**0.57**	**14**	**0.68**	**1.87**	**5.87**	**1.28**	**2.66**	**2.71**	**2.78**	**2.98**
Polynuclear Aromatic Hydrocarbons (non-MDDEP 13)																	
1-Methylnaphthalene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.114 J**	**0.123 J**	**0.125 J**	**0.126 J**
Benzo(b+k)fluoranthene	µg/L	**0.025**	**0.013**	**0.007**	**0.03**	**0.031**	**0.074**	**0.021**	**0.305**	**0.052**	**0.03**	**0.097**	**0.058**	**0.0172 J**	**0.0176 J**	**0.0180 J**	**0.0190 J**
Benzo(e)pyrene	µg/L	**0.026**	**0.024**	**0.008**	**0.018**	**0.025**	**0.067**	**0.019**	**0.205**	**0.037**	**0.026**	**0.084**	**0.043**	**0.0129 J**	**0.0165 J**	**0.0169 J**	**0.0179 J**
Benzo(g,h,i)perylene	µg/L	**0.005**	ND	ND	**0.004**	ND	**0.015**	ND	**0.047**	ND	ND	**0.012**	ND	ND	ND	ND	ND
C1-Chrysenes	µg/L	ND	ND	ND	ND	ND	ND	ND	**0.051**	ND	**0.003**	ND	ND	**0.00385 J**	**0.00421 J**	**0.00430 J**	**0.00445 J**
C1-Fluoranthenes/Pyrenes	µg/L	**0.124**	**0.12**	**0.006**	**0.188**	**0.227**	**0.421**	**0.091**	**2.77**	**0.111**	**0.26**	**0.909**	**0.211**	**0.123 J**	**0.133 J**	**0.139 J**	**0.141 J**
C1-Fluorenes	µg/L	**2.34**	**0.178**	**0.049**	**0.143**	**0.098**	**0.073**	**0.111**	**0.435**	**0.064**	**0.152**	**0.473**	**0.111**	**0.336 J**	**0.371 J**	**0.398 J**	**0.443 J**
C1-Phenanthrenes/Anthracenes	µg/L	**1.65**	**0.141**	ND	**0.124**	**0.067**	**0.112**	**0.114**	**1.28**	**0.1**	**0.181**	**0.392**	**0.121**	**0.111 J**	**0.123 J**	**0.127 J**	**0.178 J**
C2-Chrysenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C2-Fluorenes	µg/L	**0.636**	ND	ND	ND	ND	ND	ND	**0.989**	ND	**0.127**	**0.973**	ND	ND	ND	ND	ND
C2-Naphthalenes	µg/L	**0.493**	**0.302**	**0.201**	**0.248**	**0.267**	**0.181**	**0.338**	**0.209**	**0.29**	**0.163**	**0.523**	**0.306**	**0.451 J**	**0.521 J**	**0.566 J**	**0.707 J**
C2-Phenanthrenes/Anthracenes	µg/L	**0.105**	ND	ND	ND	ND	ND	ND	**1.43**	ND	ND	**0.605**	ND	ND	ND	ND	ND
C3-Chrysenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3-Fluorenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3-Naphthalenes	µg/L	**1.64**	**0.108**	ND	**0.072**	**0.041**	**0.028**	**0.098**	**0.551**	**0.087**	**0.21**	**6.16**	ND	**0.183 J**	**0.217 J**	**0.228 J**	**0.263 J**
C3-Phenanthrenes/Anthracenes	µg/L	ND	ND	ND	ND	ND	ND	ND	**0.467**	ND	ND	**0.205**	ND	ND	ND	ND	ND
C4-Chrysenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4-Naphthalenes	µg/L	ND	ND	ND	ND	ND	ND	ND	**1.7**	ND	ND	**9.24**	ND	ND	ND	ND	ND
C4-Phenanthrenes/Anthracenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-c,d)pyrene	µg/L	ND	ND	ND	**0.002**	ND	**0.003**	ND	**0.029**	ND	ND	**0.006**	ND	ND	ND	ND	ND
Perylene	µg/L	ND	ND	**0.002**	**0.001**	**0.004**	**0.005**	**0.003**	**0.031**	**0.006**	ND	**0.013**	**0.008**	**0.00384 J**	**0.00430 J**	**0.00640 J**	**0.00714 J**

Table 3-5
Summary of 2006-2008 Porewater Sampling and Laboratory Analysis Results

Location ID		**BC_25**	**BC_25**	**BC_25**	**BC_25**	**BC_26**	**BC_26**	**BC_26**	**BC_26**	**BC_27**	**BC_27**	**BC_27**	**BC_27**	**BC_28**	**BC_28**	**BC_28**	**BC_28**
Sample Type		**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Sample Description		**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**
Year		**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**
Major Remediation Area		**ADM**	**ADM**	**ADM**	**ADM**	**BDA**	**BDA**	**BDA**	**BDA**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**
Analyte	**Unit**																
Conventionals																	
Dissolved organic carbon	µg/L	ND	na	na	na	ND	na	na	na	ND	na	na	na	ND	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEF																	
2-Methylnaphthalene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	µg/L	**0.410 J**	**0.440 J**	**0.489 J**	**0.507 J**	ND	ND	ND	ND	**0.0318 J**	**0.0383 J**	**0.0433 J**	**0.0455 J**	**0.212 J**	**0.220 J**	**0.222 J**	**0.244 J**
Acenaphthylene	µg/L	**0.0636 J**	**0.0724 J**	**0.0796 J**	**0.0924 J**	ND	ND	ND	ND	**0.0142 J**	**0.0144 J**	**0.0150 J**	**0.0189 J**	ND	ND	ND	ND
Anthracene	µg/L	**0.0438 J**	**0.0502 J**	**0.0559 J**	**0.0605 J**	ND	ND	ND	ND	**0.0868 J**	**0.0872 J**	**0.105 J**	**0.109 J**	**0.140 J**	**0.153 J**	**0.157 J**	**0.185 J**
Benzo(a)anthracene	µg/L	**0.0197 J**	**0.0227 J**	**0.0238 J**	**0.0255 J**	**0.00199 J**	**0.00233 J**	**0.00252 J**	**0.00376 J**	**0.0259 J**	**0.0264 J**	**0.0273 J**	**0.0284 J**	**0.0521 J**	**0.0538 J**	**0.0551 J**	**0.0688 J**
Benzo(a)pyrene	µg/L	**0.0146 J**	**0.0148 J**	**0.0179 J**	**0.0181 J**	ND	ND	ND	ND	ND	ND	ND	ND	**0.0131 J**	**0.0131 J**	**0.0158 J**	**0.0182 J**
Chrysene	µg/L	**0.0210 J**	**0.0240 J**	**0.0330 J**	**0.0341 J**	**0.00706 J**	**0.00849 J**	**0.0113 J**	**0.0117 J**	**0.0344 J**	**0.0383 J**	**0.0391 J**	**0.0425 J**	**0.0608 J**	**0.0627 J**	**0.0649 J**	**0.0887**
Dibenzo(a,h)anthracene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	µg/L	**0.304 J**	**0.333 J**	**0.339 J**	**0.407**	ND	ND	ND	ND	**0.401**	**0.402**	**0.408**	**0.417**	**1.43**	**1.44**	**1.57**	**1.88**
Fluorene	µg/L	**0.00505 J**	**0.00773 J**	**0.00812 J**	**0.00835 J**	ND	ND	ND	ND	**0.0352 J**	**0.0365 J**	**0.0428 J**	**0.0441 J**	**0.0638 J**	**0.0656 J**	**0.0693 J**	**0.0706 J**
Naphthalene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	µg/L	**0.0106 J**	**0.0106 J**	**0.0120 J**	**0.0122 J**	ND	ND	ND	ND	**0.0554 J**	**0.0563 J**	**0.0570 J**	**0.0673 J**	**0.0353 J**	**0.0431 J**	**0.0475 J**	**0.0480 J**
Pyrene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	**0.111 J**	**0.111 J**	**0.112 J**	**0.114 J**	**0.568**	**0.572**	**0.63**	**0.722**
Total PAH13 (calculated)	µg/L	**0.865**	**0.958**	**1.01**	**1.13**	**0.00906**	**0.0108**	**0.0125**	**0.0138**	**0.76**	**0.76**	**0.8**	**0.83**	**2.53**	**2.59**	**2.79**	**3.28**
Polynuclear Aromatic Hydrocarbons (non-MI																	
1-Methylnaphthalene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(b+k)fluoranthene	µg/L	**0.0125 J**	**0.0158 J**	**0.0183 J**	**0.0225 J**	ND	ND	ND	ND	ND	ND	ND	ND	**0.0203 J**	**0.0226 J**	**0.0228 J**	**0.0255 J**
Benzo(e)pyrene	µg/L	**0.0117 J**	**0.0149 J**	**0.0155 J**	**0.0220 J**	ND	ND	ND	ND	ND	ND	ND	ND	**0.0139 J**	**0.0165 J**	**0.0214 J**	**0.0224 J**
Benzo(g,h,i)perylene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C1-Chrysenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C1-Fluoranthenes/Pyrenes	µg/L	**0.0677 J**	**0.0686 J**	**0.0856 J**	**0.0857 J**	ND	ND	ND	ND	**0.123 J**	**0.124 J**	**0.127 J**	**0.129 J**	**0.388 J**	**0.397 J**	**0.436 J**	**0.459**
C1-Fluorenes	µg/L	**0.0465 J**	**0.0535 J**	**0.0545 J**	**0.0641 J**	ND	ND	ND	ND	**0.0625 J**	**0.0631 J**	**0.0653 J**	**0.0899 J**	**0.203 J**	**0.213 J**	**0.237 J**	**0.258 J**
C1-Phenanthrenes/Anthracenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.163 J**	**0.176 J**	**0.184 J**	**0.186 J**
C2-Chrysenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C2-Fluorenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C2-Naphthalenes	µg/L	ND	ND	ND	ND	**0.340 J**	**0.378 J**	**0.441 J**	**0.442 J**	ND	ND	ND	ND	**0.309 J**	**0.329 J**	**0.359 J**	**0.377 J**
C2-Phenanthrenes/Anthracenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3-Chrysenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3-Fluorenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3-Naphthalenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3-Phenanthrenes/Anthracenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4-Chrysenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4-Naphthalenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4-Phenanthrenes/Anthracenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-c,d)pyrene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perylene	µg/L	**0.00741 J**	**0.00863 J**	**0.00884 J**	**0.00889 J**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 3-5
Summary of 2006-2008 Porewater Sampling and Laboratory Analysis Results

Location ID		BC_29	BC_29	BC_29	BC_29	BC_30	BC_30	BC_30	BC_30	BC_31	BC_31	BC_31	BC_31	BC_32	BC_32	BC_32	BC_32
Sample Type		N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description		Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater
Year		2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
Major Remediation Area		BDA	BDA	BDA	BDA	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**																
Conventionals																	
Dissolved organic carbon	µg/L	ND	na	na	na	ND	na	na	na	ND	na	na	na	ND	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEF																	
2-Methylnaphthalene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	µg/L	**0.0144 J**	**0.0145 J**	**0.0147 J**	**0.0150 J**	ND	ND	ND	ND	**0.0940 J**	**0.110 J**	**0.111 J**	**0.134 J**	ND	ND	ND	ND
Acenaphthylene	µg/L	**0.00746 J**	**0.0108 J**	**0.0129 J**	**0.0138 J**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	µg/L	**0.0110 J**	**0.0129 J**	**0.0130 J**	**0.0135 J**	**0.0315 J**	**0.0326 J**	**0.0343 J**	**0.0354 J**	**0.176 J**	**0.193**	**0.205**	**0.223**	**0.0958 J**	**0.101 J**	**0.111 J**	**0.122 J**
Benzo(a)anthracene	µg/L	**0.00705 J**	**0.00772 J**	**0.00858 J**	**0.00887 J**	**0.00772 J**	**0.00841 J**	**0.00894 J**	**0.00907 J**	**0.389**	**0.434**	**0.497**	**0.513**	**0.0165 J**	**0.0186 J**	**0.0217 J**	**0.0231 J**
Benzo(a)pyrene	µg/L	ND	ND	ND	ND	**0.0102 J**	**0.0107 J**	**0.0148 J**	**0.0181 J**	**0.133**	**0.143**	**0.198**	**0.218**	ND	ND	ND	ND
Chrysene	µg/L	**0.0131 J**	**0.0131 J**	**0.0133 J**	**0.0143 J**	**0.0217 J**	**0.0245 J**	**0.0257 J**	**0.0264 J**	**0.399**	**0.487**	**0.522**	**0.56**	**0.0374 J**	**0.0375 J**	**0.0416 J**	**0.0430 J**
Dibenzo(a,h)anthracene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	µg/L	**0.0695 J**	**0.0717 J**	**0.0770 J**	**0.0770 J**	**0.0769 J**	**0.0776 J**	**0.0838 J**	**0.0864 J**	**7.43**	**7.87**	**8.56**	**8.8**	**0.381**	**0.387**	**0.406**	**0.411**
Fluorene	µg/L	**0.00470 J**	**0.00506 J**	**0.00707 J**	**0.00838 J**	ND	ND	ND	ND	**0.0788 J**	**0.0862 J**	**0.0866 J**	**0.105 J**	**0.0665 J**	**0.0682 J**	**0.0738 J**	**0.0788 J**
Naphthalene	µg/L	ND	ND	ND	ND	**0.159 J**	**0.179 J**	**0.27 J**	**0.298 J**	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	µg/L	**0.0121 J**	**0.0131 J**	**0.0166 J**	**0.0209 J**	ND	ND	ND	ND	**0.110 J**	**0.127 J**	**0.133 J**	**0.150 J**	**0.124 J**	**0.129 J**	**0.135 J**	**0.144 J**
Pyrene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	**4.81**	**5.1**	**5.51**	**5.69**	**0.169 J**	**0.172 J**	**0.173 J**	**0.181 J**
Total PAH13 (calculated)	µg/L	**0.119**	**0.133**	**0.136**	**0.147**	**0.288**	**0.308**	**0.419**	**0.439**	**13.6**	**14.5**	**15.8**	**16.4**	**0.85**	**0.87**	**0.94**	**0.98**
Polynuclear Aromatic Hydrocarbons (non-MI																	
1-Methylnaphthalene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(b+k)fluoranthene	µg/L	ND	ND	ND	ND	**0.0142 J**	**0.0156 J**	**0.0174 J**	**0.0202 J**	**0.237**	**0.289**	**0.38**	**0.38**	ND	ND	ND	ND
Benzo(e)pyrene	µg/L	ND	ND	ND	ND	**0.0114 J**	**0.0147 J**	**0.0182 J**	**0.0213 J**	**0.173**	**0.199**	**0.238**	**0.268**	ND	ND	ND	ND
Benzo(g,h,i)perylene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	**0.0277**	**0.0383**	**0.0422**	**0.0474**	ND	ND	ND	ND
C1-Chrysenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	**0.0734 J**	**0.0884 J**	**0.102 J**	**0.11**	ND	ND	ND	ND
C1-Fluoranthenes/Pyrenes	µg/L	**0.0150 J**	**0.0241 J**	**0.0246 J**	**0.0278 J**	**0.0429 J**	**0.0471 J**	**0.0515 J**	**0.0618 J**	**2.61**	**2.75**	**3.03**	**3.17**	**0.120 J**	**0.121 J**	**0.123 J**	**0.124 J**
C1-Fluorenes	µg/L	**0.0687 J**	**0.0744 J**	**0.0926 J**	**0.119 J**	**0.123 J**	**0.128 J**	**0.142 J**	**0.153 J**	**0.376 J**	**0.424 J**	**0.478 J**	**0.497 J**	**0.111 J**	**0.123 J**	**0.128 J**	**0.151 J**
C1-Phenanthrenes/Anthracenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	**1.26 J**	**1.26 J**	**1.41 J**	**1.47 J**	**0.115 J**	**0.126 J**	**0.140 J**	**0.163 J**
C2-Chrysenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C2-Fluorenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	**0.590 J**	**0.591 J**	**0.646 J**	**0.699 J**	ND	ND	ND	ND
C2-Naphthalenes	µg/L	ND	ND	ND	ND	**0.292 J**	**0.298 J**	**0.327 J**	**0.383 J**	**0.408 J**	**0.451 J**	**0.534 J**	**0.536 J**	**0.311 J**	**0.359 J**	**0.359 J**	**0.366 J**
C2-Phenanthrenes/Anthracenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	**0.846 J**	**0.868 J**	**1.05 J**	**1.13 J**	ND	ND	ND	ND
C3-Chrysenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3-Fluorenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3-Naphthalenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	**0.914 J**	**0.918 J**	**1.24 J**	**1.30 J**	ND	ND	ND	ND
C3-Phenanthrenes/Anthracenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	**0.177 J**	**0.233 J**	**0.255 J**	**0.287 J**	ND	ND	ND	ND
C4-Chrysenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4-Naphthalenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	**1.19 J**	**1.20 J**	**1.58 J**	**1.59 J**	ND	ND	ND	ND
C4-Phenanthrenes/Anthracenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-c,d)pyrene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	**0.0144**	**0.0171**	**0.0178**	**0.0218**	ND	ND	ND	ND
Perylene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	**0.033**	**0.0441**	**0.051**	**0.0518**	ND	ND	ND	ND

Table 3-5
Summary of 2006-2008 Porewater Sampling and Laboratory Analysis Results

Location ID		BC_33	BC_33	BC_33	BC_33	BC_34	BC_34	BC_34	BC_34	BC_35	BC_35	BC_35	BC_35	BC_36	BC_36	BC_36	BC_36
Sample Type		N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description		Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater
Year		2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
Major Remediation Area		ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	BDA	BDA	BDA	BDA
Analyte	**Unit**																
Conventionals																	
Dissolved organic carbon	µg/L	ND	na	na	na	ND	na	na	na	ND	na	na	na	ND	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEF																	
2-Methylnaphthalene	µg/L	ND	ND	ND	ND	**0.0260 J**	**0.0263 J**	**0.0282 J**	**0.0306 J**	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	µg/L	**0.334 J**	**0.346 J**	**0.377 J**	**0.392 J**	**0.088 J**	**0.100 J**	**0.102 J**	**0.107 J**	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	µg/L	**0.00377 J**	**0.00415 J**	**0.00573 J**	**0.00680 J**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	µg/L	**0.111 J**	**0.112 J**	**0.118 J**	**0.125 J**	**0.169 J**	**0.180 J**	**0.191**	**0.197**	**0.0578 J**	**0.0606 J**	**0.0682 J**	**0.0762 J**	ND	ND	ND	ND
Benzo(a)anthracene	µg/L	**0.0595 J**	**0.0599 J**	**0.0617 J**	**0.0635 J**	**0.164**	**0.169**	**0.186**	**0.198**	**0.0224 J**	**0.0233 J**	**0.0243 J**	**0.0290 J**	**0.00806 J**	**0.0109 J**	**0.0114 J**	**0.0134 J**
Benzo(a)pyrene	µg/L	**0.0170 J**	**0.0196 J**	**0.0205 J**	**0.0274 J**	**0.0584 J**	**0.0693**	**0.0722**	**0.0822**	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	µg/L	**0.0816**	**0.0848**	**0.087**	**0.0891**	**0.234**	**0.237**	**0.259**	**0.269**	**0.0289 J**	**0.0294 J**	**0.0303 J**	**0.0329 J**	**0.0195 J**	**0.0222 J**	**0.0271 J**	**0.0297 J**
Dibenzo(a,h)anthracene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	µg/L	**1.05**	**1.09**	**1.1**	**1.13**	**2.66**	**2.67**	**2.99**	**3.04**	**0.344 J**	**0.353**	**0.356**	**0.379**	**0.0888 J**	**0.102 J**	**0.109 J**	**0.111 J**
Fluorene	µg/L	**0.152 J**	**0.166 J**	**0.169 J**	**0.172 J**	**0.0626 J**	**0.0638 J**	**0.0694 J**	**0.0728 J**	**0.0470 J**	**0.0540 J**	**0.0558 J**	**0.0591 J**	ND	ND	ND	ND
Naphthalene	µg/L	ND	ND	ND	ND	**0.180 J**	**0.183 J**	**0.209 J**	**0.219 J**	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	µg/L	**0.238 J**	**0.239 J**	**0.248 J**	**0.265 J**	**0.159 J**	**0.168 J**	**0.178 J**	**0.194 J**	**0.0654 J**	**0.0676 J**	**0.0814 J**	**0.0832 J**	ND	ND	ND	ND
Pyrene	µg/L	**0.564**	**0.605**	**0.607**	**0.629**	**1.75**	**1.79**	**2**	**2.03**	**0.183 J**	**0.189 J**	**0.198 J**	**0.199 J**	**0.0344 J**	**0.0369 J**	**0.0395 J**	**0.0537 J**
Total PAH13 (calculated)	µg/L	**2.57**	**2.67**	**2.75**	**2.86**	**5.49**	**5.61**	**6.22**	**6.37**	**0.71**	**0.74**	**0.78**	**0.81**	**0.128**	**0.16**	**0.16**	**0.19**
Polynuclear Aromatic Hydrocarbons (non-MI																	
1-Methylnaphthalene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(b+k)fluoranthene	µg/L	**0.0292 J**	**0.0296 J**	**0.0298 J**	**0.0307 J**	**0.105**	**0.116**	**0.127**	**0.141**	**0.0116 J**	**0.0176 J**	**0.0177 J**	**0.0194 J**	ND	ND	ND	ND
Benzo(e)pyrene	µg/L	**0.0204 J**	**0.0221 J**	**0.0222 J**	**0.0223 J**	**0.0773**	**0.0966**	**0.107**	**0.108**	**0.0142 J**	**0.0154 J**	**0.0196 J**	**0.0234 J**	ND	ND	ND	ND
Benzo(g,h,i)perylene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C1-Chrysenes	µg/L	**0.00723 J**	**0.00837 J**	**0.00856 J**	**0.00946 J**	**0.0265 J**	**0.0281 J**	**0.0305 J**	**0.0379 J**	ND	ND	ND	ND	ND	ND	ND	ND
C1-Fluoranthenes/Pyrenes	µg/L	**0.455**	**0.465**	**0.472**	**0.489**	**0.936**	**1**	**1.04**	**1.15**	**0.141 J**	**0.147 J**	**0.152 J**	**0.172 J**	**0.0378 J**	**0.0382 J**	**0.0519 J**	**0.0690 J**
C1-Fluorenes	µg/L	**0.240 J**	**0.274 J**	**0.279 J**	**0.280 J**	**0.343 J**	**0.343 J**	**0.372 J**	**0.426 J**	ND	ND	ND	ND	**0.0661 J**	**0.110 J**	**0.141 J**	**0.152 J**
C1-Phenanthrenes/Anthracenes	µg/L	**0.336 J**	**0.413 J**	**0.420 J**	**0.422 J**	**0.451 J**	**0.494 J**	**0.517 J**	**0.547 J**	ND	ND	ND	ND	ND	ND	ND	ND
C2-Chrysenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C2-Fluorenes	µg/L	ND	ND	ND	ND	**0.446 J**	**0.474 J**	**0.634 J**	**0.649 J**	ND	ND	ND	ND	ND	ND	ND	ND
C2-Naphthalenes	µg/L	**0.296 J**	**0.310 J**	**0.311 J**	**0.337 J**	**0.429 J**	**0.471 J**	**0.476 J**	**0.507 J**	ND	ND	ND	ND	**0.438 J**	**0.460 J**	**0.491 J**	**0.534 J**
C2-Phenanthrenes/Anthracenes	µg/L	ND	ND	ND	ND	**0.413 J**	**0.422 J**	**0.498 J**	**0.563 J**	ND	ND	ND	ND	ND	ND	ND	ND
C3-Chrysenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3-Fluorenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3-Naphthalenes	µg/L	**0.115 J**	**0.119 J**	**0.162 J**	**0.162 J**	**1.57 J**	**1.89 J**	**1.94 J**	**2.04 J**	ND	ND	ND	ND	ND	ND	ND	ND
C3-Phenanthrenes/Anthracenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4-Chrysenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4-Naphthalenes	µg/L	ND	ND	ND	ND	**2.30 J**	**2.65 J**	**2.86 J**	**2.89 J**	ND	ND	ND	ND	ND	ND	ND	ND
C4-Phenanthrenes/Anthracenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-c,d)pyrene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perylene	µg/L	**0.00452 J**	**0.00506 J**	**0.00694 J**	**0.00798 J**	**0.0155 J**	**0.0164 J**	**0.0203 J**	**0.0245 J**	ND	ND	ND	ND	ND	ND	ND	ND

Table 3-5
Summary of 2006-2008 Porewater Sampling and Laboratory Analysis Results

Location ID		BC_38	BC_38	BC_38	BC_38	BC_39	BC_39	BC_39	BC_39	BC_40	BC_40	BC_40	BC_40	BC_41	BC_41	BC_41	BC_41
Sample Type		N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Sample Description		Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater	Porewater
Year		2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
Major Remediation Area		ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM	ADM
Analyte	**Unit**																
Conventionals																	
Dissolved organic carbon	µg/L	ND	na	na	na	ND	na	na	na	ND	na	na	na	ND	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEF																	
2-Methylnaphthalene	µg/L	**0.0682 J**	**0.0726 J**	**0.0767 J**	**0.0780 J**	ND	ND	ND	ND	**0.0614 J**	**0.0682 J**	**0.0727 J**	**0.0809 J**	ND	ND	ND	ND
Acenaphthene	µg/L	**0.152 J**	**0.163 J**	**0.173 J**	**0.207 J**	ND	ND	ND	ND	**0.316 J**	**0.333 J**	**0.338 J**	**0.386 J**	**0.105 J**	**0.109 J**	**0.125 J**	**0.129 J**
Acenaphthylene	µg/L	ND	ND	ND	ND	**0.00785 J**	ND	ND	ND	**0.0328 J**	**0.0360 J**	**0.0412 J**	**0.0458 J**	**0.0247 J**	**0.0282 J**	**0.0367 J**	**0.0391 J**
Anthracene	µg/L	**0.105 J**	**0.111 J**	**0.111 J**	**0.121 J**	ND	ND	ND	ND	**0.224**	**0.234**	**0.241**	**0.265**	**0.0186 J**	**0.0198 J**	**0.0213 J**	**0.0302 J**
Benzo(a)anthracene	µg/L	**0.0229 J**	**0.0236 J**	**0.0262 J**	**0.0278 J**	**0.00524 J**	**0.00548 J**	**0.00745 J**	**0.00794 J**	**0.0277 J**	**0.0286 J**	**0.0298 J**	**0.0438 J**	**0.0139 J**	**0.0144 J**	**0.0147 J**	**0.0151 J**
Benzo(a)pyrene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	µg/L	**0.0477 J**	**0.0530 J**	**0.0564 J**	**0.0575 J**	**0.0122 J**	**0.0133 J**	**0.0155 J**	**0.017 J**	**0.0295 J**	**0.0416 J**	**0.0503 J**	**0.0531 J**	**0.0312 J**	**0.0322 J**	**0.0324 J**	**0.0328 J**
Dibenzo(a,h)anthracene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	µg/L	**0.323 J**	**0.328 J**	**0.339 J**	**0.356**	ND	ND	ND	ND	**0.454**	**0.458**	**0.464**	**0.468**	**0.262 J**	**0.269 J**	**0.271 J**	**0.276 J**
Fluorene	µg/L	**0.119 J**	**0.123 J**	**0.129 J**	**0.135 J**	ND	ND	ND	ND	**0.232 J**	**0.241 J**	**0.259 J**	**0.264 J**	**0.0124 J**	**0.0146 J**	**0.0172 J**	**0.0194 J**
Naphthalene	µg/L	ND	ND	ND	ND	**0.0519 J**	**0.0583 J**	**0.0641 J**	**0.0772 J**	**0.395 J**	**0.428 J**	**0.470 J**	**0.476 J**	ND	ND	ND	ND
Phenanthrene	µg/L	**0.207 J**	**0.216 J**	**0.218 J**	**0.251 J**	ND	ND	ND	ND	**0.452 J**	**0.490 J**	**0.493 J**	**0.496 J**	ND	ND	ND	ND
Pyrene	µg/L	**0.217 J**	**0.217 J**	**0.224**	**0.23**	ND	ND	ND	ND	**0.215 J**	**0.216 J**	**0.220 J**	**0.228**	ND	ND	ND	ND
Total PAH13 (calculated)	µg/L	**1.21**	**1.27**	**1.3**	**1.42**	**0.0731**	**0.0655**	**0.0774**	**0.0879**	**2.39**	**2.52**	**2.62**	**2.75**	**0.44**	**0.44**	**0.49**	**0.5**
Polynuclear Aromatic Hydrocarbons (non-MI																	
1-Methylnaphthalene	µg/L	**0.0738 J**	**0.0967 J**	**0.104 J**	**0.113 J**	ND	ND	ND	ND	**0.0786 J**	**0.0816 J**	**0.0932 J**	**0.0981 J**	ND	ND	ND	ND
Benzo(b+k)fluoranthene	µg/L	**0.0203 J**	**0.0207 J**	**0.0261 J**	**0.0283 J**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(e)pyrene	µg/L	**0.0161 J**	**0.0175 J**	**0.0201 J**	**0.0244 J**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C1-Chrysenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C1-Fluoranthenes/Pyrenes	µg/L	**0.153 J**	**0.155 J**	**0.164 J**	**0.165 J**	ND	ND	ND	ND	**0.153 J**	**0.168 J**	**0.176 J**	**0.185 J**	**0.0633 J**	**0.0673 J**	**0.0690 J**	**0.0884 J**
C1-Fluorenes	µg/L	**0.135 J**	**0.144 J**	**0.145 J**	**0.197 J**	ND	ND	ND	ND	**0.295 J**	**0.375 J**	**0.382 J**	**0.499 J**	**0.0717 J**	**0.0783 J**	**0.0871 J**	**0.101 J**
C1-Phenanthrenes/Anthracenes	µg/L	**0.151 J**	**0.164 J**	**0.191 J**	**0.213 J**	ND	ND	ND	ND	**0.341 J**	**0.474 J**	**0.511 J**	**0.520 J**	ND	ND	ND	ND
C2-Chrysenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C2-Fluorenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C2-Naphthalenes	µg/L	**0.366 J**	**0.408 J**	**0.429 J**	**0.521 J**	ND	ND	ND	ND	**0.497 J**	**0.511 J**	**0.645 J**	**0.689 J**	ND	ND	ND	ND
C2-Phenanthrenes/Anthracenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3-Chrysenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3-Fluorenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3-Naphthalenes	µg/L	**0.136 J**	**0.178 J**	**0.199 J**	**0.221 J**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3-Phenanthrenes/Anthracenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4-Chrysenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4-Naphthalenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4-Phenanthrenes/Anthracenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-c,d)pyrene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perylene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 3-5
Summary of 2006-2008 Porewater Sampling and Laboratory Analysis Results

Location ID		**BC_42**	**BC_42**	**BC_42**	**BC_42**	**BC_48**	**BC_48**	**BC_49**	**BC_49**	**BC_50**	**BC_50**	**BC_51**	**BC_51**	**BC_52**	**BC_52**	**BC_53**	**BC_53**
Sample Type		**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Sample Description		**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**
Year		**2007**	**2007**	**2007**	**2007**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**
Major Remediation Area		**BDA**	**BDA**	**BDA**	**BDA**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**
Analyte	**Unit**																
Conventionals																	
Dissolved organic carbon	µg/L	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEF																	
2-Methylnaphthalene	µg/L	ND	ND	ND	ND	**0.0136 J**	**0.0218 J**	**0.00999 J**	**0.0103 J**	**0.00403 J**	**0.0112 J**	**0.0117 J**	**0.0135 J**	**0.00774 J**	**0.0109 J**	**0.0205 J**	**0.0226 J**
Acenaphthene	µg/L	**0.0349 J**	**0.0350 J**	**0.0376 J**	**0.0406 J**	**0.242 J**	**0.251 J**	**0.300 J**	**0.311 J**	**0.0557 J**	**0.0571 J**	**0.00871 J**	**0.00882 J**	**0.200 J**	**0.206 J**	**0.198 J**	**0.203 J**
Acenaphthylene	µg/L	**0.00851 J**	**0.00973 J**	**0.0105 J**	**0.0127 J**	**0.0204 J**	**0.0241 J**	**0.0300 J**	**0.0330 J**	**0.00779 J**	**0.00874 J**	**0.00165 J**	**0.00681 J**	**0.0226 J**	**0.0247 J**	**0.0260 J**	**0.0341 J**
Anthracene	µg/L	**0.329**	**0.334**	**0.409**	**0.412**	**0.227**	**0.228**	**0.272**	**0.281**	**0.0185 J**	**0.0191 J**	**0.00683 J**	**0.00727 J**	**0.138 J**	**0.142 J**	**0.192**	**0.199**
Benzo(a)anthracene	µg/L	**0.0615 J**	**0.0654 J**	**0.0736 J**	**0.0746 J**	**0.132 J**	**0.140 J**	**0.0182 J**	**0.0183 J**	**0.00320 J**	**0.00348 J**	**0.00475 J**	**0.00496 J**	**0.0621 J**	**0.0637 J**	**0.165**	**0.167**
Benzo(a)pyrene	µg/L	**0.0257 J**	**0.0269 J**	**0.0281 J**	**0.0349 J**	**0.0645**	**0.086**	**0.0142 J**	**0.0180 J**	0.005 U	0.005 U	0.005 U	0.005 U	**0.0291 J**	**0.0397 J**	**0.101**	**0.117**
Chrysene	µg/L	**0.0704**	**0.0755**	**0.0842**	**0.0862**	**0.195**	**0.21**	**0.0258 J**	**0.0259 J**	**0.00518 J**	**0.00586 J**	**0.00638 J**	**0.00663 J**	**0.101**	**0.105**	**0.249**	**0.255**
Dibenzo(a,h)anthracene	µg/L	ND	ND	ND	ND	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Fluoranthene	µg/L	**1.71**	**1.8**	**2.09**	**2.13**	**4.8**	**4.82**	**0.65**	**0.651**	**0.123 J**	**0.127 J**	**0.0524 J**	**0.0546 J**	**1.92**	**1.98**	**3.78**	**3.83**
Fluorene	µg/L	**0.0546 J**	**0.0587 J**	**0.0653 J**	**0.0667 J**	**0.170 J**	**0.173 J**	**0.192 J**	**0.203 J**	**0.0148 J**	**0.0181 J**	**0.000609 J**	**0.00303 J**	**0.0329 J**	**0.0354 J**	**0.158 J**	**0.161 J**
Naphthalene	µg/L	ND	ND	ND	ND	**0.0629 J**	**0.0751 J**	**0.0594 J**	**0.0624 J**	**0.0401 J**	**0.0441 J**	**0.0723 J**	**0.0759 J**	**0.0595 J**	**0.0847 J**	**0.104 J**	**0.108 J**
Phenanthrene	µg/L	**0.0673 J**	**0.0831 J**	**0.0994 J**	**0.101 J**	**0.372 J**	**0.390 J**	**0.325 J**	**0.332 J**	**0.0298 J**	**0.0321 J**	**0.0146 J**	**0.0259 J**	**0.0304 J**	**0.0335 J**	**0.147 J**	**0.151 J**
Pyrene	µg/L	**0.586**	**0.616**	**0.71**	**0.729**	**2.72**	**2.74**	**0.214 J**	**0.216 J**	**0.0291 J**	**0.0297 J**	**0.0139 J**	**0.0158 J**	**0.184 J**	**0.191 J**	**1.72**	**1.75**
Total PAH13 (calculated)	µg/L	**2.91**	**3.05**	**3.54**	**3.65**	**8.96**	**9.09**	**2.06**	**2.12**	**0.29**	**0.308**	**0.179**	**0.198**	**2.74**	**2.86**	**6.79**	**6.94**
Polynuclear Aromatic Hydrocarbons (non-MI																	
1-Methylnaphthalene	µg/L	ND	ND	ND	ND	**0.00950 J**	**0.0117 J**	**0.00931 J**	**0.00943 J**	**0.00451 J**	**0.0111 J**	**0.0117 J**	**0.0133 J**	**0.00655 J**	**0.0109 J**	**0.0263 J**	**0.0269 J**
Benzo(b+k)fluoranthene	µg/L	**0.0357 J**	**0.0447 J**	**0.0453 J**	**0.0464 J**	**0.0902**	**0.118**	**0.0118 J**	**0.0147 J**	0.01 U	0.01 U	0.01 U	0.01 U	**0.0465 J**	**0.0478 J**	**0.145**	**0.161**
Benzo(e)pyrene	µg/L	**0.0309 J**	**0.0325 J**	**0.0331 J**	**0.0334 J**	**0.0598 J**	**0.0652**	**0.00945 J**	**0.0135 J**	0.005 U	0.005 U	0.005 U	0.005 U	**0.0400 J**	**0.0402 J**	**0.119**	**0.122**
Benzo(g,h,i)perylene	µg/L	ND	ND	ND	ND	**0.00832 J**	**0.00870 J**	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	**0.0282**	**0.0314**
C1-Chrysenes	µg/L	**0.0100 J**	**0.0102 J**	**0.0147 J**	**0.0160 J**	**0.0164 J**	**0.0167 J**	**0.00499 J**	**0.00566 J**	**0.00496 J**	**0.00612 J**	ND	ND	**0.0118 J**	**0.0120 J**	**0.0194 J**	**0.0208 J**
C1-Fluoranthenes/Pyrenes	µg/L	**0.395 J**	**0.396 J**	**0.444**	**0.505**	**1.01**	**1.02**	**0.123 J**	**0.135 J**	**0.0313 J**	**0.0414 J**	**0.0268 J**	**0.0293 J**	**0.481**	**0.516**	**1.04**	**1.08**
C1-Fluorenes	µg/L	**0.174 J**	**0.262 J**	**0.265 J**	**0.266 J**	**0.470 J**	**0.524 J**	**0.0968 J**	**0.119 J**	**0.0512 J**	**0.0577 J**	**0.0318 J**	**0.0389 J**	**0.0493 J**	**0.0604 J**	**0.151 J**	**0.198 J**
C1-Phenanthrenes/Anthracenes	µg/L	**0.177 J**	**0.204 J**	**0.226 J**	**0.233 J**	**0.327 J**	**0.333 J**	**0.171 J**	**0.174 J**	**0.0494 J**	**0.0639 J**	0.2 U	0.2 U	**0.129 J**	**0.144 J**	**0.252 J**	**0.293 J**
C2-Chrysenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C2-Fluorenes	µg/L	ND	ND	ND	ND	**0.369 J**	**0.385 J**	**0.0721 J**	**0.0817 J**	0.1 U	0.1 U	0.1 U	0.1 U	**0.102 J**	**0.117 J**	**0.175 J**	**0.234 J**
C2-Naphthalenes	µg/L	ND	ND	ND	ND	**0.274 J**	**0.388 J**	**0.279 J**	**0.300 J**	**0.267 J**	**0.278 J**	**0.252 J**	**0.266 J**	**0.253 J**	**0.295 J**	**0.293 J**	**0.316 J**
C2-Phenanthrenes/Anthracenes	µg/L	**0.120 J**	**0.136 J**	**0.174 J**	**0.184 J**	**0.341 J**	**0.349 J**	**0.129 J**	**0.165 J**	0.05 U	0.05 U	0.05 U	0.05 U	**0.159 J**	**0.232 J**	**0.241 J**	**0.261 J**
C3-Chrysenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3-Fluorenes	µg/L	ND	ND	ND	ND	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
C3-Naphthalenes	µg/L	ND	ND	ND	ND	**0.419 J**	**0.460 J**	**0.119 J**	**0.126 J**	**0.0725 J**	**0.0819 J**	**0.0677 J**	**0.0763 J**	**0.117 J**	**0.126 J**	**0.459 J**	**0.464 J**
C3-Phenanthrenes/Anthracenes	µg/L	ND	ND	ND	ND	**0.519 J**	**0.569 J**	**0.179 J**	**0.209 J**	0.02 U	0.02 U	0.02 U	0.02 U	**0.197 J**	**0.258 J**	**0.236 J**	**0.242 J**
C4-Chrysenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4-Naphthalenes	µg/L	ND	ND	ND	ND	**1.77 J**	**2.03 J**	**0.133 J**	**0.185 J**	0.05 U	0.05 U	0.05 U	0.05 U	**0.292 J**	**0.324 J**	**0.951 J**	**1.01 J**
C4-Phenanthrenes/Anthracenes	µg/L	ND	ND	ND	ND	0.02 U	0.02 U	**0.11 J**	**0.115 J**	0.02 U	0.02 U	0.02 U	0.02 U	**0.143 J**	**0.226 J**	**0.106 J**	**0.158 J**
Indeno(1,2,3-c,d)pyrene	µg/L	ND	ND	ND	ND	**0.00328**	**0.00372**	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	**0.0108**	**0.0113**
Perylene	µg/L	ND	ND	ND	ND	**0.00864 J**	**0.00975 J**	**0.00678 J**	**0.00840 J**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	**0.0308**	**0.0375**

Table 3-5
Summary of 2006-2008 Porewater Sampling and Laboratory Analysis Results

Location ID		**BC_54**	**BC_54**	**BC_55**	**BC_55**	**BC_56**	**BC_56**	**BC_57**	**BC_57**	**BC_58**	**BC_58**	**BC_59**	**BC_59**	**BC_60**	**BC_60**	**BC_61**	**BC_61**
Sample Type		**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Sample Description		**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**	**Porewater**
Year		**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**	**2008**
Major Remediation Area		**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**	**ADM**
Analyte	**Unit**																
Conventionals																	
Dissolved organic carbon	µg/L	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEF																	
2-Methylnaphthalene	µg/L	**0.00350 J**	**0.00567 J**	**0.00364 J**	**0.00572 J**	**0.00571 J**	**0.00640 J**	**0.0133 J**	**0.0154 J**	**0.0157 J**	**0.0164 J**	**0.0114 J**	**0.0159 J**	**0.0223 J**	**0.0234 J**	**0.0235 J**	**0.0242 J**
Acenaphthene	µg/L	**0.106 J**	**0.115 J**	**0.00842 J**	**0.0128 J**	**0.132 J**	**0.146 J**	**0.0219 J**	**0.0301 J**	**0.00695 J**	**0.0110 J**	**0.0142 J**	**0.0154 J**	**0.0310 J**	**0.0335 J**	**0.00303 J**	**0.00438 J**
Acenaphthylene	µg/L	**0.0113 J**	**0.0160 J**	**0.00292 J**	**0.00362 J**	**0.0173 J**	**0.0178 J**	**0.00399 J**	**0.00447 J**	**0.00360 J**	**0.00582 J**	**0.00651 J**	**0.00694 J**	**0.0105 J**	**0.0112 J**	**0.00200 J**	0.1 U
Anthracene	µg/L	**0.0593 J**	**0.0607 J**	**0.00806 J**	**0.00820 J**	**0.0531 J**	**0.0567 J**	**0.00719 J**	**0.00856 J**	**0.00304 J**	**0.00308 J**	**0.00999 J**	**0.0101 J**	**0.0191 J**	**0.0200 J**	**0.00417 J**	**0.00525 J**
Benzo(a)anthracene	µg/L	**0.0217 J**	**0.0223 J**	**0.00790 J**	**0.00834 J**	**0.0201 J**	**0.0223 J**	**0.0154 J**	**0.0154 J**	**0.00439 J**	**0.00571 J**	**0.00613 J**	**0.00777 J**	**0.0196 J**	**0.0217 J**	**0.0120 J**	**0.0130 J**
Benzo(a)pyrene	µg/L	**0.00770 J**	**0.0126 J**	0.005 U	0.005 U	0.005 U	0.005 U	**0.00691 J**	**0.00803 J**	0.005 U	0.005 U	0.005 U	0.005 U	**0.0148 J**	**0.0209 J**	0.005 U	0.005 U
Chrysene	µg/L	**0.0354 J**	**0.0358 J**	**0.0119 J**	**0.0123 J**	**0.0302 J**	**0.0309 J**	**0.0181 J**	**0.0185 J**	**0.00797 J**	**0.00806 J**	**0.0105 J**	**0.0121 J**	**0.0352 J**	**0.0366 J**	**0.0166 J**	**0.0179 J**
Dibenzo(a,h)anthracene	µg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Fluoranthene	µg/L	**0.439**	**0.443**	**0.0904 J**	**0.0911 J**	**0.443**	**0.446**	**0.248 J**	**0.261 J**	**0.0601 J**	**0.0619 J**	**0.102 J**	**0.108 J**	**0.260 J**	**0.262 J**	**0.147 J**	**0.149 J**
Fluorene	µg/L	**0.0171 J**	**0.0192 J**	**0.00234 J**	**0.00254 J**	**0.0263 J**	**0.0273 J**	**0.00459 J**	**0.00581 J**	**0.00202 J**	**0.00262 J**	**0.00318 J**	0.05 U	**0.00311 J**	**0.00400 J**	**0.000215 J**	0.05 U
Naphthalene	µg/L	**0.00504 J**	0.5 U	**0.0102 J**	**0.0115 J**	**0.0270 J**	**0.0395 J**	**0.104 J**	**0.107 J**	**0.102 J**	**0.113 J**	**0.118 J**	**0.120 J**	**0.126 J**	**0.130 J**	**0.105 J**	**0.115 J**
Phenanthrene	µg/L	**0.0273 J**	**0.0416 J**	**0.00859 J**	**0.0104 J**	**0.0123 J**	**0.0128 J**	**0.0184 J**	**0.0301 J**	**0.00617 J**	**0.00634 J**	**0.00651 J**	**0.00800 J**	**0.0134 J**	**0.0159 J**	**0.00448 J**	**0.00686 J**
Pyrene	µg/L	**0.0380 J**	**0.0413 J**	**0.00904 J**	**0.0104 J**	**0.0389 J**	**0.043 J**	**0.0145 J**	**0.0169 J**	**0.00475 J**	**0.00683 J**	**0.00790 J**	**0.00873 J**	**0.0134 J**	**0.0146 J**	**0.00647 J**	**0.00670 J**
Total PAH13 (calculated)	µg/L	**0.716**	**0.776**	**0.161**	**0.168**	**0.766**	**0.796**	**0.433**	**0.487**	**0.209**	**0.228**	**0.28**	**0.281**	**0.513**	**0.554**	**0.3**	**0.313**
Polynuclear Aromatic Hydrocarbons (non-MI																	
1-Methylnaphthalene	µg/L	**0.000383 J**	0.2 U	**0.00556 J**	**0.00617 J**	**0.00699 J**	**0.00832 J**	**0.0162 J**	**0.0177 J**	**0.0188 J**	**0.0207 J**	**0.0130 J**	**0.0197 J**	**0.0293 J**	**0.0295 J**	**0.0285 J**	**0.0299 J**
Benzo(b+k)fluoranthene	µg/L	**0.0140 J**	**0.0157 J**	0.01 U	0.01 U	**0.0173 J**	**0.0190 J**	**0.0130 J**	**0.0162 J**	0.01 U	0.01 U	0.01 U	0.01 U	**0.0120 J**	**0.0184 J**	**0.0177 J**	**0.0179 J**
Benzo(e)pyrene	µg/L	**0.0101 J**	**0.0101 J**	0.005 U	0.005 U	**0.0110 J**	**0.0129 J**	**0.0110 J**	**0.0134 J**	0.005 U	0.005 U	0.005 U	0.005 U	**0.0161 J**	**0.0178 J**	**0.0135 J**	**0.0141 J**
Benzo(g,h,i)perylene	µg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
C1-Chrysenes	µg/L	**0.00557 J**	**0.00790 J**	ND	ND	ND	ND	**0.00408 J**	**0.00413 J**	ND	ND	ND	ND	ND	ND	ND	ND
C1-Fluoranthenes/Pyrenes	µg/L	**0.130 J**	**0.148 J**	**0.0378 J**	**0.0432 J**	**0.107 J**	**0.129 J**	**0.0809 J**	**0.0839 J**	**0.0253 J**	**0.0266 J**	**0.0345 J**	**0.0441 J**	**0.0916 J**	**0.0957 J**	**0.0600 J**	**0.0636 J**
C1-Fluorenes	µg/L	**0.0310 J**	**0.0525 J**	**0.0201 J**	**0.0296 J**	0.1 U	0.1 U	**0.0212 J**	**0.0232 J**	**0.0108 J**	**0.0152 J**	0.1 U	0.1 U	**0.0237 J**	**0.0242 J**	**0.0173 J**	**0.0258 J**
C1-Phenanthrenes/Anthracenes	µg/L	**0.0550 J**	**0.0853 J**	**0.0261 J**	**0.0327 J**	**0.0498 J**	**0.0645 J**	**0.0320 J**	**0.0414 J**	**0.0272 J**	**0.0315 J**	0.2 U	0.2 U	**0.0349 J**	**0.0471 J**	**0.0283 J**	**0.0429 J**
C2-Chrysenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C2-Fluorenes	µg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
C2-Naphthalenes	µg/L	**0.191 J**	**0.231 J**	**0.199 J**	**0.220 J**	**0.189 J**	**0.224 J**	**0.256 J**	**0.264 J**	**0.203 J**	**0.220 J**	**0.233 J**	**0.240 J**	**0.253 J**	**0.270 J**	**0.239 J**	**0.250 J**
C2-Phenanthrenes/Anthracenes	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	**0.0725 J**	**0.102 J**	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
C3-Chrysenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3-Fluorenes	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
C3-Naphthalenes	µg/L	**0.0299 J**	**0.0396 J**	0.3 U	0.3 U	**0.0278 J**	**0.0382 J**	**0.0434 J**	**0.0484 J**	**0.0291 J**	**0.0390 J**	**0.0381 J**	**0.0433 J**	**0.0487 J**	**0.0610 J**	**0.0515 J**	**0.0604 J**
C3-Phenanthrenes/Anthracenes	µg/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
C4-Chrysenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4-Naphthalenes	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
C4-Phenanthrenes/Anthracenes	µg/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Indeno(1,2,3-c,d)pyrene	µg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Perylene	µg/L	**0.00413 J**	**0.00501 J**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U

Table 3-5
Summary of 2006-2008 Porewater Sampling and Laboratory Analysis Results

Location ID		**BC_62**	**BC_62**	**BC_63**	**BC_63**
Sample Type		**N**	**N**	**N**	**N**
Sample Description		**Porewater**	**Porewater**	**Porewater**	**Porewater**
Year		**2008**	**2008**	**2008**	**2008**
Major Remediation Area		**ADM**	**ADM**	**ADM**	**ADM**
Analyte	**Unit**				
Conventionals					
Dissolved organic carbon	µg/L	na	na	na	na
Polynuclear Aromatic Hydrocarbons (MDDEF					
2-Methylnaphthalene	µg/L	**0.0214 J**	**0.0238 J**	**0.0328 J**	**0.0353 J**
Acenaphthene	µg/L	**0.0129 J**	**0.0164 J**	**0.0122 J**	**0.0139 J**
Acenaphthylene	µg/L	**0.00626 J**	**0.00692 J**	**0.00996 J**	**0.0151 J**
Anthracene	µg/L	**0.00156 J**	**0.00170 J**	**0.00106 J**	**0.00249 J**
Benzo(a)anthracene	µg/L	**0.00330 J**	**0.00480 J**	0.01 U	0.01 U
Benzo(a)pyrene	µg/L	0.005 U	0.005 U	0.005 U	0.005 U
Chrysene	µg/L	**0.00552 J**	**0.00617 J**	0.01 U	0.01 U
Dibenzo(a,h)anthracene	µg/L	0.002 U	0.002 U	0.002 U	0.002 U
Fluoranthene	µg/L	**0.0502 J**	**0.0534 J**	**0.00807 J**	**0.0111 J**
Fluorene	µg/L	**0.00187 J**	**0.00193 J**	**0.00719 J**	**0.00855 J**
Naphthalene	µg/L	**0.125 J**	**0.128 J**	**0.166 J**	**0.176 J**
Phenanthrene	µg/L	**0.00782 J**	**0.00799 J**	**0.0181 J**	**0.0292 J**
Pyrene	µg/L	**0.00485 J**	**0.00604 J**	**0.00483 J**	**0.00634 J**
Total PAH13 (calculated)	µg/L	**0.231**	**0.236**	**0.241**	**0.267**
Polynuclear Aromatic Hydrocarbons (non-MI					
1-Methylnaphthalene	µg/L	**0.0308 J**	**0.0329 J**	**0.0380 J**	**0.0426 J**
Benzo(b+k)fluoranthene	µg/L	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(e)pyrene	µg/L	0.005 U	0.005 U	0.005 U	0.005 U
Benzo(g,h,i)perylene	µg/L	0.002 U	0.002 U	0.002 U	0.002 U
C1-Chrysenes	µg/L	ND	ND	ND	ND
C1-Fluoranthenes/Pyrenes	µg/L	**0.0221 J**	**0.0251 J**	0.05 U	0.05 U
C1-Fluorenes	µg/L	0.1 U	0.1 U	0.1 U	0.1 U
C1-Phenanthrenes/Anthracenes	µg/L	0.2 U	0.2 U	0.2 U	0.2 U
C2-Chrysenes	µg/L	ND	ND	ND	ND
C2-Fluorenes	µg/L	0.1 U	0.1 U	0.1 U	0.1 U
C2-Naphthalenes	µg/L	**0.239 J**	**0.267 J**	**0.245 J**	**0.250 J**
C2-Phenanthrenes/Anthracenes	µg/L	0.05 U	0.05 U	0.05 U	0.05 U
C3-Chrysenes	µg/L	ND	ND	ND	ND
C3-Fluorenes	µg/L	0.5 U	0.5 U	0.5 U	0.5 U
C3-Naphthalenes	µg/L	**0.0351 J**	**0.0509 J**	**0.0557 J**	**0.0688 J**
C3-Phenanthrenes/Anthracenes	µg/L	0.02 U	0.02 U	0.02 U	0.02 U
C4-Chrysenes	µg/L	ND	ND	ND	ND
C4-Naphthalenes	µg/L	0.05 U	0.05 U	0.05 U	0.05 U
C4-Phenanthrenes/Anthracenes	µg/L	0.02 U	0.02 U	0.02 U	0.02 U
Indeno(1,2,3-c,d)pyrene	µg/L	0.002 U	0.002 U	0.002 U	0.002 U
Perylene	µg/L	0.005 U	0.005 U	0.005 U	0.005 U

Table 3-5
Summary of 2006-2008 Porewater Sampling and Laboratory Analysis Results

Notes:
Bold = Detected result
J = Estimated value
N = normal sample
ND = Compound analyzed, but not detected above detection limit
na = Compound not analyzed
PAH = polynuclear aromatic hydrocarbon
PCB = polychlorinated biphenyl
U = Compound analyzed, but not detected above detection limit
µg/L = micrograms per liter

Table 4-7
Summary of Sediment Volume Estimate Calculations

Core	Dredge Depth to OEL (centimetres)	Dredge Depth to OEL (metres)	Full Polygon Area (square metres)	Total Volume (cubic metres)
C-4	60	0.60	1,290.90	775
C-8	165	1.65	1,509.84	2,491
CAP-1M	150	1.50	1,668.30	2,502
CAP-2	100	1.00	2,313.59	2,314
CAP-8	10	0.10	2,592.06	259
MNR-2	10	0.10	2,064.64	206
MNR-1	10	0.10	991.76	99
MNR-5	10	0.10	1,245.67	125
MNR-6	10	0.10	1,906.13	191
MNR-4	10	0.10	2,860.53	286
MNR-3	10	0.10	1,374.41	137
C-30	0	0	1,628.13	0
CAP-5	0	0	2,723.56	0
C-18	0	0	1,670.16	0
C-12	60	0.60	2,069.14	1,241
CAP-9	100	1.00	700.98	701
C-7	100	1.00	818.58	819
CAP-3	0	0	2,040.20	0
C23	60	0.60	2,412.97	1,448
CAP-6	200	2.00	3,968.46	7,937
DA-1	100	1.00	1,829.41	1,829
101	50	0.50	915.48	458
105	150	1.50	672.79	1,009
109	50	0.50	1,236.31	618
C-33	100	1.00	1,511.58	1,512
C-32	125	1.25	1,301.44	1,627
CAP-7	20	0.20	1,942.18	388
C-27	50	0.50	2,042.79	1,021
C-22	225	2.25	2,881.49	6,483
CAP-4	270	2.70	2,673.95	7,220
C-11	150	1.50	1,503.22	2,255
CAP-10	240	2.40	1,189.44	2,855
C-6A	150	1.50	394.53	592
C-16A	207	2.07	1,549.16	3,207
11AQSC1	75	0.75	2,980.75	2,236
11AQSC2	179	1.79	4,608.23	8,249
C-3	100	1.00	3,159.22	3,159
C-21	100	1.00	1,658.11	1,658
CAP-11	100	1.00	1,025.79	1,026
C-20	105	1.05	2,584.83	2,714
C-26	100	1.00	1,839.27	1,839
Total Volume				**73,486**

Table 8-1
Step 1 - Preliminary Screening of General Response Actions, Rehabilitation Technologies, and Process Options

Process Option(s)	Description	Screening Result
GRA - No Further Action		
--	This technology consists of no additional actions taken to remediate sediments. Although treatment, engineering controls or institutional controls are not part of this technology, monitoring may be conducted.	This technology is not expected to result in additional protection of human health or the environment, but is retained as a baseline technology.
GRA – Monitoring		
Sediment and Water Quality Monitoring	Periodic visual observation and/or sediment and water field sampling and laboratory analysis would be used to monitor ADM conditions.	Retained as implementable
GRA – Institutional Controls		
Access restrictions	Constraints, such as fencing and signs, would be placed along river to limit access.	Already in place – waterway is owned and access is controlled by Alcoa
Consumption advisories	Advisories to indicate how consumption of some fish should be limited.	Already in place – waterway is owned and fishing is prohibited is controlled by Alcoa
Deed restrictions	Constraints would be placed on future ADM use.	Already in place – waterway is owned and present and future uses are controlled by Alcoa
GRA – Source Control		
Source Control	Constraints/controls placed on point sources to reduce discharges of contaminants to the ADM	Already in place – Alcoa has implemented source control measures starting in the 1980s/1990s that have resulted in a >99 % decrease in discharges of contaminants
GRA – Natural Recovery		
Sedimentation	Natural recovery processes include deposition of clean sediment over sediment containing PAHs and PCBs, and mixing of those sediments with cleaner sediment, thereby isolating contaminants from receptors and reducing the potential for resuspension, transport, and redeposition of PCBs/PAHs.	Retained as implementable.
Biological	Sediment contaminant toxicity and mobility are reduced by naturally occurring microbial processes in sediments.	Retained as implementable.

Table 8-1
Step 1 - Preliminary Screening of General Response Actions, Rehabilitation Technologies, and Process Options

Process Option(s)	Description	Screening Result
GRA – In Situ Containment		
Thin-layer Cover or Cap	Thin-layer covers and caps consist of relatively thin layers (approximately 6 inches) of clean soil or sand placed on contaminated sediments, usually in low hydraulic energy environments.	Retained as implementable.
Reactive Cover or Cap	Cover or cap containing reactive materials that sequester or sorb contaminants that may diffuse into cap.	Retained as implementable.
Engineered Materials Cap	Specialized materials with physical properties (e.g., low permeability) for application in areas with compatible environmental conditions. AquaBlok is an example of an engineered material, typically used in areas without significant ground water advection/uplift pressure.	Retained as potentially implementable.
Armored Cap	Cap augmented with relatively robust armor layer to resist dynamic hydrologic conditions (i.e., waves, propeller wash).	Retained as implementable.
Engineered Fill	Complete burial of contaminated sediments by construction of filled areas creating additional land areas.	Retained as implementable.
Asphalt Cap	Application of asphalt or concrete layer over sediment.	Retained as potentially implementable for limited application.
GRA - Sediment Treatment		
In situ		
Biodegradation	Enhancement of naturally occurring biodegradation of contaminants in sediments by addition of nutrients.	Not retained. Effectiveness is questionable for PCBs and for PAHs associated present in pitch.
Stabilization or solidification	Solidification of sediment matrix to immobilize contaminants by injection or mixing of additives (i.e., cement, binders).	Retained as potentially implementable for limited application.
Thermal	Use of high temperatures to volatilize and capture contaminants from the sediment matrix.	Not retained. Not implementable in submerged settings.
Extraction	Use of air, steam, or solvent flow through sediments to volatilize or otherwise liberate contaminants.	Not retained. Not implementable in submerged settings.
Chemical	Injection of solvents or other chemicals to detoxify or remove contaminants.	Not retained. Not implementable in submerged settings.
Ex Situ		
Stabilization/solidification	Solidification of sediment matrix to immobilize contaminants by injection or mixing of additives (e.g., Portland Cement, fly ash, coke breeze).	Retained as potentially implementable.

Table 8-1

Step 1 - Preliminary Screening of General Response Actions, Rehabilitation Technologies, and Process Options

Process Option(s)	Description	Screening Result
Thermal	Use of high temperatures to volatilize and capture contaminants from the sediment matrix. Thermal technologies include: • Low-temperature thermal desorption (LTTD) • High-temperature thermal desorption (HTTD) • Incineration High temperatures (1,200^{o} C) are required for PCB decontamination. High temperatures are achieved in HTTD and incineration. High temperatures are not achieved in LTTD. Public opposition to proposed thermal treatment of sediments containing PCBs has resulted in changing rehabilitation approaches from proposed incineration of sediment for projects in New Bedford, Massachusetts and Sydney, Nova Scotia.	HTTD and incineration retained as potentially implementable.
Physical extraction	Use of air or steam flow through soil to volatilize or otherwise liberate contaminants.	Not retained. Incompatible with sediment water content and pitch.
Chemical	Examples of chemical solvent extraction include: • Basic Extraction Sludge Treatment (BESTTM) - Solvent (having inverse miscibility in water) used to remove organics from solids. Sediment and solvent extractant are mixed in an extractor, dissolving the inorganic chemicals. The extracted solution is then placed in a separator, where the chemicals and extractant are separated for treatment and further use. • Low Energy Extraction Process (META LEEPSM) - Acetone, kerosene and other solvents are used to extract organic and inorganic chemical constituents from solids. • CF Systems® Solvent Extraction Process - Critical fluids and liquefied gases such as carbon dioxide, propane, or other liquid hydrocarbons used at high pressure to separate and extract PCBs from wastewater, sludge, sediment, and soil. • Terra Kleen Solvent Extraction - Solvent used to extract PCBs and other organics from sediments. The solvent is separated from the materials and reused. • Biotherm (former Carver-Greenfield) Process - Oil-soluble organic constituents extracted from sludge, soil, and sediment using a foodgrade carrier oil.	Not retained. Sediment pitch is likely to be resistant to chemical extraction processes.
Washing	Introduction of surfactants to sediment slurry to remove contaminants from matrix. An example is the Biogenesis Soil washing process which isolates individual particles and removes the adsorbed chemicals and naturally occurring organic material from fine-grained (silt and sand) sediment.	Not retained. Sediment pitch is likely to be resistant to washing processes.

Table 8-1
Step 1 - Preliminary Screening of General Response Actions, Rehabilitation Technologies, and Process Options

Process Option(s)	Description	Screening Result
Separation	Use of physical separation equipment (i.e., hydrocyclones, shaker tables, froth flotation, hydraulic sorters) to separate contaminants from sediment based on grain size or density characteristics.	Not retained. Bench-scale testing performed on ADM sediment indicated this was not likely to be effective at full-scale due to difficulty in physically separating pitch particles from sediment, and because pitch particles are present in most grain size fractions, including the coarser fractions which are typically lower in contaminant concentration.
GRA - Sediment Removal		
Dredging	Removal of sediment. Examples include: • Mechanical - remove bottom sediment by directly applying mechanical force to dislodge and excavate materials (e.g., clamshell). • Hydraulic - removal and transportation of bottom sediment in a liquid slurry form using hydraulic pumps (e.g., horizontal auger, Toyo pump, cutterhead dredge). • Pneumatic - Removal of bottom sediment by compressed air (e.g., PNEUMA pump).	Retained as implementable.
Excavation (in-the-dry)	Removal of sediment in the dry using mechanical equipment (during low tide in intertidal areas, using sheetpiling or cofferdams to enable dewatering in submerged areas).	Retained as potentially implementable for limited application.
GRA - Sediment Dewatering		
Filtration	Examples include: • Plate and frame filter press - Sediment slurry pumped into cavities formed by a series of plates covered by a filter cloth. Liquids are forced through filter cloth and dewatered solids collected in the filter cavities. • Belt filter press - Sediment slurry drops onto a perforated belt where gravity drainage takes place. Thickened solids are pressed between a series of rollers to further dewater solids. • Geotubes - Sediments are pumped into the geotubes and excess water drips through the small pores in the geotextiles, resulting in effective dewatering and volume reduction of the contaminated materials.	Retained as potentially implementable.
Centrifuge	Sediment slurry fed through a central pipe that sprays into a rotating bowl. Centrate discharges out the large end of the bowl and solids are removed from tapered end of the bowl by means of a screw conveyer.	Retained as potentially implementable.

Table 8-1
Step 1 - Preliminary Screening of General Response Actions, Rehabilitation Technologies, and Process Options

Process Option(s)	Description	Screening Result
Evaporator	Excess water evaporated from sediment slurry.	Retained as potentially implementable.
Hydrocyclone	Sediment slurry fed tangentially into a funnel-shaped unit to facilitate centrifugal forces necessary to separate solids from liquids. Dewatered solids collected and overflow liquid discharged.	Retained as potentially implementable.
Gravity settling	Sediment slurry enters thickener and settles into circular tank or settling basin. Sediment thickens and consolidates at the bottom of the tank. Pretreatment with chemical addition used to enhance settleability.	Retained as potentially implementable.
Freeze-thaw desiccation	Sediment is freeze-dried by alternate cycles of freezing which accumulates water in ice, and thawing, followed by gravity settling of solids and drainage of water.	Not retained. Process option requires stockpiling and covering of sediment, and reworking stockpile to maintain drainage paths for water. Infrastructure and multiple handling not feasible.
Solidification/stabilization	Drying agents (Portland Cement, lime, fly ash)	Retained as potentially implementable.
GRA - Water Treatment		
Gravity settling	Water is maintained in a quiescent state to allow solids to settle. Chemical flocculants may be added to promote settling of solids.	Retained as potentially implementable.
Filtration	Water is flowed through filtration media to reduce solids. Filtration media may include sand or engineered material	Retained as potentially implementable.
Carbon treatment	Water is flowed through activated carbon to remove organic and some inorganic contaminants.	Retained as potentially implementable.
GRA – Sediment Disposal		
Off-site Landfill Facility	Transport to and disposal of dredged and excavated material in appropriately-permitted facility.	Retained as implementable.
Off-site Confined Aquatic Disposal	Transport and placement of sediments in submerged disposal cell, covered by appropriate cover or cap layer.	Not retained. Sediment PCB and PAH concentrations are not consistent with Quebec ocean disposal regulations.
Off-site Reuse	Transport to an offsite facility and reuse of dredged and excavated material for fill or as building material.	Not retained. Reuse would be limited to industrial sites and would require sediment handling and transport after significant reduction in PAH and PCB concentrations to comply with Quebec regulations.
On-site Landfill Facility	Construction of landfill disposal facility onsite or near ABC facility for management and disposal of ADM dredged material.	Retained as potentially implementable.

Table 8-1
Step 1 - Preliminary Screening of General Response Actions, Rehabilitation Technologies, and Process Options

Process Option(s)	Description	Screening Result
On-site Confined Aquatic Disposal	Placement of sediments in submerged disposal cell, covered by appropriate cover or cap layer. Ability to permit is questionable.	Retained.
On-site CDF	Placement of removed sediments in appropriately confined (within a structure or engineered berm) disposal cell in uplands or adjacent to waterway.	Retained as implementable.
On-site Reuse	Disposal of sediments meeting applicable criteria in upland on-site areas.	Retained. Sediment would require significant reduction in PAH and PCB concentration to comply with Quebec regulations.

Note:
Technologies retained for further evaluation (see Section 8.2) are shaded gray.

Table 8-2
Step 2 - Screening of General Response Actions, Rehabilitation Technologies, and Process Options

General Response Action/Rehabilitation Technology	Process Option(s)	Effectiveness			Implementability		Relative Cost
		Ability to meet Rehabilitation Objectives	Implementation Effects	Is the Technology Proven and Reliable	Technical Feasibility	Administrative Feasibility	
No Further Action							
	--	Historic trends in sediment and biota concentration require further information to evaluate.	None	Reliable	Readily implementable	Readily implementable with no permits/ equipment required	Negligible
Monitoring							
	Sediment and Water Quality Monitoring	Historic trends in sediment and biota concentration require further information to evaluate.	None	Reliable	Readily implementable	Readily implementable with no permits/ equipment required	Low to Moderate
Institutional Controls							
	Access restrictions	Does not meet RAOs. Limits potential human access to ADM.	None	Reliable	Readily implementable	Readily implementable	Low
	Consumption advisories	Does not meet RAOs. Limits potential exposure routes based on reducing human consumption of ADM biota.	None	Reliable	Readily implementable	Readily implementable	Low
	Deed restrictions	Constraints would be placed on future ADM use.	None	Reliable	Readily implementable	Readily implementable	Low
Source Control							
	Source Control	Reduces PAH and PCB input to the ADM allowing natural recovery lessening the time to achieve rehabilitation objectives.	ABC facility source controls have been in place since 1980s and have significantly reduced PAH and PCB inputs to the ADM.	ADM BC facility source control measures have significantly reduced PCB and PAH inputs to the ADM.	Technically feasible based on current discharge requirements.	Implementable	Specific to source
Natural Recovery							
	Sedimentation	Reduces sediment PCB/PAH flux, resuspension of sediment contaminants, and shallow sediment PAH/PCB concentration through natural deposition and mixing.	None	Scientific literature and studies at other sites indicate this process is effective, often in combination with other technologies.	Readily implementable, requires further evaluation to determine extent to which this is naturally occurring in the Study Area	Natural processes, no permits, specialized equipment, or personnel are necessary.	Negligible

Table 8-2

Step 2 - Screening of General Response Actions, Rehabilitation Technologies, and Process Options

General Response Action/Rehabilitation Technology	Process Option(s)	Effectiveness			Implementability		Relative Cost
		Ability to meet Rehabilitation Objectives	Implementation Effects	Is the Technology Proven and Reliable	Technical Feasibility	Administrative Feasibility	
	Biological	Biodegradation breaks down PCBs and PAHs in sediment, eventually resulting in reduced toxicity. Not likely to achieve prompt reduction of PCBs or high molecular weight PAHs sediment, but together with other natural processes could result in eventual reduction in PCB/PAH bioavailability and transport, which would result in eventual achievement of rehabilitation objectives. However, this process is not expected to be an important near-term process at this site.	None	Scientific literature and studies at other sites indicate this process may be effective in the longer term, often in combination with other technologies. This process does not generally result in short term reduction in PCB/high molecular weight PAH sediment concentrations.	Readily implementable, naturally occurring	Natural processes, no permits, specialized equipment, or personnel are necessary.	Negligible
In situ Containment							
	Thin-layer Cover or Cap	Meets rehabilitation objectives in areas where sediment conditions are stable by reducing sediment PCB/PAH flux, resuspension of sediment contaminants, and shallow sediment PAH/PCB concentration through deposition of thin layer capping material and mixing.	Experience at other sites indicates impacts on water quality are minimal. Truck and/or barge traffic to deliver capping material to the site requires coordination with local traffic and ABC facility operations. Short term impacts to benthic community are expected.	Reliable for areas where sediment is stable and natural restoration is occurring.	Readily implementable	Permits are required. Specialized equipment and trained personnel are required for cap construction.	Low to Moderate
	Reactive Cover or Cap	Reduces sediment PCB/PAH flux to the water column by absorbing, retarding, or treating PCB/PAH in shallow sediment porewater. Higher reactive capacity (compared to earthen materials) allows placement of thin layer of reactive material. Used in combination with anchoring/armoring layer. Some products are in particulate form (e.g., activated carbon), others in geosynthetics (e.g., reactive core mats)	Experience at other sites indicates impacts on water quality are minimal, and are typically lower than for earthen materials. Truck and/or barge traffic to deliver capping material to the site requires coordination with local traffic and ABC facility operations. Short term impacts to benthic community are expected. Longer term effects are typically mitigated by placing a thin layer of sand over the cap.	Has been demonstrated at other sites, typically used in smaller areas.	Implementable	Permits are required. Specialized materials, equipment, and trained personnel are required for cap construction.	Moderate to High

Table 8-2

Step 2 - Screening of General Response Actions, Rehabilitation Technologies, and Process Options

General Response Action/Rehabilitation Technology	Process Option(s)	Effectiveness			Implementability		Relative Cost
		Ability to meet Rehabilitation Objectives	Implementation Effects	Is the Technology Proven and Reliable	Technical Feasibility	Administrative Feasibility	
	Engineered Materials Cap	Reduces sediment PCB/PAH flux to the water column by retarding movement of PCB/PAH in shallow sediment porewater. Similar to reactive cover or cap, includes low permeability, gas vent layers, or other physical barrier materials. Used in combination with anchoring/armoring layer. Some products are in particulate form (e.g., AquaBlok), others in geosynthetics (e.g., flexible membrane liners).	Experience at other sites indicates impacts on water quality are minimal, and are typically lower than for earthen materials. Truck and/or barge traffic to deliver capping material to the site requires coordination with local traffic and ABC facility operations. Short term impacts to benthic community are expected. Longer term effects are typically mitigated by placing a thin layer of sand over the cap.	Has been demonstrated at other sites, typically used in smaller areas.	Implementable	Permits are required. Specialized materials, equipment, and trained personnel are required for cap construction.	Moderate to High
	Armored Cap	Should be effective in reducing PAH/PCB flux to the water column and downstream PCB loading to achieve RAOs. This option would be selectively applied in areas where additional cap stability may be required (i.e., erosion prone areas) and would need to be used in combination with other process options to achieve rehabilitation objectives.	Experience at other sites indicates impacts on water quality are minimal. Truck and/or barge traffic to deliver capping material to the site requires coordination with local traffic and ABC facility operations. Short term impacts to benthic community are expected.	Has been demonstrated at other sites.	Implementable	Permits are required. Specialized materials, equipment, and trained personnel are required for cap construction.	Moderate to High
	Engineered Fill	Should be effective in limiting access to and stabilizing sediment PAH/PCB. May be applied in combination with other process options to achieve rehabilitation objectives.	Experience at other sites indicates impacts on water quality are minimal. Truck and/or barge traffic to deliver capping material to the site requires coordination with local traffic and ABC facility operations. Sub-aqueous benthic community is eliminated.	Has been demonstrated at other sites.	Implementable, but requires coordination with ABC facility operations to minimize interference with waterfront operations.	Permits are required. Specialized materials, equipment, and trained personnel are required for cap construction. Mitigation for lost/changed habitat is likely to be required.	Moderate
	Asphalt Cap	Should be effective in limiting access to and stabilizing sediment PAH/PCB. Applied in combination with other process options to achieve rehabilitation objectives.	Not typically placed in areas that are natural habitat.	Proven at other sites.	Implementable, requires maintenance.	Permit requirements are dependent on location of cap placement. Equipment and trained personnel are readily available.	Low to moderate

Table 8-2

Step 2 - Screening of General Response Actions, Rehabilitation Technologies, and Process Options

General Response Action/Rehabilitation Technology	Process Option(s)	Effectiveness			Implementability		Relative Cost
		Ability to meet Rehabilitation Objectives	Implementation Effects	Is the Technology Proven and Reliable	Technical Feasibility	Administrative Feasibility	
Sediment Treatment							
In situ							
	Stabilization/solidification	Should be effective in limiting access to and stabilizing sediment PAH/PCB. Applied in combination with other process options to achieve rehabilitation objectives and in limited areas, e.g., in proximity to nearshore structures to limit destabilizing of structures.	Short-term water quality impacts typically require extensive containment systems to limit potential impacts to immediate s/s area. Benthic habitat requires restoration after s/s is completed.	Proven at other sites.	Implementable. Use is limited to maintaining nearshore structural stability, and is not used in areas that may require future navigational dredging.	Permits are required. Specialized materials, equipment, and trained personnel are required for sub-aqueous s/s. Mitigation for lost/changed habitat is likely to be required.	Moderate to high
Ex Situ							
	Stabilization/solidification	Does not meet rehabilitation objectives alone, but may be considered in conjunction with other technologies to form potential rehabilitation actions (e.g., removal, dewatering, disposal, residuals management) that eventually would be expected in combination to meet rehabilitation objectives.	Reduces mobility of sediment PCBs/PAHs, but increases disposal volume. Potential safety concerns during material transport, handling, and processing would be managed through implementation of a HASP. Also may reduce water content.	Process option has been shown to be effective ex situ and demonstrated full scale at other sites. Commonly used to reduce free moisture for disposal purposes.	Implementable. Space is required for s/s mixing agents, stockpiling sediment before and after mixing.	Implementable.	Moderate
	Thermal	Does not meet rehabilitation objectives alone, but may be considered in conjunction with other technologies to form potential rehabilitation actions (e.g., removal, dewatering, disposal, residuals management) that eventually would be expected in combination to meet rehabilitation objectives.	Potential impacts could be mitigated through use of engineering controls. Extraction residuals may have limited disposal options. Emissions data collected during full-scale operations of similar thermal processes have indicated that emissions may be an issue. Risk of release and potential exposures increased due to additional material transport, handling, and processing.	Reliability has been site-dependent. Site-specific tests would be required to evaluate effectiveness.	High temperature thermal desorption or incineration are required for PCBs. Sediment water and pitch content are problematic – water content for dredged material typically requires reduction prior to effective thermal treatment, and presence of pitch could require prolonged processing to destroy pitch. Requires specialized equipment, materials, and operating personnel.	Permits are required. May be able to combine with proposed ABC soil rehabilitation project. Some projects have met significant public opposition to thermal processing of sediment.	High

Table 8-2
Step 2 - Screening of General Response Actions, Rehabilitation Technologies, and Process Options

General Response Action/Rehabilitation Technology	Process Option(s)	Effectiveness			Implementability		Relative Cost
		Ability to meet Rehabilitation Objectives	Implementation Effects	Is the Technology Proven and Reliable	Technical Feasibility	Administrative Feasibility	
Sediment Removal							
Dredging	Mechanical	Ability to meet rehabilitation objectives is dependent on post-dredging residual PCB/PAH concentrations achieved and degree of PCB/PAH releases during dredging. Based on ADM characteristics, it is anticipated that dredging would need to be combined with other process options such as onsite dredged material disposal and capping to meet rehabilitation objectives.	Would disturb/remove benthic habitat, may result in increased residual PCB/PAH concentrations at locations where higher PCB/PAH concentrations exist at depth and/or release of PCBs/PAHs during rehabilitation activities. Should large sediment volumes be removed/dewatered, the potential impacts on ABC facility operations must be considered. Potential risk of release and exposure also exists during material transport, handling, and processing.	Has been applied at other locations worldwide. Post-dredging residuals and releases during dredging are difficult to predict. Typically used for removal of boulders/debris.	Implementable	Permits are required. Similar to any marine activity associated with rehabilitation, must be coordinated with the ABC facility waterfront operations.	Moderate
	Hydraulic	Ability to meet rehabilitation objectives is dependent on post-dredging residual PCB/PAH concentrations achieved and degree of PCB/PAH releases during dredging. Based on ADM characteristics, it is anticipated that dredging would need to be combined with other process options such as onsite dredged material disposal and capping to meet rehabilitation objectives.	Would disturb/remove benthic habitat, and may result in increased residual PCB/PAH concentrations at locations where higher PCB/PAH concentrations exist at depth and/or release of PCBs/PAHs during rehabilitation activities. Typically resuspends less sediment than mechanical dredging. Should large sediment volumes be removed/dewatered, large staging/disposal areas would be required. Potential risk of release and exposure also exists during material transport, handling, and processing.	Has been applied at other locations worldwide. Post-dredging residuals and releases during dredging are difficult to predict. Typically requires combining with mechanical for removal of boulders/debris.	Implementable. Presence of debris and requirement to manage large volumes of water compared to mechanical dredging) will limit effectiveness/ implementability. Would need to be combined with mechanical removal to manage debris known to exist at the site, and to limit water generation when space restrictions are constraining.	Permits are required. Similar to any marine activity associated with rehabilitation, must be coordinated with the ABC facility waterfront operations.	Moderate

Table 8-2
Step 2 - Screening of General Response Actions, Rehabilitation Technologies, and Process Options

General Response Action/Rehabilitation Technology	Process Option(s)	Effectiveness			Implementability		Relative Cost
		Ability to meet Rehabilitation Objectives	Implementation Effects	Is the Technology Proven and Reliable	Technical Feasibility	Administrative Feasibility	
	Pneumatic	Ability to meet rehabilitation objectives is dependent on post-dredging residual PCB/PAH concentrations achieved and degree of PCB/PAH releases during dredging. Based on ADM characteristics, it is anticipated that dredging would need to be combined with other process options such as onsite dredged material disposal and capping to meet rehabilitation objectives.	Would disturb/remove benthic habitat, and may result in increased residual PCB/PAH concentrations at locations where higher PCB/PAH concentrations exist at depth and/or release of PCBs/PAHs during rehabilitation activities. Typically resuspends sediment similar to hydraulic dredging. Should large sediment volumes be removed/dewatered, large staging/disposal areas would be required. Potential risk of release and exposure also exists during material transport, handling, and processing.	Not widely used, especially for environmental dredging. Postdredging residuals and releases during dredging are difficult to predict.	Implementable. Requires adequate water depth for operation. Sufficient water depth is available in the ADM, except for certain nearshore areas. The presence of debris may limit effectiveness/ implementability. Would need to be coupled with mechanical removal to manage debris known to exist at the site.	Permits are required. Similar to any marine activity associated with rehabilitation, must be coordinated with the ABC facility waterfront operations. Availability of equipment locally is limited.	High
Excavation (in-the-dry)	Mechanical	Ability to meet RAOs is dependent on post-dredging residual PCB/PAH concentrations achieved and degree of PCB/PAH release during excavation. It is anticipated that excavation would need to be combined with other process options, such as capping, to achieve rehabilitation objectives.	Risks to workers are greater due to the need to work within a dewatered structure below the water surface elevation. Can better handle debris. Greater removal precision than dredging through water column. Would disturb/remove benthic habitat. Less potential for PCB/PAH release than other removal methods with possible exception of overtopping/failure of dewatered structure. Should large sediment volumes be removed/dewatered, the high volume of truck traffic in the area must be considered. Potential risk of release and exposure also exists during material transport, handling, and processing.	Typically applied on a small scale to address localized areas of affected sediment. However, experience at other sites indicates that residual concentrations exist at highly variable levels even in "dry conditions."	Questionable due to water depths and coastal hydraulics. ABC facility shipping operations limit the safe use of fixed structures in the ADM, even for short-term use.	Permits are required. Similar to any marine activity associated with rehabilitation, must be coordinated with the ABC facility waterfront operations.	High (due to the efforts involved with dewatering structure construction and attempts to keep work area dry).

Table 8-2
Step 2 - Screening of General Response Actions, Rehabilitation Technologies, and Process Options

General Response Action/Rehabilitation Technology	Process Option(s)	Effectiveness			Implementability		Relative Cost
		Ability to meet Rehabilitation Objectives	Implementation Effects	Is the Technology Proven and Reliable	Technical Feasibility	Administrative Feasibility	
Sediment Dewatering							
Filtration	Plate and Frame Filter Press	Does not meet rehabilitation objectives on its own, but may be necessary for removed sediments that are high in water content prior to subsequent management.	Minimal, assuming waste streams are properly managed. Possible worker exposure to PCB/PAH containing sediment and water. Treated water likely would be discharged back to ADM.	Reliable, with proper pre-treatment steps. A site-specific study would be required to assess dewatering effectiveness.	Implementable	Implementable	Moderate
	Belt Filter Press	Does not meet rehabilitation objectives on its own, but may be necessary for removed sediments that are high in water content prior to subsequent management.	Minimal, assuming waste streams are properly managed. Possible worker exposure to PCB/PAH containing sediment and water. Treated water likely would be discharged back to ADM.	Reliable, with proper pre-treatment steps. A site-specific study would be required to assess dewatering effectiveness.	Implementable	Implementable	Moderate
	Geotubes	Does not meet rehabilitation objectives on its own, but may be necessary for removed sediments that are high in water content prior to subsequent management.	Minimal, assuming waste streams are properly managed. Possible worker exposure to PCB/PAH containing sediment and water. Treated water likely would be discharged back to ADM.	Reliable, with proper pre-treatment steps, but used typically with hydraulic dredging.	Potentially implementable; use of geotubes would require addressing issues such as capacity, need for stabilization of sediment required for other process options.	Implementable	Moderate
Centrifuge	Solid bowl	Does not meet rehabilitation objectives on its own, but may be necessary for removed sediments that are high in water content prior to subsequent management.	Minimal, assuming waste streams are properly managed. Possible worker exposure to PCB/PAH containing sediment and water. Treated water likely would be discharged back to ADM.	Experience on other sites has been that frequent maintenance was required and operational difficulties occurred. A site-specific study would be required to assess dewatering effectiveness.	Implementable	Implementable	Moderate
Evaporator	Evaporator	Does not meet rehabilitation objectives on its own, but may be necessary for removed sediments that are high in water content prior to subsequent management.	Minimal, assuming waste streams are properly managed. Possible worker exposure to PCB/PAH containing sediment and water. Treated water likely would be discharged back to ADM.	Reliable. A site-specific study would be required to assess treatment effectiveness.	Implementable; may produce drier solid fraction than required, not typically used for sediment dewatering.	Implementable	High

Table 8-2
Step 2 - Screening of General Response Actions, Rehabilitation Technologies, and Process Options

General Response Action/Rehabilitation Technology	Process Option(s)	Effectiveness			Implementability		Relative Cost
		Ability to meet Rehabilitation Objectives	Implementation Effects	Is the Technology Proven and Reliable	Technical Feasibility	Administrative Feasibility	
	Hydrocyclone	Does not meet rehabilitation objectives on its own, but may be necessary for removed sediments that are high in water content prior to subsequent management.	Minimal, assuming waste streams are properly managed. Possible worker exposure to PCB/PAH containing sediment and water. Treated water likely would be discharged back to ADM.	Experience at other sites indicates this is a reliable technology.	Results from other sites indicates most effective on sediment with relatively higher coarse particle content (i.e., sand) and solids content 5 to 25%.	Implementable	Moderate
Gravity settling	Thickener or settling basin	Does not meet rehabilitation objectives on its own, but may be necessary for removed sediments that are high in water content prior to subsequent management.	Minimal, assuming waste streams are properly managed. Possible worker exposure to PCB/PAH containing sediment and water. Treated water likely would be discharged back to ADM.	Reliable, based on engineering testing that included field dewatering testing and column settling testing (see Appendix B)	Implementable	Implementable	Low
Water Treatment							
	Filtration	Does not meet rehabilitation objectives alone, but can be used in conjunction with other technologies to form rehabilitation actions (e.g., removal, dewatering, disposal) that eventually would be expected to meet rehabilitation objectives. Could be applied to aqueous-based residuals from sediment treatment technologies or water generated during sediment dewatering.	Minimal, assuming waste streams are properly managed. Possible worker exposure to PCB/PAH containing sediment and water.	Reliable, with pre-treatment steps.	Implementable	Implementable	Low to Moderate
	Carbon treatment	Does not meet rehabilitation objectives alone, but can be used in conjunction with other technologies to form rehabilitation actions (e.g., removal, dewatering, disposal) that eventually would be expected to meet rehabilitation objectives. Could be applied to aqueous-based residuals from sediment treatment technologies or water generated during sediment dewatering.	Minimal, assuming waste streams are properly managed. Possible worker exposure to PCB/PAH containing sediment and water. Spent carbon would require proper disposal.	Activated carbon commonly used for water treatment.	Implementable	Implementable	Low to Moderate
Off-Site Sediment Disposal							
	Existing Off-site Landfill Facility	Transport to and disposal of dredged and excavated material in appropriately-permitted facility.	Retained as potentially implementable.	Reliable, with pre-treatment steps to prepare sediment for transport and disposal.	Implementable. Depends on landfill location, permitted waste, availability, and capacity.	Implementable	High

Table 8-2
Step 2 - Screening of General Response Actions, Rehabilitation Technologies, and Process Options

General Response Action/Rehabilitation Technology	Process Option(s)	Effectiveness			Implementability		Relative Cost
		Ability to meet Rehabilitation Objectives	Implementation Effects	Is the Technology Proven and Reliable	Technical Feasibility	Administrative Feasibility	
	Construct Off-site Landfill Facility	Construct landfill cell in accordance with Quebec requirements for Class D soil. Transport to and disposal of dredged and excavated material in appropriately-permitted facility.	Not retained	Reliable, with pre-treatment steps to prepare sediment for transport and disposal.	Implementable, complicated by need to acquire land and permit facility	Requires permits	High
On-Site Sediment Disposal							
	On-site Contained Aquatic Disposal	Placement of sediments in submerged disposal cell, covered by appropriate cover or cap layer.	Not retained	Reliability is site-dependent.	Requires significant space to accommodate deep sediment removal to accommodate placement of dredged material and capping. Space constraints and presence of wharf structures within the ADM limit the ability to dredge to a depth required for disposal/capping, and sediment removed from the CAD cell may be difficult to dispose in open ocean.	Implementable. Requires environmental permits.	High
	On-site Nearshore CDF	Placement of removed sediments in appropriately confined (within a structure or engineered berm) disposal cell in uplands or adjacent to waterway.	Retained as implementable.	This technology has been demonstrated reliable on other sites.	Implementable.	Implementable. Requires environmental permits.	Moderate
	On-site Reuse	Disposal of sediments meeting applicable criteria in upland on-site areas.	Not retained. Sediment would require significant reduction in PAH and PCB concentration to comply with Quebec regulations.	This technology has been demonstrated reliable on other sites.	Requires reduction in sediment contaminant concentrations to levels below upland soil. A reduction of this magnitude is not likely feasible.	Implementable. Requires environmental permits.	High
	On-site Landfill Facility	Construction of landfill disposal facility onsite or near ABC facility for management and disposal of ADM dredged material.	Not retained due to lack of space and location on the facility site with adequate capacity and suitable subsurface conditions for construction.	Reliable, with pre-treatment steps to prepare sediment for transport and disposal.	Implementable. Requires extensive site preparation to accommodate facility.	Implementable. Requires environmental permits.	High

Notes:
Technologies retained for further evaluation (see Section 8.2) are shaded gray.
Costs are relative to other process options within each general response action.

Table 8-3
Representative Process Options

General Response Action/Rehabilitation Technology	Representative Process Option
A) No Further Action	No further action
B) Monitoring	Sediment and water quality monitoring
C) Institutional Controls	• Access restrictions • Consumption advisories • Deed restrictions
D) Source Control	Source control
E) Natural Recovery	• Sedimentation • Biological degradation
F) In Situ Containment Capping	• Armored cap • Engineered fill
G) Sediment Treatment Ex Situ Treatment	Stabilization/solidification
H) Sediment Removal Dredging	Mechanical
I) Sediment Dewatering	To be determined during rehabilitation design
J) Water Treatment	To be determined during rehabilitation design
K) Off-Site Sediment Disposal	Retained
L) On-Site Sediment Disposal	Nearshore confined disposal facility

Table 8-4
Quebec MDDEP Matrix for Managing Contaminated Soil

Degree of Contamination	Management Options
< Critèrion A	• Use without restriction.
From A – B	• Use as backfill on contaminated land for residential purposes in the process of rehabilitation or road commercial or industrial, provided that their use does not have the effect of increasing contamination of receiving site* and, moreover, for land for residential purposes, the soils do not emit perceptible hydrocarbon odors. • Use as a daily cover material in a landfill. • Use as a final cover material in landfill provided final cover material is capped with 15 centimetres of clean soil.
From B – C	• Decontaminate** in an authorized treatment facility and manage according to the level of treatment acheived. • Use as backfill on the site of origin, provided that their use does not have the effect of increasing contamination in the area the materials are placed, and the use of that land is commercial or industrial. • Use as a daily cover material in landfill.
> Critèrion C	• Decontaminate** in an authorized treatment facility and manage according to the level of treatment achieved. • If the previous option is not practical, final disposal is required in a secure landfill authorized to receive the material.
From A – B	• Use without restriction.

Notes:
Contaminated land for residential purposes that is in the process of rehabilitation are those dedicated to residential use including a characterization showing contamination above criterion B and where the contribution of soil from the outside will be required at restoration.
*Contamination refers to the nature of the contaminants and their concentration.
**Optimal treatment is defined for all contaminants reaching the criterion B or 80% reduction of the initial concentration and volatile organic compounds (VOCs) that are criterion B. VOCs are defined as contaminants whose boiling point is less than 180 degrees Celsius or Henry's Law constant is greater than 6.58 x 10 7 atmospheres-metres^3/grams including contaminants identified in Section III of the soil criteria included in Appendix 2 of the *Policy soil protection and contaminated land*.

Source: MDDEP (2002)

Table 8-5
Characteristics of the Principal Types of Dredges used in the St. Lawrence Region

	Mechanical Dredges				Hydraulic Dredges			
	Clamshell Dredge	**Spoon Dredge**	**Hydraulic Excavator**	**Bucket Dredge Pump (Amphibex™)**	**Vacuum Dredge**	**Cutterhead Suction Dredge**	**Hopper Dredge**	**Horizontal Auger (Mud Cat™)**
Material types	Fine sediment, sand, gravel	Soft sediment, broken rock	All types	All types	Mud, sand, gravel	Mud, sand, gravel	Sand, non-cohesive sediment	Fine sediment
Maximum water depth (metres)	12 m	12 m	12 m	6 m	12 m	12 m	12 m	6 m
Dredging precision under normal working conditions (minimal waves and wind)	35 - 50 cm	35 - 50 cm	10 cm	10 cm	10 to 20 cm	10 à 20 cm	Vertical: 0.5 to 1 m Horizontal: 3 to 10 m	10 to 20 cm
Reported production rates under normal working conditions (minimal waves and wind)	30 to 500 m^3/h	30 to 200 m^3/h	30 to 200 m^3/h	~100 m^3/h	50 to 1000 m^3/h	50 to 100 m^3/h	50 to 500 m^3/h	100 m^3/h
Relative resuspension potential under normal working conditions (minimal waves and wind)	Average	Moderate	Average	Average	Low	Low	Moderate	Moderate
Water content of dredged material	Low	Low	Low	Average	High	High	High	High
Dredged material transport	Barge, truck	Barge, truck	Barge, truck	Barge, truck, pipeline	Pipeline	Pipeline	Combination	Pipeline

Source: Alliance Environnement (2004)

cm = centimeter
h = hour
m = metre
m^3 = cubic metres

Table 8-6
Principal Advantages and Disadvantages of Mechanical Dredges used in the St. Lawrence Region

	Advantages	Disadvantages
General	• Low reworking of excavated materials for high solids and low water contents • Minimum facilities required for the transport, processing, and reusing of materials • Ability to work safely near docks and other structures • Effective removal of sediments near the shore or in the floodplain • Flexibility in removing unconsolidated materials in the presence of obstacles or debris • Unit costs are generally lower than hydraulic dredges for dredging small volumes of sediment • Good accuracy dredging in shallow waters • Facilitates transport over long distances of dredged material • Can remove debris	• Relatively low production rate and decreasing with depth • Rate of sediment resuspension is relatively high • Low efficiency in loose sediments or if debris is present • Additional handling required when open water disposal is not an option for dredged material • Safety of the crew (possibility of increased exposure to contaminated materials)
Clamshell	• Maneuverability • Can remove debris • Relatively low water content in dredged material • Dredging possible in relatively deep water, but accuracy is limited	• Resuspension potential is medium to high, especially in very loose, non-cohesive materials
Spoon dredge	• Stable working platform • Efficient for excavation of dense, hard materials	• Operation is difficult in bad weather and high waves • Low production rate • Resuspension potential is medium to high, especially in very loose, non-cohesive materials
Hydraulic excavator	• Stable working platform • Efficient for excavation of dense, hard materials • Stability of the pontoon • Provides relatively high precision	• Operation is difficult in bad weather and high waves • Low production rate • Resuspension potential is medium to high, especially in very loose, non-cohesive materials

Source: Alliance Environnement (2004) and USEPA (2005)

Table 8-7
Principal Advantages and Disadvantages of Hydraulic Dredges used in the St. Lawrence Region

	Advantages	Disadvantages
General	• High production rate • Use less dependent on working conditions • Lessens potential exposures for workers via use of pipeline transport for dredged material • Unit costs are generally lower for the excavation of large volumes than for mechanical dredges	• High water content of excavated material (80 to 90%) • Large area required for dredged material management and water treatment • Limited effectiveness when debris is present • Dredge and pipeline can be an obstacle to navigation • Presence of gas in the sediments may affect the operation of pumps • Noise level sometimes problematic
Vacuum dredge	• High efficiency in fine and loose sediments	• Difficult to separate contaminated from underlying less contaminanted sediment
Cutterhead suction dredge	• Compatible with a wide range of materials • Accurate and consistent removal if sediment conditions are consistent	• Resuspension potential high if pumping power does not match agitation of sediment
Hopper dredge	• Relatively effective in rougher working conditions • Limited obstruction to navigation • Transporting over long distances possible	• Limited to non-contaminated dredged sand that can be discharged into open water (usually reserved for large dredge volumes in the navigation channel of the St. Lawrence) • Depth of dredging limited by the draft of the boat and suction hopper • Needs deepening (several passages to achieve desired dredge depth)
Horizontal auger (Mud Cat™)	• Small size (easy to transport and can work in confined spaces)	• Moderate production • Causes some resuspension particularly at the ends of the auger • Maximum depth of dredging limited to 6 metres • Sensitivity to winds and currents requires frequent repositioning

Source: Alliance Environnement (2004) and USEPA (2005)

Table 8-8
Principal Advantages and Disadvantages of Environmental Dredges used in the St. Lawrence Region

Dredge Type	Advantages	Disadvantages
Bucket Dredge Pump (Amphibex™)	• Low loss of material during dredging and transport • Small size (easy transportation by truck and can work in confined and low access locations) • Costs of mobilization/demobilization are low and manning requirements are low • Provides capacity to produce level surface • Wide variety of uses • Ability to effectively recover contaminated materials • Good control of the volume to be dredged, reducing overdredging • Percentage of dredged sediments is much higher than other conventional hydraulic dredges because the pumps are designed to push the sediment rather than to suction, which has advantages for dredged material management, dewatering, and production rate	• Moderate production rate • Maximum depth of dredging limited to 6 metres • Need to construct dewatering facilities • Requires significant maintenance and cleaning
Cable Arm™ Clamshell	• Low resuspension, depending on sediment type and working conditions • Minimizes the amount of water during dredging • High recovery of contaminated sediments and reduction of overdredging with the use of positioning software Clam Vision™ • Provides capacity to produce level surface (Level-Cut®)	• Limited effectiveness when debris is present
Groupe Océan Dredge (in development)	• To be determined	• To be determined

Source: Alliance Environnement (2004) and Cable Arm Inc. (2004)

FIGURES

NOTES:
1. Horizontal Datum: NAD 83 MTM 6, Meters.
2. Base data acquired from Natural Resources Canada, National Topographic Data Base website.
3. Vicinity map data provided by BING web services via ESRI.

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ANCHOR QEA

Figure 1-1
Site Location Map
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

A:\CAD - Boston\PROJECTS\090002-03 - BAIE COMEAU\2013 Projects\AofA\A of A Figures\ANC-BAIE-COMEAU-AofA_Fig_1-2.dwg Figure 1-2 (ENG)

Jun 13, 2013 9:22am dbinkney

SOURCE: Aerial Photo by XEOS Imaging Inc., 2009.
HORIZONTAL DATUM: MTM Fuseau 6, NAD83, metres.
VERTICAL DATUM: Chart Datum, metres.

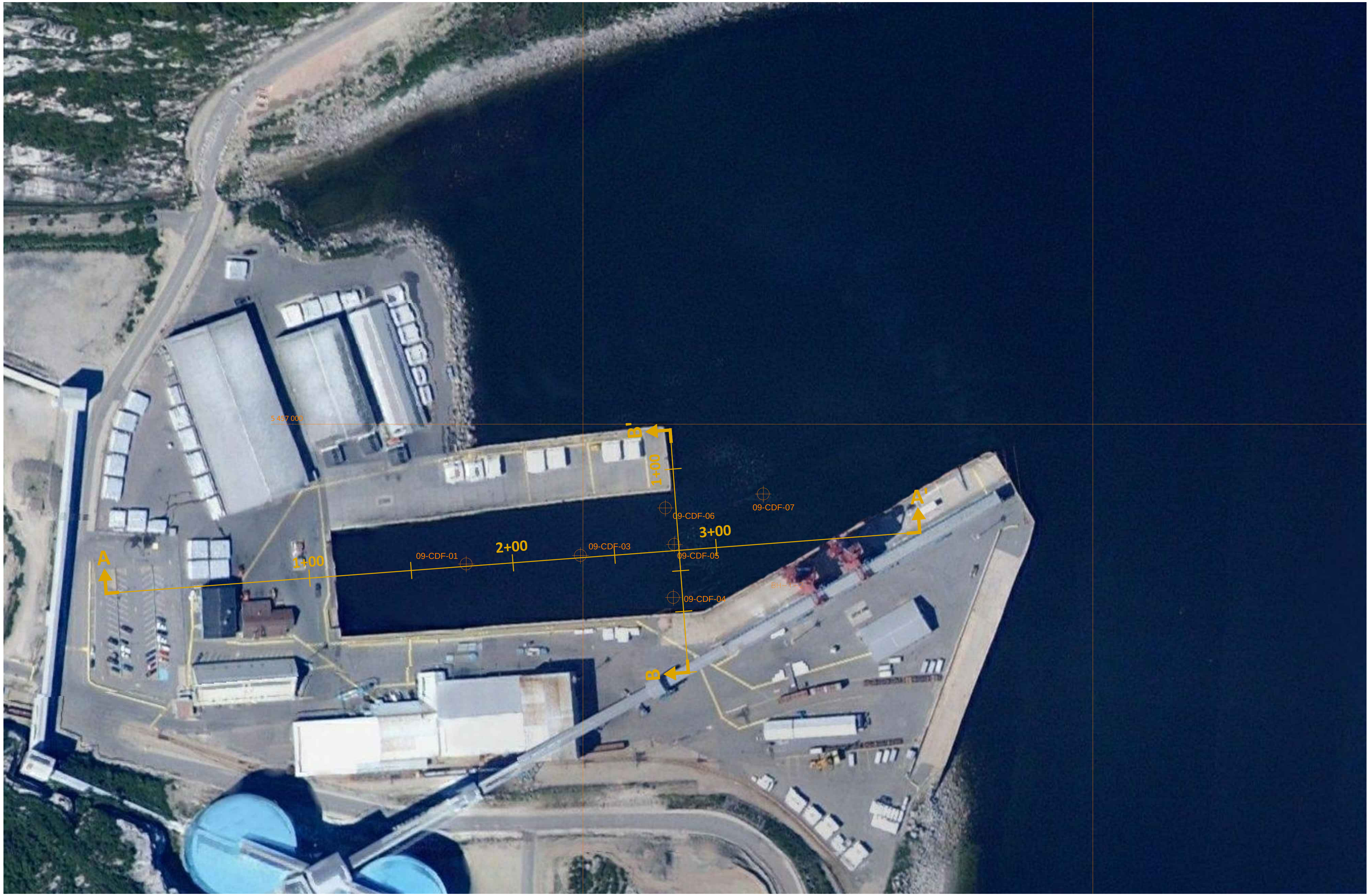
NOTES:
1. Basemap provided by Hatch Engineering, Inc.
2. Alignments of proposed remedial areas should be considered approximate, and subject to change.
3. Depicted bathymetric contours represent 2011 conditions. Survey data provided by Genivar.

0 50 100 150
Scale in Metres

ANCHOR QEA

Figure 1-2
Site Location/Layout Map
Analysis of Rehabiliatation Alternatives
Alcoa, Baie-Comeau, Québec

Jun 13, 2013 9:46am mcarlino C:\Users\mcarlino\appdata\local\temp\AcPublish_7856\ANC-BAIE-COMEAU-AofA_Fig_2-English.dwg Figure 2-1



LEGEND:

⊕ 09-CDF-07 Boring Location

A A' Cross Section Location

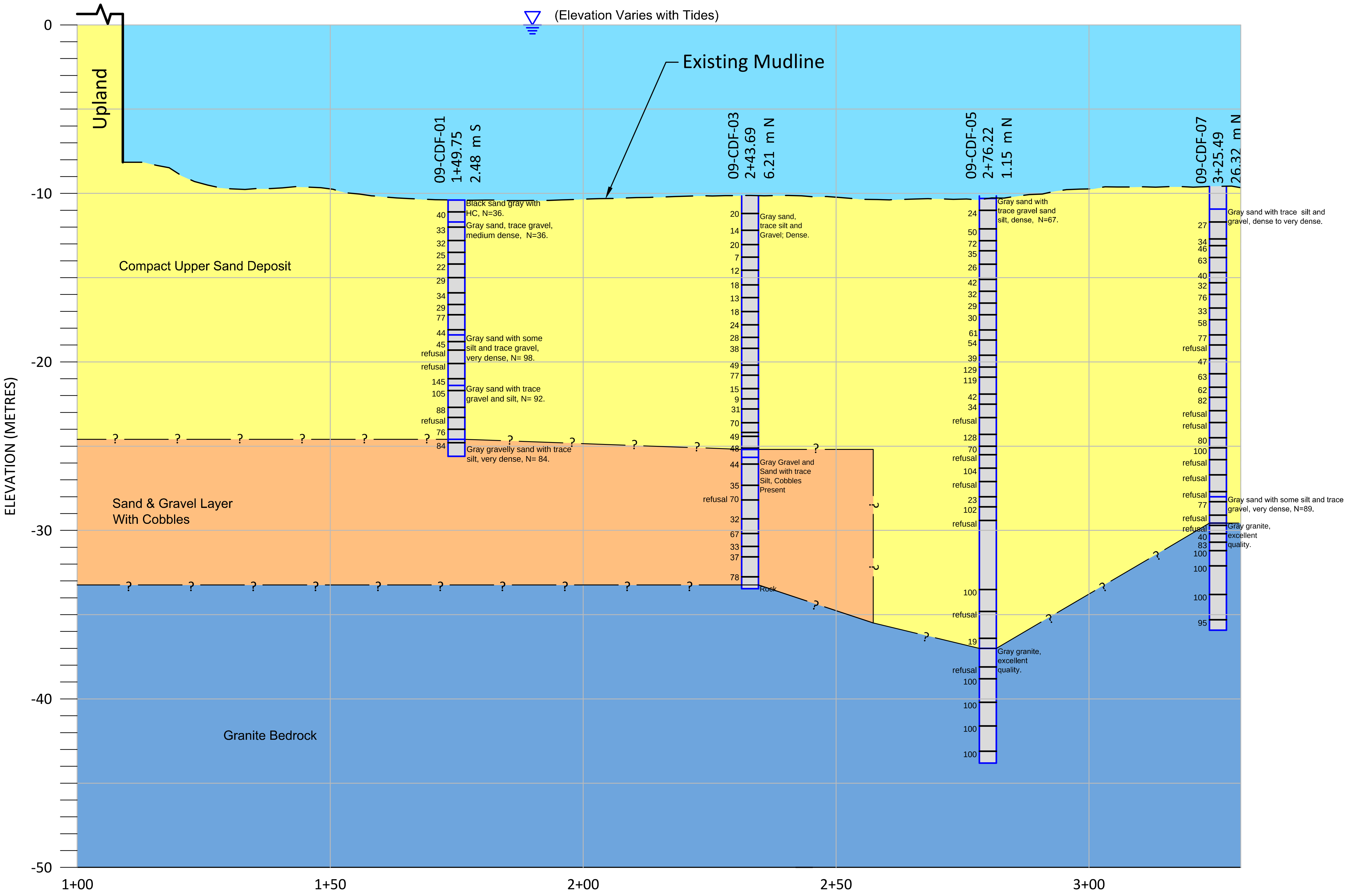
SOURCE: Drawing prepared from Hatch Engineering drawing entitled "Wharf Extension Geotechnical Investigations Proposed Borehole Locations", dated June 9, 2009. Aerial photo provided by XEOS Imaging, Inc.

HORIZONTAL DATUM: California State Plane Zone 6, NAD83.
VERTICAL DATUM: mean lower low water (MLLW).

0 50
Scale in Meters

ANCHOR QEA

Figure 2-1
Cross Section Location Plan
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec



SECTION A-A'

LEGEND:

🟨 Compact Upper Sand Deposit

🟧 Sand & Gravel Layer (With Cobbles Where Present)

🟦 Granite Bedrock

—?— Interpolated Stratigraphy Boundary

N/RQD VALUE	BORING	DESCRIPTION
8	▯	Gray SAND w/trace Silt
100	▯	Gray granite
refusal	▯	

SOURCE: Drawing prepared from Hatch Engineering drawing entitled "Wharf Extension Geotechnical Investigations Proposed Borehole Locations", dated June 9, 2009. Bathymetry from Entreprises Normand Juneau, Inc. (ENJI), drawing entitled "Plan des Profondeurs Maregraphiques," reference number 07-066, dated December 2007, provided by Genivar. Elevations referenced to Chart Datum.

HORIZONTAL DATUM: California State Plane Zone 6, NAD83.

VERTICAL DATUM: mean lower low water (MLLW).

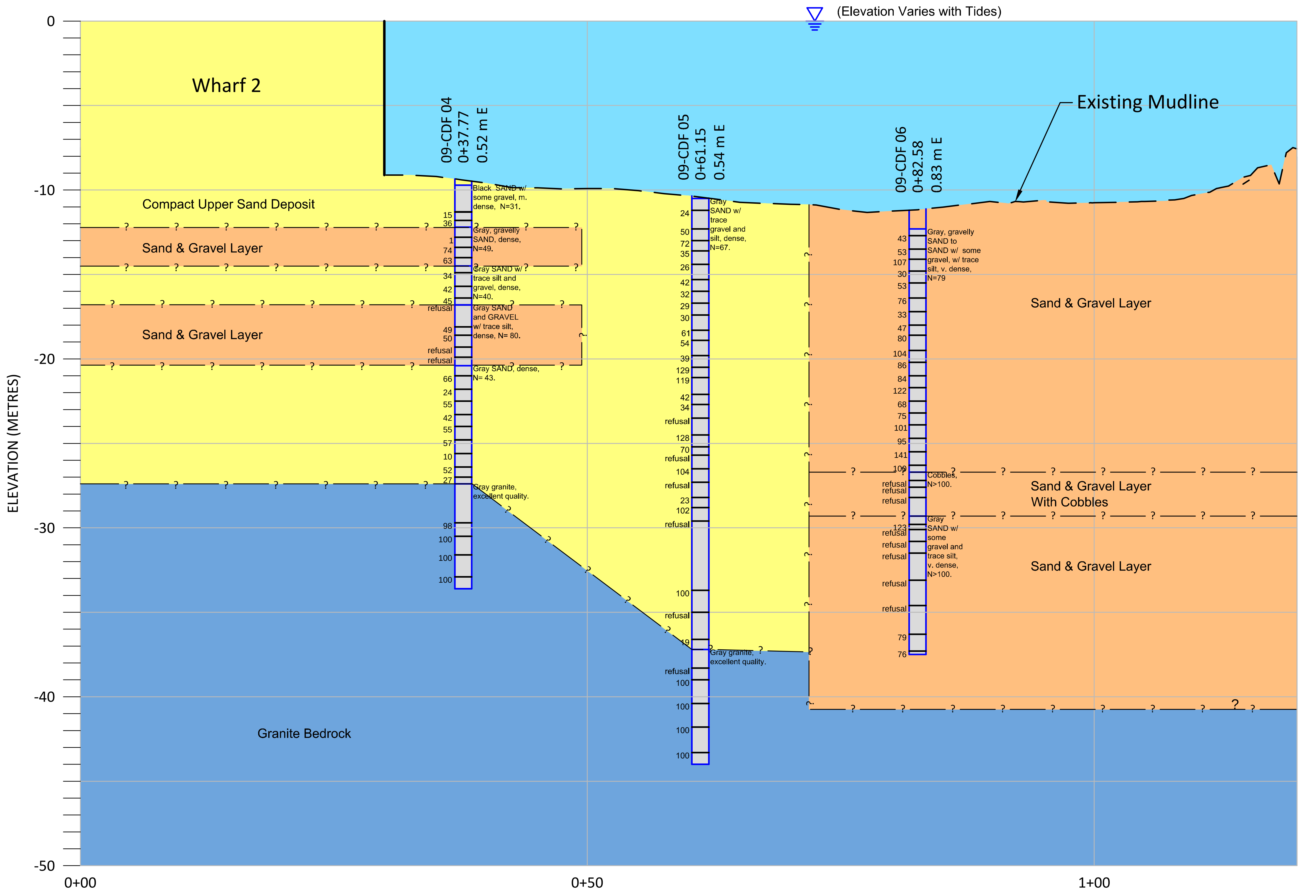
NOTE:

1. Drawing is not to scale
2. Soil stratification, blow counts and soil descriptions are as depicted in the report "Geotechnical Investigation - New Wharf no.1 Baie-Comeau Alcoa smelter dated December 2009. N/ref: F099382 prepared by SMI international inc.

Jun 13, 2013 9:46am mcarlino C:\Users\mcarlino\appdata\local\temp\AcPublish_7856\ANC-BAIE-COMEAU-AofA_Fig_2-English.dwg Figure 2-2

ANCHOR QEA

Figure 2-2
Cross Section A-A'
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec



SECTION B-B'

LEGEND:

🟨 Compact Upper Sand Deposit

🟧 Sand & Gravel Layer (With Cobbles Where Present)

🟦 Granite Bedrock

—?— Interpolated Stratigraphy Boundary

N/RQD VALUE	BORING	DESCRIPTION
8		Gray SAND w/trace Silt
100		Gray granite
refusal		

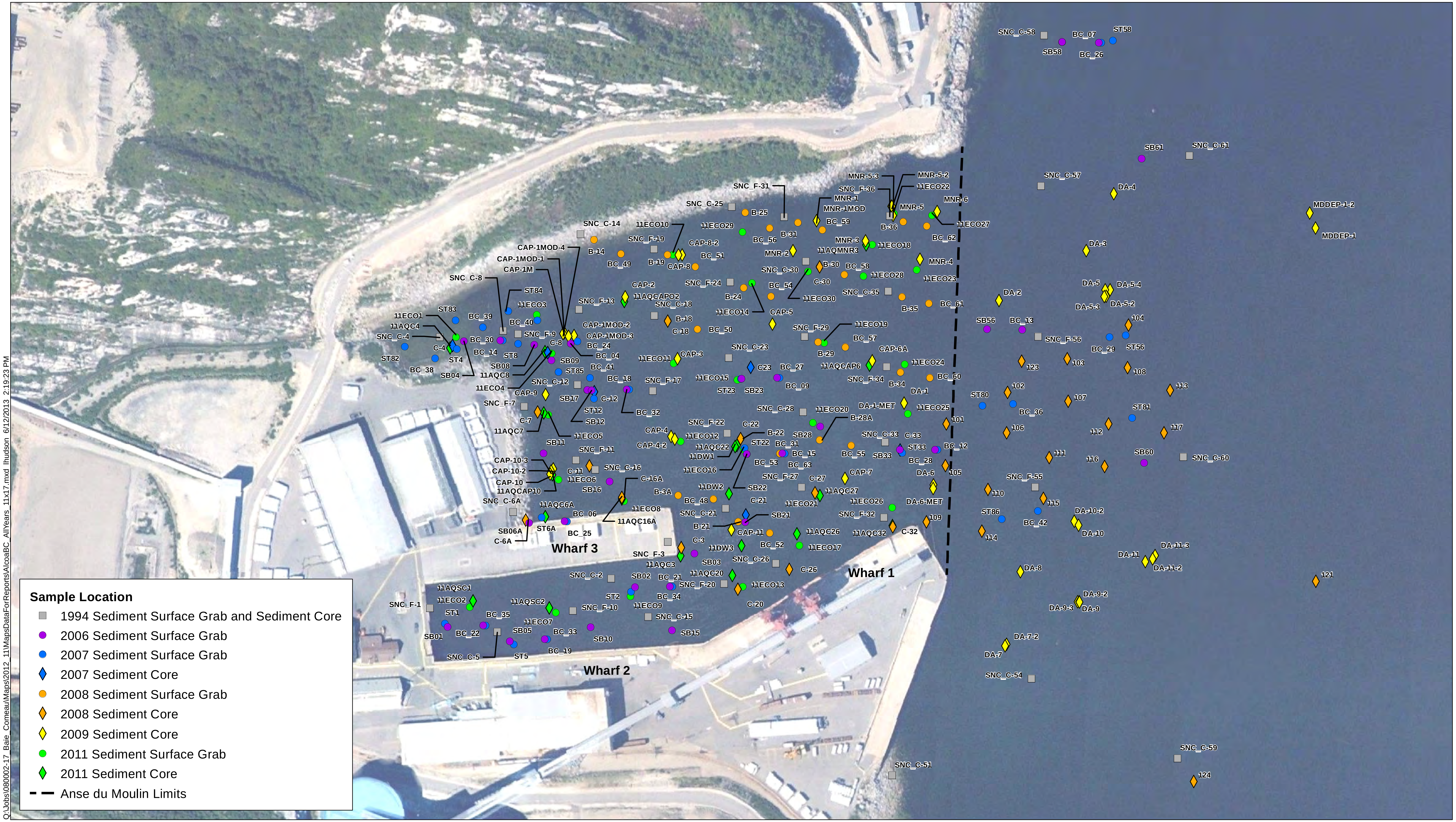
SOURCE: Drawing prepared from Hatch Engineering drawing entitled "Wharf Extension Geotechnical Investigations Proposed Borehole Locations", dated June 9, 2009. Bathymetry from Entreprises Normand Juneau, Inc. (ENJI), drawing entitled "Plan des Profondeurs Maregraphiques," reference number 07-066, dated December 2007, provided by Genivar. Elevations referenced to Chart Datum.
HORIZONTAL DATUM: California State Plane Zone 6, NAD83.
VERTICAL DATUM: mean lower low water (MLLW).

NOTE:
1. Drawing is not to scale
2. Soil stratification, blow counts and soil descriptions are as depicted in the report "Geotechnical Investigation - New Wharf no.1 Baie-Comeau Alcoa smelter dated December 2009. N/ref: F099382 prepared by SMI international inc.

Jun 13, 2013 9:47am mcarlino C:\Users\mcarlino\appdata\local\temp\AcPublish_7856\ANC-BAIE-COMEAU-AofA_Fig_2-English.dwg Figure 2-3

ANCHOR QEA

Figure 2-3
Cross Section B-B'
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec



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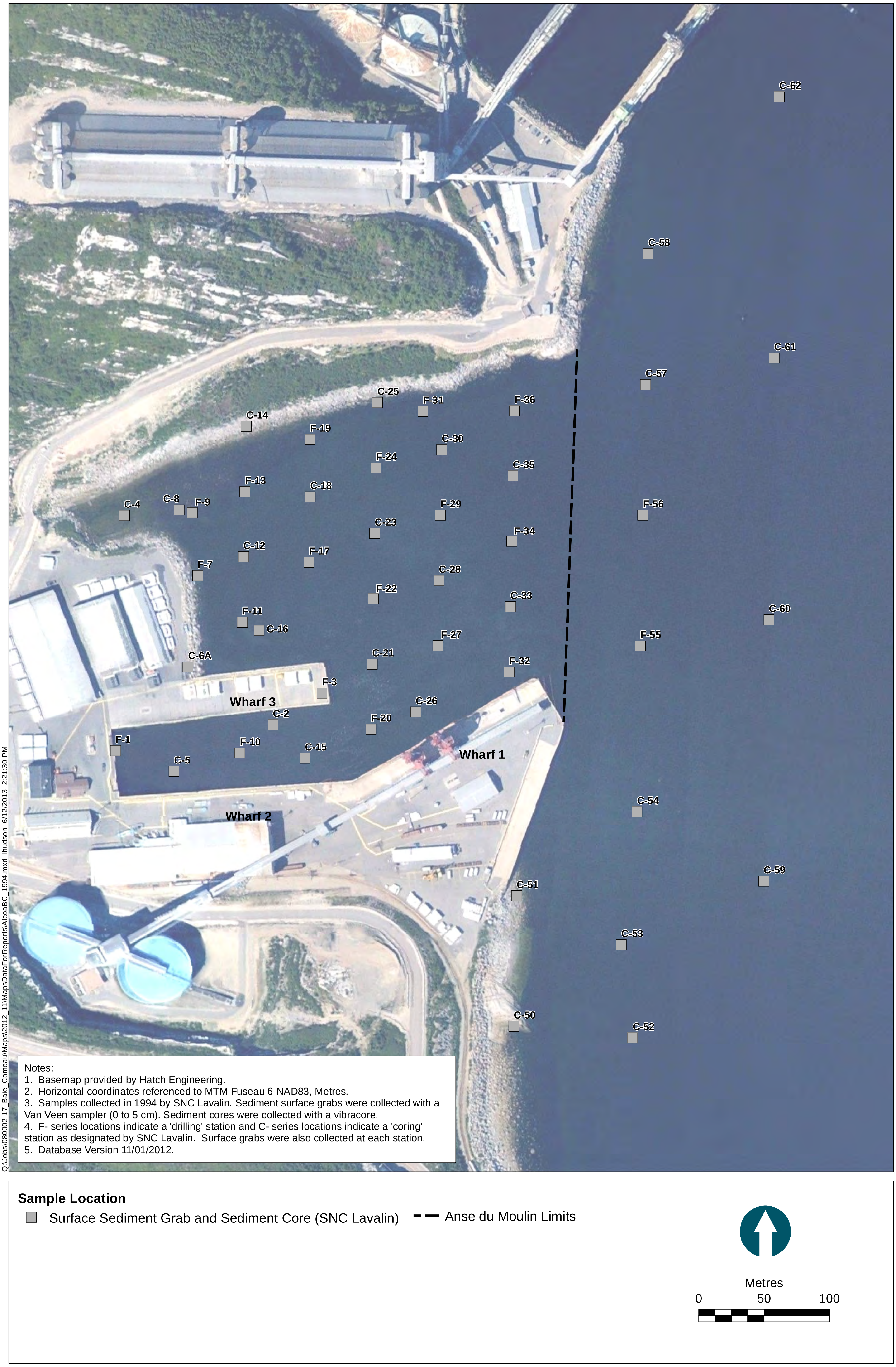
Notes:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. Sediment grabs were collected with a Ponar or Van Veen Sampler and are from the (0-10 cm) or (0-5 cm) depth. Sediment cores were collected with a vibracore.
4. Database Version 09/26/2012.

Metres
0 50 100

Figure 3-1
Compiled Sediment Investigations (1994-2011) Location Map
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec



Notes:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. Samples collected in 1994 by SNC Lavalin. Sediment surface grabs were collected with a Van Veen sampler (0 to 5 cm). Sediment cores were collected with a vibracore.
4. F- series locations indicate a 'drilling' station and C- series locations indicate a 'coring' station as designated by SNC Lavalin. Surface grabs were also collected at each station.
5. Database Version 11/01/2012.

Sample Location

- ▨ Surface Sediment Grab and Sediment Core (SNC Lavalin)
- – – Anse du Moulin Limits

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Figure 3-2
1994 Sediment Investigation Location Map
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

Notes:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. All samples collected in 2006 by GENIVAR. Surface sediment grabs (GENIVAR) were collected with a Van Veen sampler (0 to 5 cm) and surface sediment grabs (Retec) were collected with a Ponar grab sampler (0 to 10 cm). Porewater samples were extracted from the surface sediment grabs by the SPME method.
4. BC series locations were collected for the Retec study. SB series locations were collected for GENIVAR.
5. Database Version 11/01/2012.

Sample Location

● Sediment Surface Grab (GENIVAR)

○ Sediment Surface Grab, Porewater Extraction (Retec)

-- Anse du Moulin Limits

Metres
0 50 100

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ANCHOR QEA

Figure 3-3
2006 Sediment Investigation Location Map
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

Notes:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. All samples collected in 2007 by GENIVAR. Surface sediment grabs (GENIVAR) were collected with a Van Veen sampler (0 to 5 cm) and surface sediment grabs (Retec) were collected with a Ponar grab sampler (0 to 10 cm). Porewater samples were extracted from the surface sediment grabs by the SPME method. Sediment cores were collected with a vibracore.
4. BC series locations were collected for the Retec study. ST series locations were grabs collected for GENIVAR and C- series locations were cores collected for GENIVAR.
5. Database Version 11/01/2012.

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Sample Location

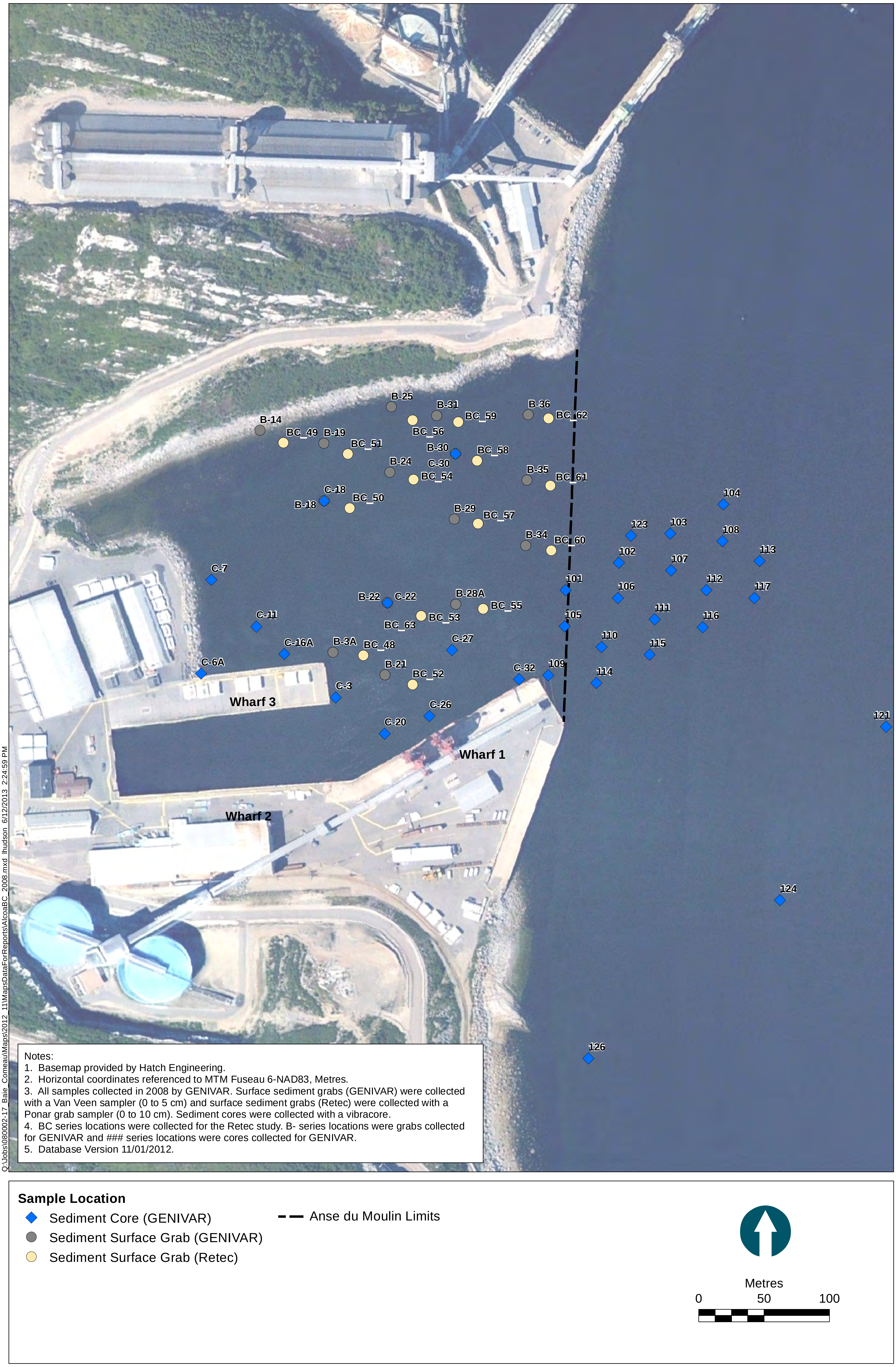
- 🔷 Sediment Core (GENIVAR)
- ● Sediment Surface Grab (GENIVAR)
- ○ Sediment Surface Grab, Porewater Extraction (Retec)

- - - Anse du Moulin Limits

Metres
0 50 100

ANCHOR QEA

Figure 3-4
2007 Sediment Investigation Location Map
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec



Notes:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. All samples collected in 2008 by GENIVAR. Surface sediment grabs (GENIVAR) were collected with a Van Veen sampler (0 to 5 cm) and surface sediment grabs (Retec) were collected with a Ponar grab sampler (0 to 10 cm). Sediment cores were collected with a vibracore.
4. BC series locations were collected for the Retec study. B- series locations were grabs collected for GENIVAR and ### series locations were cores collected for GENIVAR.
5. Database Version 11/01/2012.

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Figure 3-5
2008 Sediment Investigation Location Map
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

Notes:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. Samples collected in 2009 by GENIVAR. Sediment cores were collected with a vibracore.
4. CAP series locations were within the previously contemplated sediment capping area. DA series locations were within the previously contemplated dredging area. MNR series samples were within the expected monitored natural attenuation area. MDDEP series were collected for background comparison to the Baie des Anglais.
5. Database Version 11/01/2012.

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Sample Location

◆ Sediment Core Sample Location (GENIVAR)

-- Anse du Moulin Limits

Metres
0 50 100

Figure 3-6
2009 Sediment Investigation Location Map
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

Notes:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. Samples collected in 2011 by GENIVAR and Sanexen. Surface sediment grabs (Sanexen) were collected with a Van Veen sampler (0 to 10 cm). Sediment cores were collected with a vibracore.
4. The 11ECO series locations were grabs collected for the Risk Assessment. 11AQSC series locations were sediment cores collected for GENIVAR and Anchor QEA.
5. Database Version 11/01/2012.

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Sample Location

◆	Sediment Core Sample Location (GENIVAR)
●	Surface Sediment Grab Location (Sanexen)
– –	Anse du Moulin Limits

Metres
0 50 100

Figure 3-7
2011 Sediment Investigation Location Map
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

ANCHOR QEA

Notes:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. Database Version 04/25/2013.

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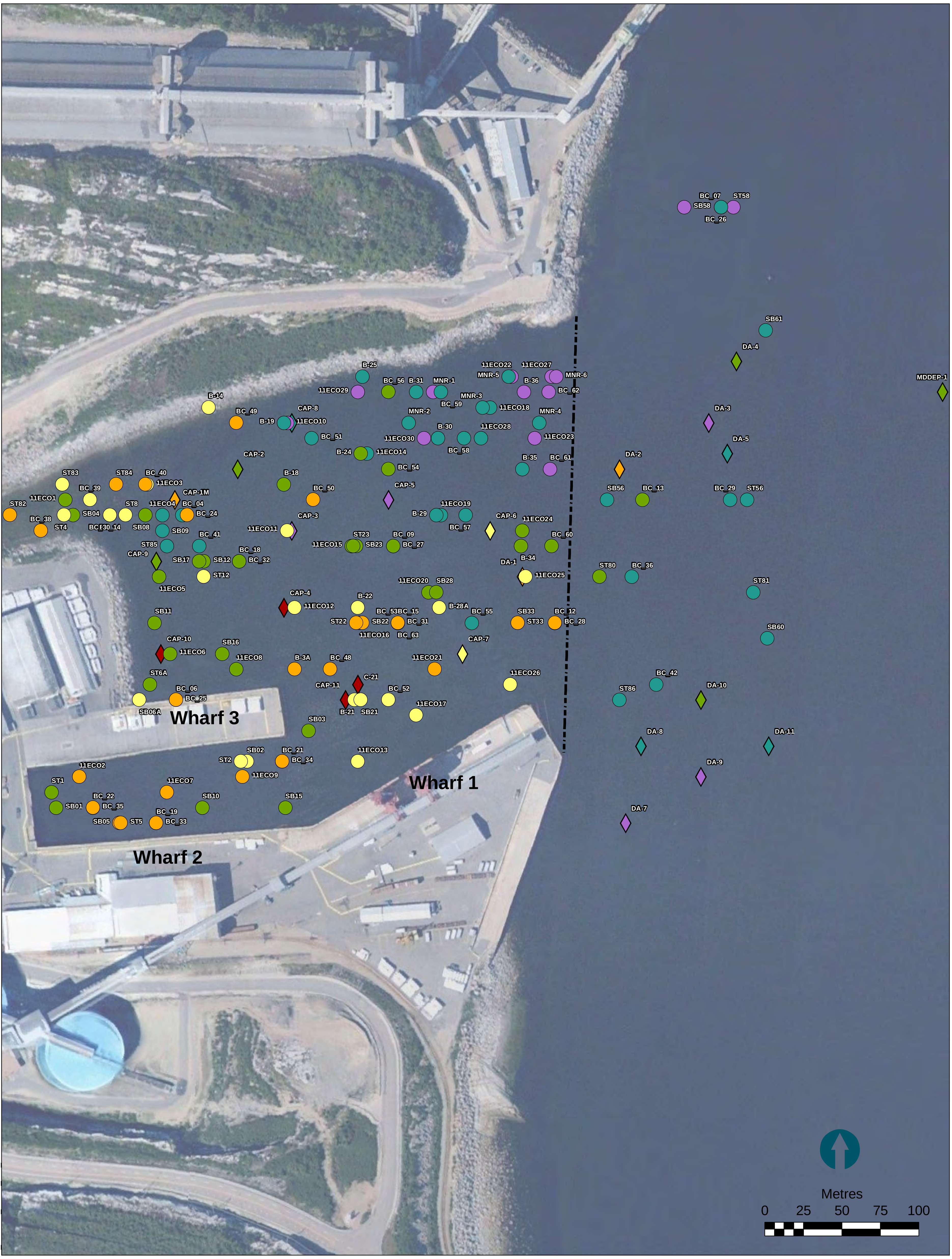
Figure 3-8
2009 Surface Water Sampling Location Map
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec



Surface Sediment Grab Location
TPAH-13 Concentration (mg/kg)

● ND - 2.43 (OEL)
● 2.43 - 21.26 (FEL)
● 21.26 - 100
● 100 - 250
● 250 - 1,000
● > 1,000

Sediment Core Sample Location
TPAH-13 Concentration (mg/kg)

◆ ND - 2.43 (OEL)
◆ 2.43 - 21.26 (FEL)
◆ 21.26 - 100
◆ 100 - 250
◆ 250 - 1,000
◆ > 1,000

-·-·- Anse du Moulin Limits

NOTES:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. TPAH-13 is the sum of the 13 PAHs for which an MDDEP Sediment Criteria is available including: 2-Methylnaphthalene, Acenaphthene, Acenaphthylene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Chrysene, Dibenzo(a,h)anthracene, Fluoranthene, Fluorene, Naphthalene, Phenanthrene, and Pyrene.
4. ND = 0.
5. ND = Non-detect.
6. OEL = Occasional Effect Level.
7. FEL = Frequent Effect Level.
8. Concentrations were averaged for duplicates and for multiple results per depth interval for a sample location.
9. Database Version 11/01/2012.

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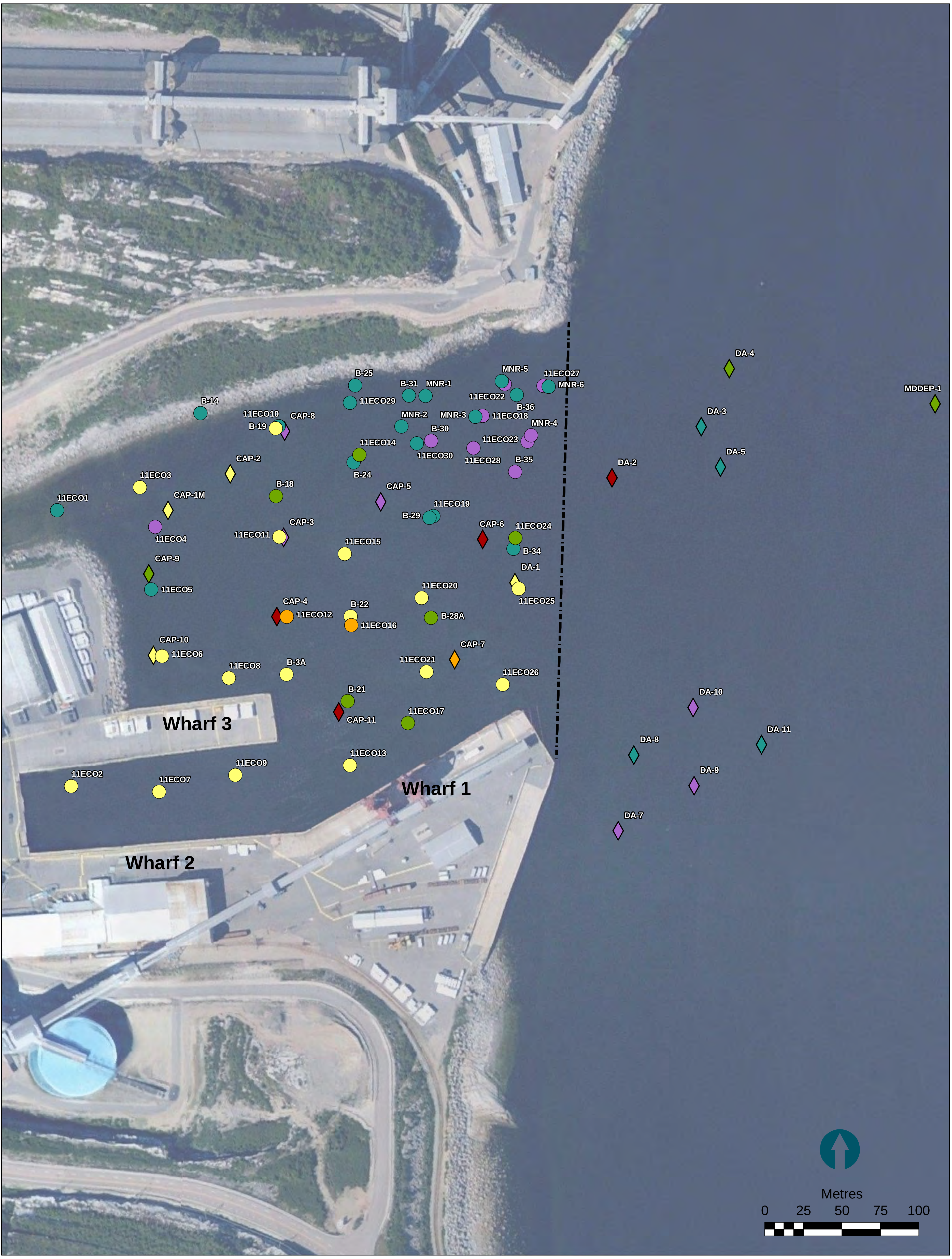
Figure 4-1
2006-2011 Surface Sediment TPAH-13 Concentrations (0 - 10 cm)
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec



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Surface Sediment Grab Location
TPCB Congener Concentration (mg/kg)
- ● ND - 0.059 (OEL)
- ● 0.059 - 0.49 (FEL)
- ● 0.49 - 1
- ● 1 - 5
- ● 5 - 10
- ● >10

Sediment Core Sample Location
TPCB Congener Concentration (mg/kg)
- ◆ ND - 0.059 (OEL)
- ◆ 0.059 - 0.49 (FEL)
- ◆ 0.49 - 1
- ◆ 1 - 5
- ◆ 5 - 10
- ◆ > 10

-·- Anse du Moulin Limits

NOTES:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. ND = 0.
4. ND = Non-detect.
5. OEL = Occasional Effect Level.
6. FEL = Frequent Effect Level.
7. Concentrations were averaged for duplicates and for multiple results per depth interval for a sample location.
8. Database Version 11/01/2012.

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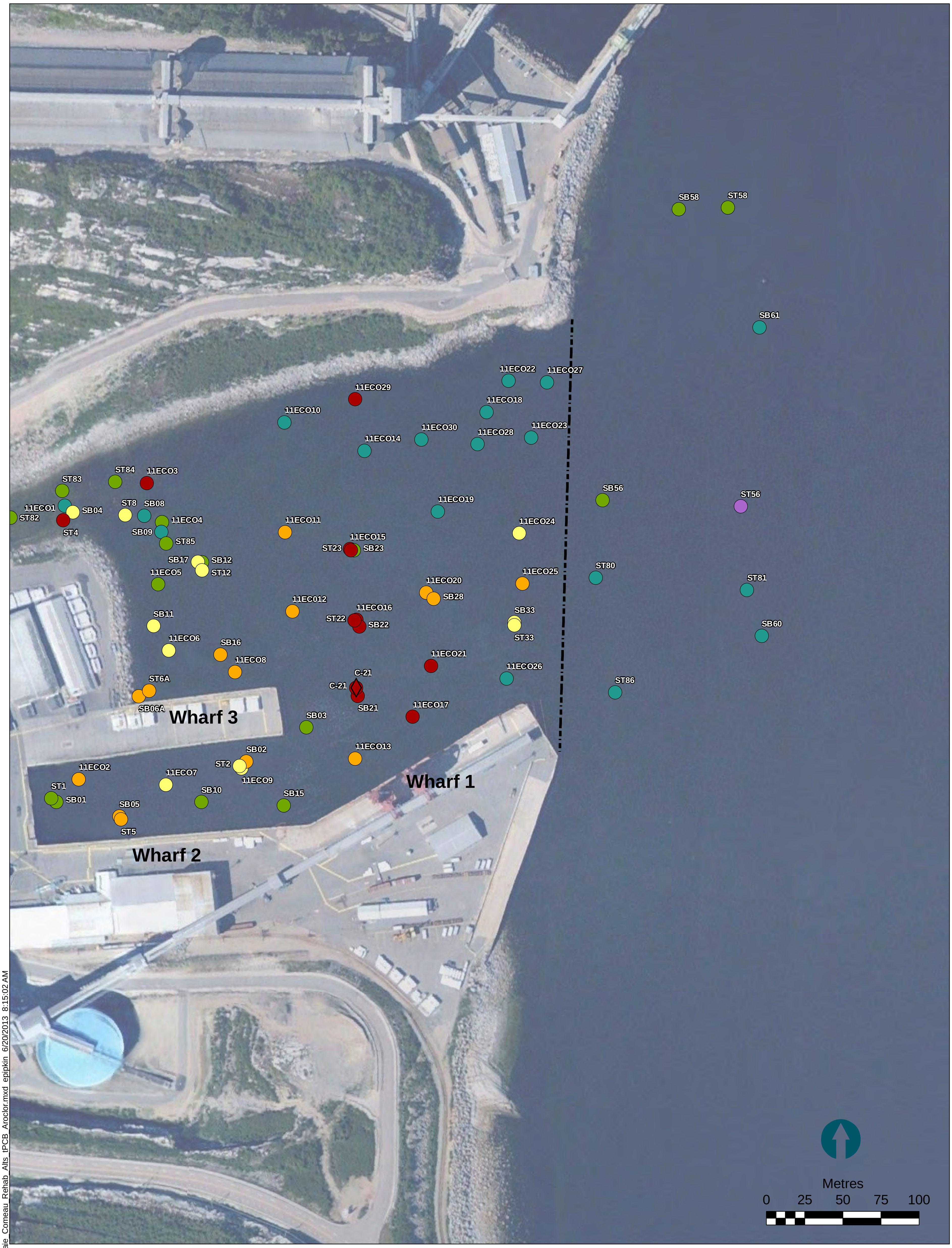
Figure 4-2
2006-2011 Surface Sediment TPCB Congener Concentrations (0 - 10 cm)
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec



Surface Sediment Grab Location

TPBC Aroclor Concentrations (mg/kg)

- ● ND - 0.05
- ● 0.05 - 0.25
- ● 0.25 - 1
- ● 1 - 1.5
- ● 1.5 - 3
- ● >3

-·- Anse du Moulin Limits

NOTES:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. ND = 0.
4. ND = Non-detect.
5. Concentrations were averaged for duplicates and for multiple results per depth interval for a sample location.
6. Database Version 11/01/2012.

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Figure 4-3
2006-2011 Surface Sediment TPCB Aroclor Concentrations (0 - 10 cm)
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

% Total Organic Carbon

- ● 0 - 0.5
- ● 0.5 - 1
- ● 1 - 2
- ● 2 - 5
- ● 5 - 10
- ● 10 - 22

- - - - Anse du Moulin Limits

○ Surface Sediment Grab Sample Location

◊ Sediment Core Sample Location

NOTES:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. TOC = Total organic carbon
4. ND = 0.
5. Percents were averaged for duplicates.
6. Database Version 11/01/2012.

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Figure 4-4
2006 - 2011 Surface Sediment TOC Distribution (0 - 10 cm)
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

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% Soot Organic Carbon
- ● 0 - 0.1
- ● 0.1 - 0.25
- ● 0.25 - 0.5
- ● 0.5 - 1
- ● 1 - 1.5
- ● 1.5 - 3

- - - - Anse du Moulin Limits

○ Surface Sediment Grab Sample Location

NOTES:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. SOC = Soot Organic Carbon
4. ND = 0.
5. Percents were averaged for duplicates.
6. Database Version 11/01/2012.

Metres
0 50 100

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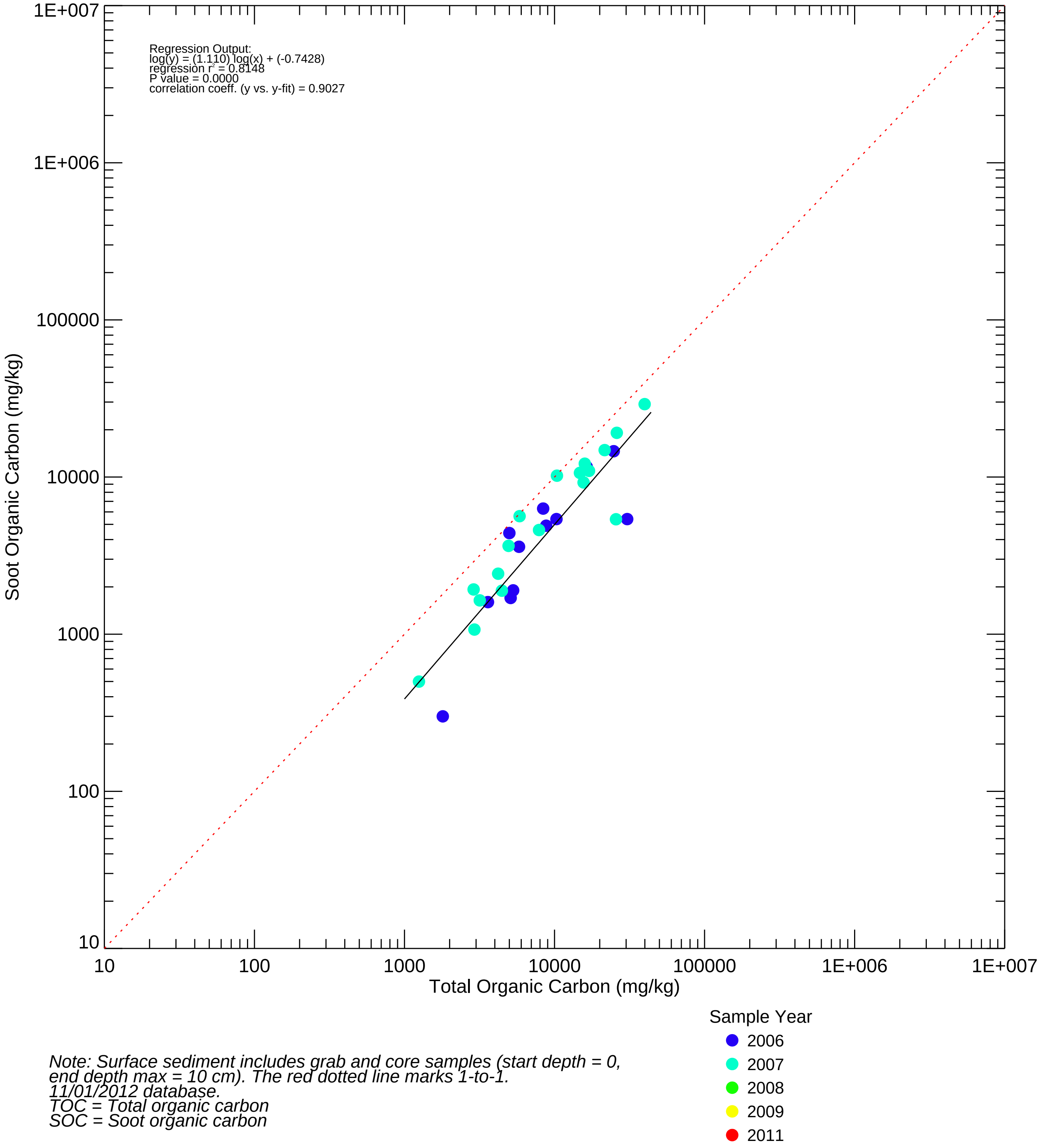
Figure 4-5
2006 - 2008 Surface Sediment SOC Distribution (0 - 10 cm)
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

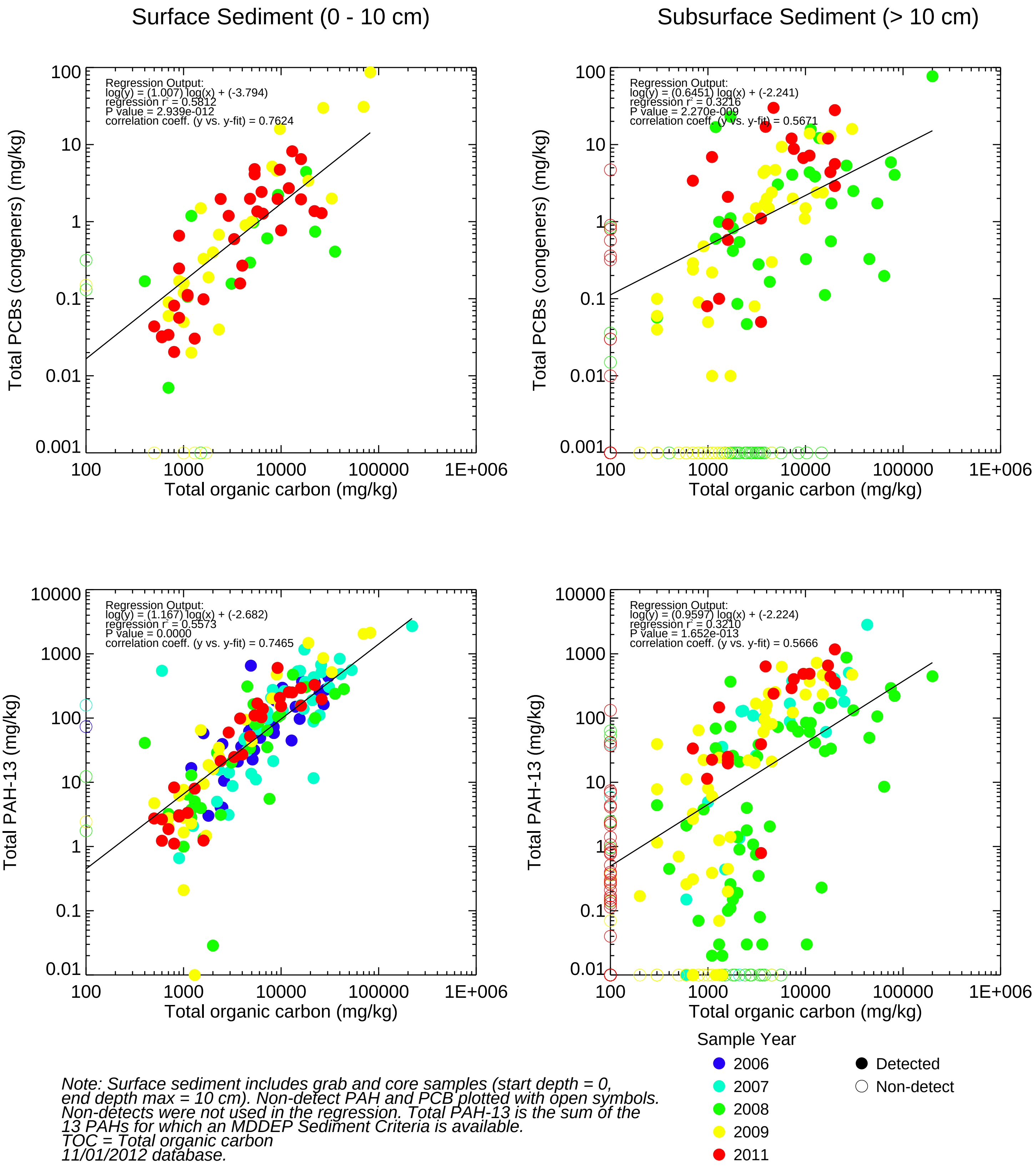


Regression Output:
log(y) = (1.110) log(x) + (-0.7428)
regression r^2 = 0.8148
P value = 0.0000
correlation coeff. (y vs. y-fit) = 0.9027

Note: Surface sediment includes grab and core samples (start depth = 0, end depth max = 10 cm). The red dotted line marks 1-to-1.
11/01/2012 database.
TOC = Total organic carbon
SOC = Soot organic carbon

Figure 4-6

Comparison of TOC and SOC in Surface Sediment (0 - 10 cm)
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec



Note: Surface sediment includes grab and core samples (start depth = 0, end depth max = 10 cm). Non-detect PAH and PCB plotted with open symbols. Non-detects were not used in the regression. Total PAH-13 is the sum of the 13 PAHs for which an MDDEP Sediment Criteria is available.
TOC = Total organic carbon
11/01/2012 database.

Figure 4-7

Comparison of PAH, PCB, and TOC Concentrations in Sediment
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

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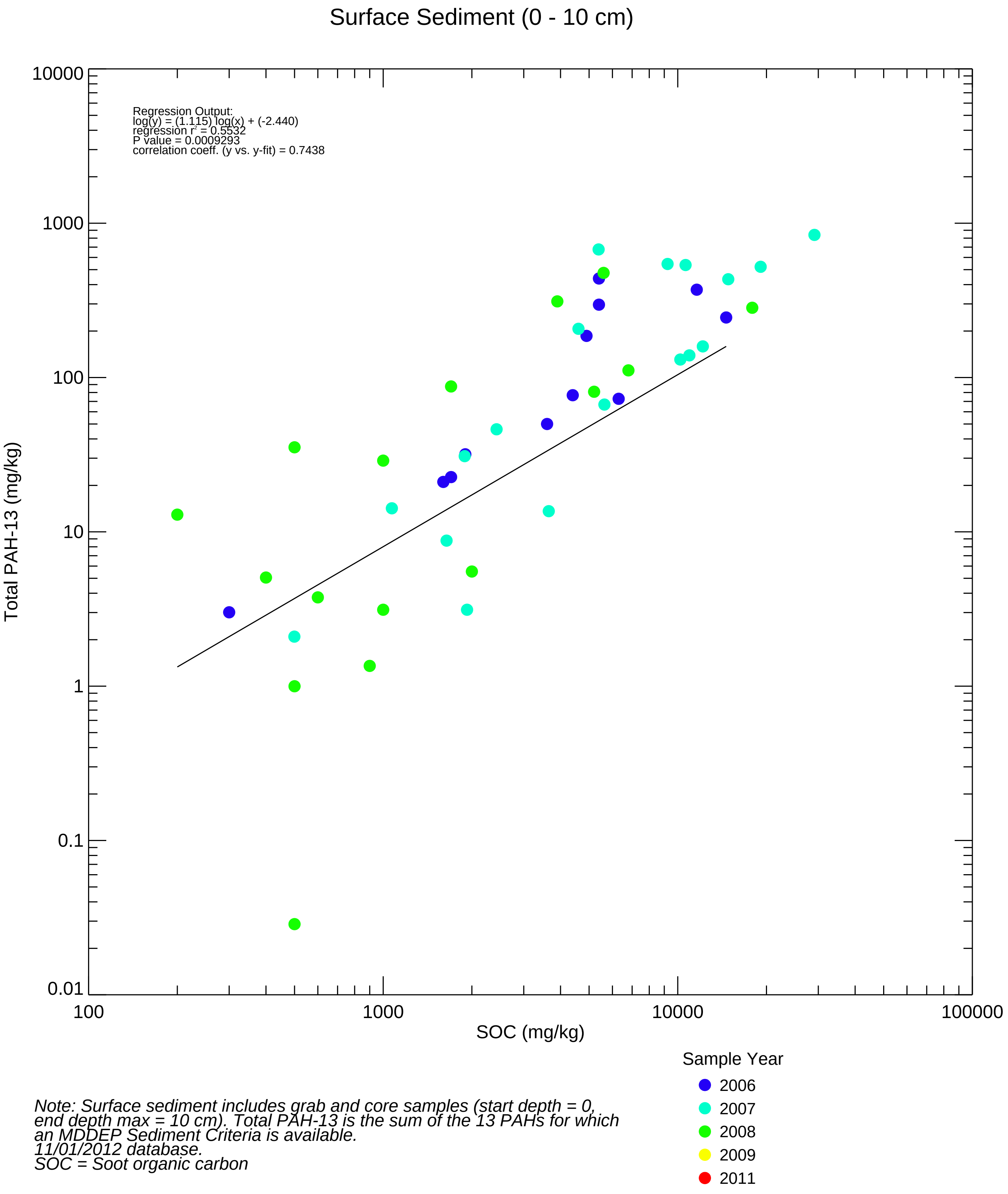

Note: Surface sediment includes grab and core samples (start depth = 0, end depth max = 10 cm). Total PAH-13 is the sum of the 13 PAHs for which an MDDEP Sediment Criteria is available.
11/01/2012 database.
SOC = Soot organic carbon

Figure 4-8

Comparison of PAH and SOC in Surface Sediment (0 - 10 cm)
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

NOTES:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. % Fines is the sum of % Silt and % Clay.
4. ND = 0.
5. Percents were averaged for duplicates.
6. Database Version 11/01/2012.

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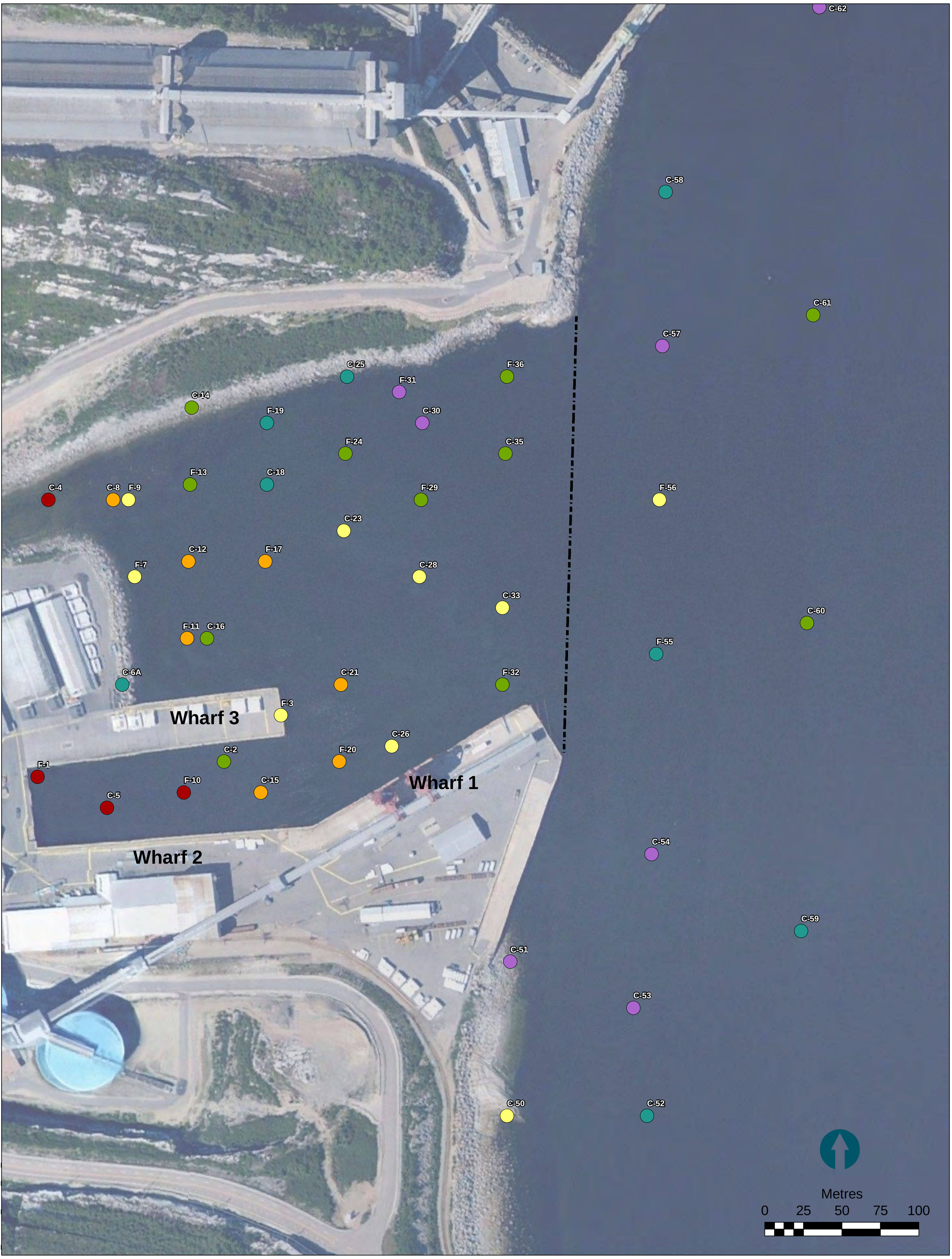
Figure 4-9

2006 - 2011 Surface Sediment Grain Size Distribution (0 - 10 cm)

Analysis of Rehabilitation Alternatives

Alcoa, Baie-Comeau, Quebec



Surface Sediment Grab Location

TPAH-13 Concentration (mg/kg)

- ● ND - 2.43 (OEL)
- ● 2.43 - 21.26 (FEL)
- ● 21.26 - 100
- ● 100 - 250
- ● 250 - 1,000
- ● > 1,000

-·-· Anse du Moulin Limits

NOTES:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. TPAH-13 is the sum of the 13 PAHs for which an MDDEP Sediment Criteria is available including: 2-Methylnaphthalene, Acenaphthene, Acenaphthylene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Chrysene, Dibenzo(a,h)anthracene, Fluoranthene, Fluorene, Naphthalene, Phenanthrene, and Pyrene.
4. ND = 0.
5. ND = Non-detect.
6. OEL = Occasional Effect Level.
7. FEL = Frequent Effect Level.
8. Concentrations were averaged for duplicates and for multiple results per depth interval for a sample location.
9. Database Version 11/01/2012.

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Figure 4-10
1994 Surface Sediment TPAH-13 Concentrations (0 - 10 cm)
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

Surface Sediment Grab Location

TPAH-13 Concentration (mg/kg)

- 🟣 ND - 2.43 (OEL)
- ● 2.43 - 21.26 (FEL)
- 🟢 21.26 - 100
- 🟡 100 - 250
- 🟠 250 - 1,000
- 🔴 > 1,000

-·-· Anse du Moulin Limits

NOTES:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. TPAH-13 is the sum of the 13 PAHs for which an MDDEP Sediment Criteria is available including: 2-Methylnaphthalene, Acenaphthene, Acenaphthylene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Chrysene, Dibenzo(a,h)anthracene, Fluoranthene, Fluorene, Naphthalene, Phenanthrene, and Pyrene.
4. ND = 0.
5. ND = Non-detect.
6. OEL = Occasional Effect Level.
7. FEL = Frequent Effect Level.
8. Concentrations were averaged for duplicates and for multiple results per depth interval for a sample location.
9. Database Version 11/01/2012.

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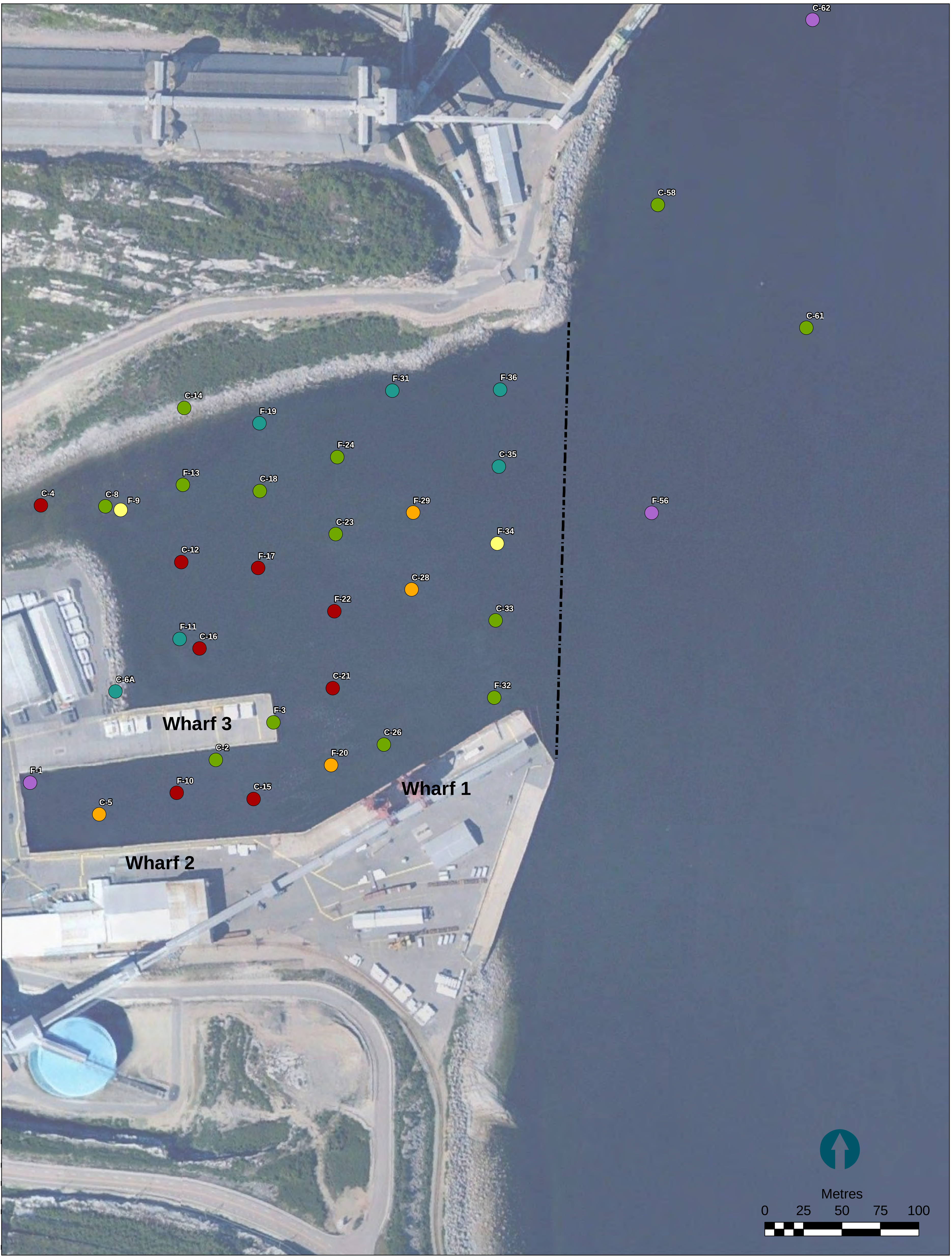
Figure 4-11
2011 Surface Sediment TPAH-13 Concentrations (0 - 10 cm)
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec



Surface Sediment Grab Location

TPBC Aroclor Concentrations (mg/kg)

- 🟣 ND - 0.05
- ● 0.05 - 0.25
- 🟢 0.25 - 1
- 🟡 1 - 1.5
- 🟠 1.5 - 3
- 🔴 >3

-·-·- Anse du Moulin Limits

NOTES:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. ND = 0.
4. ND = Non-detect.
5. Concentrations were averaged for duplicates and for multiple results per depth interval for a sample location.
6. Database Version 11/01/2012.

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Figure 4-12
1994 Surface Sediment TPCB Aroclor Concentrations (0 - 10 cm)
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

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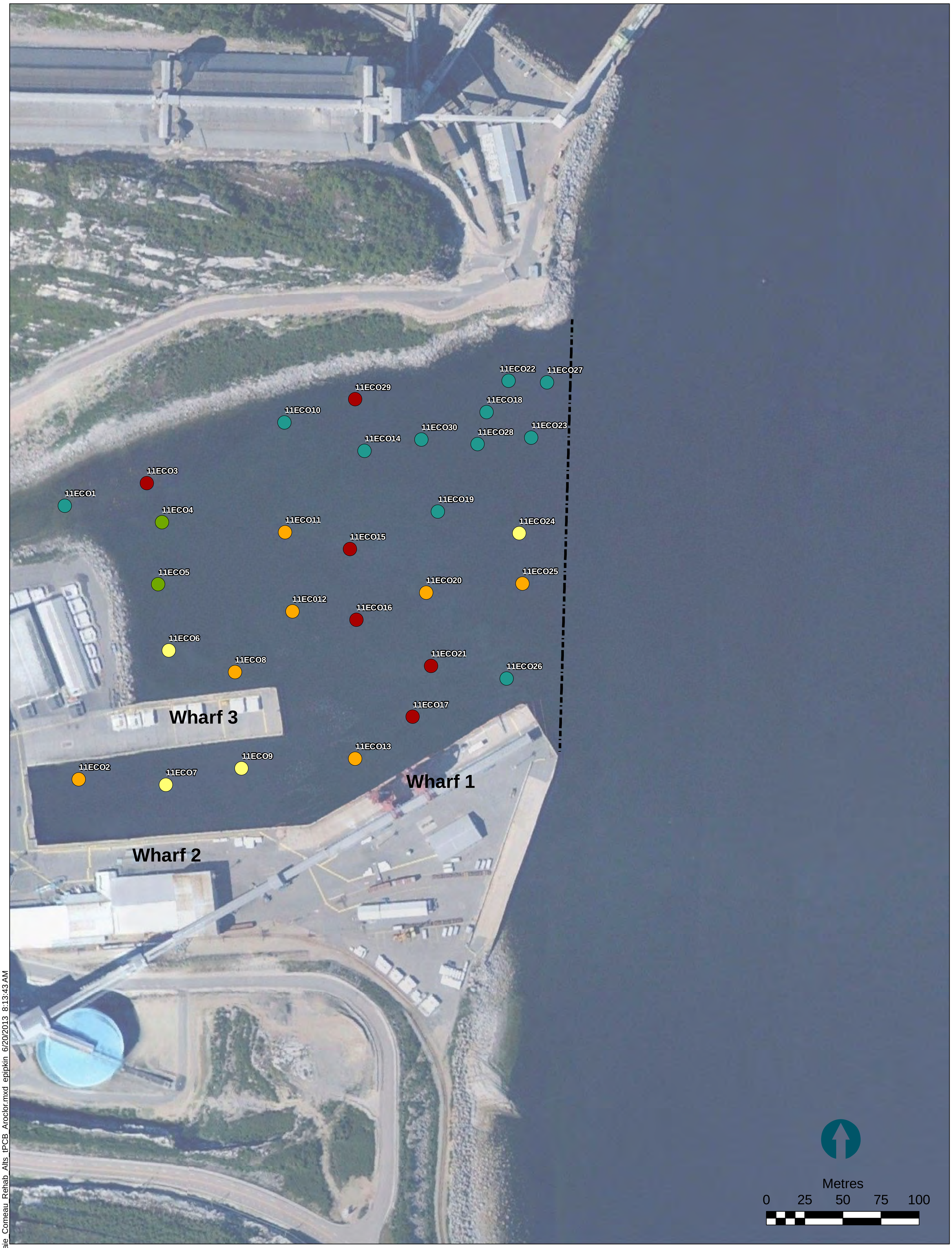

Surface Sediment Grab Location

TPBC Aroclor Concentrations (mg/kg)

- 🟣 ND - 0.05
- ● 0.05 - 0.25
- 🟢 0.25 - 1
- 🟡 1 - 1.5
- 🟠 1.5 - 3
- 🔴 >3

-·-· Anse du Moulin Limits

NOTES:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. ND = 0.
4. ND = Non-detect.
5. Concentrations were averaged for duplicates and for multiple results per depth interval for a sample location.
6. Database Version 11/01/2012.

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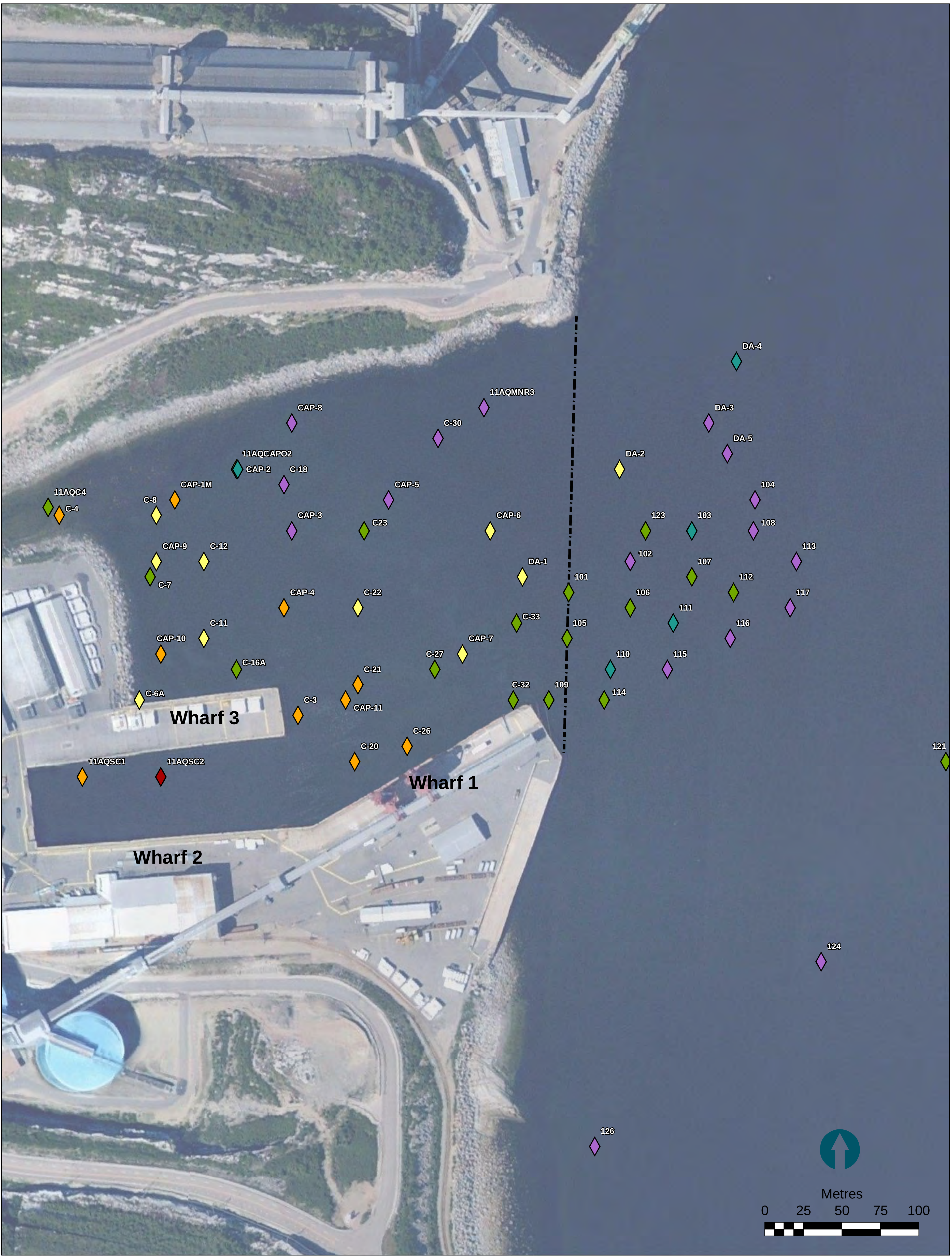
Figure 4-13
2011 Surface Sediment TPCB Aroclor Concentrations (0 - 10 cm)
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec



Sediment Core Sample Location

TPAH-13 Concentration (mg/kg)

- ◆ ND - 2.43 (OEL)
- ◆ 2.43 - 21.26 (FEL)
- ◆ 21.26 - 100
- ◆ 100 - 250
- ◆ 250 - 1,000
- ◆ > 1,000

-·-· Anse du Moulin Limits

NOTES:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. TPAH-13 is the sum of the 13 PAHs for which an MDDEP Sediment Criteria is available including: 2-Methylnaphthalene, Acenaphthene, Acenaphthylene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Chrysene, Dibenzo(a,h)anthracene, Fluoranthene, Fluorene, Naphthalene, Phenanthrene, and Pyrene.
4. ND = 0.
5. ND = Non-detect.
6. OEL = Occasional Effect Level.
7. FEL = Frequent Effect Level.
8. Concentrations were averaged for duplicates and for multiple results per depth interval for a sample location.
9. Database Version 11/01/2012.

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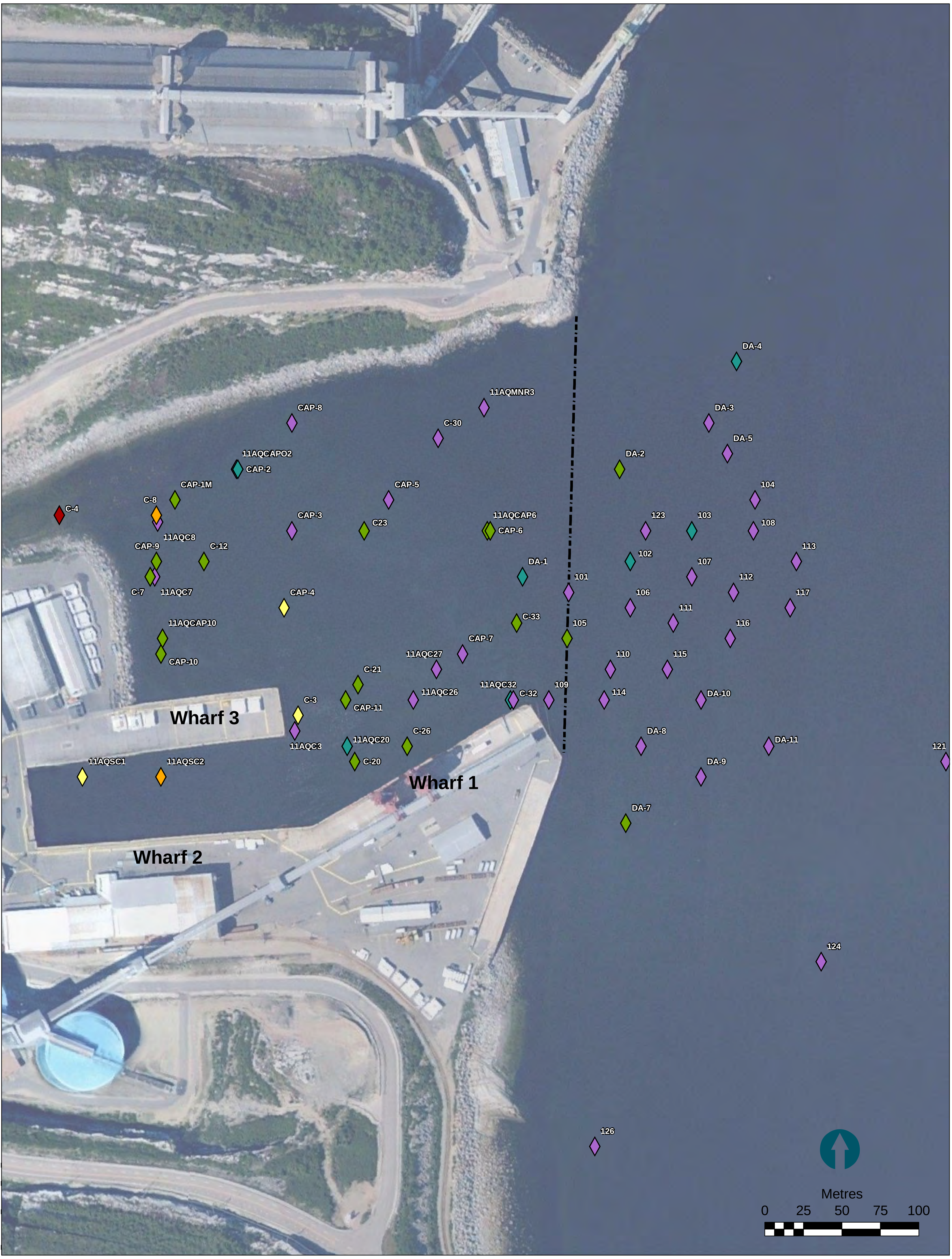
Figure 4-14
2007-2011 Subsurface Sediment TPAH-13 Concentrations (10 - 50 cm)
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec



Sediment Core Sample Location

TPAH-13 Concentration (mg/kg)

- ◆ ND - 2.43 (OEL)
- ◆ 2.43 - 21.26 (FEL)
- ◆ 21.26 - 100
- ◆ 100 - 250
- ◆ 250 - 1,000
- ◆ > 1,000

- - - Anse du Moulin Limits

NOTES:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. TPAH-13 is the sum of the 13 PAHs for which an MDDEP Sediment Criteria is available including: 2-Methylnaphthalene, Acenaphthene, Acenaphthylene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Chrysene, Dibenzo(a,h)anthracene, Fluoranthene, Fluorene, Naphthalene, Phenanthrene, and Pyrene.
4. ND = 0.
5. ND = Non-detect.
6. OEL = Occasional Effect Level.
7. FEL = Frequent Effect Level.
8. Concentrations were averaged for duplicates and for multiple results per depth interval for a sample location.
9. Database Version 11/01/2012.

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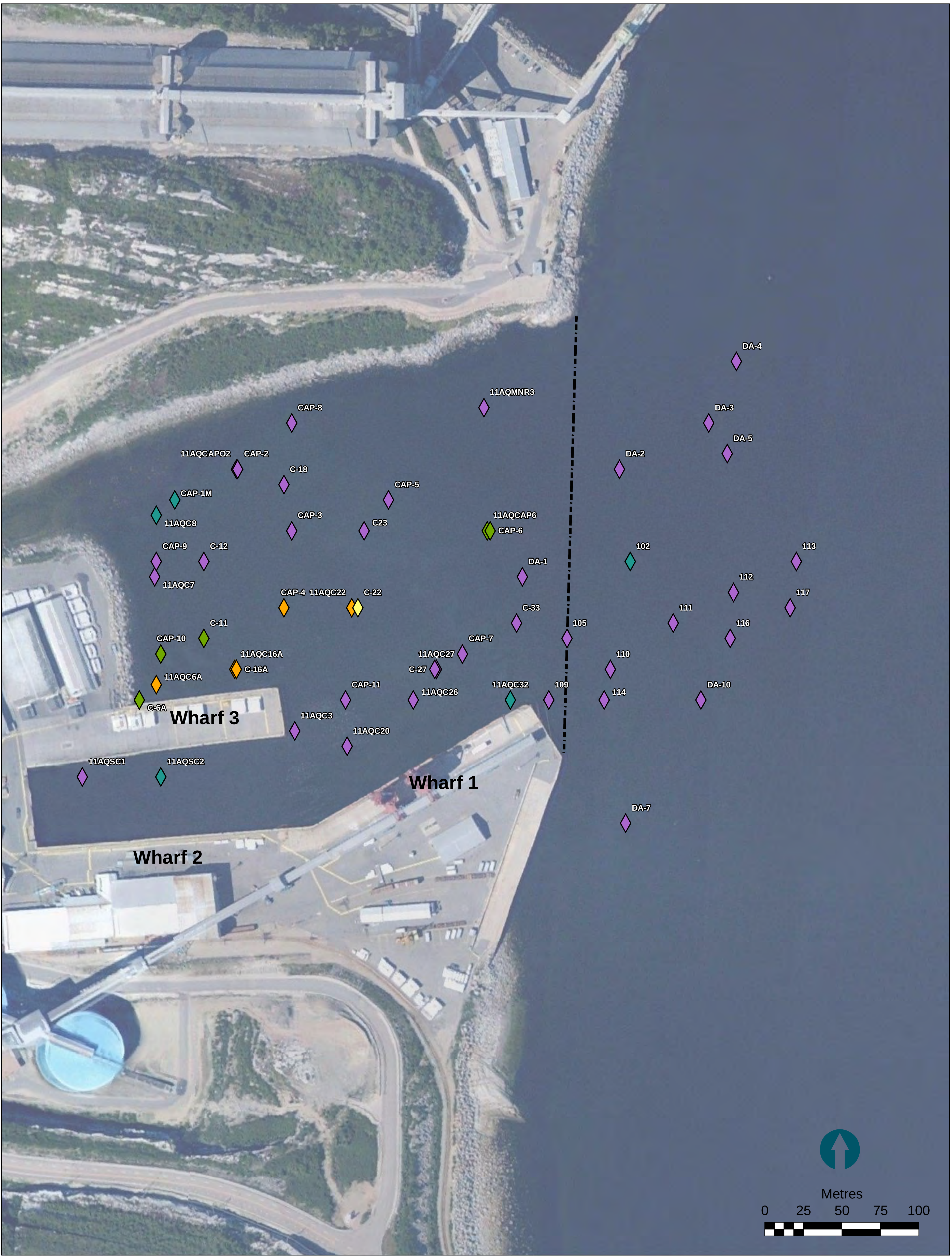
Figure 4-15
2007-2011 Subsurface Sediment TPAH-13 Concentrations (50 - 100 cm)
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec



Sediment Core Sample Location

TPAH-13 Concentration (mg/kg)

- ◆ ND - 2.43 (OEL)
- ◆ 2.43 - 21.26 (FEL)
- ◆ 21.26 - 100
- ◆ 100 - 250
- ◆ 250 - 1,000
- ◆ > 1,000

-·- Anse du Moulin Limits

NOTES:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. TPAH-13 is the sum of the 13 PAHs for which an MDDEP Sediment Criteria is available including: 2-Methylnaphthalene, Acenaphthene, Acenaphthylene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Chrysene, Dibenzo(a,h)anthracene, Fluoranthene, Fluorene, Naphthalene, Phenanthrene, and Pyrene.
4. ND = 0.
5. ND = Non-detect.
6. OEL = Occasional Effect Level.
7. FEL = Frequent Effect Level.
8. Concentrations were averaged for duplicates and for multiple results per depth interval for a sample location.
9. Database Version 11/01/2012.

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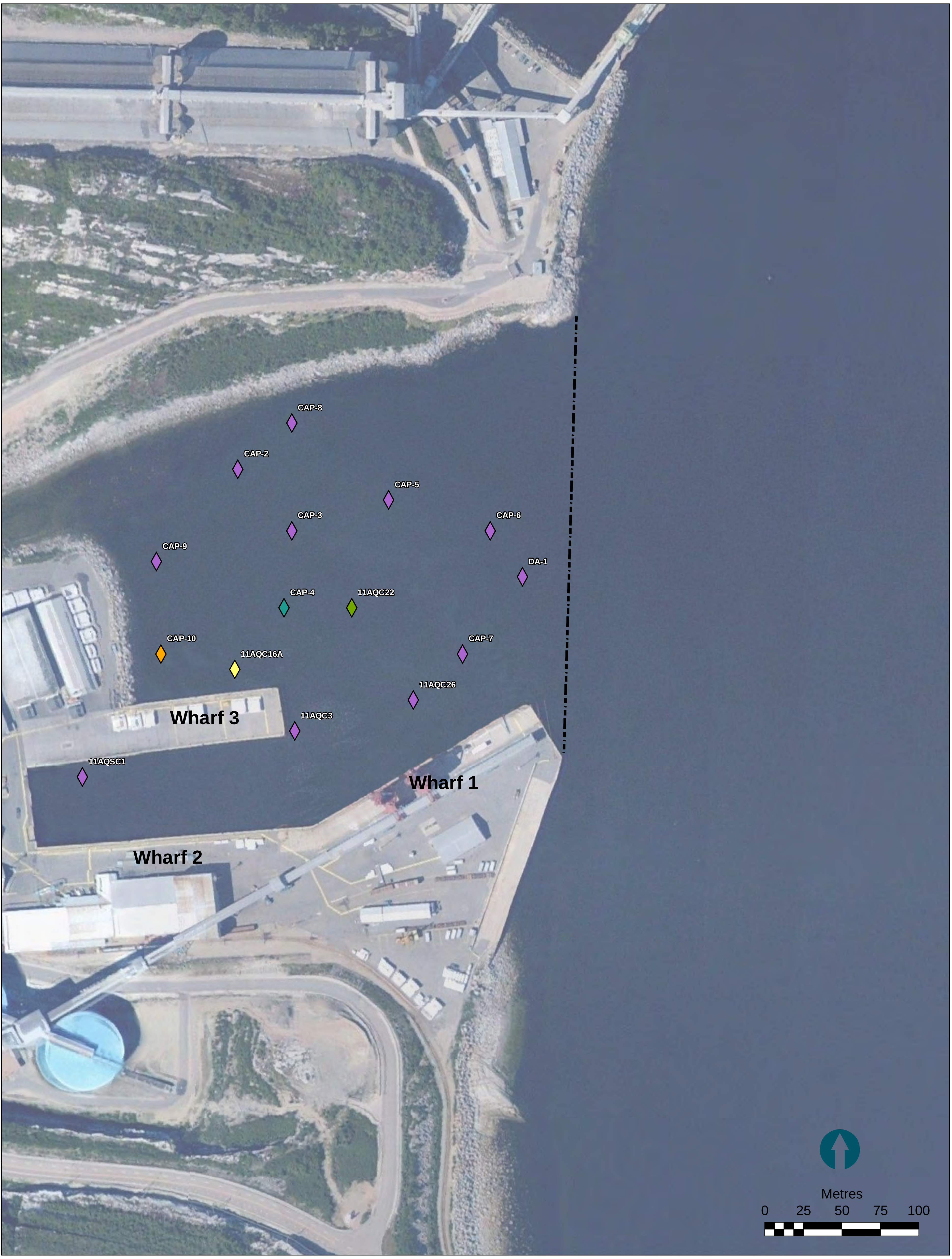
Figure 4-16

2007-2011 Subsurface Sediment TPAH-13 Concentrations (100 - 200 cm)
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec



Sediment Core Sample Location

-·- Anse du Moulin Limits

TPAH-13 Concentration (mg/kg)

- ◆ ND - 2.43 (OEL)
- ◆ 2.43 - 21.26 (FEL)
- ◆ 21.26 - 100
- ◆ 100 - 250
- ◆ 250 - 1,000
- ◆ > 1,000

NOTES:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. TPAH-13 is the sum of the 13 PAHs for which an MDDEP Sediment Criteria is available including: 2-Methylnaphthalene, Acenaphthene, Acenaphthylene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Chrysene, Dibenzo(a,h)anthracene, Fluoranthene, Fluorene, Naphthalene, Phenanthrene, and Pyrene.
4. ND = 0.
5. ND = Non-detect.
6. OEL = Occasional Effect Level.
7. FEL = Frequent Effect Level.
8. Concentrations were averaged for duplicates and for multiple results per depth interval for a sample location.
9. Database Version 11/01/2012.

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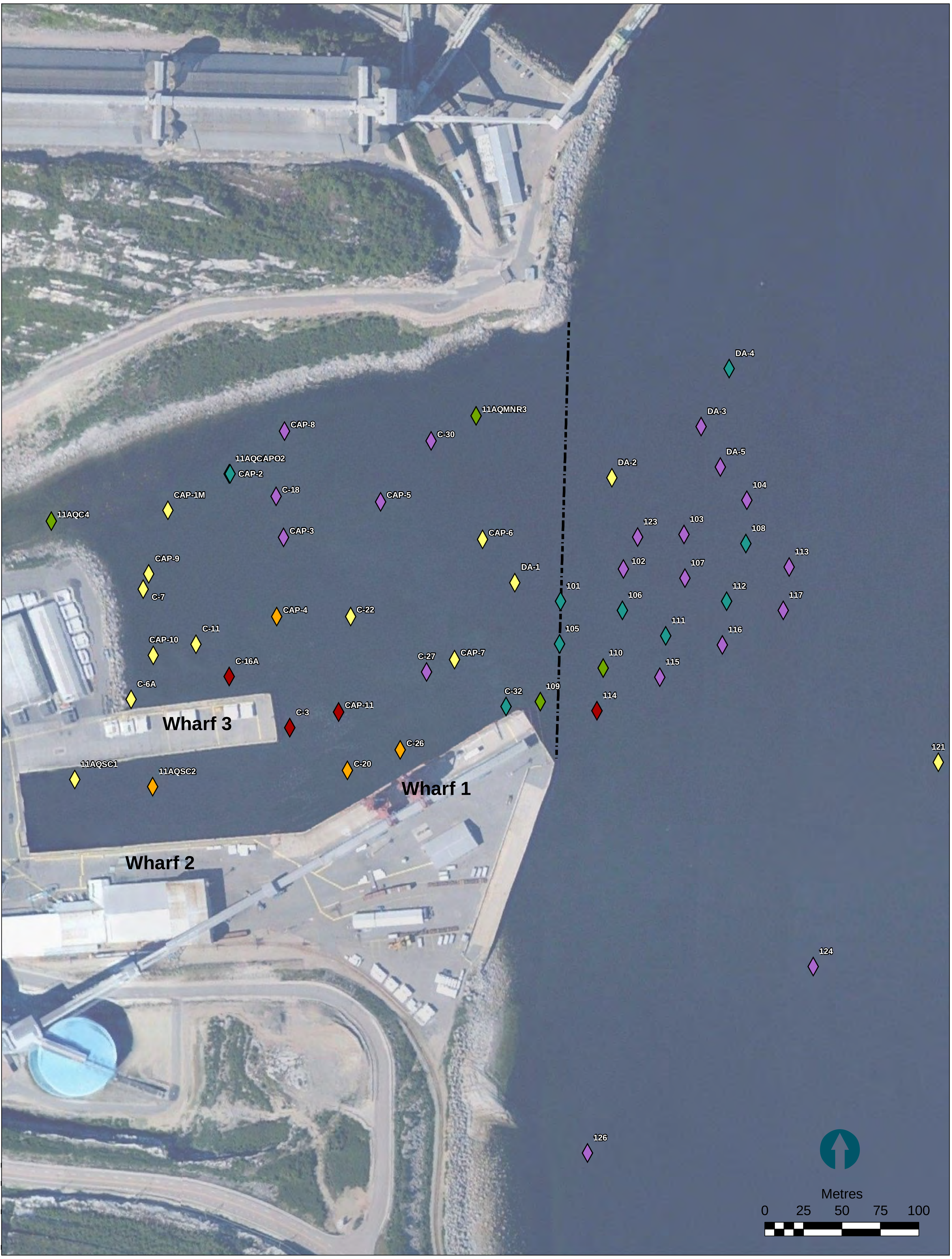
Figure 4-17
2007-2011 Subsurface Sediment TPAH-13 Concentrations (200 - 300 cm)
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec



Sediment Core Sample Location

TPCB Congener Concentration (mg/kg)

- 🟪 ND - 0.059 (OEL)
- 🟩 0.059 - 0.49 (FEL)
- 🟩 0.49 - 1
- 🟨 1 - 5
- 🟧 5 - 10
- 🟥 > 10

-·- Anse du Moulin Limits

NOTES:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. ND = 0.
4. ND = Non-detect.
5. OEL = Occasional Effect Level.
6. FEL = Frequent Effect Level.
7. Concentrations were averaged for duplicates and for multiple results per depth interval for a sample location.
8. Database Version 11/01/2012.

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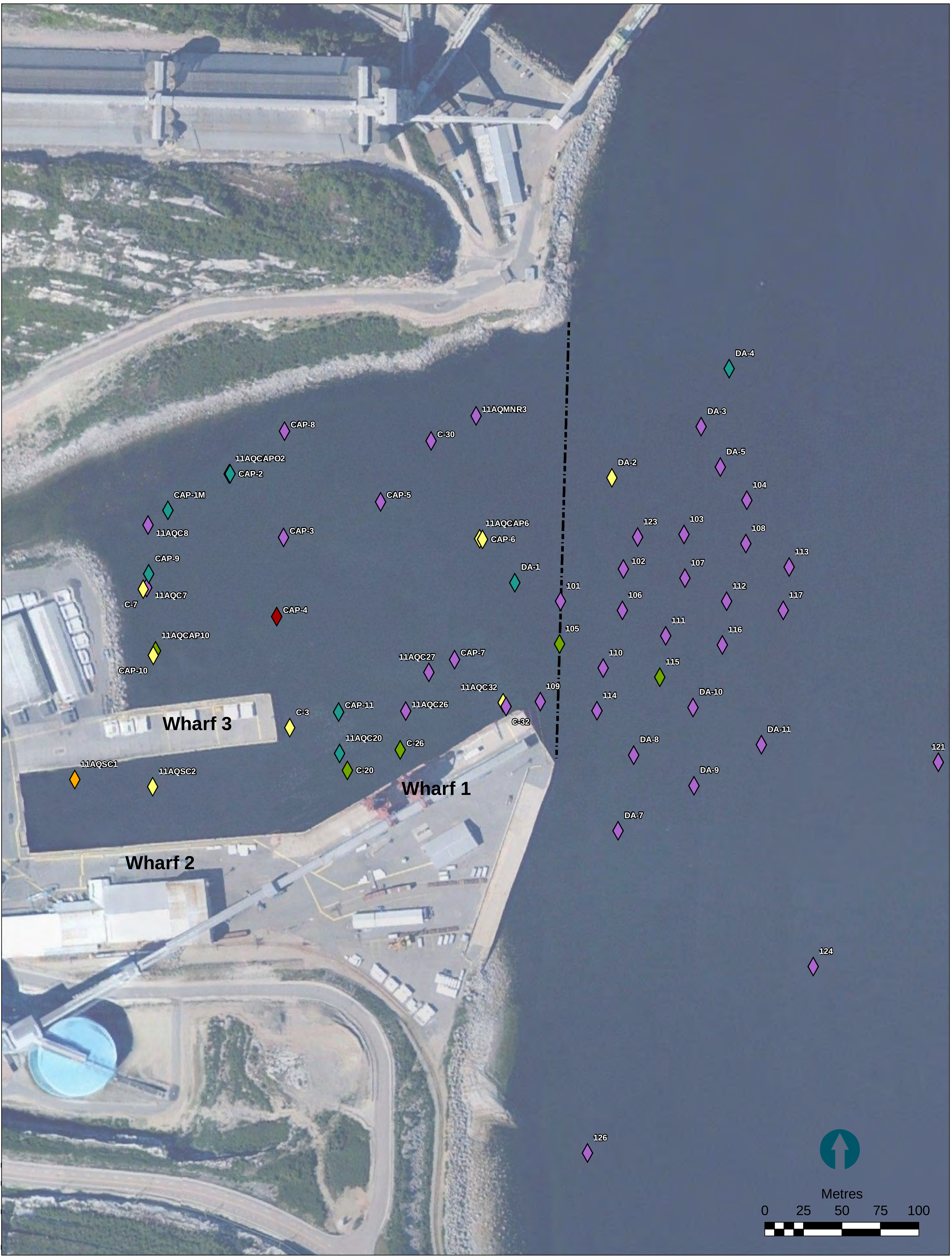
Figure 4-18
2008-2011 Subsurface Sediment TPCB Congener Concentrations (10 - 50 cm)
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec



Sediment Core Sample Location

TPCB Congener Concentration (mg/kg)

- ◆ ND - 0.059 (OEL)
- ◆ 0.059 - 0.49 (FEL)
- ◆ 0.49 - 1
- ◆ 1 - 5
- ◆ 5 - 10
- ◆ > 10

-·- Anse du Moulin Limits

NOTES:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. ND = 0.
4. ND = Non-detect.
5. OEL = Occasional Effect Level.
6. FEL = Frequent Effect Level.
7. Concentrations were averaged for duplicates and for multiple results per depth interval for a sample location.
8. Database Version 11/01/2012.

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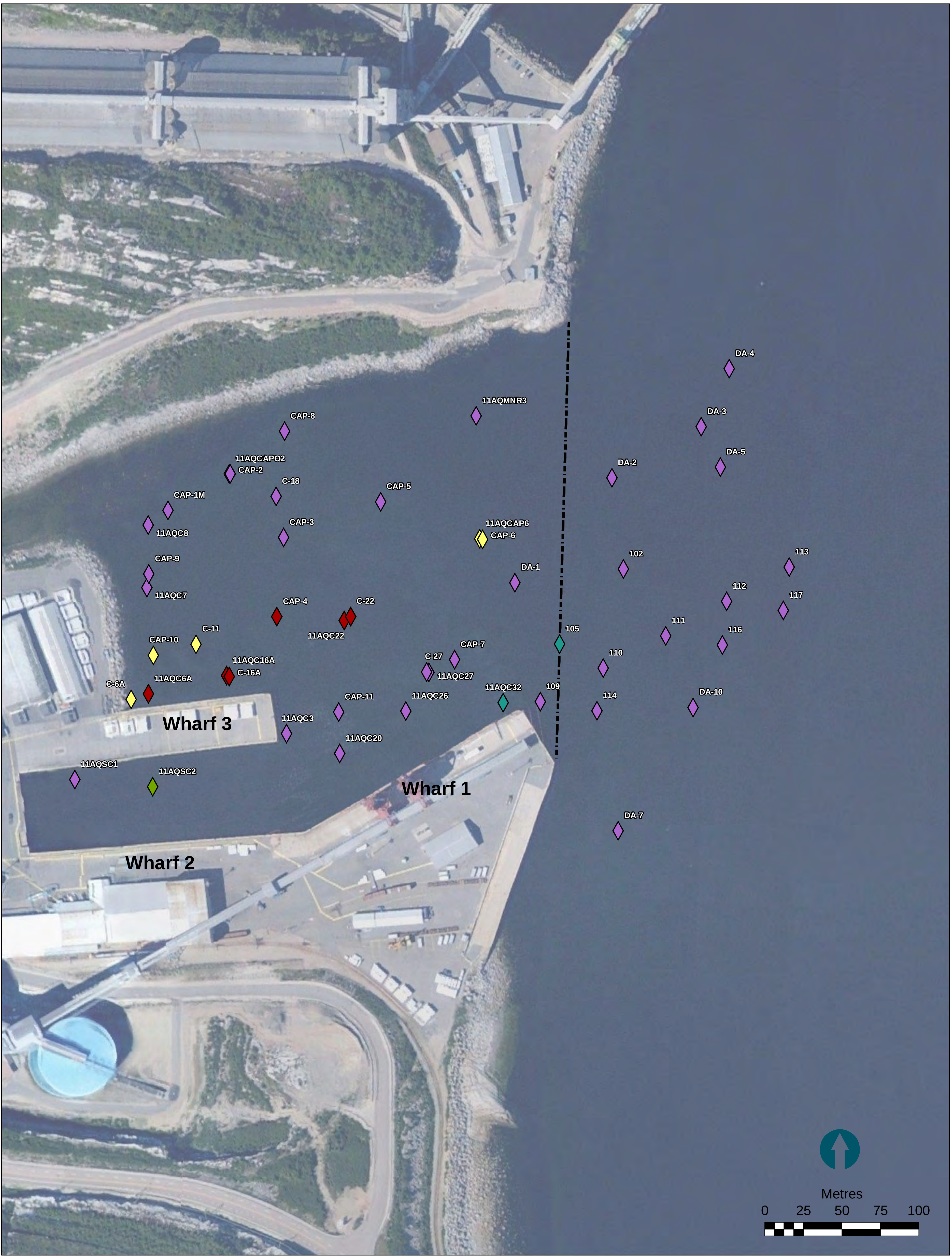
Figure 4-19
2008-2011 Subsurface Sediment TPCB Congener Concentrations (50 - 100 cm)
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec



Sediment Core Sample Location

TPCB Congener Concentration (mg/kg)

- ◆ ND - 0.059 (OEL)
- ◆ 0.059 - 0.49 (FEL)
- ◆ 0.49 - 1
- ◆ 1 - 5
- ◆ 5 - 10
- ◆ > 10

-·-· Anse du Moulin Limits

NOTES:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. ND = 0.
4. ND = Non-detect.
5. OEL = Occasional Effect Level.
6. FEL = Frequent Effect Level.
7. Concentrations were averaged for duplicates and for multiple results per depth interval for a sample location.
8. Database Version 11/01/2012.

Q:\Jobs\080002-17_Baie_Comeau\Maps\Rehab_Alts\Baie_Comeau_Rehab_Alts_tPCB.mxd lhudson 6/13/2013 9:25:23 AM

ANCHOR QEA

Figure 4-20

2008-2011 Subsurface Sediment TPCB Congener Concentrations (100 - 200 cm)

Analysis of Rehabilitation Alternatives

Alcoa, Baie-Comeau, Quebec

Sediment Core Sample Location

TPCB Congener Concentration (mg/kg)

- ◆ ND - 0.059 (OEL)
- ◆ 0.059 - 0.49 (FEL)
- ◆ 0.49 - 1
- ◆ 1 - 5
- ◆ 5 - 10
- ◆ > 10

-·-· Anse du Moulin Limits

NOTES:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. ND = 0.
4. ND = Non-detect.
5. OEL = Occasional Effect Level.
6. FEL = Frequent Effect Level.
7. Concentrations were averaged for duplicates and for multiple results per depth interval for a sample location.
8. Database Version 11/01/2012.

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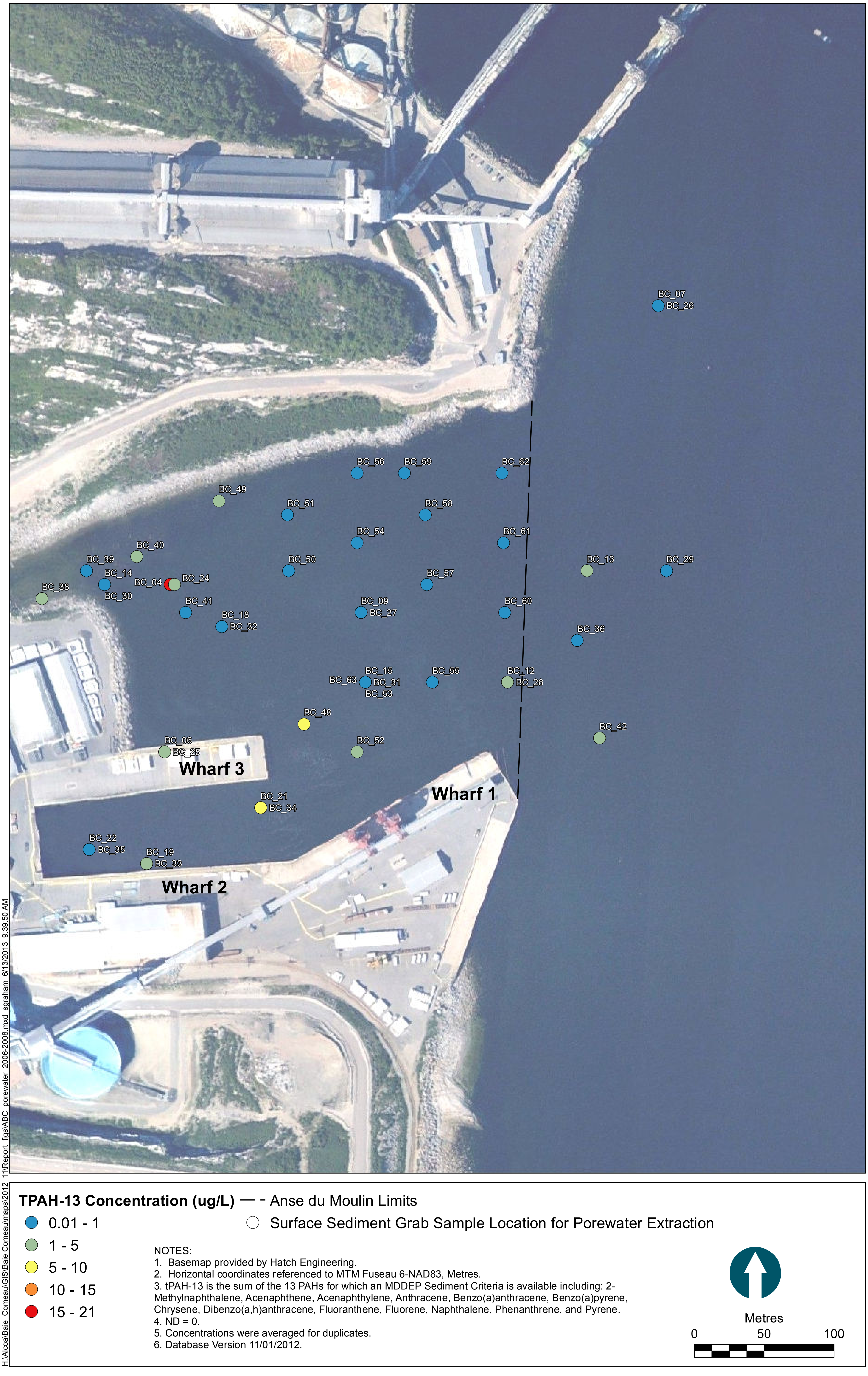
Figure 4-21
2008-2011 Subsurface Sediment TPCB Congener Concentrations (200 - 300 cm)
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec



NOTES:
1. Basemap provided by Hatch Engineering.
2. Horizontal coordinates referenced to MTM Fuseau 6-NAD83, Metres.
3. tPAH-13 is the sum of the 13 PAHs for which an MDDEP Sediment Criteria is available including: 2-Methylnaphthalene, Acenaphthene, Acenaphthylene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Chrysene, Dibenzo(a,h)anthracene, Fluoranthene, Fluorene, Naphthalene, Phenanthrene, and Pyrene.
4. ND = 0.
5. Concentrations were averaged for duplicates.
6. Database Version 11/01/2012.

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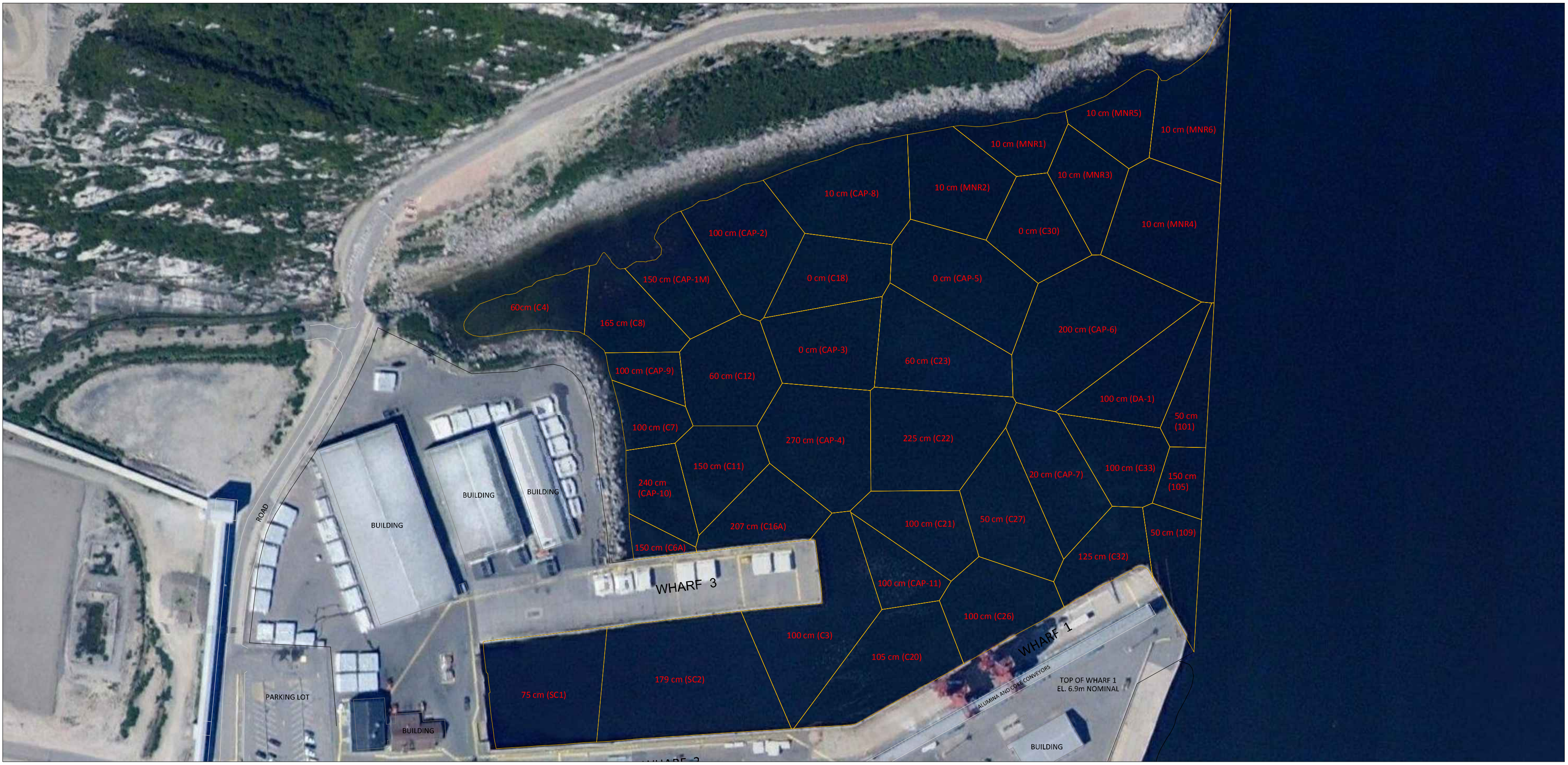
ANCHOR QEA

Figure 4-22
2006 - 2008 Surface Sediment Porewater TPAH-13 Concentrations (0 - 10 cm)
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec



SOURCE: Aerial photo by XEOS, 2009.
HORIZONTAL DATUM: MTM Fuseau 6, NAD83, metres.
VERTICAL DATUM: Chart datum, metres.

NOTES:
1. Base map provided by Hatch Engineering.
2. Alignments of depicted Thiessen polygons should be considered approximate, and subject to change.
3. This plan is for informational use only, not to be used for construction.

LEGEND

105 cm (C20)	Perimeter of Thiessen Polygon

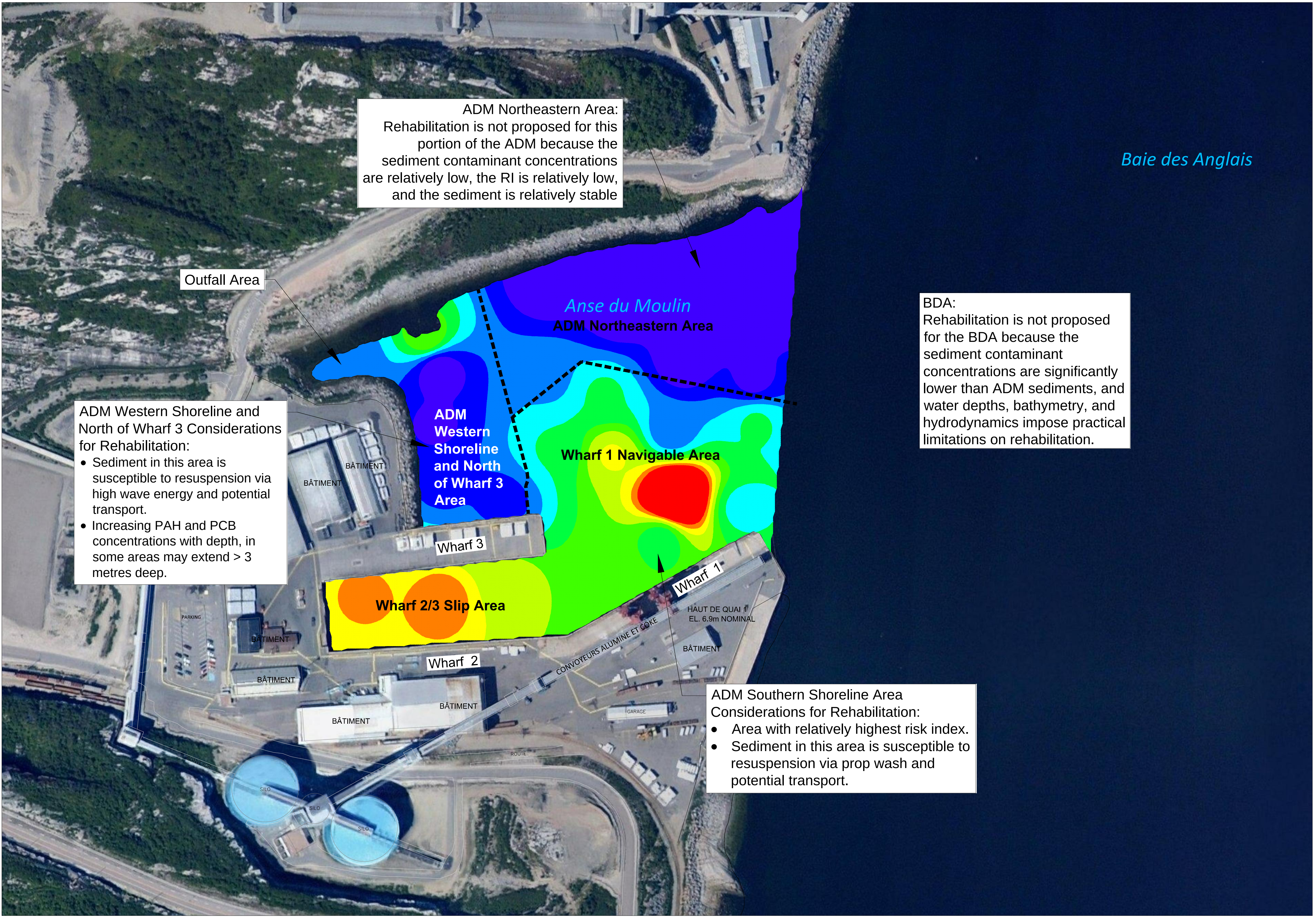
Depth of Contaminants Exceeding FEL and OEL (cm)

Representative Sample Location

0 80 160
Scale in Metres

Figure 4-23
Anse du Moulin Sediment Areas Used For Volume Estimate
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

A:\CAD - Boston\PROJECTS\090002-03 - BAIE COMEAU\2013 Projects\AofA\A of A Figures\ANC-BAIE-COMEAU-AofA_Fig_4-23-Sediment Volume Estimate.dwg Figure 4-23
Jun 13, 2013 9:26am dbinkney



ADM Northeastern Area: Rehabilitation is not proposed for this portion of the ADM because the sediment contaminant concentrations are relatively low, the RI is relatively low, and the sediment is relatively stable

ADM Western Shoreline and North of Wharf 3 Considerations for Rehabilitation:

- Sediment in this area is susceptible to resuspension via high wave energy and potential transport.
- Increasing PAH and PCB concentrations with depth, in some areas may extend > 3 metres deep.

BDA: Rehabilitation is not proposed for the BDA because the sediment contaminant concentrations are significantly lower than ADM sediments, and water depths, bathymetry, and hydrodynamics impose practical limitations on rehabilitation.

ADM Southern Shoreline Area Considerations for Rehabilitation:

- Area with relatively highest risk index.
- Sediment in this area is susceptible to resuspension via prop wash and potential transport.

LEGEND:

Sanexen Risk Index Map	
Risk	Color
0.0 to 1.0	🟪
1.0 to 2.0	🟦
2.0 to 3.0	🟦
3.0 to 4.0	🟦
4.0 to 5.0	🟩
5.0 to 6.0	🟩
6.0 to 7.0	🟩
7.0 to 8.0	🟨
8.0 to 9.0	🟧
9.0 to 15.6	🟥

- - - - Boundary of areas defined by risk index and other rehabilitation considerations

SOURCE: Aerial photo by XEOS Imaging Inc., 2009.
HORIZONTAL DATUM: MTM Fuseau 6, NAD83, mètres.
VERTICAL DATUM: Chart datum, metres.

NOTES:
1. Basemap provided by Hatch Engineering, Inc.
2. Alignments of proposed remedial areas should be considered approximate and subject to change.
3. This plan is for informational use only, not to be used for construction.

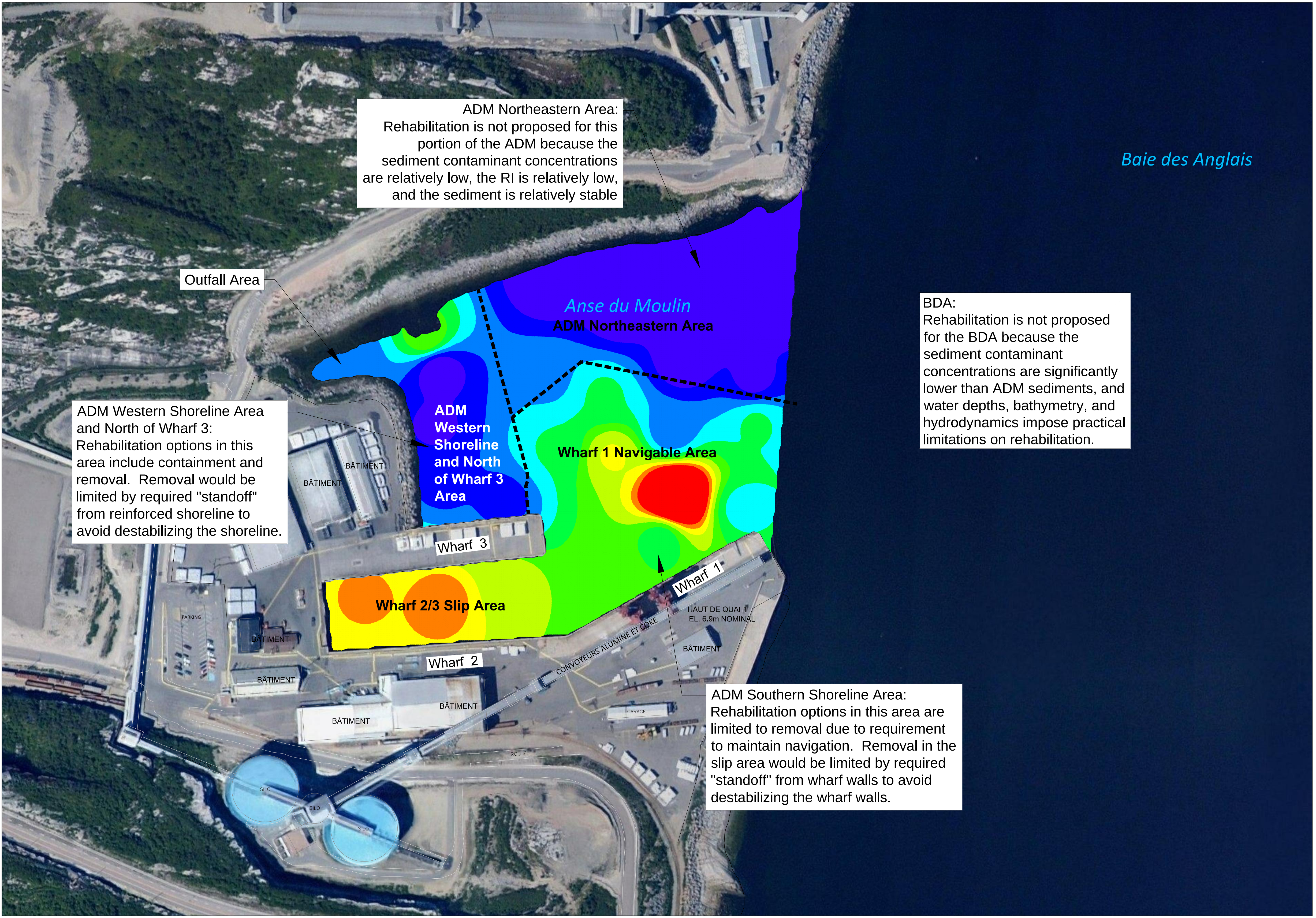
0 50 100 150
Scale in Meters

A:\CAD - Boston\PROJECTS\090002-03 - BAIE COMEAU\2013 Projects\AofA\A of A Figures\ANC-BAIE-COMEAU-AofA_Figs_7-1 and 8-1.dwg Figure 7-1 (ENG)

Jun 13, 2013 9:28am dbinkney

ANCHOR QEA

Figure 7-1
Areas Proposed for Rehabilitation
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Québec



ADM Northeastern Area:
Rehabilitation is not proposed for this portion of the ADM because the sediment contaminant concentrations are relatively low, the RI is relatively low, and the sediment is relatively stable

BDA:
Rehabilitation is not proposed for the BDA because the sediment contaminant concentrations are significantly lower than ADM sediments, and water depths, bathymetry, and hydrodynamics impose practical limitations on rehabilitation.

ADM Western Shoreline Area and North of Wharf 3:
Rehabilitation options in this area include containment and removal. Removal would be limited by required "standoff" from reinforced shoreline to avoid destabilizing the shoreline.

ADM Southern Shoreline Area:
Rehabilitation options in this area are limited to removal due to requirement to maintain navigation. Removal in the slip area would be limited by required "standoff" from wharf walls to avoid destabilizing the wharf walls.

LEGEND:

Sanexen Risk Index Map	
Risk	Color
0.0 to 1.0	🟪
1.0 to 2.0	🟦
2.0 to 3.0	🟦
3.0 to 4.0	🟦
4.0 to 5.0	🟩
5.0 to 6.0	🟩
6.0 to 7.0	🟩
7.0 to 8.0	🟨
8.0 to 9.0	🟧
9.0 to 15.6	🟥

-------- Boundary of areas defined by risk index and other rehabilitation considerations

SOURCE: Aerial photo by XEOS Imaging Inc., 2009.
HORIZONTAL DATUM: MTM Fuseau 6, NAD83, mètres.
VERTICAL DATUM: Chart datum, metres.

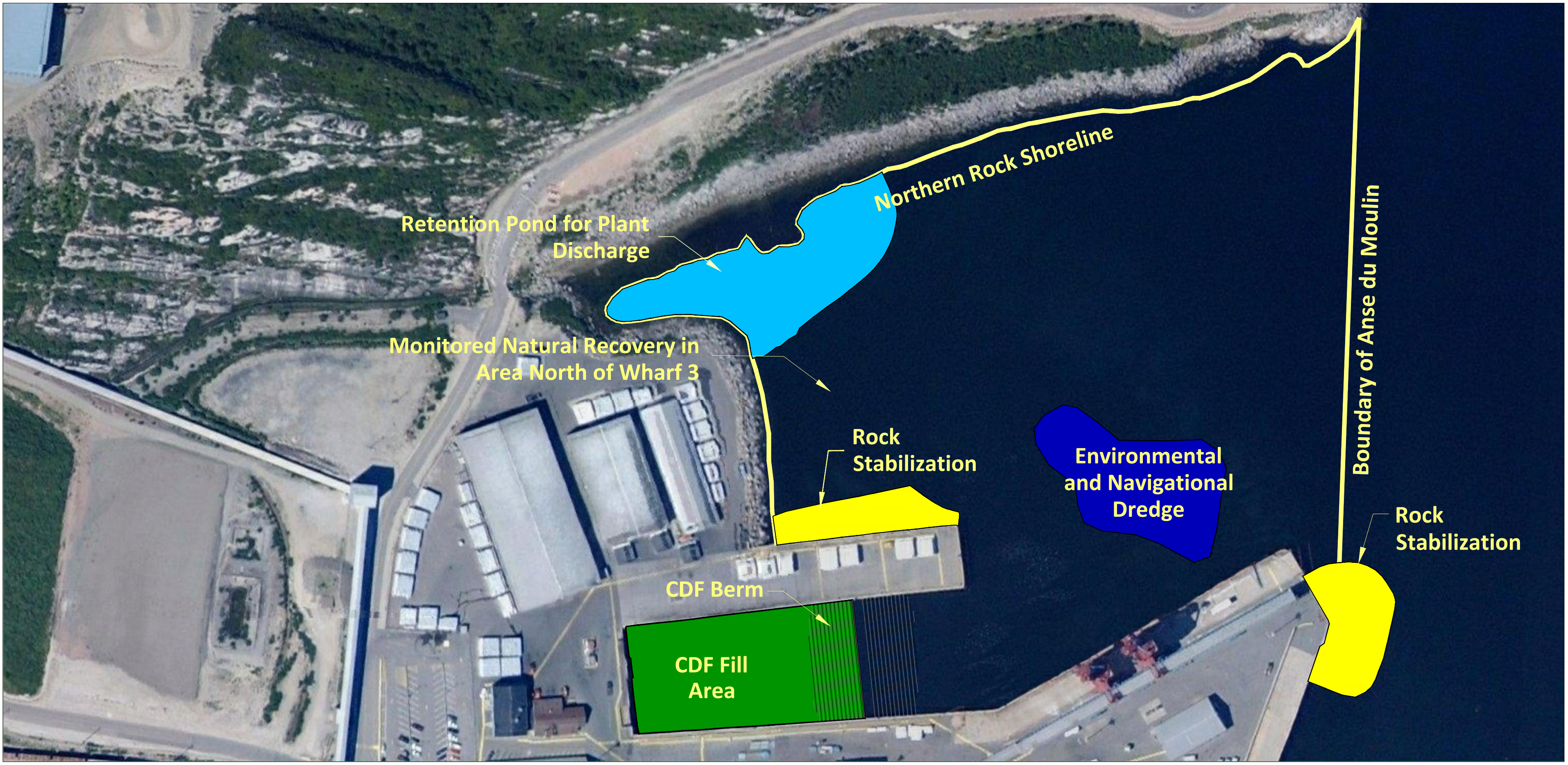
NOTES:
1. Basemap provided by Hatch Engineering, Inc.
2. Alignments of proposed remedial areas should be considered approximate and subject to change.
3. This plan is for informational use only, not to be used for construction.

0 50 100 150
Scale in Metres

A:\CAD - Boston\PROJECTS\090002-03 - BAIE COMEAU\2013 Projects\AofA\A of A Figures\ANC-BAIE-COMEAU-AofA_Figs_7-1 and 8-1.dwg Figure 8-1 (ENG)
Jun 13, 2013 9:29am dbinkney

ANCHOR QEA

Figure 8-1
Areas Proposed for Rehabilitation and Candidate Rehabilitation Options
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Québec



SOURCE: Aerial photo by XEOS Imaging Inc., 2009.
HORIZONTAL DATUM: MTM Fuseau 6, NAD83, mètres.
VERTICAL DATUM: Chart datum, metres.

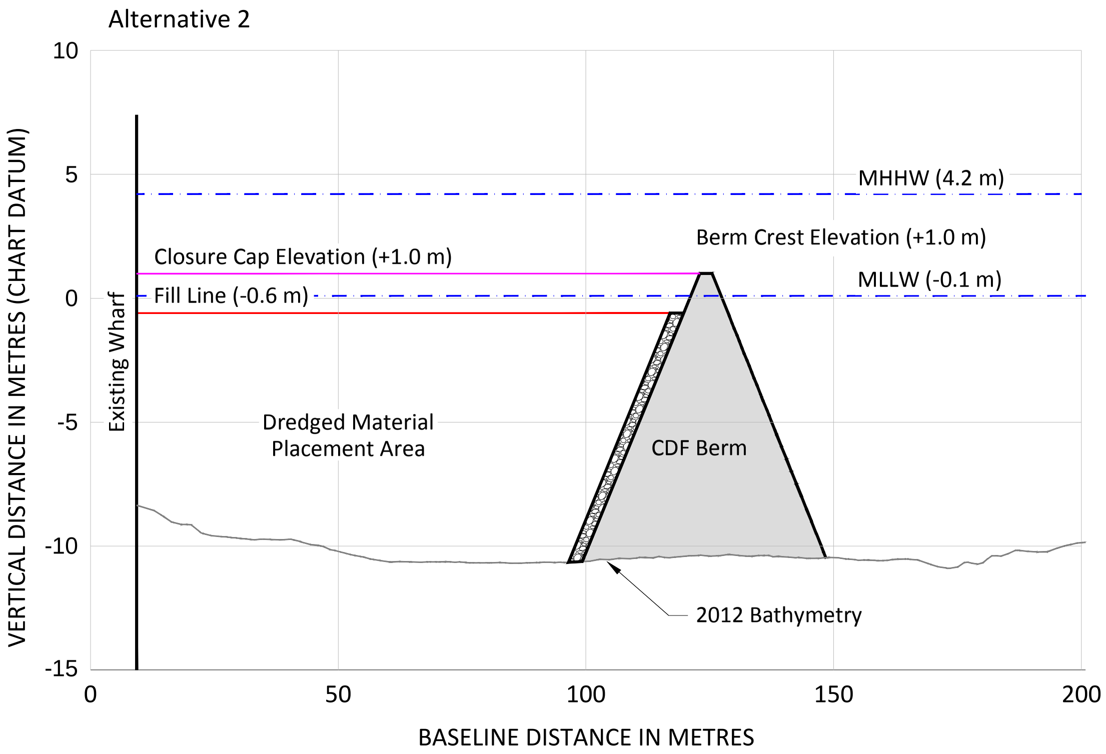
NOTES:
1. Basemap provided by Hatch Engineering, Inc.
2. Alignments of proposed remedial areas should be considered approximate, and subject to change.
3. This plan is for informational use only, not to be used for construction.

0 50 100 150
Scale in metres

A:\CAD - Boston\PROJECTS\090002-03 - BAIE COMEAU\2013 Projects\AofA\A of A Figures\ANC-BAIE-COMEAU-AofA_Figs_ 8-2 to 8-7_051313.dwg Figure 8-2 (ENG)

Jun 13, 2013 9:31am dbinkney

Figure 8-2
Rehabilitation Alternative 2 - Layout
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Québec



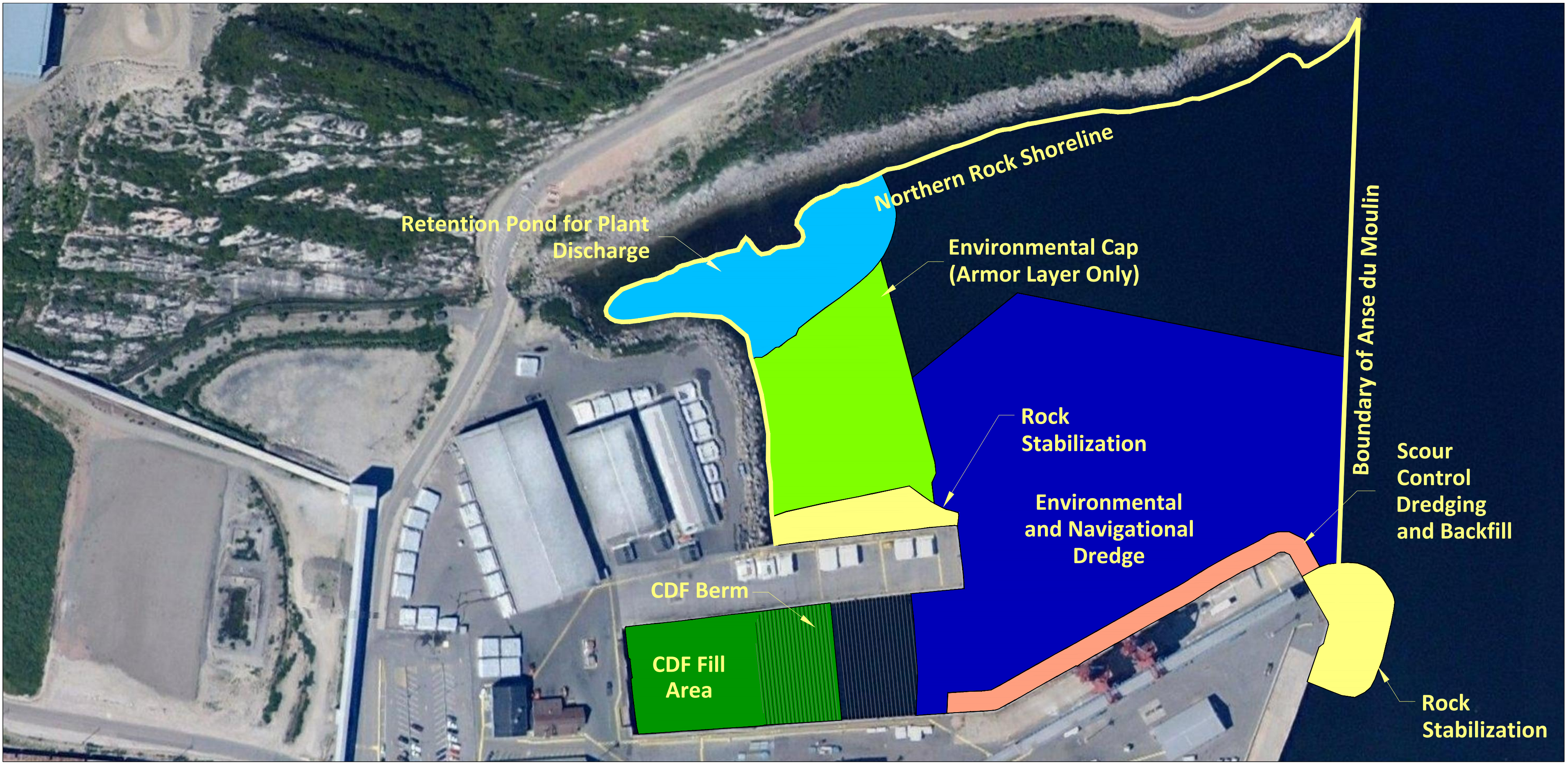
SOURCE: Aerial photo by XEOS Imaging Inc., 2009.
HORIZONTAL DATUM: MTM Fuseau 6, NAD83, mètres.
VERTICAL DATUM: Chart datum, metres.

NOTES:
1. Basemap provided by Hatch Engineering, Inc.
2. Alignments of proposed remedial areas should be considered approximate, and subject to change.
3. This plan is for informational use only, not to be used for construction.

5x Vertical Exaggeration

0 80 160
Scale in Metres

Figure 8-3
Rehabilitation Alternative 2 - Cross Section
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Québec



SOURCE: Aerial photo by XEOS Imaging Inc., 2009.
HORIZONTAL DATUM: MTM Fuseau 6, NAD83, mètres.
VERTICAL DATUM: Chart datum, metres.

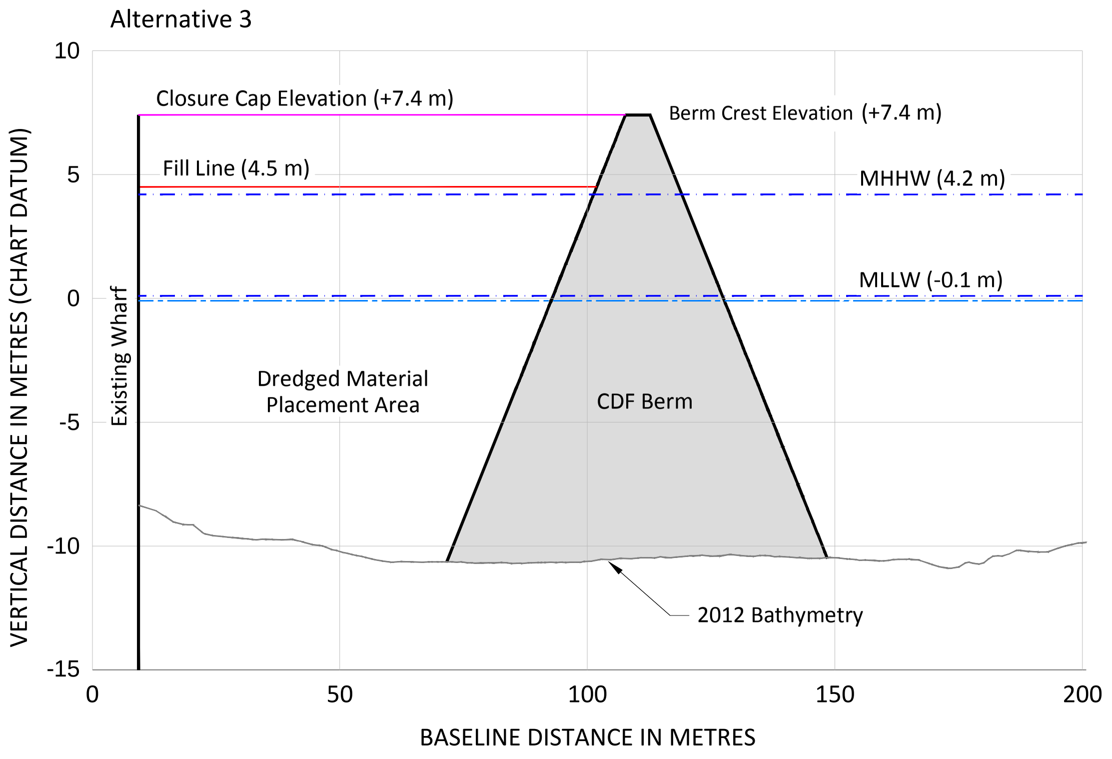
NOTES:
1. Basemap provided by Hatch Engineering, Inc.
2. Alignments of proposed remedial areas should be considered approximate, and subject to change.
3. This plan is for informational use only, not to be used for construction.

0 50 100 150
Scale in Metres

A:\CAD - Boston\PROJECTS\090002-03 - BAIE COMEAU\2013 Projects\AofA\A of A Figures\ANC-BAIE-COMEAU-AofA_Figs_ 8-2 to 8-7_051313.dwg Figure 8-4 (ENG)

Jun 13, 2013 9:34am dbinkney

Figure 8-4
Rehabilitation Alternative 3 - Layout
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Québec



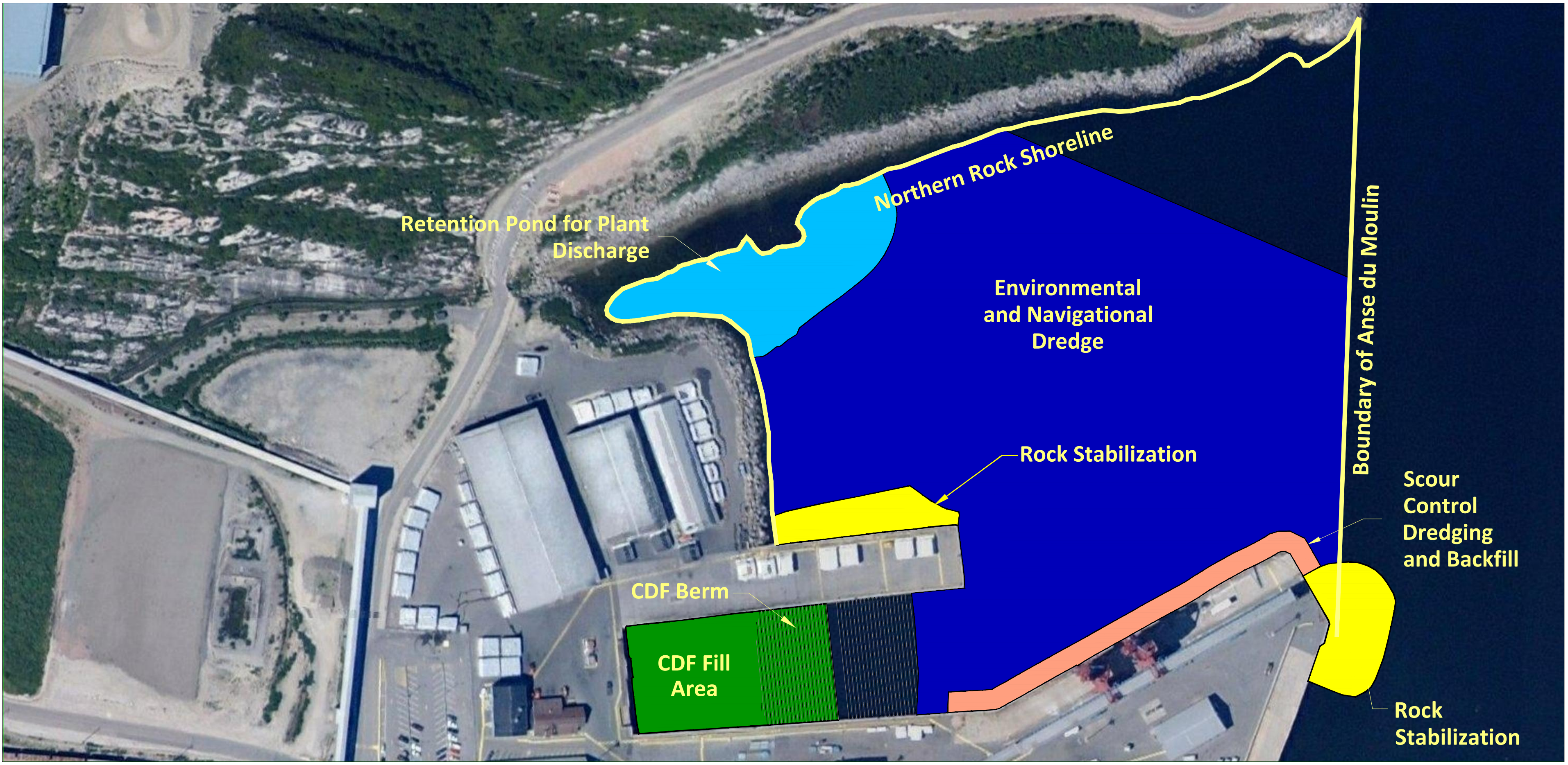
SOURCE: Aerial photo by XEOS Imaging Inc., 2009.
HORIZONTAL DATUM: MTM Fuseau 6, NAD83, mètres.
VERTICAL DATUM: Chart datum, metres.

NOTES:
1. Basemap provided by Hatch Engineering, Inc.
2. Alignments of proposed remedial areas should be considered approximate, and subject to change.
3. This plan is for informational use only, not to be used for construction.

5x Vertical Exaggeration

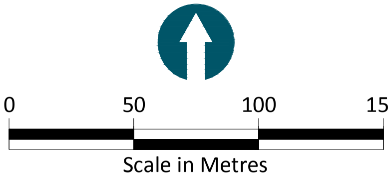
0 80 160
Scale in Metres

Figure 8-5
Rehabilitation Alternative 3 - Cross Section
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Québec



SOURCE: Aerial photo by XEOS Imaging Inc., 2009.
HORIZONTAL DATUM: MTM Fuseau 6, NAD83, mètres.
VERTICAL DATUM: Chart datum, metres.

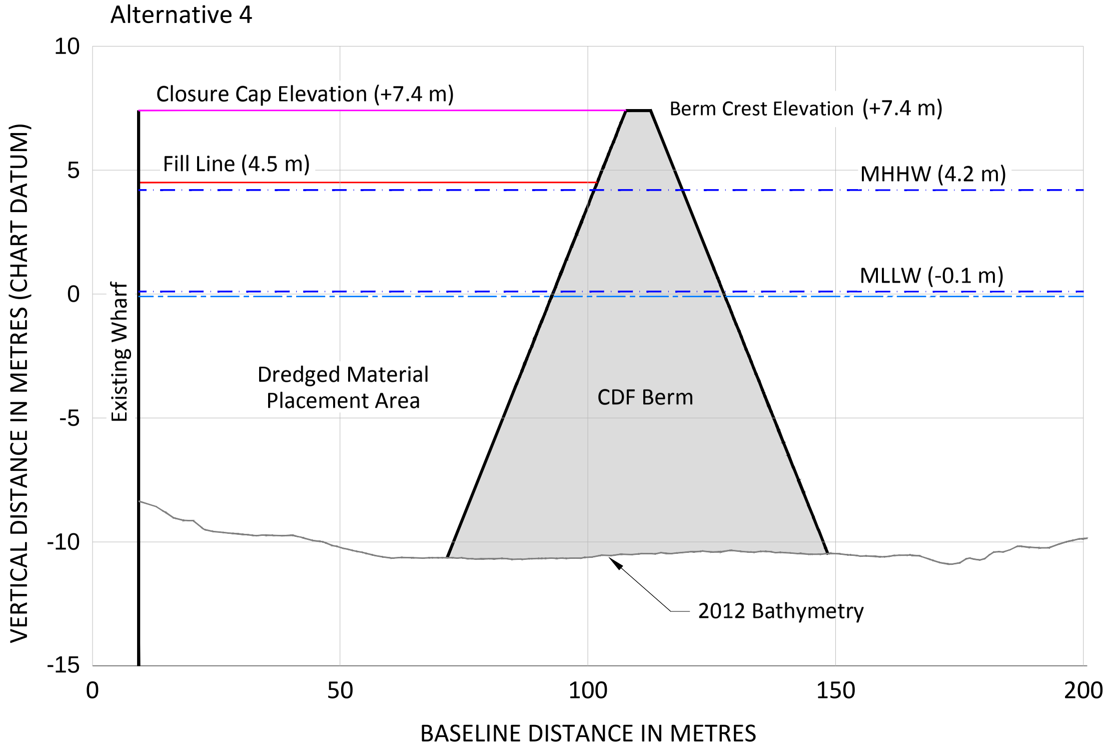
NOTES:
1. Basemap provided by Hatch Engineering, Inc.
2. Alignments of proposed remedial areas should be considered approximate, and subject to change.
3. This plan is for informational use only, not to be used for construction.



Jun 13, 2013 9:35am dbinkney A:\CAD - Boston\PROJECTS\090002-03 - BAIE COMEAU\2013 Projects\AofA\A of A Figures\ANC-BAIE-COMEAU-AofA_Figs_ 8-2 to 8-7_051313.dwg Figure 8-6 (ENG)

ANCHOR QEA

Figure 8-6
Rehabilitation Alternative 4 - Layout
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Québec



SOURCE: Aerial photo by XEOS Imaging Inc., 2009.
HORIZONTAL DATUM: MTM Fuseau 6, NAD83, mètres.
VERTICAL DATUM: Chart datum, metres.

NOTES:
1. Basemap provided by Hatch Engineering, Inc.
2. Alignments of proposed remedial areas should be considered approximate, and subject to change.
3. This plan is for informational use only, not to be used for construction.

5x Vertical Exaggeration

0 80 160
Scale in Metres

Figure 8-7
Rehabilitation Alternative 4 - Cross Section
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Québec

APPENDIX A
2009 GEOTECHNICAL INVESTIGATION REPORT

SMi

LABO S.M. INC.

Geotechnical investigation
New wharf no.4 – Baie-Comeau Alcoa smelter

Geotechnical report presented to

HATCH Ltd, Agent for Alcoa Ltd
5, Place Ville Marie, Suite 200
Montreal, Quebec, Canada H3B 2G2

HATCH™ **Vendor Document Status**

1 ☐ **Proceed to next submission and status.**

2 ☐ **Proceed with exceptions as noted to next submission and status.**

3 ☐ **Do not proceed.**
Revise as noted and resubmit next submission and status.

4 ☐ **Complete, no further submission required.**

By coui59485 at 4:07 pm, 04-Jan-2010

By: **Date:**

Review and authorization to fabricate are only for general conformance with the design concept of the Project as expressed in the Contract Documents. Sole responsibility for the accuracy and completeness of this document, including but not limited to dimensions and quantities, remains with the Supplier/Contractor. Hatch does not warrant the accuracy or completeness of any of the information contained herein, nor does Hatch authorize or approve any construction means, methods, techniques, sequences or any safety precautions or procedures.

Hatch No. E310011-ABC197-CZ023-07-124-0078_sub01 **R:**

DOCUMENT FOR INFORMATION

Prepared by:

Labo S.M. inc.
740 Galt Street West, 2e floor
Sherbrooke (Quebec) J1H 1Z3

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Geotechnical engineer

Alain Philibert, ing., Ph. D.
Project manager – Geotechnical

December 2009

O/ref.: F099382

Note: This report must not be copied, in part or in full, without written authorization from Labo S.M. inc.

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APPENDIX A: EXPLANATORY NOTICES FOR BOREHOLE REPORTS
BORING LOG
REPORTS OF LABORATORY TESTS

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001 - BOREHOLE LOCATION
002 - CROSS-SECTIONAL A-A’ AND B-B’
003 - CROSS-SECTIONAL C-C’ AND D-D’

1.0 INTRODUCTION

The professional and technical services of Labo S.M. inc. have been retained by Hatch Ltd – Agent for Alcoa Ltee to carry out a geotechnical investigation at the site of the proposed wharf extension and of the confined disposal facility (CDF) at the Baie-Comeau Alcoa smelter (Quebec). This investigation was undertaken according to the drilling specifications, *Proposed 2009 geotechnical investigations,* issued by Alcoa-Hatch, August 2009.

The purpose of the investigation was to determine the nature and the geotechnical properties of the subsurface soil and bedrock from result of test boring and by means of field and laboratory works. These informations are to provide foundation design criteria for the various elements of the proposed construction.

This report contains a description of the site, methodology and result of the site investigation and laboratory work, and our comments, conclusions or recommandations on:

- site suitability with regard to the proposed method of construction;
- likely performance of structures, differential settlement of new and existing structures, for instance ability to support surcharge loading;
- soil engineering properties;
- installation of steel sheet piles;
- design and installation of bearing piles;
- the interaction of the bearing piles and the sheet pile structure during construction and during seismic activity;
- placing fill to -14 m at the east of the new wharf;
- dynamic parameters of soil;
- seismic design consideration;
- design of strip and spread footings;

- the pavement design;
- dredging;
- potential of corrosion;
- geotechnical supervision during construction.

2.0 PROJECT AND SITE DESCRIPTION

2.1 SITE DESCRIPTION

The harbour area of Alcoa smelter is located on the north shore of the St.Lawrence River, about 1,5 kilometer north-east of the existing wharf facilities at Baie-Comeau, Quebec. It is located precisely on the western shore of Baie des Anglais. The wharves consist of a breakwater and three berths, identified with number one to three, with a dredged approach channel.

2.2 PROJECT DESCRIPTION

The proposed wharf will be called no 4 and be an extension to its existing wharf no1. It will be a double sided and will have a lenght of ± 245 m and a width of ±50m. The initial design included an anchorage steel sheet pile walls and bearing piles for the north rail support. The sheet pile does not exceed 33 m lenght. The wharf will be topped by a concrete surface.

Construction of this new wharf require dredging operation on the north side to -14 m chart datum. A backfill will also be required at the extremity of the new wharf. In addition to the new wharf, the planned project will include construction of a confined disposal facility (CDF) and its associated containment berm in the location of the existing wharf no.2. The CDF would contain dredged material from the new wharf no.4 footprint and possibly from other adjacent areas.

2.3 GEOMORPHOLOGY AND GEOLOGY

The site work is located in the geological Grenville Province at the edge of the Canadian Shield. The available geologic reports indicate that the bedrock in the Baie-Comeau region is mainly granite and granite-gneiss of Pre-Cambrian age (Proterozoïque). Several bedrock outcrops are observed all around the shore of Baie des Anglais. In this area the topography is hilly. The difference in elevation between the rock level intercepted in the offshore borehole and the shore level is about XX meters.

The last Quaternary period of glaciation has left an important alluvial (granular) deposit on the bedrock, whose a clay deposit following the Champlain Sea retreat.

Lcoal topography and the hydrographical system are characterized by hilly ground, scattered by several lakes and rivers. At about 17 km in the west of site project, the Manicouagan river drain southward, to the St. Laurence River.

3.0 PREVIOUS INVESTIGATIONS

Several geotechnical investigations were previously carried out in the project area. The studies brought to our attention are:

- Geocon 1955, ‘’Site investigation Mill Bay – Baie-Comeau’’, Report to C.D. Howe Company Limited.
- Hughes T.A. and Wallingford V.M. 1958, ‘’Aluminium smelter dock at Baie-Comeau’’ 72nd Annual general and professional meeting of the engineering institute of Canada.
- Golder & Associated 1967, ‘’ Preliminary soil investigation proposed extension to no 3 berth Baie-Comeau’’, Report to Canadian British Aluminium Company Limited.
- Dames & Moore 1970, ‘’Site investigation services proposed ship unloading facilities, Baie-Comeau’’.
- SNC/Terratech 1984, ‘’Etude géotechnique Métaux Reynolds - Extension du quai, Baie-Comeau’’, Report no 1603-0-4F.
- Terratech 1984, ‘’Etude de répercussions environnementales – Travaux de dragage d’entretien’’.
- AMEC 2004, ‘’Alcoa Baie-Comeau, Marine terminal rehabilitation study – phase 2’’.
- Qualitas 2005, ‘’Geotechnical investigation, Marine terminal rehabilitation study – phase 2A, Alcoa – Baie-Comeau’’.
- Geophysique GPR International inc. 2008,Levé de sismique refraction a l’Aluminerie de Baie-Comeau, Project ABC197 – Quai de Baie-Comeau’’, Presented to Alliance Alcoa-Hatch.

In October, 2009, Hatch has presented a synthesis of information provided by these report in their document ‘’*Summary of existing geotechnical information (Revision 1 – general)*’’.

Information contained in these reports have been considered in our study, with some relevant information on the local stratigraphy of the soil deposit.

3.0 INVESTIGATION PROCEDURE

3.1 FIELD WORK

The field work was performed between August 25th, 2009 November 21th, 2009 based on the instructions contained in the ‘’*Proposed 2009 geotechnical investigations*’’ by Hatch/Alcoa Alliance (Réf.: H310011-ABC197-0100-10-124-0001). Twenty three (23) vertical boreholes with soil and rock sampling, were performed and are identified: as

- boreholes 09-01 to 09-17 (excepted 09-06 and 09-10), located at the site of the new wharf;
- boreholes 09-CDF-01 to 09-CDF-07 (excepted 09-CDF-02), located at the site of the confined disposal facility (CDF);
- boreholes 09-DR-01 and 09-DR-02 located at the north side of the wharf, where dredging operation are planned;

All field work were carried out under the supervision of a geotechnical technician. Data from the boring operation are included in Appendix A. A note on the terminology used in our geotechnical report is also included.

3.1.1 LOCALIZATION AND LEVEL SURVEYING

Each borehole has been located by Hatch. Final position of borehole with relevant ground elevation was obtained by SMI from coordinates provided by Hatch. The X.-Y. position of each borehole was within less than 0,6 m as obtained by a GPS SXblueII. Just before beginning drilling in order to assure that each borehole is at less than 3,0 m of the theorical position. The referencial datum is the NAD83, MTM zone 6.

The ground and water level at each borehole has been obtained with a rotary level and laser prism, installed at the extremity of wharf #1. The bench mark used was the top of the cover oil well positioned at 5456928,99 northing, 258657,21 easting, with an elevation of 7,36 m in chart datum as provided by Hatch. All elevation in this report are related to chart datum, which zero level is 1,8 meter below geodetic datum, so the positive elevation value in chart datum are 1,8m higher than geodetic datum.

When the drilling operation was performed from the barge in ‘’floating mode’’, the variation of the elevation due to tide has been controlled at each sampling with an independent weight- pulley system.

Drilling surveys carried out is presented in plan 001.

3.1.2 VERTICAL BOREHOLE

Drilling was carried out using a by Diedrich D-50 hydraulic drill, installed on a jack-up barge. HW, NW and BW casing, with the following diameter, were used:

Casing	Inside diameter (mm)	Outside diameter (mm)
BW	60	73
NW	76	89
HW	102	114

Borehole has reached a depth between 5,3 m and 72,9 m. During the drilling, remoulded samples of soil were obtained at a regular interval of 0,76 m up to a depth of 20 m depth, and at the interval of 1,52 m at greater depth.

A standard ’’B’’ split spoon, with an inside diameter of 38 mm, was used to perform the standard penetration test (SPT) as per specification BNQ-2501-140. In order to increase the soil recovery following a poor recuperation of sample, a ‘’N’’ split spoon with an inside diameter of 50 mm was used.

In clayey deposit, sampling was performed using thin walls Shelby tube (inside diameter of 73 mm) equipped with an Ostenberg hydraulic piston (Ostenberg).

Field shear test were performed using a Nilcon vane as defined in the BNQ 2501-200 specification. In order to assess the sensitivity of the clay deposit, remoulded test were also performed.

Bedrock and boulders were drilled and sampling were carried out using a double-walled core barrel NQ or HQ. However, NX core barrel was also used at some occasion. The diameter are the following:

Casing	Borehole diameter (mm)	Core diameter (mm)
NX	75.7	54.7
NQ	75.7	47.7
HQ	96	63.5

Rock Quality Desigantion (RQD value) of all rock samples was determined directly on the site by the geotechnical technician assigned to the project and was validated, in the laboratory, by the geotechnical engineer.

3.2 LABORATORY WORK

All soil samples recovered were sent to our testing laboratory for visual identification by a geotechnical engineer and to complete the borehole log as shown our report. In order to determine the nature and some physical and mechanical properties of the soils, the following tests were performed on representative samples.

Table 1 Laboratory testing program

Quantity	Analysis	Standard
X	Particle size analysis	LC 21-040 (ASTM D421)
X	Moisture content	BNQ 2501-170 (ASTM D2216)
X	Atterberg limits	BNQ 2501-092 (ASTM D4318)
X	Specific gravity	ASTM D54
X	One-dimensional consolidation properties of soils using increment loading	ASTM D2435

X	Unconfined compressive strength of cohesive soil	ASTM D2166
X	Consolidated undrained triaxial compression test for cohesive soils	ASTM D4767
X	Direct shear test of soils under consolidated drained conditions	ASTM D3080

All results are contained in appendix A.

All samples recovered not used for testing will be kept until January 31th, 2012. After this date, they will be destroyed if we do not receive a request from you.

4.0 INVESTIGATION RESULTS

Information gathered during the field and laboratory investigations are presented in the following paragraphs and summarized in the tables XX to XX.

4.1 WHARF AREA

Investigations carried out at the location of the projected Wharf have revealed several soil deposits which highly different properties. Generally speaking, the intercepted soils are usually predominantly sandy and compact. However, as noted from borehole 09-05 drilling sector, its contain at shallow depth firm consistency clayey layer, whose thickness varies between 3,6 and 10,4 m. A little farther out from 09-12 and 09-13 drilling sector, a very loose silty-sand deposit was encountered with N-SPT values lower than 4 and often 0. This loose silty-sand deposit was encountered in all drilling up to the end of the wharf, and reaches thickness between 6,0 m and 16.3 m. Below these, we find a compact to dense silty-sand deposit, before reaching a more uniform compact to dense sand laying on the rock.

Through these deposits, and more often within the sandy deposits, we found occasionnaly some gravelly and stony horizons. The lateral continuity of these horizons is not well defined. For ease of understanding the stratigraphy of the soil at the site, we have defined the following description type of soil:

A. Compact upper sand deposit with locally layer of gravelly, and/or cobble and boulder content

B. Firm consistency clayey deposit

C. Very loose silty-sand deposit

D. Compact to very dense silty-sand deposit with locally layer of gravelly, and/or cobble and boulder content

E. Compact to very dense lower sand deposit with locally layer of gravelly, and/or cobble and boulder content

F. Excellent quality granitic rock

Gravely and stony layers are treated separately because they find themselves in several deposits.

The following tables as well as those at the end of this section are summaries of the stratigraphy deposits, and of the laboratory test results.

Table 2 Summary of the stratigraphy - Wharf area

Borehole n°	Elevation surface (m)	Depth of the borehole (m)	A Compact upper sand deposit*	B Firm consistency clayey deposit			C Very loose silty-sand deposit			D Compact to very dense silty-sand deposit*			E Compact to very dense lower sand deposit*		F Excellent quality granitic rock	
			Thickness (m)	Depth (m)	Elev. (m)	Thick. (m)	Depth (m)	Elev. (m)	Thick. (m)	Depth (m)	Elev. (m)	Thick. (m)	Depth (m)	Elev. (m)	Depth (m)	Elev. (m)
09-01	-6,14	15,09	>15,09	-	-	-	-	-	-	-	-	-	-	-	-	-
09-02	-9,81	19,93	>19,93	-	-	-	-	-	-	-	-	-	-	-	-	-
09-03	-9,31	19,05	>19,05	-	-	-	-	-	-	-	-	-	-	-	-	-
09-04	-10,11	20,57	>20,57	-	-	-	-	-	-	-	-	-	-	-	-	-
09-05	-10,78	61,24	0,61	0,61	-11,39	5,33	-	-	-	5,94	-16,72	6,18	12,12	-22,90	54,92	-65,70
09-07/7B	-10,71	56,31	6,17	6,17	-16,88	6,02	-	-	-	12,19	-22,90	17,07	29,26	-40,05	55,93**	-66,72**
09-08	-10,49	36,58	8,46	8,46	-18,95	7,24	-	-	-	15,70	-26,19	>20,88			-	-
09-09	-10,39	20,55	7,93	7,93	-16,32	8,22	-	-	-	16,15	-26,54	>4,40	-	-	-	-
09-11	-13,64	72,85	6,02	6,02	-19,66	9,55	-	-	-	15,57	-29,21	12,47	28,04	-41,69	>72,85	<-86,49
09-12	-12,22	28,04	6,86	6,86	-19,08	6,81	13,67	-25,89	11,78	25,45	-37,67	>2,59	-	-	-	-
09-13	-16,83	30,79	4,27	4,27	-21,10	9,14	13,41	-30,24	16,31	29,72	-46,55	>1,07	-	-	-	-
09-14	-20,43	30,33	2,44	2,44	-22,87	8,58	11,02	-31,45	13,67	24,69	-45,12	4,27	28,96	-49,39	>30,33	<-50,76
09-15	-20,60	23,32	1,80	1,80	-22,40	4,30	6,10	-26,70	7,77	13,87	-34,47	1,98	15,85	-36,45	>23,32	<-43,92
09-16	-24,12	30,18	3,05	3,05	-27,17	3,58	6,63	-30,75	6,02	12,65	-36,77	1,52	14,17	-38,29	>30,18	<-54,29
09-17	-17,27	22,70	3,35	3,35	-20,62	10,44	13,79	-31,06	6,05	20,29	-37,56	>2,41	-	-	-	-

**included occasionally gravel/cobble content* ***Refusal on rock or boulder – bedrock level not confirmed*

Table 3 Summary of the stratigraphy of previous studies - Wharf area

Borehole n°	Elevation surface (m)	Depth of the borehole (m)	A	B			C			D			E		F	
			Compact upper sand deposit*	Firm consistency clayey deposit			Very loose silty-sand deposit			Compact to very dense silty-sand deposit*			Compact to very dense lower sand deposit*		Excellent quality granitic rock	
			Thickness (m)	Depth (m)	Elev. (m)	Thick. (m)	Depth (m)	Elev. (m)	Thick. (m)	Depth (m)	Elev. (m)	Thick. (m)	Depth (m)	Elev. (m)	Depth (m)	Elev. (m)
Dames et Moores 1970																
9	-10,05	14,75	3,66	3,66	-13,72	3,66				7,32	-17,37	6,10	13,42	-23,47	>14,75	<-25,00
10	-14,02	24,51	7,32	7,32	-21,34	6,36				13,68	-27,70	>10,83				
10A	-12,29	14,22	7,52	7,52	-19,81	6,40				13,92	-26,21	>0,31				
16	-10,19	10,23	1,39	1,39	-11,58	3,35				4,74	-14,93	2,57	7,31	-17,50	>10,23	<-20,42
19	-9,45	14,76	>14,76													
SNC/Terratech 1984																
HE-1	-10,00	14,50	3,20	3,20	-13,23	5,27				8,50	-18,50	>6,00				
HE-2	-10,86	22,20	7,50	7,50	-18,36	9,5				17,00	-27,86	>5,20				
HE-3	-9,85	19,50	0,85	0,85	-10,70	1,36				2,20	-12,05	>17,30				
HE-4	-11,10	26,50	6,50	6,50	-17,60	5,00				11,70	-22,80	>14,80				
HE-5	-15,57	19,20	4,50	4,50	-20,07	9,22	13,72	-29,29	>5,48							
HE-20	-9,03	20,43	>20,40													
HE-26	-9,69	5,50	0,00	0,00	-9,69	2,84				2,84	-12,53	>2,67				
HE-31	-9,80	9,04	0,70	0,70	-10,50	5,25				5,95	-15,75	>3,09				

**included occasionally gravel/cobble content*   ***Refusal on rock or boulder – bedrock level not confirmed*

Table 4 Summary of location of gravelly, cobble and boulder layer – Wharf area

Borehole n°	Elevation (m)	Depth (m)	Range of diameter (mm)	Remarks
09-01	-6,14 to -8,70	0,0 to 2,6	up to 200 mm	Surface deposit of cobbles and boulder – associated to the existing wharf no 1
09-01	-17,14 to -18,14	± 11,0 to 12,0	Up to 130mm	Coarse gravel and cobbles
09-02	-12,3 to -13,9 -16,13 to -21,0 -23,2 to -29,7	2,5 to 4,1 6,3 to 11,13 13,4 to 19,9	<70 mm	Gravelly deposit; the coarse gravel wasn't sampled; end of borehole in this deposit
09-03	-19,1 to -20,4	9,8 to 11,1	1100 mm	Boulder
09-03	-20,79 to -28,36	11,5 to 19,1	<70 mm	Gravelly deposit; the coarse gravel wasn't sampled; end of borehole in this deposit
09-04	-16,43 to -17,0	6,3 to 6,9	Up to 430mm	Boulder
09-04	-17,0 to -30,7	6,9 to 20,6	<70 mm	Gravelly deposit; the coarse gravel wasn't sampled; end of borehole in this deposit
09-05	-31,7 to -38,28	20,9 to 27,5	Up to 150 mm	Gravelly deposit with occasionally cobbles
09-07B	-32,59	-21,8	150 mm	Cobbles
09-07B	-40,1 to -43,4	29,3 to 33,1	<70mm	Coarse gravelly deposit
09-08	-30,3 to -31,1	19,8 to 20,6	Up to 170 mm	Gravel and cobbles
09-11	-29,2 to -30,0 -52,84 to -54,3 -64,2 to -66,5 -85,1 to -85,7	15,6 to 16,3 39,2 to 40,7 50,6 to 52,9 71,0 to 71,6	Up to 250 mm	Cobbles / boulder
09-13	-30,2 to -31,8	13,4 to 14,9	Up to 50 mm	Coarse gravel
09-13	-44,2 to -44,6	27,4 to 27,7	355 mm	boulder
09-14	-49,4 to -50,8	29,0 to 30,3	Up to 100 mm	Gravelly deposit; end of borehole in this deposit
09-15	-36,5 to -37,2	15,9 to 16,6	Up to 120 mm	Coarse gravel and cobbles
09-15	-43,0 to -43,3	22,4 to 2,7	Up to 50 mm	Coarse gravel
09-16	-38,3 to -54,3	14,2 to 30,2	Up to 200 mm	Gravelly deposit with occasionally cobbles; end of borehole in this deposit
09-17	-37,6 to -37,8	20,3 to 20,6	<70mm	Coarse gravel

4.1.1 DEPOSIT A : COMPACT UPPER SAND DEPOSIT WITH LOCALLY LAYER OF GRAVELLY, AND/OR COBBLE AND BOULDER CONTENT

The upper sand deposit was identified in each borehole at the location of the new dock. Boreholes 09-01 to 09-04 were ended in these deposits at depths ranging from 15.1 and 20.6 m. Note that a stony materials associated with the presence of the no. 1 wharf was first encountered in borehole 09-0. This material reaches a depth of 2.6 m and rest on the sand deposit ''A''. In other boreholes, past the sandy deposit, it reaches a thickness from 0.6 m to 8.5 m before reaching the underlying clay deposit ''B''.

The colour of the sand deposit ''A'' is often black near the surface turning very quickly to grey with depth. Sea-shells are encountered in small quantities at several places at the top of this deposit. This sand deposit ''A'' can be defined by the following characteristics and properties:

- Gravel content: 1% to 45 %, very variable depending on the presence of gravely layers; by extracting some (2/30) non-représentatives values we have an average of 12 %.
- Sand content: 36% to 90%; by extracting some (2/30) non-représentatives values we have an average of 76%.
- Silt content: 3% to 22%; by extracting some (3/30) non-représentatives values we have an average of 11%.
- Clay content: 0% to 5%; by extracting some (3/30) non-représentatives values we have an average of 1%.
- Uniformity coefficient (CU): Often included value between 1.9 and 7. By extracting some (10/30) non-représentatives values we have an average of 3,7.

The compactness of the sandy deposit is more often defined as «compact to dense» with N-SPT values greater than 15 and sometime close to 100. However, in some cases N-SPT value less than 10 were encountered when the deposit is loose to very loose.

- 09-02 : 0-1,0 m → N=6
- 09-03 : 0-3,0 m → N<2
- **09-04 : 0-7,5 m → 2<N<15**
- 09-05 : 0-0,23 m → N=4
- 09-11 : 0-0,6 m → N=4
- 09-16 : 0-3,1 m → N=12;21;4;0

It is important to note that the sand deposit ‘’A’’ in borehole 09-04 is in a loose to very loose state throughout all its thickness.

Direct shear tests results on representative samples are as follows. As seen below, the effective cohesion (c’) for this deposit can be considered to be zero.

Table 5 Summary of directs shear test on upper sand deposit ‘’A’’

Borehole n^o	Sample	Depth (m)	Effective angle of internal friction - ϕ’
09-07	SS-1/2/3	0,2 – 2,9	X
09-08	SS-9/10	6,2 – 7,6	X
09-12	SS-4/5/6	2,3 – 4,4	X
09-13	SS-3/4/5	1,5 -3,7	X
09-14	SS-1/2	0,3 – 1,5	X
09-16	SS-1/2	0,3 – 1,7	X
		Average	**X**

4.1.2 DEPOSIT B: FIRM CONSISTENCY CLAYEY DEPOSIT

The clayey deposit ‘’B’’ was encountered in the boreholes 09-05 to 09-17. This deposit reaches a thickness between 3.6 and 10.4 m and, in boreholes 09-05 to 09-11, it rests on the compact silty-sand deposit "D", and in borehole 09-12 to 09-17 on the very loose silty-sand deposit "C".

The colour of the clayey deposit ‘’B’’ is grey and the deposit is often laminate with thin beds of mainly silty and/or sandy material. The clayey deposit ‘’B’’ is defined by the following characteristics and properties (we have extracted two unreliable values from the results):

- Gravel content: 0%.
- Sand content: 8% to 38%; for an average of 24%.

- Silt content: 38% to 64%; for an average of 46%.
- Clay content: 20% to 49%; for an average of 30%.
- Uniformity coefficient (CU): Indeterminate value, however the grain size distribution of the material is very well-graded.
- Water content (W): 32% to 50%; for an average of 38%.
- Plastic limit (Wp): 17% to 22%; for an average of 19%.
- Liquid limit (Wl): 27% to 38%; for an average of 31%.
- Plasticity index (Ip): 9% to 16%; for an average of 12%.

Specific density

Table 6 gives results for seven specific density analyses made on intact samples from clayey deposit ''B'':

Table 6 Summary of specific density test on clayey deposit ''B''

Borehole n°	Sample	Depth(m)	Specific gravity
09-05	ST-3	1,8 -1,9	2,75
09-07	ST-10	7,3 – 7,4	2,77
09-07	ST-11	9,2 – 9,3	2,74
09-08	ST-13	10,4 – 10,5	2,73
09-09	ST-14	11,3 – 11,4	2,75
09-09	ST-15	14,7 – 14,8	2,75
09-12	ST-11	7,8 – 8,0	2,74
		Average	**2,75**

In situ shear strength

The consistency of the clay deposit ''B'' can be considered to be «firm», on the basis of the results of the shear tests performed during drilling where (Su) intact (undrained) values reach between 12.9 and 56.3 kPa for an average of 30.6 kPa. Remoulded state shear strength values (Sur) are between 1 and 22 kPa with an average of 5.7 kPa. The sensitivity of the clay is from 2.5 to 16.7 with an average of 5.3, qualifying the clay deposit ‘’B’’ as to be of «medium sensitivity» to «extra-sensitive».

It is possible that the in situ shear test results are overvalue due to the resistance offered by the thin beds of silt and/or sand noted in the clay.

Unconfined compression test

The compressive strength as obtained from the results of the unconfined compressive tests (CU) conducted in laboratory is between 15 and 39 kPa, for an average of 31 kPa; as a result, shear strength is in the order of 15 kPa. Results from the unconfined compression tests are in the following table.

Table 7 Summary of unconfined compression test on clayey deposit ‘’B’’

Borehole n^o	Sample	Depth (m)	Unconfined compression strenght - UC (kPa)
09-05	ST-3	1,8 -1,9	41
09-07	ST-10	7,3 – 7,4	32
09-07	ST-11	9,2 – 9,3	28
09-08	ST-13	10,4 – 10,5	45
09-08	ST-14	11,8 -11,9	39
09-09	ST-13	10,1 – 10,2	27
09-09	ST-15	14,7 – 14,8	34
09-11	ST-10	7,9 – 8,0	16
09-11	ST-11	9,3 – 9,4	18
09-11	ST-12	13,0 – 13,1	53
09-12	ST-11	8,1 – 8,2	15
09-12	ST-12	9,7 – 9,8	21
09-13	ST-9	X	X
09-13	ST-10	X	X
09-14	ST-7	X	X
09-15	ST-4	X	X

09-16	ST-6	X	X
09-16	ST-7	X	X
09-17	ST-7	x	X
		Average	**30,7 kPa**

Direct shear test

More information to come

Table 8, here after contains a summary of the direct shear test results.

Table 8 Summary of direct shear test on clayey deposit ‘’B’’ sample

Borehole n^{o}	**Sample**	**Depth (m)**	**Effective angle of internal friction - ϕ’**	**Effective cohesion c’ (kPa)**
09-05	ST-3	1,9 – 2,0	25,6°	6,8
09-07	ST-10	7,7 – 7,8	25,6°	6,8
09-08	ST-14	11,6 – 11,7	<32,7°	0
09-09	ST-14	X	X	X
09-09	ST-15	14,5 – 14,6	<32,5°	0
09-11	ST-10	7,8 -7.9	<29,4°	0
09-13	ST-10	X	X	X
09-13	ST-12	X	X	X
09-16	ST-7	X	X	X
09-17	ST-7	X	X	X

(Average **ϕ’ =** 31,4°, **c’** = 1,1 kPa) result to be reassessed when more value will be available

Consolidated undrained triaxial compression test

More information to come

Table 8, hereafter contains a summary of the consolidated undrained triaxial test results.

Table 9 Summary of the consolidated undrained triaxial compression test results clayey deposit ''B'' sample

Borehole n°	Sample	Depth (m)	Effective angle of internal friction - ϕ'	Effective cohesion c' (kPa)
09-05	ST-3	2,1 – 2,2	<23,0°	0
09-07	ST-10	7,5 – 7,6	<22.4°	0
09-09	ST-15	14,6 – 14,7	<28,9°	0

Consolidation test

Consolidation tests carried out on undisturbed samples from the clayey deposit ''B'' provide the following parameters: **Preconsolidation pressure (σ'_p)** ranging from XXX to XXX kPa, compression index **(Cc)** ranging from XXX to XXX, and a recompression index **(Ccr)** ranging from XXX to XXX.

The vertical coefficient of consolidation (Cv) etc XXX *to be calculated* .

Summary of the consolidation test performed on undisturbed samples from the clayey deposit ''B'' is given in the following table.

Table 10 Summary of consolidation test on clayey deposit (B)

Borehole n^o	Sample	Depth (m)	Vertical effective stress σ'_{vo} kPa	Preconsolidation pressure σ'_p kPa	Compression index (Cc)	Recompression index (Ccr)
09-05	ST-3	X	X	76	0,8205	0,0358
09-07	ST-10	X	X	94	0,6428	0,0527
09-07	ST-11	X	X	X	X	X
09-08	ST-14	X	X	98	0,5145	0,0459
09-09	ST-14	X	X	74	0,7286	0,0315
09-09	ST-15	X	X	X	X	X
09-11	ST-10	X	X	53	0,5891	0,0258
09-11	ST-12	X	X	84	0,5785	0,0372
09-12	ST-12	X	X	X	X	X
09-13	ST-9	X	X	X	X	X
09-13	ST-10	X	X	X	X	X
09-13	ST-12	X	X	X	X	X
09-14	ST-7	X	X	X	X	X
09-15	ST-4	X	X	X	X	X
09-16	ST-6	X	X	X	X	X
09-16	ST-7	X	X	X	X	X
09-16	ST-8	X	X	X	X	X
09-17	ST-7	X	X	X	X	X

4.1.3 DEPOSIT C: VERY LOOSE SILTY-SAND DEPOSIT (N<4)

The silty-sand deposit ‘’C’’ is encountered under the clayey deposit "B" in boreholes 09-12 to 09-17 at depths of 6.1 m to 13,8 m; thicknesses of the deposit are between 6,0 m to 16.3 m.

This deposit rests at all boreholes location on the compact to dense silty-sand deposit "D" which offers a similar particle size distribution as deposit ‘’C’’.

This silty-sand deposit is defined by the following characteristics and properties (we have extracted two unreliable values):

- Gravel content: 0% to 2%, with extreme value of 6 % for an average of 0.9 % (average of 0.5 % if we remove the value of 6 %)
- Sand content: 41% to 76%; for an average of 58%.
- Silt content: 19% to 45%; for an average of 32%.
- Clay content: 5% to 13%; for an average of 10%.
- Uniformity coefficient (CU): 34 to 100; for an average of 62.
- Water of content (W): 15% to 24%; for an average of 19%.
- Plastic limit (Wp): 13% to 15%; for an average of 14%.
- Liquid limit (Wl): 16% to 18%; for an average of 17%.
- Plasticity index (Ip): 2% to 4%; for an average of 3%.

The compactness of the silty-sand deposit ''C'' is considered to be «very loose» with SPT-N values less than 4 and very often at 0.

However, we must be cautious when using the interpretation of the density of this soil deposit from the standard penetration test ''N'' value as quicksand was often noted at the bottom of the casing during the drilling operations within the silty-sand deposit ''C''. Furthermore, in many cases, the casing and drill rods need to be griped at the barge level so they will not sink down the silty-sand soil under their own weight.

Hydraulic water pressure in excess of the water level in the river was also noted in borehole 09-15 at a depth of 11.2 m which have produced a flow of water out of the casing to a height of some 600 mm.

All these information with the soil properties as described previously bring us to believe that the silty-sand deposit ''C'' is not consolidated.

Two intact samples taken from deposit ''C'' have been tested in the laboratory to assess the mechanical properties of the material with the following results.

Direct shear test

The effective angle of internal friction (ϕ') obtained from the direct shear tests is ranging from XXX to XXX, with an average of XXX. Effective cohesion (c') obtained has varied between XXX and XXX with an average of XXX.

More information to come

The summary of this results is in the following table.

Table 11 Summary of directs shear test on samples from the silty-sand deposit ''C''

Borehole n°	Sample	Depth (m)	Effective angle of internal friction - ϕ'	Effective cohesion c' (kPa)

Consolidated undrained triaxial compression test

One result to come (3 points)

Consolidation test

More information to come

4.1.4 DEPOSIT D : COMPACT TO VERY DENSE SILTY-SAND DEPOSIT WITH LOCALLY LAYER OF GRAVELLY, AND/OR COBBLE AND BOULDER CONTENT

The compact to dense silty-sand deposit was encountered directly under the clay deposit "B" or the very loose silty-sand deposit "C". The boreholes 09-08, 09-09, 09-12, 09-13 and 09-17 were ended in this deposit. Borehole 09-07, 09-07 / 7B, 09-11, 09-14, 09-15 and 09-16) shown that the thickness of this deposit varies from 1.5 to 17.1 m. It rest on the compact to very dense lower sand deposit "E".

This silty-sand deposit is defined by the following characteristics and properties (we have extracted two values with non-représentative important gravelly proportion):

- Gravel content : 0 % of 11%, variation depending on the presence of gravely layer; for an average of 2,4%.
- Sand content: 53% to 81%; for an average of 69%.
- Silt content : 14% to 39%; for an average of 23%.
- Clay content : 1% to 8%; for an average of 5%.
- Uniformity coefficient (CU) : Value between 10 and 43, for an average of 24.

The compactness of silty-sand deposit is generally described as compact to very dense with ‘’N’’ values range from 10 to 64. However, locally, lower values are obtained, mainly at the following location:

- 09-05 : 11,5 m → N=3
- 09-07/7B : 14,2 m → N=8
- 09-09 : 17,4 – 18,6 m → N=8;7
- **09-11 : 16,3 m -28,4 m →N=2;13;12;4;16;26;5;7;7**

In borehole 09-11, the low ‘’N’’ value seems indicate a transition zone between deposits "C" and "D".

4.1.5 DEPOSIT E: COMPACT TO VERY DENSE LOWER SAND DEPOSIT WITH LOCALLY LAYER OF GRAVELLY, AND/OR COBBLE AND BOULDER CONTENT

The sand deposit ‘’E’’ is encountered directly under the "D" silty-sand deposit. Borehole 09-07/7B, 09-11, 09-14, 09-15 and 09-16 were ended in this layer without reaching the rock. In borehole 09-05, bedrock has been intercepted after drilling 6.2 m though deposit ‘’E’’.

The properties and characteristics of the sand deposit is defined here under:

- Gravel content : 0% to 72%, for an average of 19%.
- Sand content: de 24% to 93%; for an average of 68%.
- Silt content: de 4% to 30%; for an average of 11%.
- Clay content: de 1% to 7%; for an average of 2%.
- Uniformity coefficient (CU) : Value between 3,6 and 87, for an average of 18.

This sand deposit is generally qualified dense to very dense with ‘’N’’ value greater than 26.

4.1.6 BEDROCK F: EXCELLENT QUALITY GRANITIC ROCK

The bedrock was reache at borehole 09-05 after drilling 54.9 m though the soil (elev. -65,7 m). It is possible that refusal was encountered in bedrock or a large boulder in borehole 09-08 at a depth of 55,9 m (elev. - 66,7 m). The bedrock consists of a pink and grey high quality granite to granitic gneiss of high quality based on more than 90 % RQD index. *To be completed*.

Table 12 **Deposit A in new wharf area - Summary of results laboratory test - physical properties**

Borehole n^o	Sample	Depth (m)	Moisture content (%)	Atterberg limits			Particle size distribution				Uniformity coefficient (CU)	USCS Classification
				W_L (%)	W_P (%)	I_P (%)	% gravel (Ø > 5 mm)	% sand (5 mm > Ø > 80 µm)	% silt (80 µm > Ø > 2 µm)	% clay (Ø < 2 µm)		
09-01	SS-5	2,6 – 3,1					12	84	3	1	3,3	
09-01	SS-14	9,9 – 10,5					6	88	6	0	4,1	
09-02	SS-1	0,4 – 0,9					11	76	8	5	13,8	
09-02	SS-4	2,7 – 3,3					14,1	80,6	5,3	0	4,8	
09-02	SS-10	8,2 – 8,8					28	67	5	0	9,6	
09-02	SS-18	14,1 – 14,4					34	55	16	1	37,4	
09-02	SS-23	18,0 – 18,4					10,5	82	7,5	0	7,2	
09-03	SS-2	0,7 – 1,4	30,2	21	15	6	9	23	53	15	nd	
09-03	ST-3	1,8 – 2,4	19,15				0,8	77,4	21,8	nd	nd	
09-03	SS-11	7,8 – 8,4					6	90	4	0	2,9	
09-03	SS-15	10,8 – 11,2					9	81	8	2	6,1	
09-03	SS-17	12,2 – 12,4					37	49	11	3	46,4	
09-04	SS-4	3,4 – 4,0					1	64	30	5	15,4	
09-04	SS-13	8,0 – 8,5					23	72	4	1	15,9	
09-04	SS-19	11,0 – 11,4					39	53	7	1	45,2	
09-04	SS-22	13,2 – 13,7					45	51	3	1	51,2	
09-04	SS-28	18,6 – 18,7					30,3	63,1	6,6	0	18,4	
09-07/7B	SS-1/2/3	0,16 – 2,9					0	86	11	3	2,0	
09-07/7B	SS-4	2,4 – 3,0					7	75	18	0	2,5	
09-08	SS-8	5,5 – 6,0					12	72	16	0	3,8	

Borehole n°	Sample	Depth (m)	Moisture content (%)	Atterberg limits			Particle size distribution				Uniformity coefficient (CU)	USCS Classification
				W_L (%)	W_P (%)	I_P (%)	% gravel (Ø > 5 mm)	% sand (5 mm > Ø > 80 µm)	% silt (80 µm > Ø > 2 µm)	% clay (Ø < 2 µm)		
09-08	SS-9/10	6,2 – 7,6					1	79	19	1	3,0	
09-08	SS-11	8,2 – 8,4					24	36	29	11	146	
09-09	SS-6	3,8 – 4,4					2	81	16	1	2,4	
09-11	SS-2	0,8 – 1,4					0	85	15	0	1,9	
09-12	SS-4/5/6	2,3 – 4,4					0	84	14	2	1,9	
09-12	SS-7	4,6 – 5,2					1	87	10	2	3,6	
09-13	SS-3/4/5	1,5 - 3,7					7	80	12	1	3,5	
09-14	SS-1/2	0,3 – 1,5					0	87	12	1	2,3	
09-16	SS-1/2	0,3 – 1,7					0	86	13	1	2,1	
09-17	SS-3	1,5 – 2,1					5	80	15	0	3,3	

Table 13 Deposit B in new wharf area - Summary of results laboratory test – physical properties

Borehole n°	Sample	Depth (m)	Moisture content (%)	Atterberg limits			Particle size distribution				Uniformity coefficient (CU)	USCS Classification
				W_L (%)	W_P (%)	I_P (%)	% gravel (Ø > 5 mm)	% sand (5 mm > Ø > 80 µm)	% silt (80 µm > Ø > 2 µm)	% clay (Ø < 2 µm)		
09-05	SS-2	0,8 – 1,4	49,2	38	22	16						
09-05	ST-3											
09-05	SS-4	2,4 - 3,0	32,7	26	17	9	0	29	49	22	ND	
09-05	ST-6	5,1 – 5,6	29,4	25	16	9	0	51,7	48,2	Result to come	ND	
09-07/7B	SS-9	6,2 – 6,9	49,5	38	22	16	0	8	43	49	ND	
09-07/7B	SS-13	10,4 – 11,0	22,5	20	16	4	1	69	17	13	ND	
09-08	ST-13											
09-08	ST-14											
09-08	SS-15	12,3 – 13,0	29,4	26	18	8	0	16	64	20	ND	
09-09	SS-12	8,4 – 9,0	46,6	36	20	16	0	21	40	39	ND	
09-09	ST-14											
09-09	ST-15											
09-09	SS-16	15,5 – 15,8	32,3	25	16	9						
09-11	SS-9	6,0 – 6,7	41,9	36	22	14	0	20	43	37	ND	
09-11	ST-10											
09-11	ST-11											
09-11	ST-12											
09-11	SS-13	13,3 – 13,9	32,1	27	17	10	0	38	35	27	ND	
09-11	SS-14	14,5 – 15,0					0	27	52	21	ND	
09-12	SS-10	6,8 – 7,5	34,5	30	18	12						
09-12	ST-11											
09-12	ST-12											

Borehole n°	Sample	Depth (m)	Moisture content (%)	Atterberg limits			Particle size distribution				Uniformity coefficient (CU)	USCS Classification
				W_L (%)	W_P (%)	I_P (%)	% gravel (Ø > 5 mm)	% sand (5 mm > Ø > 80 µm)	% silt (80 µm > Ø > 2 µm)	% clay (Ø < 2 µm)		
09-12	SS-13	12,9 – 13,6	32,2	28	17	11						
09-13	ST-9											
09-13	ST-10											
09-13	ST-12											
09-14	ST-7											
09-14	SS-12	10,1 – 10,7	40,8	30	18	12	0	19	54	27	ND	
09-15	ST-4											
09-16	ST-6											
09-16	ST-7											
09-17	ST-7											
09-17	SS-11/12	9,1 – 10,5	36,9	31	17	14	0	34	38	28	ND	

Table 14 Deposit C in new wharf area - Summary of results laboratory test – physical properties

Borehole n°	Sample	Depth (m)	Moisture content (%)	Atterberg limits			Particle size distribution				Uniformity coefficient (CU)	USCS Classification
				W_L (%)	W_P (%)	I_P (%)	% gravel (Ø > 5 mm)	% sand (5 mm > Ø > 80 µm)	% silt (80 µm > Ø > 2 µm)	% clay (Ø < 2 µm)		
09-12	SS-21	19,0 – 19,7					1	63	26	10	100	
09-12	SS-23	21,3 – 22,0					0	56	33	11	78	
09-13	SS-17/18	16,5 – 18,6					0	57	33	10	59	
09-13	SS-22	24,0 – 24,7					1	59	29	11	86	
09-13	SS-23	25,6 – 26,2					1	61	31	7	34	
09-13	SS-24	27,1 – 27,4					0	76	19	5	34,3	
09-13	SS-26	28,6 – 29,3					0	55	32	13	ND	
09-14	SS-14/15	11,6 – 14,0	15,9	17	15	2	1	63	30	6	32,0	
09-14	SS-17/18	15,8 – 20,6	16,8	16	14	2	0	59	30	11	91,9	
09-14	SS-19/20	17,7 / 19,7	15,5	17	14	3	6	56	29	9	62,3	
09-14	SS-25/26	21,3 – 24,5	19,4	18	15	3	0	50	38	12	ND	
09-15	SS-7/8	7,3 – 8,7	24,3	17	13	4	0	55	35	10	60,4	
09-15	SS-11/12	10,4 – 11,7	18,5	17	13	4	0	53	38	9	53,3	
09-16	ST-8											
09-16	SS-11/12	10,0 – 12,2	21,1	18	14	4	1	41	45	13	ND	
09-17	SS-16/18	14,6 – 16,8					2	63	26	9	53,3	

Table 15 **Deposit D in new wharf area - Summary of results laboratory test – physical properties**

Borehole n°	Sample	Depth (m)	Moisture content (%)	Atterberg limits			Particle size distribution				Uniformity coefficient (CU)	USCS Classification
				W_L (%)	W_P (%)	I_P (%)	% gravel (Ø > 5 mm)	% sand (5 mm > Ø > 80 µm)	% silt (80 µm > Ø > 2 µm)	% clay (Ø < 2 µm)		
09-05	SS-7	6,0 – 6,7					0	55	38	7	15,7	
09-05	SS-8/9	6,8 – 8,2					0	71	25	4	9,9	
09-05	SS-14	11,4 – 12,0					1	68	23	8	58,8	
09-07/7B	SS-17	14,2 – 14,8					0	67	29	4	12,6	
09-07/7B	B-SS-4	22,7 – 23,3					0	81	15	4	16,3	
09-08	SS-21	19,2 – 19,6					9	74	14	3	16,3	
09-08	SS-26	22,3 – 23,0					3	72	20	5	25,4	
09-08	SS-34	34,4 – 35,0					33	46	18	3	10,4	
09-09	SS-18	16,8 – 17,4					1	69	25	5	18,6	
09-11	SS-18	17,5 – 18,1					11	69	15	4	19,8	
09-11	SS-21/22/323	20,9 – 24,5					2	76	15	7	31,5	
09-11	SS-24	25,5 – 26,0					1	65	27	7	42,8	
09-13	SS-27	30,2 – 30,8					0	53	39	8	29,0	
09-15	SS-15	13,9 – 14,5					4	71	24	1	22,3	
09-15	SS-17	15,4 – 15,8					44	51	3	2	36,6	
09-16	SS-13	13,1 – 13,4					1	79	15	4	14,8	

Table 16 **Deposit E in new wharf area - Summary of results laboratory test – physical properties**

Borehole n^o	Sample	Depth (m)	Moisture content (%)	Atterberg limits			Particle size distribution				Uniformity coefficient (CU)	USCS Classification
				W_L (%)	W_P (%)	I_P (%)	% gravel (Ø > 5 mm)	% sand (5 mm > Ø > 80 µm)	% silt (80 µm > Ø > 2 µm)	% clay (Ø < 2 µm)		
09-05	SS-17	13,7 – 14,3					15	78	6	1	6,3	
09-05	SS-28	21,3 – 21,6					72	24	4	0	87	
09-05	SS-31	27,4 – 28,0					1	89	6	4	3,8	
09-05	SS-38	42,6 – 43,3					9	87	4	0	7,2	
09-07/7B	B-SS-8	29,2 – 29,5					28	66	6	0	12,7	
09-07/7B	B-SS-13	42,2 – 42,8					31	51	16	2	14,2	
09-07/7B	B-SS-17	54,2 – 54,8					23	52	21	4	18,5	
09-11	SS-28	31,5 – 31,8					13	72	14	1	4,5	
09-11	SS-39	46,8 – 47,0					0	63	30	7	25,3	
09-15	SS-24/25/26	19,0 – 22,0					2	93	4	1	3,6	
09-16	SS-20	20,8 – 21,3					18	73	7	2	10,5	

4.2 FILL AREA AT THE EXTREMITY OF THE NEW WHARF

From borehole 09-14, 09-15 and 09-16, the area at the end of the wharf to be backfilled show the same deposits as those encountered at some distance toward. From bottom, the sand deposit ‘’A’’ containing some silt, medium dense has a thickness of 3,0 m and is successively the firm consistency clayey deposit ‘’B’’ with a thickness of 6.6 m, and the very loose of silty-sand deposit ‘’C’’ containing some clay. Both the silty-sand and clayey deposits are stratified with thin beds of silt and sand.

Under the very loose silty-sand deposits ‘’C’’ at a depth of 12.7 m, we find a thin layer of compact sand containing some silt to silty, about 1.5 m thick, followed by a significant deposit of dense to very dense gravelly coarse sand containing some silt and cobbles. Borehole 09-16 has been ended in this deposit at a depth of 30,18 m below the river floor (elevation of -54,29 m) without reaching the bedrock.

The properties of these deposits were previously discussed in section 4.1.1 with borehole 09-16 result.

4.3 CDF AREA

Six boreholes were performed in the CDF area between wharfs # 2 and # 3, identified 09-CDF-01 to 09-CDF-07 (except 09-CDF-02).The boreholes reache a depth between 15.2 m and 33.5 m. Three of these boreholes have been conducted in the bedrock to obtain the bedrock profile as required for the design of the CDF.

Soils in this sector are relatively homogeneous and sandy belonging to the sand deposit "A" as described before and more precisely here under at the CDF location

- ***Sand deposit ‘’A’’***

Sand of gray, medium to coarse sand, containing traces to some silt, and traces of gravel. In borehole 09-CDF-01/03/04, a black sand layer is observed in the first 1.3 to

1.9 m. In borehole 09-CDF-03, glazed black residues are also observed. This sand deposit is defined by characteristics and properties as follow (we have extracted two values with a very high gravelly content):

- Gravel content: Less than 10%, for an average of 3,9%
- Sand content: 72% to 92%; for an average of 85%.
- Silt content: 3% to 26%; for an average of 11%.
- Clay content: 0% to 4%; for an average of 0,6%.
- Uniformité coefficient (CU) : Often included value between 2.4 and 6.8, for an average of 4,2.

Table 17 Summary of the stratigraphy - CDF area

Borehole n°	Elevation surface (m)	Depth of the borehole (m)	A Compact upper sand deposit*	F Excellent quality granitic rock	
			Thickness (m)	Depth (m)	Elev. (m)
09-CDF-01	-10,50	15,24	>15,24		
09-CDF-03	-11,19	22,27	>22,27*		
09-CDF-04	-9,71	23,90	17,68	17,68	-27,38
09-CDF-05	-10,48	33,53	27,43	27,43	-37,91
09-CDF-06	-12,33	25,15	>25,15		
09-CDF-07	-10,94	24,99	18,65	18,65	-29,59

**Refusal on rock or boulder*

Table 18 Deposit A in CDF area - Summary of results laboratory test

Borehole n^o	**Sample**	**Depth** (m)	**Particle size distribution**				**Uniformity coefficient** (CU)	**USCS Classification**
			% gravel (Ø > 5 mm)	**% sand** (5 mm > Ø > 80 µm)	**% silt** (80 µm > Ø > 2 µm)	**% clay** (Ø < 2 µm)		
09-CDF-01	SS-3	2,0 – 2,6	1	92	7	0	3,6	
09-CDF-01	SS-12	8,0 – 8,6	8	62	26	4	58	
09-CDF-03	SS-1	0,0 – 0,6	8	81	11	0	5,7	
09-CDF-03	SS-3	1,5 – 2,1	0	87	13	0	2,4	
09-CDF-03	SS-12	8,4 – 9,0	65	34	1	0	21	
09-CDF-03	SS-14	9,9 – 10,5	0	90	8	2	3,9	
09-CDF-04	SS-2	1,8 – 2,4	1	84	14	1	4,2	
09-CDF-04	SS-6	4,9 – 5,5	10	87	3	0	3,5	
09-CDF-04	SS-12	9,4 – 9,7	62	36	2	0	104	
09-CDF-05	SS-4	2,9 – 3,5	2	92	7	0	3,8	
09-CDF-05	SS-16	12,0 - 12,6	3	89	8	0	3,9	
09-CDF-05	SS-21	15,8 - 16,3	0	79	19	2	6,8	
09-CDF-06	SS-1	0,0 – 0,6	9	85	6	0	4,4	
09-CDF-06	SS-10	6,8 – 7,5	8	84	8	0	4,8	
09-CDF-06	SS-13	9,1 – 9,7	2	88	10	0	3,1	
09-CDF-06	SS-28	22,2 -22,3	3	89	8	0	2,8	
09-CDF-07	SS-1	0,6 – 1,2	10	82	8	0	6,3	
09-CDF-07	SS-8	5,6 – 6,2	2	91	7	0	3,8	
09-CDF-07	SS-24	17,0 - 17,5	0	77	22	1	4,0	

Compactness of the sand deposit is described as to be compact to very dense with ''N'' values between 7 to more than 100. However, most ''N'' values are between 30 and 50. The lowest indice ''N'' are encountered mainly I borehole 09-CDF-03 where they range from 7 to 20 in the upper 5 m of the deposit.

Quicksand are observed in several places within the sand deposit in borehole 09-CDF-04/05/06. The rise of the sand in the casing has reached a height of 0.9 m and occurs mainly between - 21 m and - 33 m.

- ***Gravel and cobble layers***

At certain depth, bottom the river bed, within the sand deposit, we find beds of high concentration of gravel and cobbles. Position of these beds is shown in the following table.

Table 19 Summary of gravel and cobble layer – CDF area

Borehole n°	Elevation (m)	Depth (m)	Range of diameter (mm)	Remarks
09-CDF-01	-16,98 to -18,50 -24,67 to <-25,74	6,48 to 8,00 14,17 to 15,24	<100 <100	-
09-CDF-03	-19,57 to -21,71 -25,11 to < -33,46	8,38 to 10,52 13,92 to >22,27	<100 <450	Concentration of cobble and boulder between 17m and 18 m depth (<240 mmØ) and at 21m depth (450mmØ)
09-CDF-04	-12,22 to -14,51 -16,79 to -20,37	2,52 to 4,80 7,09 to 10,67	<70 <100	-
09-CDF-05	-	-	-	Trace to some gravel in the deposit
09-CDF-06	-26,71 to -29,32 -29,32 to -37,48	14,38 to 16,99 16,99 to >25,15	<200 <70	-
09-CDF-07	-	-	-	Trace to some gravel in the deposit

- ***Bedrock***

The bedrock has been drilled and sampled in borehole 09-CDF-04/05/07 as following:

Table 20 Summary of bedrock surface – CDF area

Borehole n°	Elevation (m)	Depth (m)	Core length (m)	RQD value (%)	RQD classification
09-CDF-04	-27,38	17,68	6,22	98-100	Excellent quality
09-CDF-05	-37,91	27,43	6,10	100	Excellent quality
09-CDF-07	-29,59	18,65	6,34	40 in the first meter After 83-100	Poor quality in the first meter After, good to excellent quality

The bedrock is a gray and pink granite to granitic gneiss, generally of excellent quality with RQD indices greater than 90 %. At borehole 09-CDF-07, a RQD index of 40 has been obtained in the first metre of the bedrock.

4.4 DREDGING AREA

Two boreholes identified 09-DR-01 and 09-DR-02 have been implemented in the dredging area located on the north side of the projected wharf. Since the floor of the dredging area is planned to be at the level -14,0 m (in char datum), the borehole were conducted to a depth of 16.7 and 16.3 m below the river bed respectively.

The soil deposit deposits encountered at these depths are very similar to the sand deposit ‘’A’’ described as ‘’*Compact upper sand deposit with locally layer of gravelly, and/or cobble and boulder content’’.*

They are composed of grey sand containing traces to some silt, traces of gravel and occasionally seashells but no gravelly layers, or stony content was noted in the samples. The compactness of the deposit is qualified to be compact to dense with N values ranging from 14 and 41. The sand deposit is generally very poorly graded with an uniformity coefficient from 1.9 and 3.4. This sand deposit is defined by the following properties and characteristics :

- Gravel content: Less than 5 %, for an average of 1,8%
- Sand content : 79% to 87%; for an average of 83%.
- Silt content : 8% to 21%; for an average of 15%.
- Clay content : Less than 1%; for an average of 0,3%.
- Uniformity coefficient (CU) : alue often included between 1.9 and 3.4 for an average of 2,5.

Table 21 Deposit A in dredging area - Summary of results laboratory test

Borehole n°	**Sample**	**Depth** (m)	**Particle size distribution**				**Uniformity coefficient** (CU)	**USCS Classification**
			% gravel (Ø > 5 mm)	**% sand** (5 mm > Ø > 80 µm)	**% silt** (80 µm > Ø > 2 µm)	**% clay** (Ø < 2 µm)		
09-DR-01	SS-2	1,0 – 1,7	0	86	14	0	1,9	
09-DR-01	SS-4	2,6 – 3,2	2	81	16	1	2,3	
09-DR-02	SS-1	0,2 – 0,8	5	87	8	0	3,4	
09-DR-02	SS-3	1,7 – 2,3	0	79	21	0	2,4	

5.0 COMMENTS AND RECOMMENDATIONS

5.1 ABSTRACT

This study is part of the project of construction of the new wharf no.4, be an extension of existing wharf no.1. It will be a double sided structure with a lenght of ± 245 m and a width of ±50m. The initial design consist of anchored steel sheet-pile wall and bearing piles to support the north rail.

The construction of this new wharf will required a dredging operation on the north side to bring the bottom of the river to -14 m chart datum. A backfill will also be required at the extremity of the new wharf. In addition to the new wharf, the project will include construction of a confined disposal facility (CDF) and its associated containment berm close to the existing wharf no.2. The CDF will contain the dredged material from the new wharf no.4 footprint and possibly from other adjacent areas.

5.2 SITE SUITABILITY

The geotechnical investigations have highlighted the existence of many soils deposits with variable physical and mechanical properties at the project site. Generally speaking, the deposit are compact to dense sand deposit. However, the clay deposit encountered at low depth below the river floor laying on a very loose silty sand deposit toward the last third position of the new wharf no 4 to the river makes the site particulary vulnerable to differential settlement under any additional vertical load.

The existence of very loose silty-sand deposit ‘’C’’ also bring concern in regard to the potential of liquefaction properties of this material. These factors must be taking into account in the design and feasibility of the project. It should be noted that the very loose silty-sand deposit ‘’C’’ will certainly bring some complexity construction due to the fact that the bottom of this deposit ‘’C’’ lays at a depth of some 30 m in the area of the project.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-01
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 1 of 2
LOCATION OF BOREHOLE: X : 258730,38 Y : 5456949,20		**CASING:** HW / NW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL** HQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -6.14	**BORING DATE START:** 2009-09-16 23:30:00	**END:** 2009-09-17 13:30:00	

Type of Sampler

SS:	Split Spoon	☒	Remoulded
DC:	Diamond Core	▨	Intact
WS:	Wash Sample	■	Lost
HT:	Hydraulic Trust	◨	Rock Core
HW:	Hammer Weight		
SP:	Shelby and Piston		
AS:	Auger Sampler		
ST:	Thin Walled Shelby Tube		

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

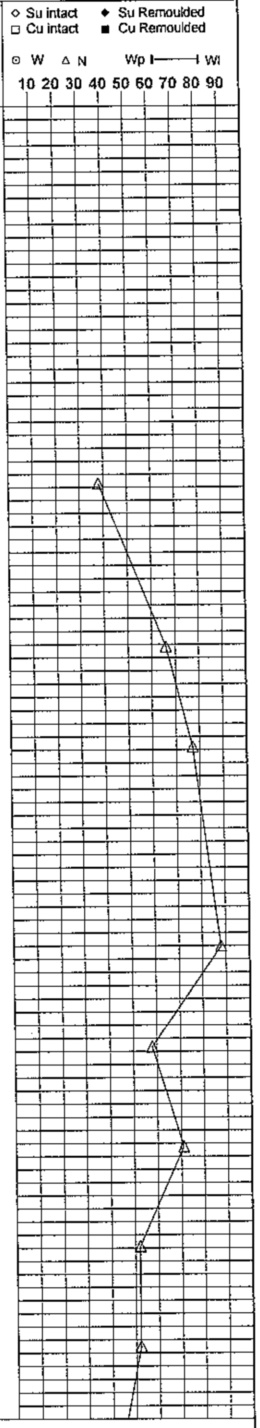
Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY | SAMPLES | LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
	-6.14 0.00	Cobbles and boulders			SS-1	N			/refusal		
					DC-2	HQ	95				
					SS-3	B			/refusal		
					DC-4	HQ	98				
	-8.70 2.57	Gray to black sand with some gravel and trace silt; very dense.			SS-5	B	58	38	19-20-18-19		GSA, CU=3.2
					SS-6	B	25	66	33-29-37-36		
					SS-7	B	50	77	34-34-43-40		
					SS-8	B	63		43-62 /refusal		
	-12.11 5.97	Gray sand with trace silt and gravel; very dense.			SS-9	B	46	88	67-45-43-50		
					SS-10	B	75	58	23-29-29-32		
					SS-11	B	8	71	22-34-37-37		
					SS-12	B	38	52	22-28-24-30		
					SS-13	B	50	52	25-27-25-24		



Notes:

Approved by :
Sonya Graveline, ing.

SM Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			BOREHOLE: 09-01
SITE: Alcoa - Baie-Comeau smelter (Quebec)			PAGE: 2 of 2
LOCATION OF BOREHOLE: X : 258730,38 Y : 5456949,20		CASING: HW / NW	FILE NO: F099382300
EQUIPEMENT USED: D-50	SAMPLER: Indicated	CORE BARREL HQ	TECHNICIAN: Simon Marois, tech.
SURFACE ELEVATION (m): -6.14	BORING DATE START: 2009-09-16 23:30:00	END: 2009-09-17 13:30:00	

Type of Sampler

SS:	Split Spoon	⊠	Remoulded
DC:	Diamond Core	▨	Intact
WS:	Wash Sample	■	Lost
HT:	Hydraulic Trust	◨	Rock Core
HW:	Hammer Weight		
SP:	Shelby and Piston		
AS:	Auger Sampler		
ST:	Thin Walled Shelby Tube		

Laboratory and In situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

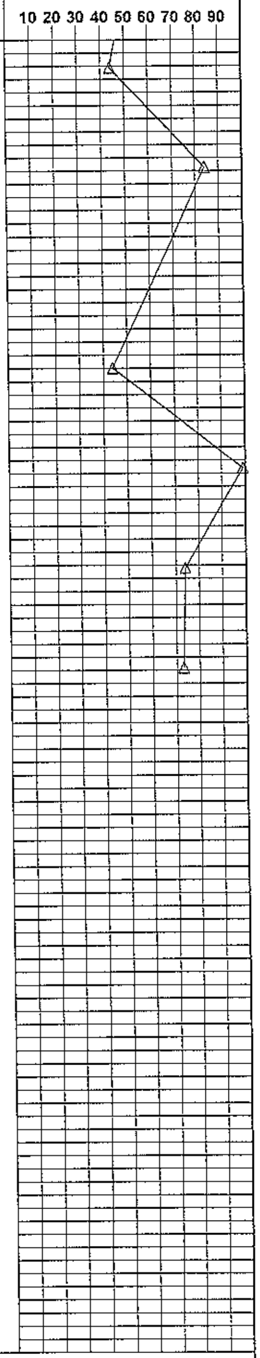
Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY | SAMPLES | LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
					SS-14	B	62	44	21-21-23-28		GSA, CU=4.1
11		11m to 11,5m depth: stratified with layers of sand 40mm thick.			SS-15	B	54	84	29-39-45-48		
		11,5m depth: 130mmØ cobble			SS-16 DC-17	B HQ	55		/refusal		
12											
					SS-18	B	58	44	23-20-24-31		
13					SS-19	B	75	99	35-54-45-50		
14					SS-20	B	62	74	19-38-36-35		
					SS-21	B	71	73	27-36-37-35		
15	-21.22 15.09	End of borehole									
16											
17											
18											
19											



Notes:

Approved by :
Sonya Graveline, ing.

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2238

File Number	: **F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: ------
City	: Baie-Comeau (Québec)	Uses	: ------
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	: **09-2087**	Source	: 09-01, SS-5, Depth.: 2,6 to 3,1 m.
Sample No.	: ------	Tests completed on	: 2009-09-30

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	1,05	% Gravel:	12
C.U.	3,252	% Sand:	84
Unified Classification:		% Silt:	3
Fineness Module: 2,45		% Clay:	1

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: ______________ 2009-09-30
Sylvie Daigle, Tech.

Verified by: ______________ 2009-09-30
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

This report must not be copied, in part or in full, without written authorization from Labo S.M. inc.

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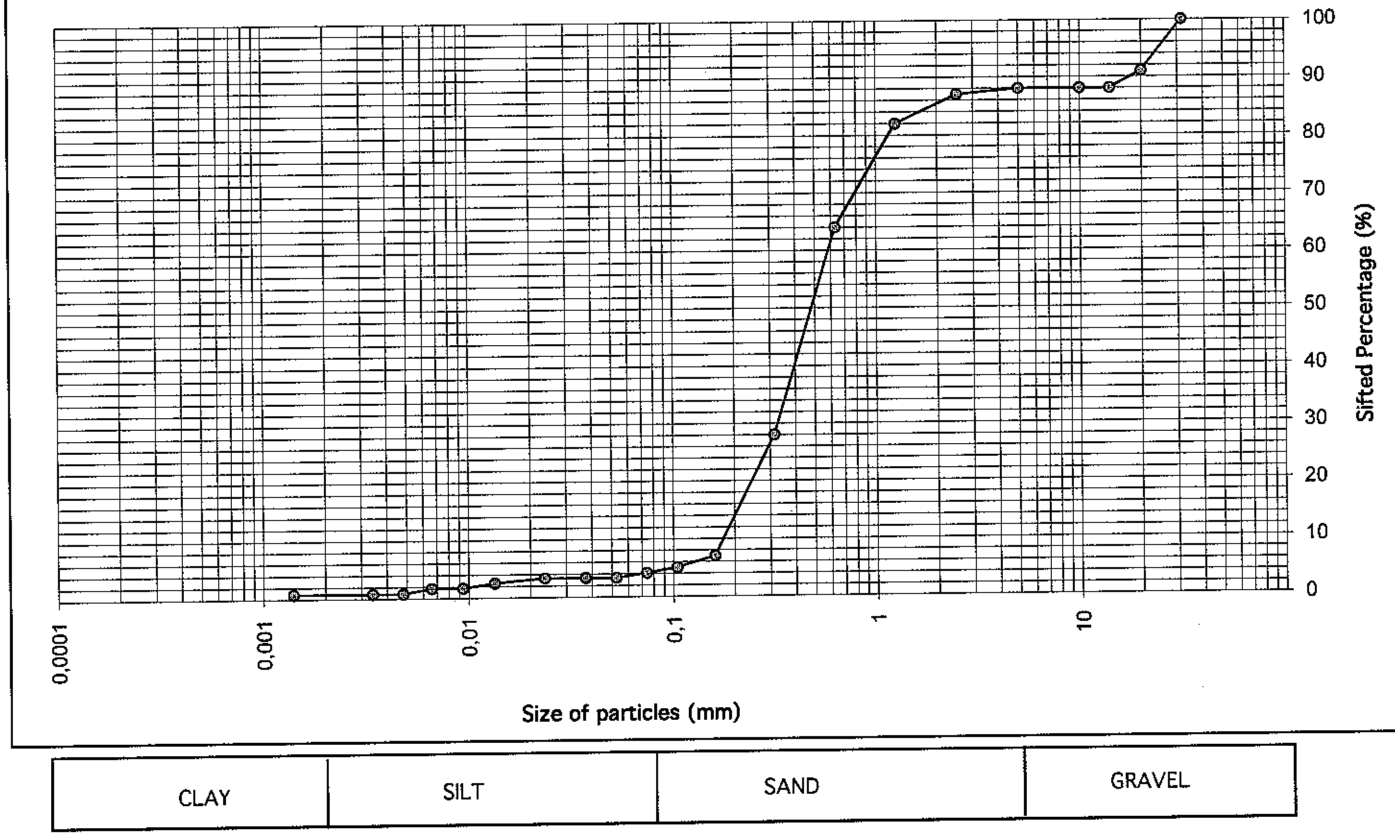
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
31,5	100
20	91
14,0	88
10,0	88
5,00	88
2,500	87
1,250	82
0,630	64
0,3150	28,0
0,1600	7,0
0,1045	5,0
0,0741	4,1
0,0526	3,3
0,0372	3,3
0,0235	3,3
0,0134	2,5
0,0094	1,7
0,0066	1,7
0,0048	0,8
0,0034	0,8
0,0014	0,8

Chart for particle size analysis



Project: New Baie-Comeau wharf

File #: F099382200

Customer: Alcoa

Laboratory No. : 09-2087

Type of material: Sand, some gravel, traces silt & clay.

Source: Material on site, 09-01,SS-5, Depth: 2,6 to 3,1 m.

Approuved by : ______ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2240

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2088**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-01, SS-14, Depth.: 9,9 to 10,5 m.
Tests completed on : 2009-09-30

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	0,981	% Gravel:	6
C.U.	4,083	% Sand:	88
Unified Classification:		% Silt:	6
Fineness Module: 1,92		% Clay:	0

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: ______________ 2009-09-30
Sylvie Daigle, Tech.

Verified by: ______________ 2009-09-30
Sonya Graveline, Ing.

SM
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
20	100
14,0	99
10,0	95
5,00	94
2,500	92
1,250	88
0,630	74
0,3150	45,0
0,1600	16,0
0,1030	8,8
0,0738	4,4
0,0523	3,5
0,0370	3,5
0,0234	2,6
0,0135	1,8
0,0094	0,9

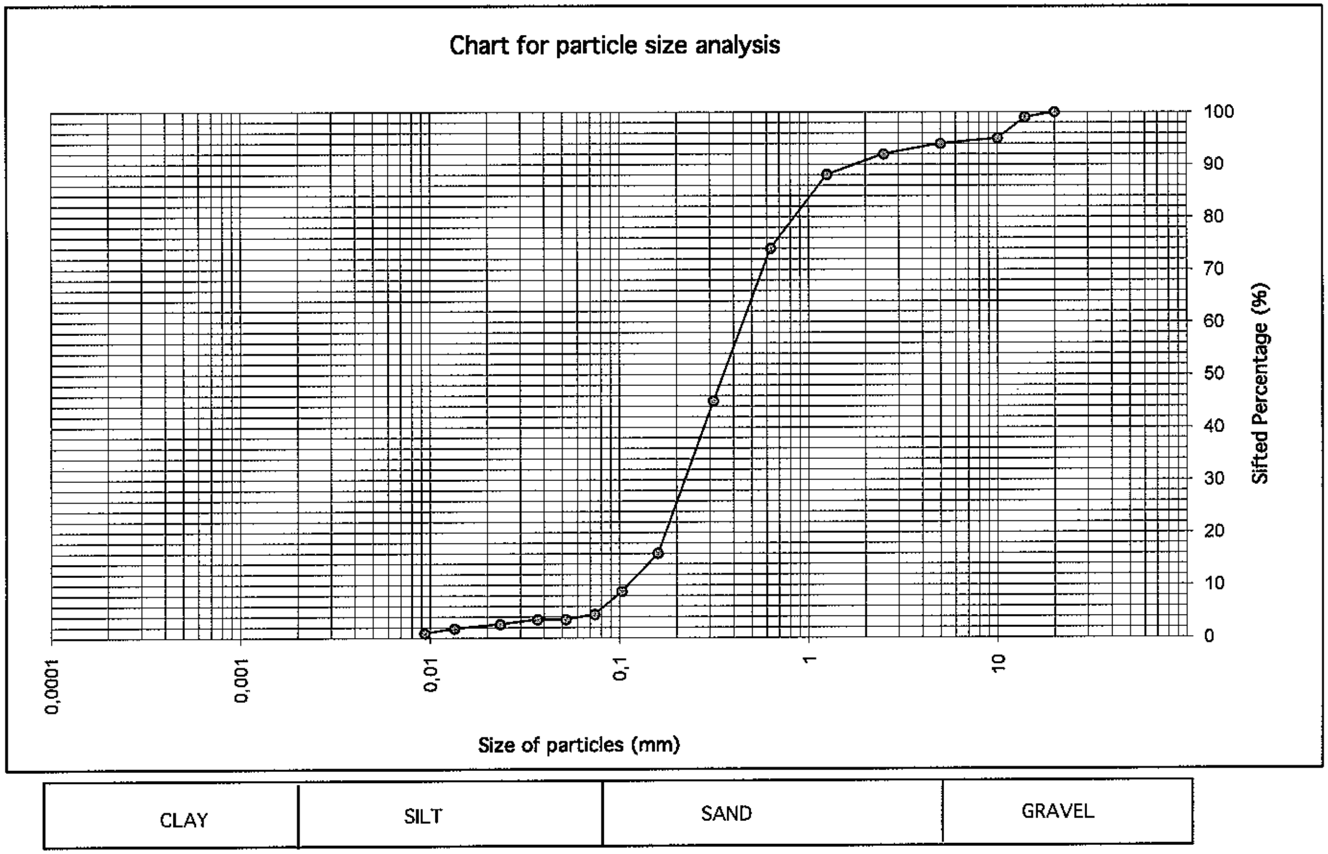


Chart for particle size analysis

Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2088

Type of material: Sand, traces gravel & clay.

Source: Material on site, 09-01,SS-14 , Depth: 9,9 to 10,5 m.

Approuved by : Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-02
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 1 of 2
LOCATION OF BOREHOLE: X : 258702,70 Y : 5456990,91		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL-**	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -9,81	**BORING DATE START:** 2009-09-20 09:00:00	**END:** 2009-09-21 05:00:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◧	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

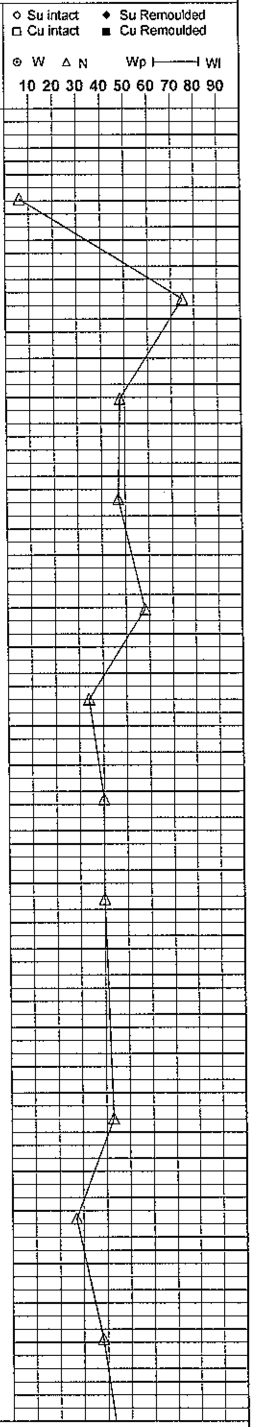
Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY — SAMPLES — LABO AND IN SITU TESTS

Depth	Elev. Depth -9.81	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
	0.00	Black to gray sand with some gravel gravel and trace silt and clay; loose.		☒	SS-1	B	67	6	4-3-3-9		GSA, CU=13.8
1	-10.88 1.07	Gray medium sand with some gravel and trace silt; dense.		☒	SS-2	B	42	75	44-40-35-33		
2				☒	SS-3	B	38	48	31-24-24-25		
3	-12.31 2.50	Deposit more gravelly		☒	SS-4	N	46	47	28-25-22-25		GSA, CU=4.9
				☒	SS-5	N	12	58	26-27-31-31		
4	-13.92 4.11	Gray sand with some gravel and trace silt; dense.		☒	SS-6	B	38	34	12-16-18-18		
5				☒	SS-7	B	38	40	13-19-21-20		
6				☒	SS-8	B	33	40	14-19-21-20		
7	-16.13 6.32	Gray gravelly sand with trace to some silt; dense.									No sampling - difficulties during the driving in of the caising
8				☒	SS-9	B	42	43	16-24-19-15		
				☒	SS-10	B	46	27	21-15-12-12		GSA, CU=9.6
9				☒	SS-11	B	33	38	16-22-16-20		
	-19.56 9.75	Gray sand and gravel with some		■							



Notes:

Approved by :
Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-02
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 2 of 2
LOCATION OF BOREHOLE: X : 258702,70 Y : 5456990,91		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL-**	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -9.81	**BORING DATE START:** 2009-09-20 09:00:00	**END:** 2009-09-21 05:00:00	

Type of Sampler

SS:	Split Spoon	⊠	Remoulded
DC:	Diamond Core	▨	Intact
WS:	Wash Sample	■	Lost
HT:	Hydraulic Trust	◧	Rock Core
HW:	Hammer Weight		
SP:	Shelby and Piston		
AS:	Auger Sampler		
ST:	Thin Walled Shelby Tube		

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

Water level

Date:	Time:	Elev.(m):

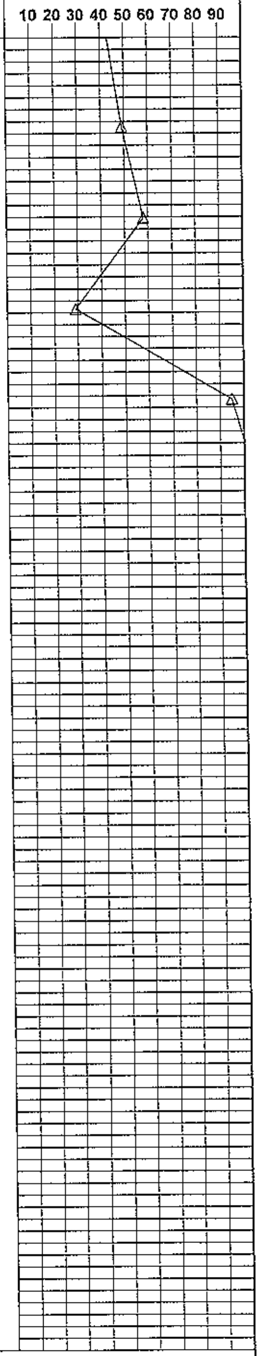
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
		silt; dense.		■	SS-12	B	0		21-24 /refusal		
				⊠	SS-13	B	8	49	52-29-20-18		Sanding up
11	-20.96 11.13	Gray fine to medium sand with trace to some silt and trace gravel; dense to very dense.		⊠	SS-14	B	71	58	21-27-31-41		
12				⊠	SS-15	B	54	29	7-11-18-29		
13				⊠	SS-16	B	54	95	38-52-43-34		
	-23.22 13.41	Gray gravelly sand with trace to some silt; very dense.		⊠	SS-17	B	18		49-50 /refusal		Many refusals on coarse gravel
14				⊠	SS-18	B	55		42-50 /refusal		GSA, CU=37.4
15				⊠	SS-19	B	50		73-75 /refusal		
16				⊠	SS-20	B	50		77 /refusal		
				⊠	SS-21	B	66		95-50 /refusal		
17											
				⊠	SS-22	B	66		20-80 /refusal		
18				⊠	SS-23	B	75		20-80 /refusal		GSA, CU=7.2
19				⊠	SS-24	B	100		80 /refusal		
				⊠	SS-25	B	64	190	62-140-50 /refusal		
20	-29.74 19.94	End of borehole									



Notes:

Approved by :
Sonya Graveline, ing.

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2309

File Number	: **F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: ------
City	: Baie-Comeau (Québec)	Uses	: ------
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	: **09-2135**	Source	: 09-02, SS-1, Depth.: 0,4 to 0,9m.
Sample No.	: ------	Tests completed on	: 2009-10-02

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 2,739 — % Gravel: 11
C.U. 13,843 — % Sand: 76
Unified Classification: — % Silt: 8
Fineness Module: 1,75 — % Clay: 5

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

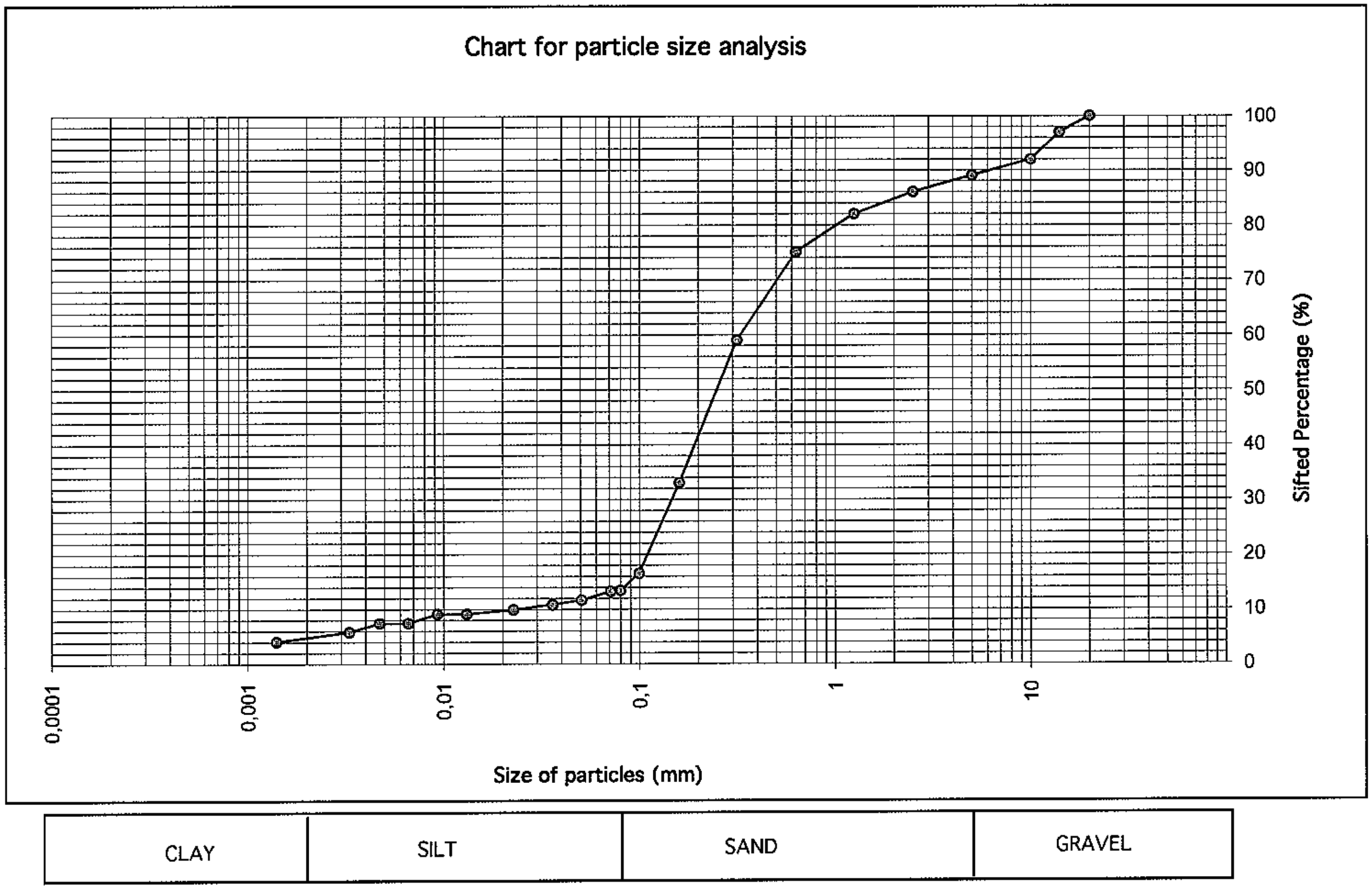
Prepared by: 2009-10-07
Sylvie Daigle, Tech.

Verified by: 2009-10-07
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
20	100
14	97
10	92
5	89
2,5	86
1,250	82
0,630	75
0,3150	59
0,1600	33
0,0996	16,5
0,0800	13,4
0,0711	13,2
0,0506	11,6
0,0359	10,8
0,0227	9,9
0,0131	9,1
0,0093	9,1
0,0066	7,4
0,0047	7,4
0,0033	5,8
0,0014	4,1



Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2135

Type of material: Sand, some gravel, traces silt & clay.

Source: Material on site, 09-02,SS-1, Depth: 0,4 to 0,9m.

Approuved by :__________ Date : 30/10/2009.

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2291

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2136**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-02, SS-4, Depth.: 2,7 to 3,3 m.
Tests completed on : 2009-10-02

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	0,968	% Gravel:	14,1
C.U.	4,853	% Sand:	80,6
Unified Classification:		% Silt:	5,3
Fineness Module:	2,36	% Clay:	

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

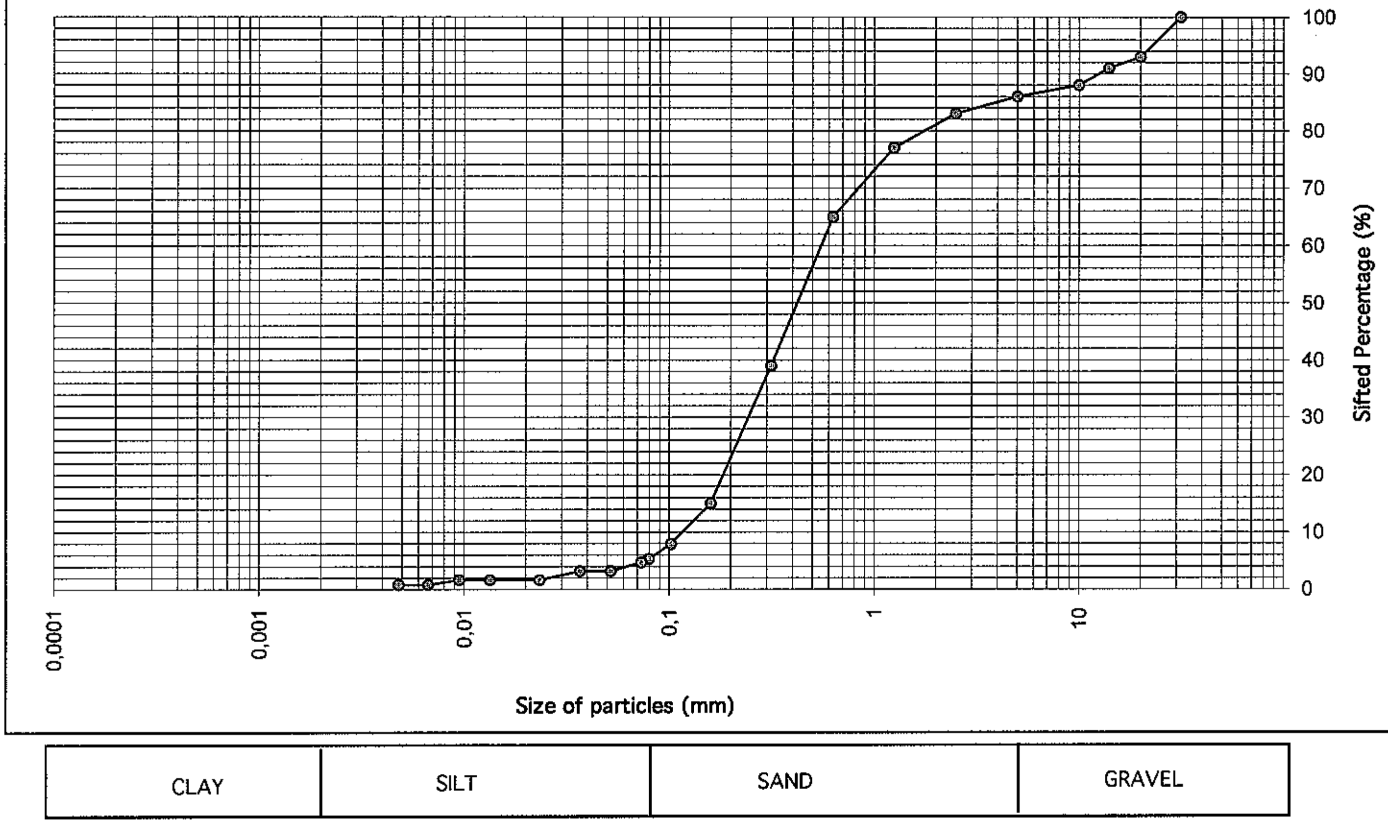
Prepared by: 2009-10-07
Sylvie Daigle, Tech.

Verified by: 2009-10-07
Sonya Graveline, Ing.

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
31,5	100
20	93
14	91
10	88
5	86
2,5	83
1,250	77
0,630	65
0,3150	39
0,1600	15
0,1025	7,9
0,0800	5,3
0,0732	4,7
0,0521	3,2
0,0368	3,2
0,0234	1,6
0,0134	1,6
0,0095	1,6
0,0067	0,8
0,0048	0,8

Chart for particle size analysis



Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2136

Type of material: Sand, some gravel, traces silt.

Source: Material on site, 09-02,SS-4, Depth: 2,7 to 3,3 m.

Approuved by :__________ Date : 30/10/2009.

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2290

File Number : F099382200
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : 09-2137
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-02, SS-10, Depth.: 8,2 to 8,8 m.
Tests completed on : 2009-10-02

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 0,504
C.U. 9,629
Unified Classification:
Fineness Module: 3,06

% Gravel: 28
% Sand: 67
% Silt: 5
% Clay:

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

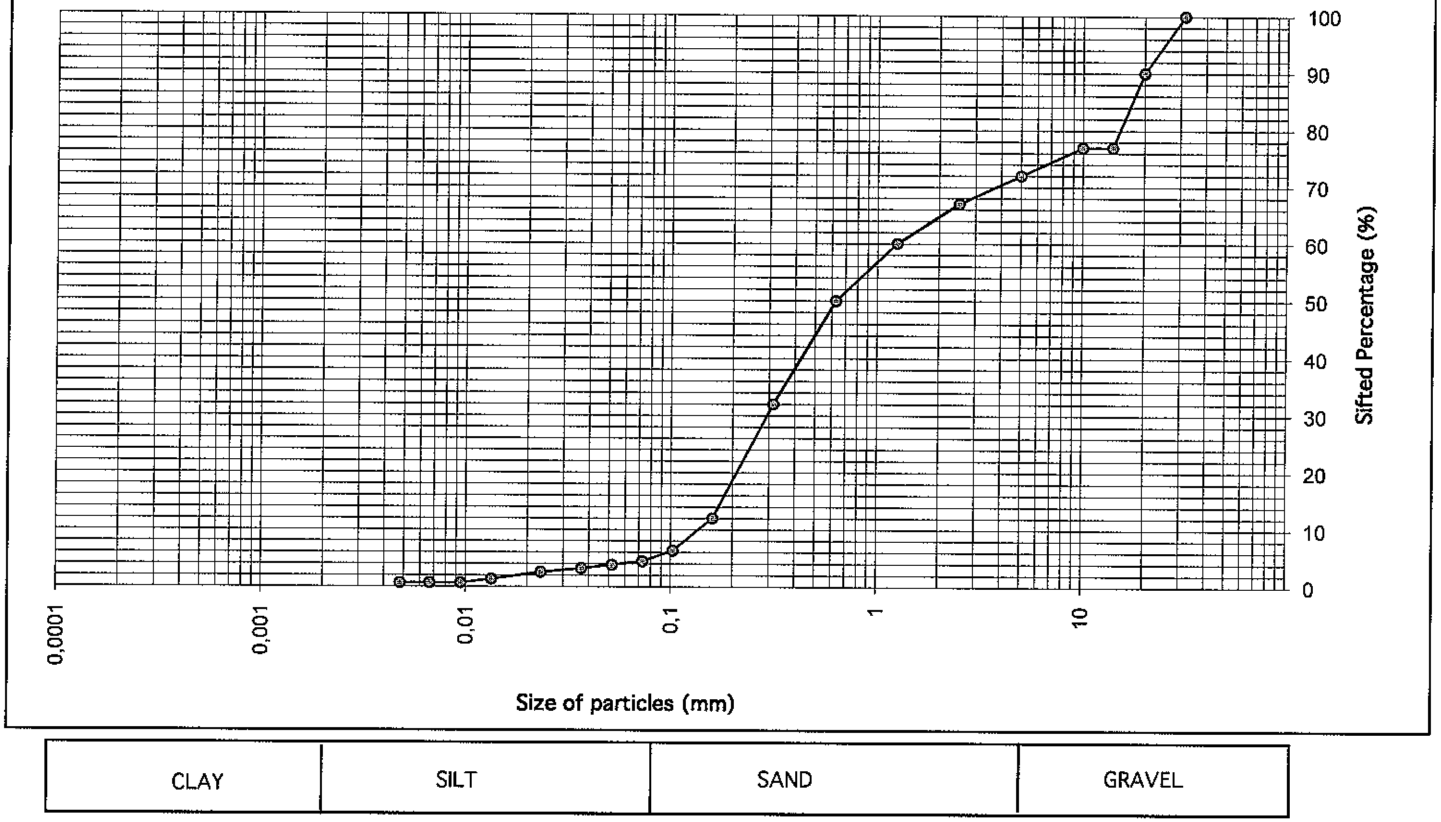
Prepared by: 2009-10-07
Sylvie Daigle, Tech.

Verified by: 2009-10-07
Sonya Graveline, Ing.

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
31,5	100
20	90
14	77
10	77
5	72
2,5	67
1,250	60
0,630	50
0,3150	32
0,1600	12
0,1028	6,3
0,0731	4,4
0,0519	3,8
0,0368	3,2
0,0233	2,5
0,0134	1,3
0,0095	0,6
0,0067	0,6
0,0048	0,6

Chart for particle size analysis



Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2137

Type of material: Gravelly sand, traces silt.

Source: Material on site, 09-02,SS-10, Depth: 8,2 to 8,8 m.

Approuved by :________ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2288

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2138**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-02, SS-18, Depth.:14,1 to 14,4 m.
Tests completed on : 2009-10-02

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	0,666	% Gravel:	34
C.U.	37,395	% Sand:	55
Unified Classification:		% Silt:	16
Fineness Module: 3,32		% Clay:	1

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: ____________ 2009-10-07
Sylvie Daigle, Tech.

Verified by: ____________ 2009-10-07
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

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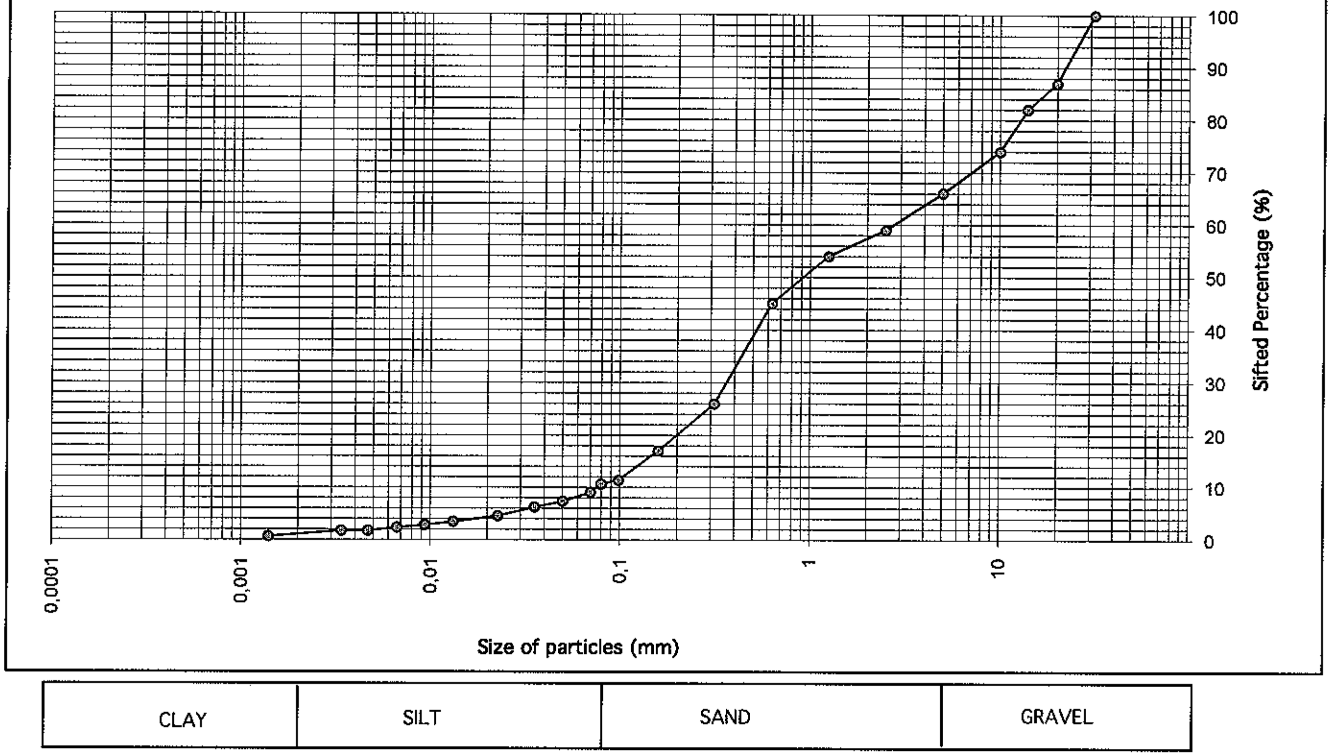
FLS-051b (00-05) rév. 1

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
31,5	100
20	87
14	82
10	74
5	66
2,5	59
1,250	54
0,630	45
0,3150	26
0,1600	17
0,0985	11,3
0,0800	10,6
0,0703	9,0
0,0501	7,3
0,0356	6,2
0,0227	4,5
0,0132	3,4
0,0094	2,8
0,0067	2,3
0,0047	1,7
0,0034	1,7
0,0014	0,6

Chart for particle size analysis



Project: New Baie-Comeau wharf
Laboratory No. : 09-2138
Type of material: Gravelly sand, some silt, traces clay.

File #: **F099382200**

Source: Material on site, 09-02,SS-18, Depth: 14,1 to 14,4 m.

Customer: **Alcoa**

Approuved by : ____________ Date : 30/10/2009.

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2289

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2139**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-02, SS-23, Depth.: 18 to 18,4 m.
Tests completed on : 2009-10-02

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 1,253
C.U. 7,181
Unified Classification:
Fineness Module: 2,57

% Gravel: 10,5
% Sand: 82
% Silt: 7,5
% Clay:

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: Sylvie Daigle, Tech. 2009-10-07

Verified by: Sonya Graveline, Ing. 2009-10-07

N.B. These results are exclusively for analysis sampled.

SMi
LABO S.M INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
20	100
14	96
10	96
5	90
2,5	83
1,250	72
0,630	55
0,3150	29,0
0,1600	14,0
0,1004	9,3
0,0715	7,7
0,0507	6,2
0,0360	5,4
0,0230	3,1
0,0134	2,3
0,0095	0,8
0,0067	0,8

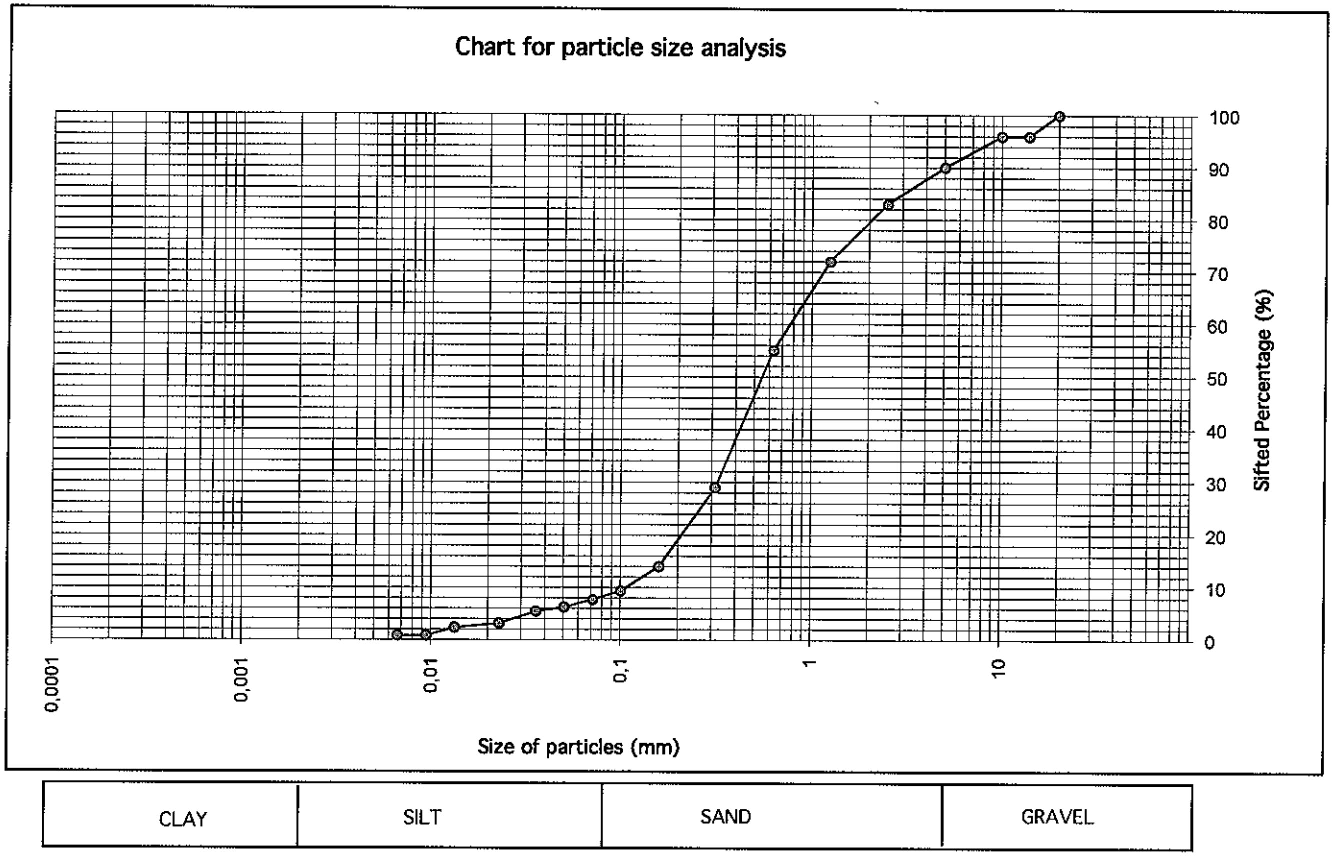


Chart for particle size analysis

Project: New Baie-Comeau wharf

Laboratory No. : 09-2139

Type of material: Sand, some gravel, traces silt.

File #: **F099382200**

Source: Material on site, 09-02,SS-23, Depth: 18 to 18,4 m.

Customer: **Alcoa**

Approuved by : Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-03
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 1 of 2
LOCATION OF BOREHOLE: X : 258758,16 Y : 5456964,38		**CASING:** HW / NW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL**NQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -9.31	**BORING DATE** **START:** 2009-09-14 11:00:00	**END:** 2009-09-15 05:00:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◫	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity Index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

Water level

Date:	Time:	Elev.(m):

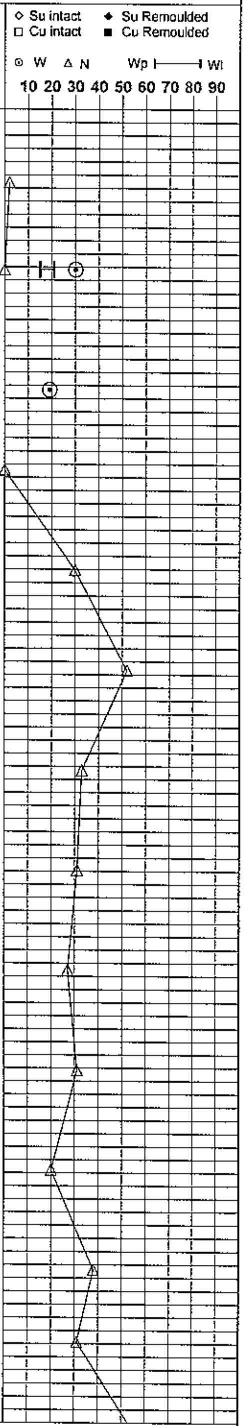
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth -9.31	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
	0.00	Gray fine sand with trace silt; very loose		☒	SS-1	B	42	2	5-2-0-0		
1	-10.17 0.86	Gray sandy silt with some clay and trace sand; very loose		☒	SS-2	B	42	0	0-0-0-0		GSA, CU>50, W=30.2%, Wp=15%, Wl=21%
2	-10.83 1.52	Gray silty fine sand; loose		▨	ST-3		79				GSA, CU=XXX, W=19.2
	-11.74 2.44	Gray sand with trace gravel and silt; medium dense to dense.		☒	SS-4	B	50	0	1-0-0-3		
3				☒	SS-5	B	71	30	6-15-15-28		
4				☒	SS-6	B	67	52	35-26-26-24		
5				☒	SS-7	B	67	33	18-18-15-18		
6				☒	SS-8	B	50	31	11-16-15-25		
7				☒	SS-9	B	50	27	24-17-10-14		
				☒	SS-10	B	25	31	17-16-15-14		
8				☒	SS-11	B	67	20	9-10-10-11		GSA, CU=2.9
9				☒	SS-12	B	12	38	30-21-17-18		0,12 m sanding up at 8,4 m depth
				☒	SS-13	B	84	31	2-11-20-50 /refusal		
	-19.06 9.75	Boulder (1,1m Ø)		■							



Notes:

Approved by :

Sonya Graveline, ing.

SM Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			BOREHOLE: 09-03
SITE: Alcoa - Baie-Comeau smelter (Quebec)			PAGE: 2 of 2
LOCATION OF BOREHOLE: X : 258758,16 Y : 5456964,38		CASING: HW / NW	FILE NO: F099382300
EQUIPEMENT USED: D-50	SAMPLER: Indicated	CORE BARRELNQ	TECHNICIAN: Simon Marois, tech.
SURFACE ELEVATION (m): -9.31	BORING DATE START: 2009-09-14 11:00:00	END: 2009-09-15 05:00:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◧	Rock Core

Laboratory and in situ tests - Parameters

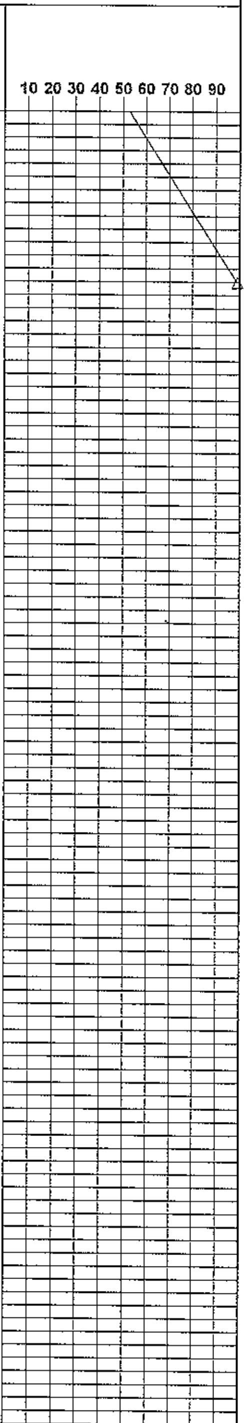
N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY					SAMPLES					LABO AND IN SITU TESTS	
Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
					DC-14	HQ	98				
11	-20.43 11.13	Gray sand with trace silt and gravel; dense.			SS-15	B	86	99	35-49-50 /refusal		GSA, CU=6.1
	-20.79 11.48	Gravel and cobbles			DC-16	HQ	17				Many refusals on coarse gravel
12	-21.19 11.89	Gray sand and gravel with some silt and occasionally cobbles; very dense			SS-17	B	66		50-50 /refusal		GSA, CU=46.4 1,5 m sanding up at 12,2 m depth
13					SS-18	N	67		100 /refusal		
14					SS-19	N	40		80-80 /refusal		
15					SS-20	B	50		100-100 /refusal		
					SS-21	N	0		100 /refusal		
16					SS-22	B	20		140 /refusal		
17					SS-23	N	0		/refusal		
18					DC-24	NQ	7				
19	-28.36 19.05	End of borehole			SS-25	B	0		50 /refusal		



Notes:

Approved by :
Sonya Graveline, ing.

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2248

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2090**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-03, SS-2, Depth.: 0,7 to 1,4m.
Tests completed on : 2009-09-30

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	% Gravel:	9
C.U.	% Sand:	23
Unified Classification:	% Silt:	53
Fineness Module: 0,94	% Clay:	15

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements
Atterberg Limits (3pts)	BNQ2501-092		
Liquid Limit (%):		21	------
Plastic Limit (%):		15	------
Plasticity index (%):		6	------
Water Content (%):	LC21-201	30,23	------

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: ______________ 2009-09-30
Sylvie Daigle, Tech.

Verified by: ______________ 2009-09-30
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

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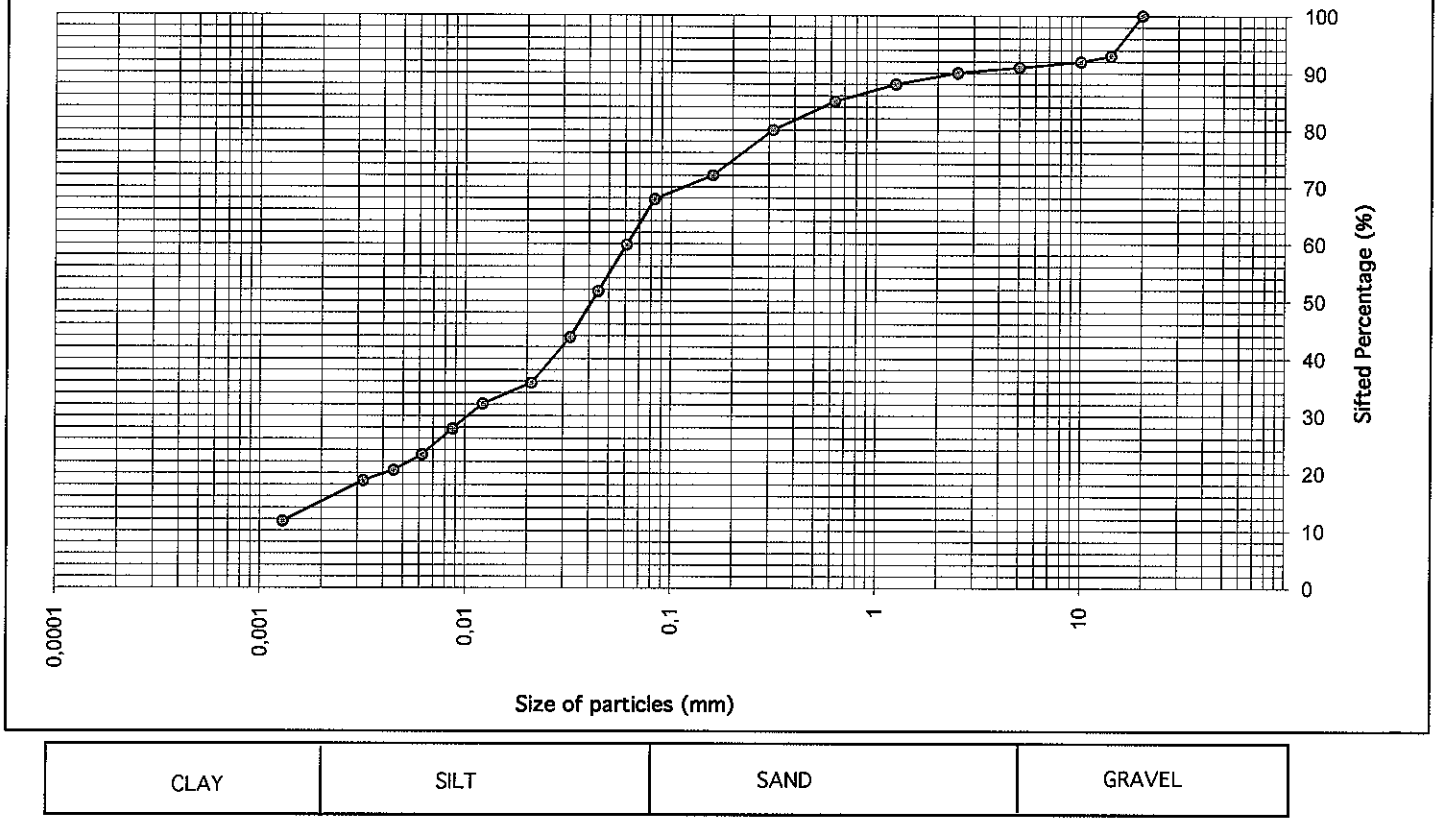
SM*i*

LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
20	100
14,0	93
10,0	92
5,00	91
2,500	90
1,250	88
0,630	85
0,3150	80,0
0,1600	72,0
0,0833	67,8
0,0609	59,8
0,0444	51,7
0,0325	43,7
0,0211	35,7
0,0122	32,1
0,0087	27,7
0,0062	23,2
0,0045	20,5
0,0032	18,7
0,0013	11,6

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2090

Type of material: Sandy silt, some clay, traces gravel.

File #: F099382200

Source: Material on site, 09-03,SS-2 , Depth: 0,7 to 1,4m.

Customer: Alcoa

Approuved by :________________ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2391

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2209**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-03, SS-11, Depth.: 7,8 to 8,4 m.
Tests completed on : 2009-10-07

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 0,793
C.U. 2,93
Unified Classification:
Fineness Module: 2,03

% Gravel: 6
% Sand: 90
% Silt: 4
% Clay:

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

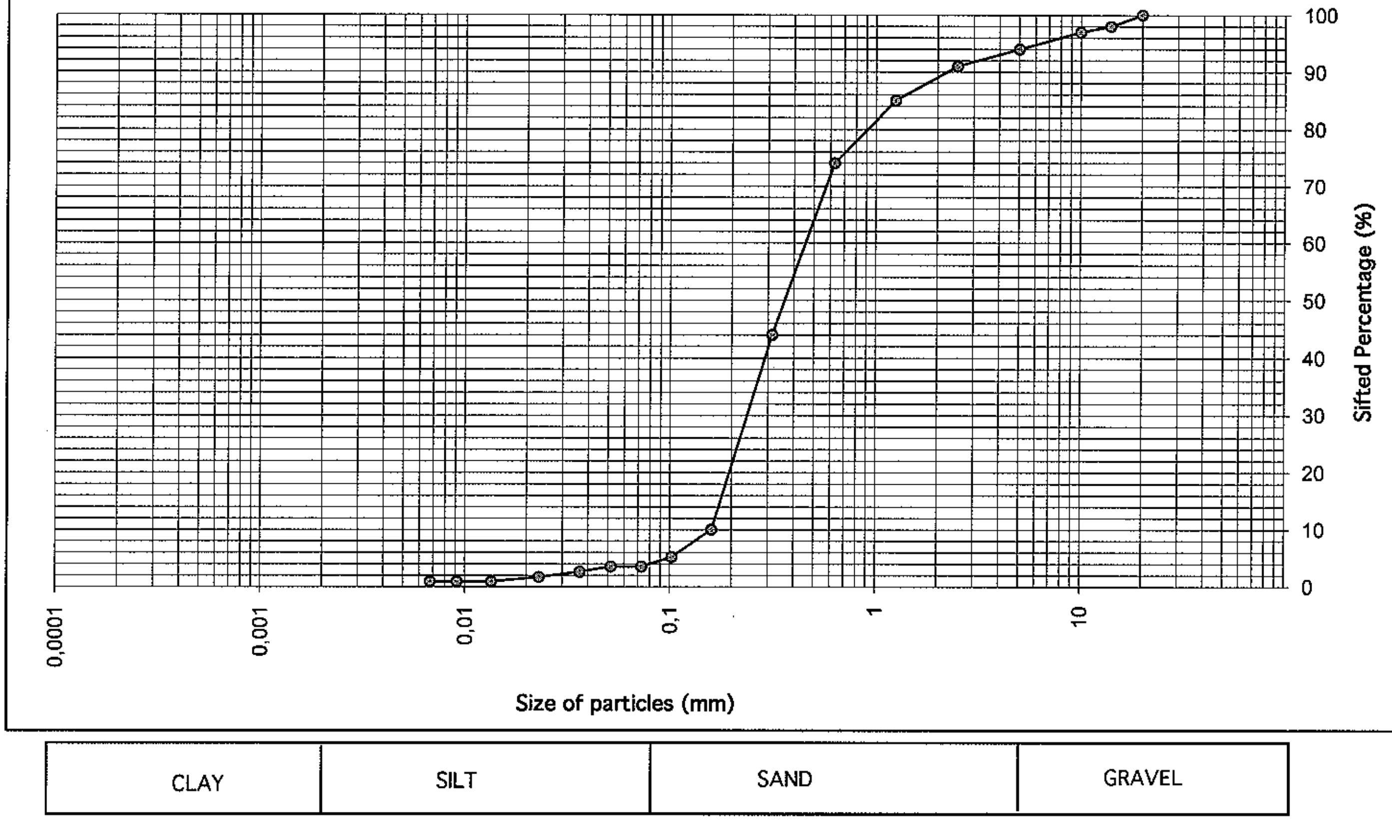
Prepared by: 2009-10-08
Sylvie Daigle, Tech.

Verified by: 2009-10-08
Sonya Graveline, Ing.

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
20	100
14	98
10	97
5	94
2,5	91
1,250	85
0,630	74
0,3150	44
0,1600	10
0,1025	5,2
0,0729	3,5
0,0516	3,5
0,0365	2,6
0,0231	1,7
0,0135	0,9
0,0092	0,9
0,0068	0,9
	0,9

Chart for particle size analysis



Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2209

Type of material: Sand, traces gravel & silt.

Source: Material on site, 09-03,SS-11, Depth: 7,8 to 8,4 m.

Approuved by :____________ Date : 30/10/2009.

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2254

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2101**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-03, SS-15, Depth.:10,8 to 11,2 m.
Tests completed on : 2009-09-30

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 0,898
C.U. 6,079
Unified Classification:
Fineness Module: 2,14

% Gravel: 9
% Sand: 81
% Silt: 8
% Clay: 2

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: 2009-09-30
Sylvie Daigle, Tech.

Verified by: 2009-09-30
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

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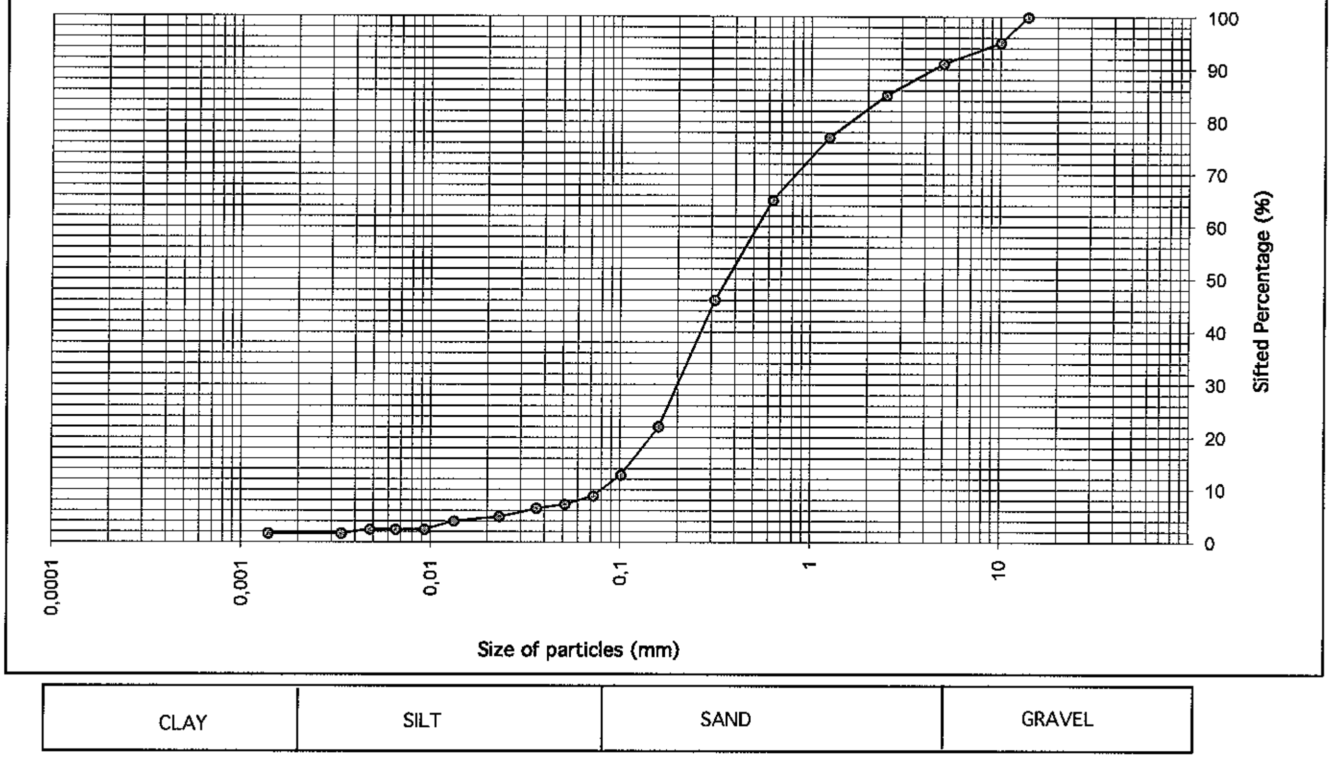
SM*i*

LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
14,0	100
10,0	95
5,00	91
2,500	85
1,250	77
0,630	65
0,3150	46,0
0,1600	22,0
0,1011	12,8
0,0724	8,8
0,0515	7,2
0,0364	6,4
0,0232	4,8
0,0134	4,0
0,0094	2,4
0,0066	2,4
0,0048	2,4
0,0034	1,6
0,0014	1,6

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2101

Type of material: Sand, traces gravel, silt & clay.

File #: **F099382200**

Source: Material on site, 09-03,SS-15, Depth: 10,8 to 11,2 m.

Customer: **Alcoa**

Approuved by : ______________ Date : 30/10/09

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2259

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2100**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-03, SS-17, Depth.:12,2 to 12,4 m.
Tests completed on : 2009-09-30

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	0,445	% Gravel:	37
C.U.	46,392	% Sand:	49
Unified Classification:		% Silt:	11
Fineness Module: 2,99		% Clay:	3

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: ______________________ 2009-09-30
Sylvie Daigle, Tech.

Verified by: ______________________ 2009-09-30
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

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SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
31,5	100
20	74
14,0	67
10,0	66
5,00	63
2,500	61
1,250	58
0,630	53
0,3150	40,0
0,1600	26,0
0,0971	16,5
0,0699	13,0
0,0499	10,6
0,0357	8,9
0,0227	7,7
0,0131	7,7
0,0092	5,9
0,0066	4,1
0,0047	3,5
0,0033	4,1
0,0014	2,4

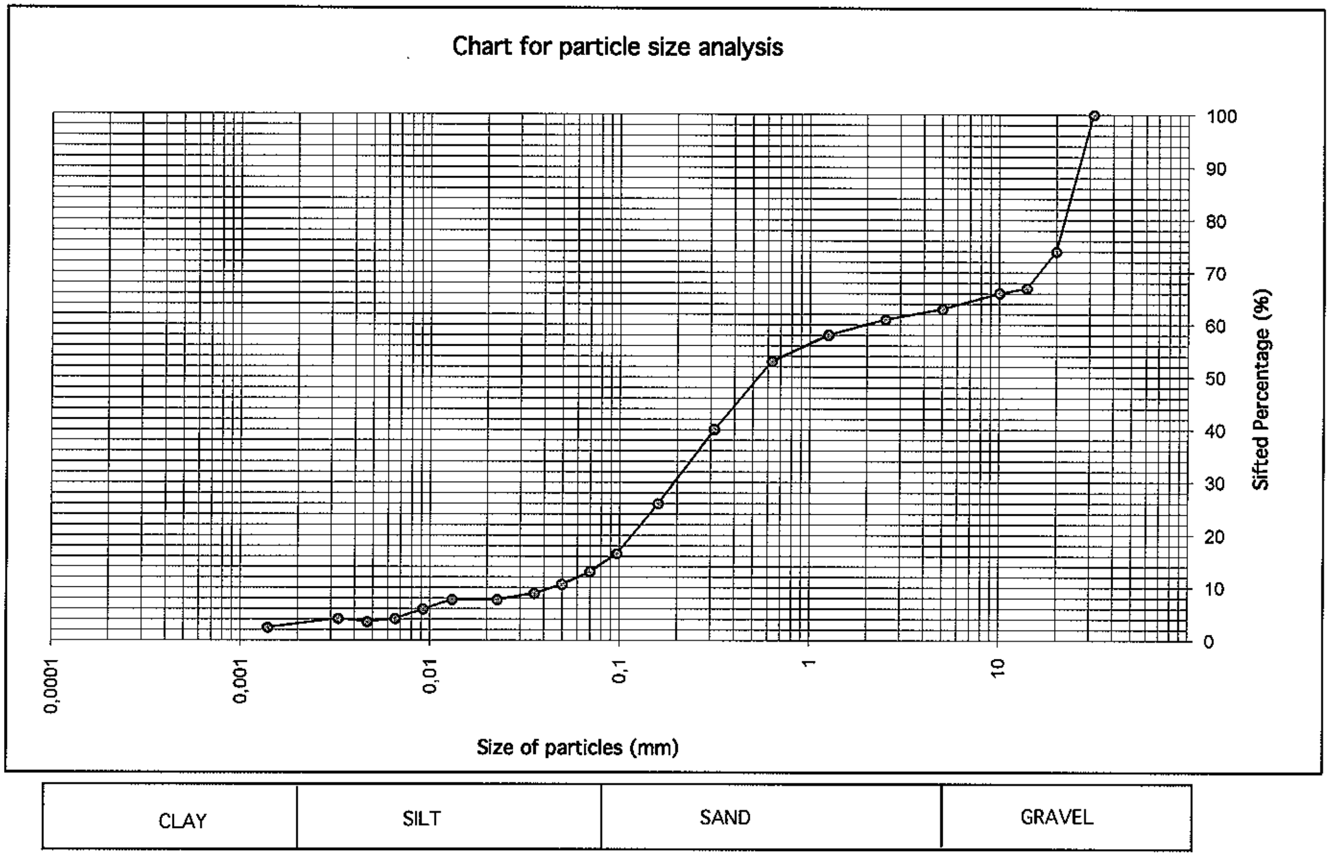


Chart for particle size analysis

Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2100

Type of material: Sand & gravel, some silt, traces clay.

Source: Material on site, 09-03,SS-17, Depth: 12,2 to 12,4m.

Approuved by : ____________ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4
SITE: Alcoa - Baie-Comeau smelter (Quebec)
LOCATION OF BOREHOLE: X : 258722,16 Y : 5457002,84
CASING: HW
EQUIPEMENT USED: D-50
SAMPLER: Indicated
CORE BARRELHQ
SURFACE ELEVATION (m): -10.11
BORING DATE START: 2009-10-06 14:00:00 END: 2009-10-07 13:30:00
BOREHOLE: 09-04
PAGE: 1 of 2
FILE NO: F099382300
TECHNICIAN: Simon Marois, tech.

Type of Sampler
SS: Split Spoon
DC: Diamond Core
WS: Wash Sample
HT: Hydraulic Trust
HW: Hammer Weight
SP: Shelby and Piston
AS: Auger Sampler
ST: Thin Walled Shelby Tube

☒ Remoulded
▨ Intact
■ Lost
◧ Rock Core

Laboratory and in situ tests - Parameters
N: SPT N-Value
Nd: DCPT Nd-Value
Su: Field Vane
GSA: Grain size analysis
CU: Uniformity coefficient
W: Water Content
Wp: Plastic limit
Wl: Liquid limit
Ip: Plasticity index:
D: Specific density
Cu: Swedish cone
C: Consolidation
PP: Preconsolidation pressure
Cc: Compression index
Ccr: Recompression index
UC: Unconfined compression
DS: Direct shear
Phi': Angle of internal friction
c': Cohesion
CUT: Consolidation undrained triaxial

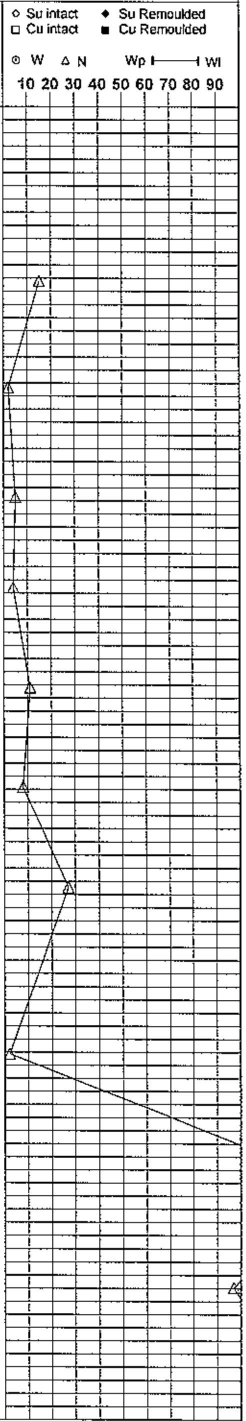
Water level
Date: Time: Elev.(m):
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth -10.11	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
	0.00	Gray silty sand with trace clay and occasionally sea shell; loose.									
1											
					SS-1	B	100	15	1-4-11-12		
2					SS-2	B	29	2	7-2-0-0		
3					SS-3	B	75	5	5-3-2-1		
					SS-4	B	83	4	1-1-3-3		GSA, CU=15.4
4											
	-14.58 4.47	Gray sand with trace gravel and silt; loose to medium dense.			SS-5	B	87	11	1-3-8-7		
5											
					SS-6	B	62	8	5-4-4-9		
6					SS-7	B	33	27	9-11-16-44		
	-16.43 6.33	Cobbles and boulders (up to 430mm Ø)			SS-8	B	0				
					DC-9	NQ	100				
					SS-10	B	0				
7	-17.02 6.91	Brown gravelly sand with trace silt; very dense.			DC-11	NQ	100				
					SS-12	B	58	2	1-2-0-11		
	-17.62 7.51	Soils becoming gray									
8											
					SS-13	B	86	140	47-68-72-80 /refusal		GSA, CU=15.9
9					SS-14	B	58	97	50-49-48-51		
	-19.91				SS-15	B	86	118	58-48-70 /refusal		
	9.80	Gravel and cobbles			DC-16	NX	60				



Notes:

Approved by :
Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-04
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 2 of 2
LOCATION OF BOREHOLE: X : 258722,16 Y : 5457002,84		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL**HQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -10.11	**BORING DATE START:** 2009-10-06 14:00:00	**END:** 2009-10-07 13:30:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◫	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value
Nd:	DCPT Nd-Value
Su:	Field Vane
GSA:	Grain size analysis
CU:	Uniformity coefficient
W:	Water Content
Wp:	Plastic limit
Wl:	Liquid limit
Ip:	Plasticity index:
D:	Specific density
Cu:	Swedish cone
C:	Consolidation
PP:	Preconsolidation pressure
Cc:	Compression index
Ccr:	Recompression index
UC:	Unconfined compression
DS:	Direct shear
Phi':	Angle of internal friction
c':	Cohesion
CUT:	Consolidation undrained triaxial

Water level

Date:	Time:	Elev.(m):

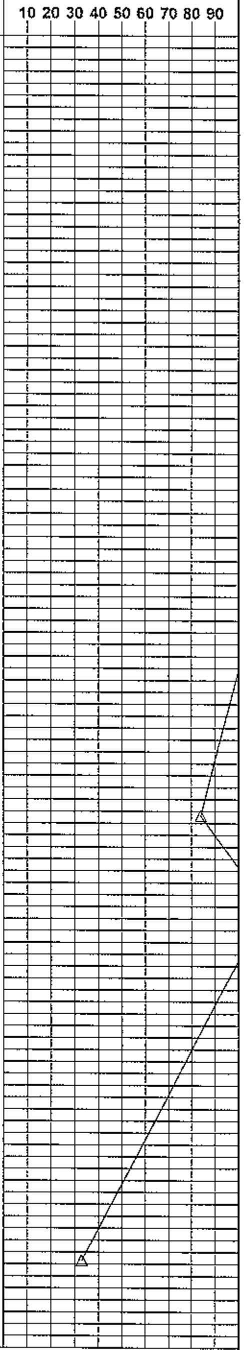
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
	-20.30 10.19	Gray medium to coarse sand and gravel (to gravelly sand) with trace silt; very dense.		■	DC-17	NX	0				
				☒	SS-18	N	67	124	39-56-68-66		
11											
				☒	SS-19	B	71	149	49-69-80 /refusal		GSA, CU=45.2
12				☒	SS-20	B	60	144	48-64-80 /refusal		
				☒	SS-21	B	59	114	53-55-59-65 /refusal		
13											
				☒	SS-22	N	69	124	48-54-70 /refusal		GSA, CU=51.2
14											
				☒	SS-23	B	49		60 /refusal		Refusal on coarse gravel
15											
				☒	SS-24	B	42		44-52		
				☒	SS-25	B	67		34-52		
16											
				☒	SS-26	B	56	84	41-36-48		
17											
				☒	SS-27	B	50	112	35-56-56		Spacing of the sampling due to bad meteorological conditions
18											
				☒	SS-28	B	80		50 /refusal		GSA, CU=18.4 Refusal on coarse gravel
19											
20											
				☒	SS-29	B	42	33	34-15-18-24		
	-30.68 20.57	End of borehole									



Notes:

Approved by :

Sonya Graveline, ing.

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2501

File Number	**: F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: ------
City	: Baie-Comeau (Québec)	Uses	: ------
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	**: 09-2295**	Source	: 09-04, SS-4, Depth.: 3,4 to 4,0 m.
Sample No.	: ------	Tests completed on	: 2009-10-19

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 5,09 — % Gravel: 1
C.U. 15,439 — % Sand: 64
Unified Classification: — % Silt: 30
Fineness Module: 0,34 — % Clay: 5

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: 2009-10-21
Sylvie Daigle, Tech.

Verified by: 2009-10-21
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

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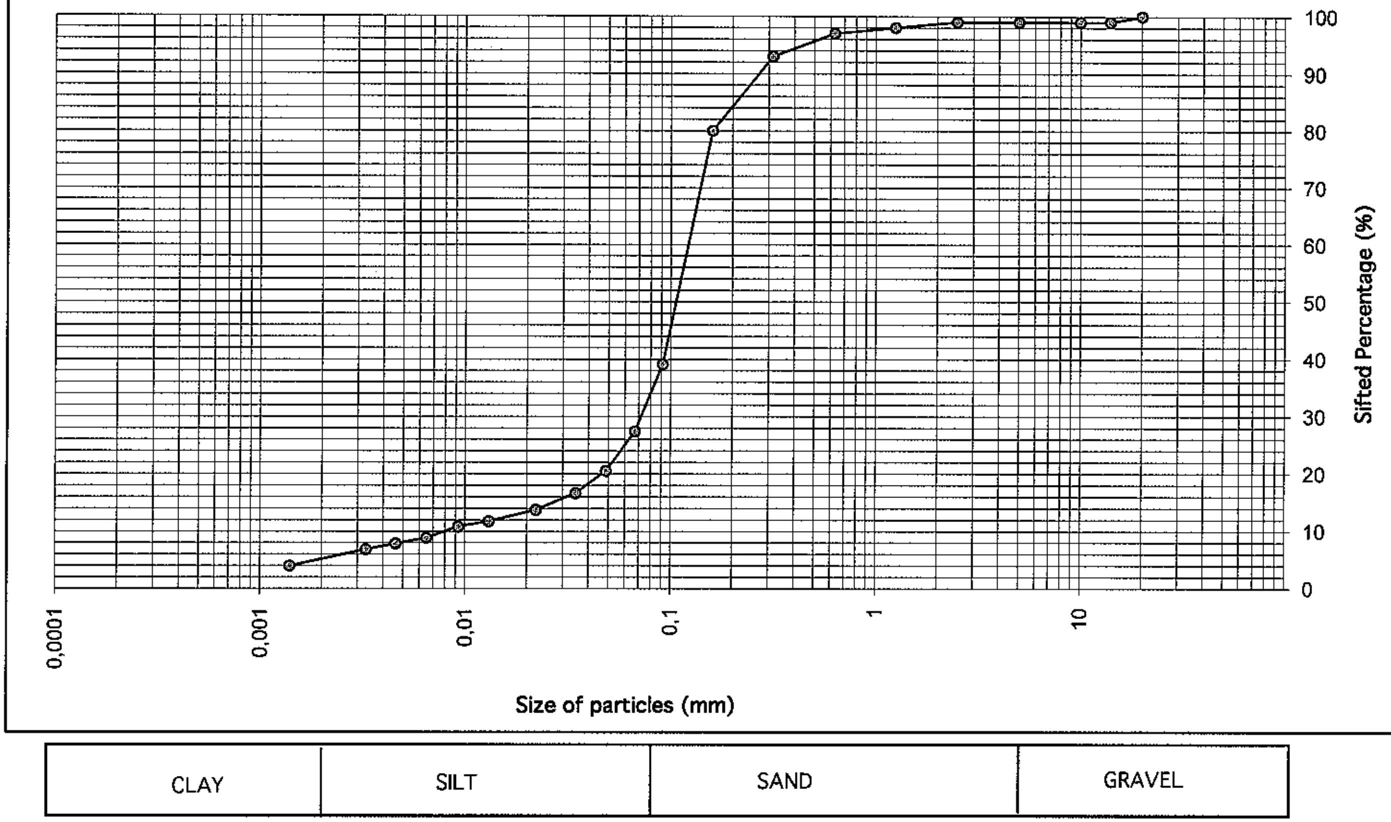
LABO S.M. INC.

Sediments Analysis NQ 2501-025

Size (mm)	% Sifted (%)
20,0	100
14,0	99
10,0	99
5,00	99
2,500	99
1,250	98
0,630	97
0,3150	93,0
0,1600	80,0
0,0917	39,1
0,0673	27,4
0,0486	20,5
0,0347	16,6
0,0222	13,7
0,0131	11,7
0,0093	10,8
0,0065	8,8
0,0046	7,8
0,0033	6,8
0,0014	3,9

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2295

Type of material: Silty sand,traces clay & gravel.

File #: **F099382200**

Source: Material on site, 09-04,SS-4, Depth: 3,4 to 4,0 m.

Customer: **Alcoa**

Approuved by : ______ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2565

File Number	**: F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: ------
City	: Baie-Comeau (Québec)	Uses	: ------
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	**: 09-2296**	Source	: 09-04, SS-13, Depth: 8,0 to 8,5 m .
Sample No.	: -----	Tests completed on	: 2009-10-22

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	0,73	% Gravel:	23
C.U.	15,89	% Sand:	72
Unified Classification:		% Silt:	4
Fineness Module: 3,35		% Clay:	1

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: ____________ 2009-10-22
Sylvie Daigle, Tech.

Verified by: ____________ 2009-10-22
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

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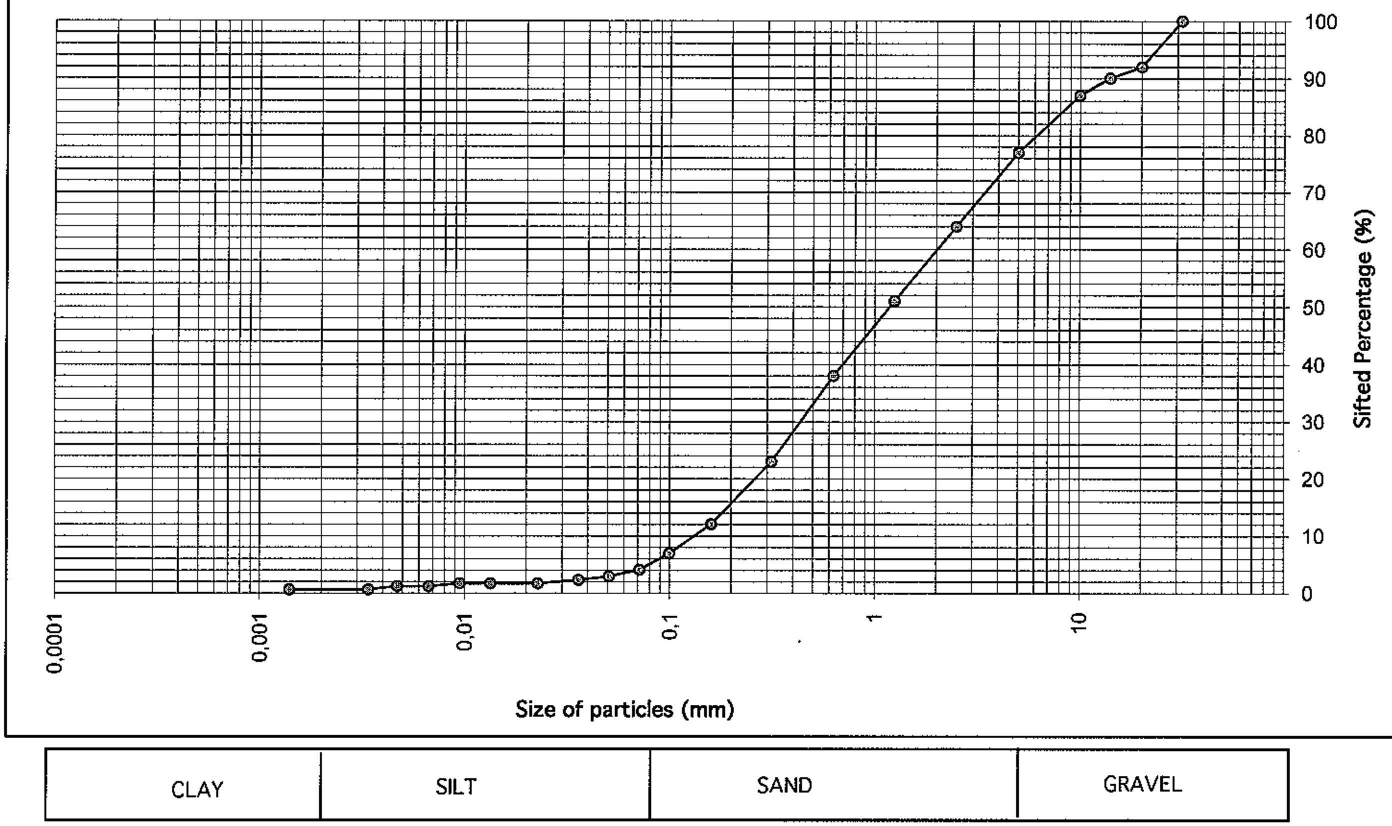
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
31,5	100
20	92
14	90
10	87
5	77
2,5	64
1,250	51
0,630	38
0,3150	23
0,1600	12
0,0997	6,9
0,0714	4,1
0,0508	2,9
0,0361	2,3
0,0228	1,7
0,0134	1,7
0,0095	1,7
0,0067	1,2
0,0047	1,2
0,0034	0,6
0,0014	0,6

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2296

Type of material: Gravelly sand,traces silt & clay.

File #: **F099382200**

Source: Material on site, 09-04,SS-13, Depth: 8,0 to 8,5 m.

Customer: **Alcoa**

Approuved by : Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

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LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2598

File Number : F099382200
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : 09-2297
Sample No. : ------

Type of Material : -----
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-04, SS-19, Depth.: 11,0 to 11,4 m.
Tests completed on : 2009-10-27

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	0,257	% Gravel:	39,0
C.U.	45,19	% Sand:	53
Unified Classification:		% Silt:	7,0
Fineness Module: 3,44		% Clay:	1,0

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: 2009-10-30
Sylvie Daigle, Tech.

Verified by: 2009-10-30
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

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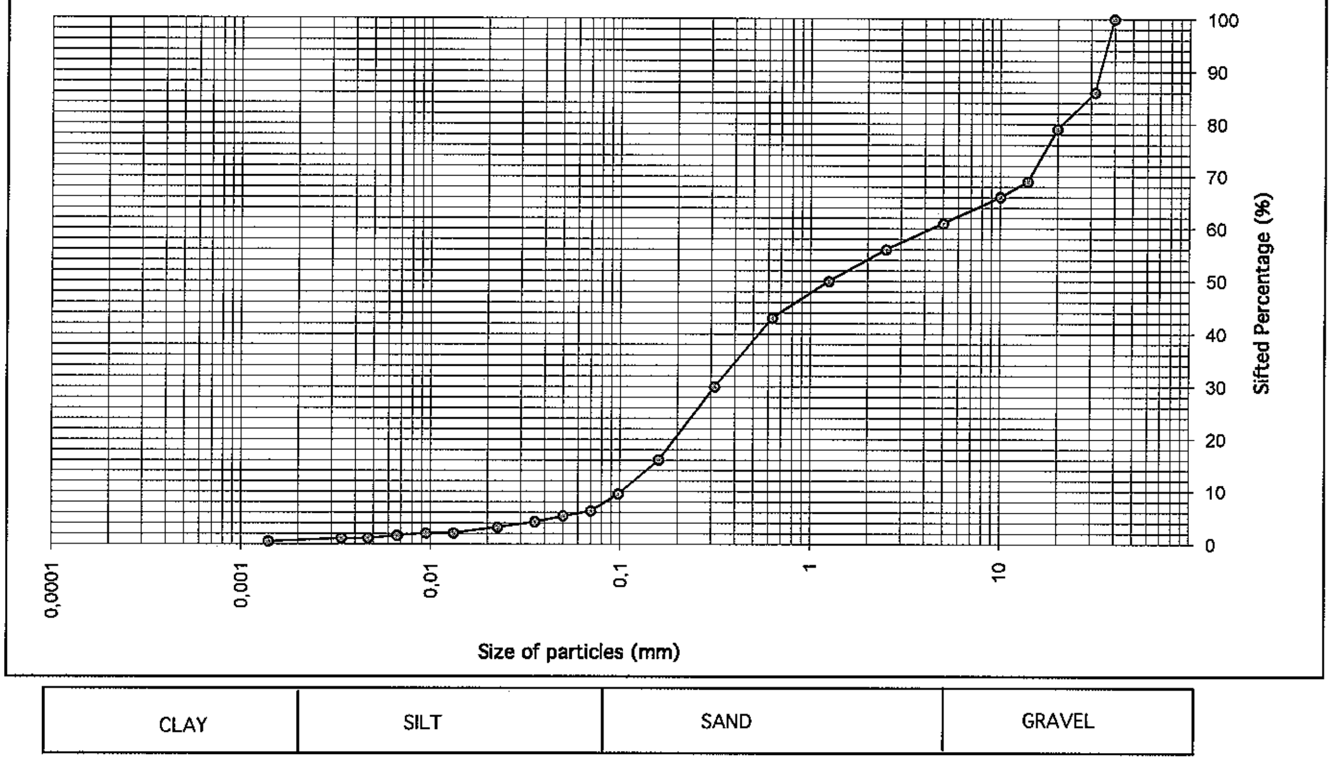
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
40,0	100
31,5	86
20,0	79
14,0	69
10,0	66
5,0	61
2,5	56
1,250	50
0,630	43
0,3150	30
0,1600	16
0,0977	9,5
0,0703	6,3
0,0500	5,3
0,0355	4,2
0,0226	3,2
0,0133	2,1
0,0095	2,1
0,0067	1,6
0,0047	1,1
0,0034	1,1
0,0014	0,5

Chart for particle size analysis



Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2297

Type of material: Sand & gravel,traces silt & clay.

Source: Material on site, 09-04,SS-19, Depth: 11,0 to 11,4 m.

Approuved by :________ Date : 30/10/2009.

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2600

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2298**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-04, SS-22, Depth.: 13,2 to 13,7 m.
Tests completed on : 2009-10-27

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	0,205	% Gravel:	45,0
C.U.	51,16	% Sand:	51
Unified Classification:		% Silt:	3,0
Fineness Module: 3,88		% Clay:	1,0

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: 2009-10-30
Sylvie Daigle, Tech.

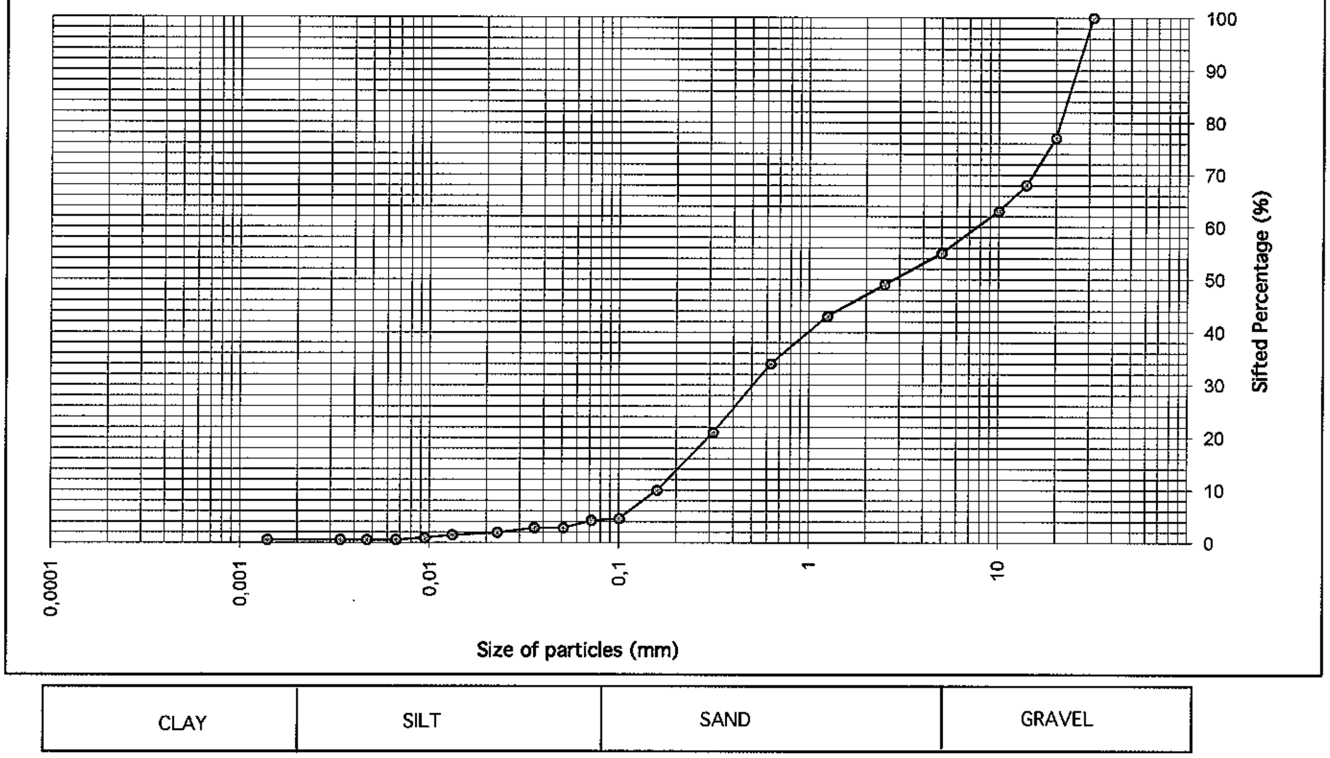
Verified by: 2009-10-30
Sonya Graveline, Ing.

SM

LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
31,5	100
20,0	77
14,0	68
10,0	63
5,0	55
2,5	49
1,250	43
0,630	34
0,3150	21
0,1600	10
0,1009	4,6
0,0715	4,2
0,0510	2,8
0,0360	2,8
0,0229	1,9
0,0133	1,4
0,0095	0,9
0,0067	0,5
0,0047	0,5
0,0034	0,5
0,0014	0,5

Chart for particle size analysis



Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2298

Type of material: Sand & gravel, traces silt & clay.

Source: Material on site, 09-04,SS-22, Depth: 13,2 to 13,7 m.

Approuved by : ________ Date : 30/10/2009

SOIL MATERIALS ANALYSIS REPORT

SM
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2623

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2432**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-04, SS-28, Depth.: 18,6 to 18,7m.
Tests completed on : 2009-10-02

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 0,508
C.U. 18,35
Unified Classification:
Fineness Module: 3,28

% Gravel: 30,3
% Sand: 63,1
% Silt: 6,6
% Clay:

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for particle size analysis.

Prepared by: 2009-10-30
Sylvie Daigle, Tech.

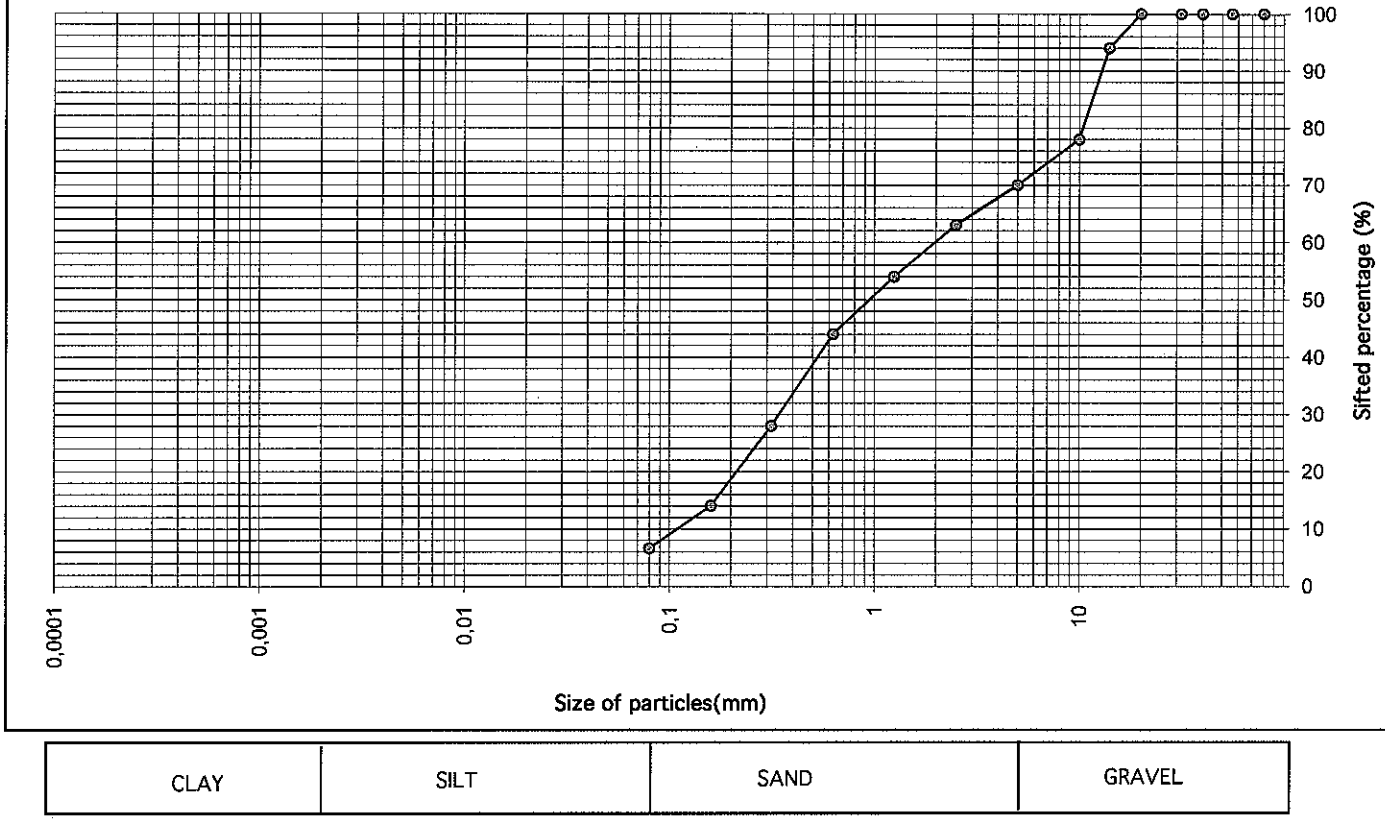
Verified by: 2009-10-30
Sonya Graveline, Ing.

SMi
LABO S.M. INC.

Particle size analysis LC 21-040	
Size (mm)	% sifted (%)
112	100
80	100
56,0	100
40	100
31,5	100
20	100
14,0	94
10,0	78
5,00	70
2,500	63
1,250	54
0,630	44
0,3150	28,0
0,1600	14,0
0,0800	6,6

ANNEXE A

Chart for particle size analysis



Project: New Baie-Comeau Wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No.: 09-2432

Type of material: Gravelly sand, traces silt.

Source: 09-04, SS-28

Depth: 18,6 to 18,7 m

Approuved by: ________ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SM Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-05
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 1 of 7
LOCATION OF BOREHOLE: X : 258752,15 Y : 5457018,41		**CASING:** HW/NW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL**HQ/NQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -10.78	**BORING DATE** **START:** 2009-09-07 08:00:00	**END:** 2009-09-14 02:00:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◫	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

Water level

Date:	Time:	Elev.(m):

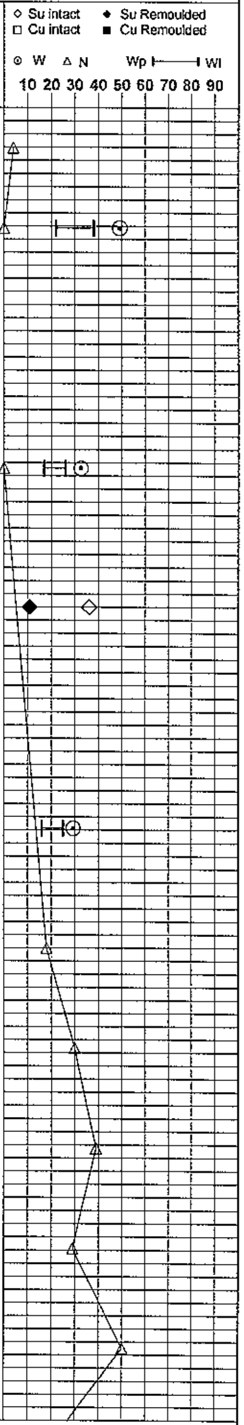
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth -10.78	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
	0.00 -11.01	Gray sand with trace silt; loose									
	0.23 -11.24	Gray silty clay with trace sand; very soft		☒	SS-1	B	71	4	9-3-1-1		
	0.46 -11.39	Gray fine sand with trace silt and sea shell; very loose									
1	0.61	Gray clayey sandy silt and occasionaly sea shell and fine layers of silt with some sand; firm		☒	SS-2	B	71	0	0-0-0-0		SS-2: W=49.2%, Wp=22%, Wl=38%, Ip=16%
2				▨	ST-3		92				ST-3: GSA, C, CUT, DS CU=XXX, W=24.2%, Wp=XXX, Wl=XXX, Ip=XXX, D=2.75, PP=76kPa, Cc=0.821, Ccr=0.036, UC=41kPa, Phi'=25.6, c'=6.8 kPa
3				☒	SS-4	B	100	0	0-0-0-0		SS-4: GSA, CU>35, W=32.7%, Wp=17%, Wl=26%, Ip=9%
4				■	ST-5		0				
5	-15.81 5.03	Gray clayey silt with layers of fine silty sand		▨	ST-6		96				SS-6: GSA, CU=XXX, W=29.4%, Wp=16%, Wl=25%, Ip=9, CU=XXX
6	-16.72 5.94	Gray silty sand, trace clay; medium dense to dense		☒	SS-7	B	71	18	10-10-8-10		SS-7: GSA, CU=15.7
7				☒	SS-8	B	79	30	17-16-14-16		Combined samples SS-8 /SS-9: GSA, DS CU=9.9, Phi'=XXX, c'=XXX
8				☒	SS-9	B	71	39	16-23-16-15		
9				☒	SS-10	B	58	29	12-14-15-17		
				☒	SS-11	B	29	50	19-26-24-18		



Notes:

Approved by :
Sonya Graveline, ing.

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-05
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 2 of 7
LOCATION OF BOREHOLE: X : 258752,15 Y : 5457018,41		**CASING:** HW/NW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL**HQ/NQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -10.78	**BORING DATE** **START:** 2009-09-07 08:00:00 **END:** 2009-09-14 02:00:00		

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◧	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

Water level

Date:	Time:	Elev.(m):

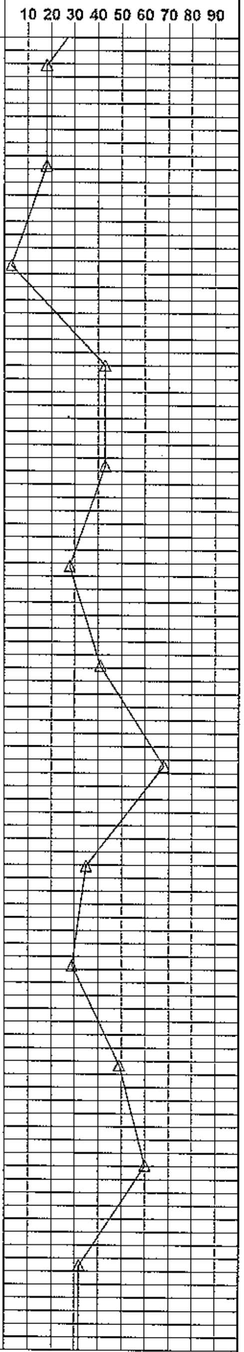
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
			SS-12	B	54	18	4-12-6-3		
11			SS-13	B	0	18	12-9-9-13		
	-22.13 11.35	Gray silty sand, traces clay silt with layers of fine sand; very loose	SS-14	B	87	3	2-1-2-9		GSA, CU=59
12	-22.90 12.12	Gray fine to coarse sand with some gravel, trace silt; dense	SS-15	B	42	43	20-21-22-24		
13			SS-16	B	0	43	19-24-19-26		
14			SS-17	B	42	28	7-14-14-11		GSA, CU=6.2
15			SS-18	B	25	41	28-22-19-11		
			SS-19	B	12	68	24-43-25-18		
16			SS-20	N	21	35	18-17-18-5		
17			SS-21	N	38	29	22-14-15-14		
18			SS-22	N	4	49	33-29-20-25		
			SS-23	N	46	60	25-26-34-27		
19			SS-24	N	25	32	18-15-17-17		
	-30.52 19.74	Gray gravel; dense							



Notes:

Approved by :

Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-05
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 3 of 7
LOCATION OF BOREHOLE: X : 258752,15 Y : 5457018,41		**CASING:** HW/NW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL** HQ/NQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -10.78	**BORING DATE START:** 2009-09-07 08:00:00	**END:** 2009-09-14 02:00:00	

Type of Sampler

SS: Split Spoon
DC: Diamond Core
WS: Wash Sample
HT: Hydraulic Trust
HW: Hammer Weight
SP: Shelby and Piston
AS: Auger Sampler
ST: Thin Walled Shelby Tube

☒ Remoulded
▨ Intact
■ Lost
◧ Rock Core

Laboratory and in situ tests - Parameters

N: SPT N-Value
Nd: DCPT Nd-Value
Su: Field Vane
GSA: Grain size analysis
CU: Uniformity coefficient
W: Water Content
Wp: Plastic limit
Wl: Liquid limit
Ip: Plasticity index:
D: Specific density
Cu: Swedish cone
C: Consolidation
PP: Preconsolidation pressure
Cc: Compression index
Ccr: Recompression index
UC: Unconfined compression
DS: Direct shear
Phi': Angle of internal friction
c': Cohesion
CUT: Consolidation undrained triaxial

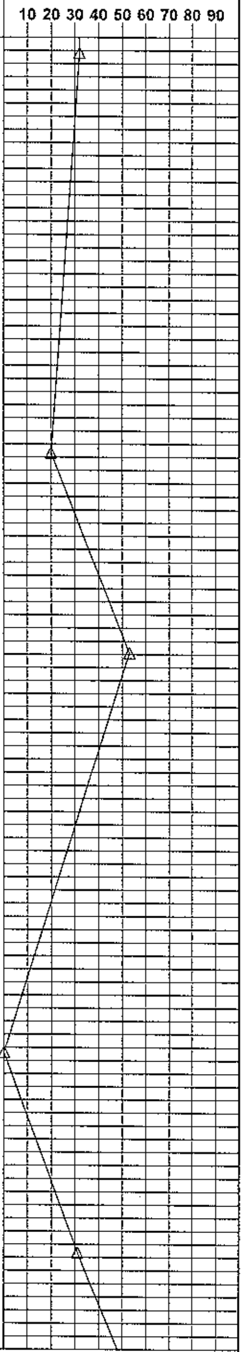
Water level

Date: Time: Elev.(m):

Installation:

STRATIGRAPHY — SAMPLES — LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
				☒	SS-25	N	4	32	22-17-15-15		
21	-31.66 20.88	Gray-brown sand and gravel with trace silt; medium dense									
				☒	SS-26	N	46		42-50		GSA, CU=87 Sanding up at 21.3 m depth
22											
				■	DC-27		15				
23				☒	SS-28	N	8	20	24-11-9-2		1,4 m sanding up at 22.9 m depth
24	-34.55 23.77	Gray and brown sand with trace silt and clay; very dense									
				☒	SS-29	N	67	53	22-27-26-35		
25	-35.78 25.00	Deposit more gravelly and presence of cobbles up to 150 mmØ									
26				☒	SS-30	N	40		60 /refusal		
27											
28	-38.28 27.50	Gray and brown sand with trace silt and clay; very dense		☒	SS-31	N	100	0	0-0-0-0		GSA, CU=3.8 2.1 m sanding up at 28 m depth
29				☒	SS-32	B	62	31	19-11-20-21		1.1 m sanding up at 29 m depth
											0.2 m sanding up at 30.5 m



Notes:

Approved by :
Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4	**BOREHOLE:** 09-05
SITE: Alcoa - Baie-Comeau smelter (Quebec)	**PAGE:** 4 of 7
LOCATION OF BOREHOLE: X : 258752,15 Y : 5457018,41 — **CASING:** HW/NW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50 — **SAMPLER:** Indicated — **CORE BARREL** HQ/NQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -10.78 — **BORING DATE START:** 2009-09-07 08:00:00 **END:** 2009-09-14 02:00:00	

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Cc: Compression index
Ccr: Recompression index
UC: Unconfined compression
DS: Direct shear
Phi': Angle of internal friction
c': Cohesion
CUT: Consolidation undrained triaxial

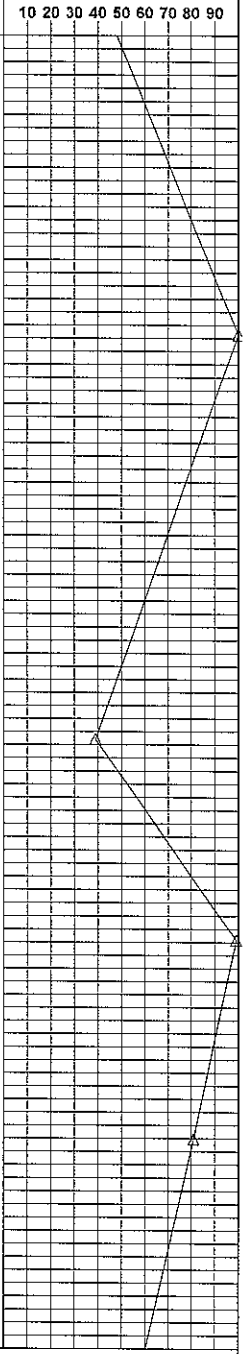
Water level

Date: Time: Elev.(m):

Installation:

STRATIGRAPHY — SAMPLES — LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
											depth
31	-41.87 31.09	Gray coarse sand with trace silt and gravel; very dense									
32				☒	SS-33	N	48	100	44-50-50-50 /refusal		1.3 m sanding up at 32 m depth
33											
34											
35				☒	SS-34	N	33	39	7-5-34-40		0.3 m sanding up at 35 m depth
36											
37				☒	SS-35	N	50	99	48-63-36-25		
38				☒	SS-36	N	33	81	55-35-46-63		
39											



Notes:

Approved by :
Sonya Graveline, ing.

SM Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-05
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 5 of 7
LOCATION OF BOREHOLE: X : 258752,15 Y : 5457018,41		**CASING:** HW/NW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL** HQ/NQ	**TECHNICIAN:** Simon Marois, tech.
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Water level

Date:	Time:	Elev.(m):

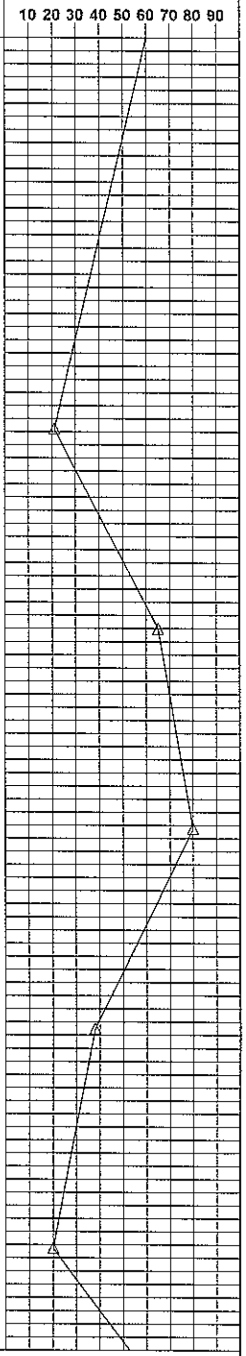
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
41											
				☒	SS-37	N	100		50 /refusal		4.3 m sanding up at 41.5 m depth
42											
43				☒	SS-38	N	42	21	15-10-11-10		GSA, CU=7.2
	-54.52 43.74	Gray fine sand, some silt; dense to very dense									
44											
				☒	SS-39	N	46	65	42-34-31-45		
45											
46				☒	SS-40	B	54	80	50-55-25-21		
47											
				☒	SS-41	B	58	38	10-18-20-38		
48											
49											
				☒	SS-42	B	100	20	16-20		



Notes:

Approved by :
Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-05
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 6 of 7
LOCATION OF BOREHOLE: X : 258752,15 Y : 5457018,41		**CASING:** HW/NW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL** HQ/NQ	**TECHNICIAN:** Simon Marois, tech.
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CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

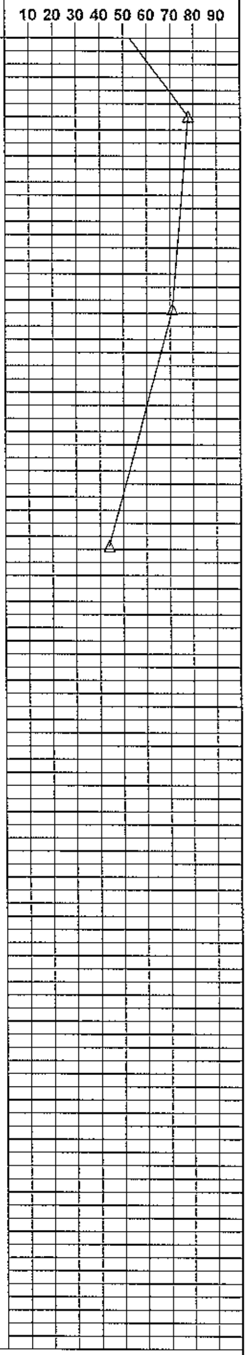
Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY / SAMPLES / LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
				☒	SS-43	N	54	78	22-27-51-46		
	-61.68										
51	50.90	Gray silty sand with trace gravel; very dense									
52				☒	SS-44	B	15	71	20-25-46-50 /refusal		
53				■	DC-45	NQ	100				
	-64.25										
	53.52	Gray sand with some silt and trace gravel; very dense		☒	SS-46	B	54	44	28-26-18-32		
54	-65.21										
	54.43	Boulders									
	-65.70										
55	54.92	Roc: Gray granitic rock; good to excellent quality	+		DC-47	NW					
			+		DC-48	NQ	91	80			
56			+		DC-49	NQ	100	100			
57			+								
58			+		DC-50	NQ	97	87			
59			+		DC-51	NQ	100	79			



Notes:

Approved by :
Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-05
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 7 of 7
LOCATION OF BOREHOLE: X : 258752,15 Y : 5457018,41		**CASING:** HW/NW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL**HQ/NQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -10.78	**BORING DATE** **START:** 2009-09-07 08:00:00	**END:** 2009-09-14 02:00:00	

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Laboratory and in situ tests - Parameters

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Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
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GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY				SAMPLES						LABO AND IN SITU TESTS		
Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks	10 20 30 40 50 60 70 80 90
			+ +	■	DC-52	NQ	100	100				
61	-72,02 61.24	End of borehole										
62												
63												
64												
65												
66												
67												
68												
69												

Notes:

Approved by :

Sonya Graveline, ing.

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2223

File Number	**: F099382200**		
Customer	: Alcoa	Type of Material	: -----
Address	: 100, route Maritime	Caliber	: -----
City	: Baie-Comeau (Québec)	Uses	:
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	**: 09-2093**	Location	: 09-05, SS-2, Depth.: 0,76 to 1,37 m.
Sample No.	: ------	Tests completed on	: 2009-09-30

Particle Size Analysis
LC 21 040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements
Atterberg Limits (3pts)	BNQ2501-092		
Liquid Limit (%):		38	------
Plastic Limit (%):		22	------
Plasticity index (%):		16	------
Water Content (%):	LC21-201	49,24	------

Legend : *** =Results not in conformity**

Remarks:

Prepared by: ____________ 2009-09-30
Sylvie Daigle, Tech.

Verified by: ____________ 2009-09-30
Sonya Graveline, Ing.

SMi LABO S.M. INC.

Rapport no. : *09LL1694*

Rapport D'essai
CONSOLIDATION OEDOMETRIQUE
ASTM D2435-90

No Dossier :	**F99382100**	Sondage :	**BH-09-05**	
Client :	**Alcoa**	Échantillon :	**ST-03**	
Adresse :	100, rue Maritime	Prof. (m) :	2,00	**2,00@2,10**
Ville :	Baie-Comeau (Québec)			
Code postal :	G4Z 2L6			
Projet no :	Usine Alcoa de Baie-Comeau/Nouveau quai			

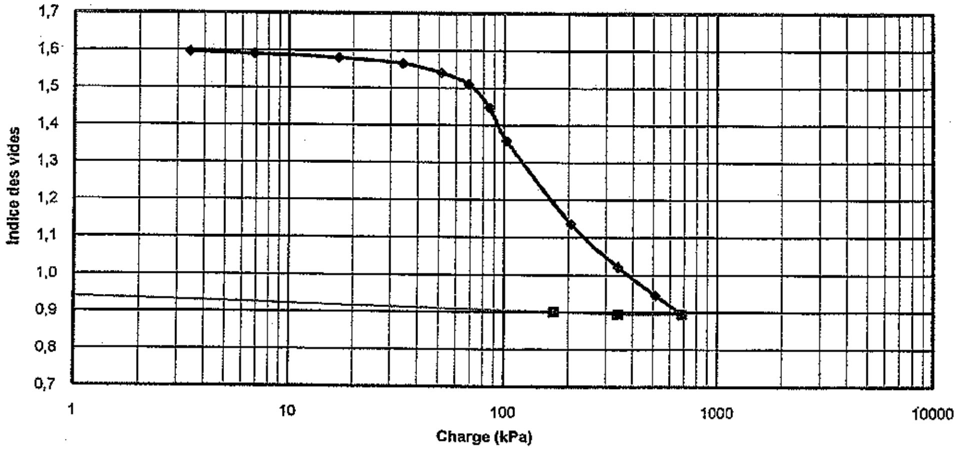
Analysé par : IG

Caractéristiques de l'anneau		
Numéro :		V-3390
Masse :	(g)	109,59
Hauteur :	(mm)	25,58
Diamètre :	(mm)	63,49
Surface :	(cm^2)	31,66
Volume :	(cm^3)	80,98

Caractéristiques de l'appareil		
Numéro de l'appareil :		6
Calibration de l'extensomètre :	(div./mm)	500,00
Bras de levier :		11,03
Déformation = b * Pression ^ m		
Facteur de correction b :	(div)	10,00
Facteur de correction m :		0,50

Caractéristiques physiques		Initial	Final	Lavage
Numéro de la tare :		Anneau	Anneau	
Masse de la tare (anneau) :	(g)	109,59	109,59	
Masse du sol humide + tare :	(g)	244,67	225,75	
Masse du sol sec + tare :		195,18	195,18	
Masse du sol humide :	(g)	135,08	116,16	
Masse du sol sec :	(g)	85,59	85,59	0,00
Teneur en eau du sol :	(%)	57,82	35,72	
Hauteur du sol humide :	(mm)	25,58	19,50	
Hauteur du sol sec :	(mm)	9,83	9,83	
Masse volumique humide :	(kg/m^3)	1 668	1 882	
Masse volumique sèche :	(kg/m^3)	1 057	1 386	
Indice des vides :		1,602	0,984	
Degré de saturation :	(%)	99,26	100,00	
Densité relative calculée :	Estimée	2,75	2,75	Calculée

Date (aaaa/mm/jj)	Heure (hh:mm)	Charge (kg)	Pression (kPa)	Lecture (0,002mm)	Correction de lecture	ΔH (mm)	Indice des vides	Hauteur (mm)	t50 (min)	Cv (m^2/s)
2009/10/24		0,00	0,00	0	0,0	0,00	1,602	25,58		
2009/10/25		0,10	3,42	35	4,4	0,06	1,596	25,52		
2009/10/26		0,20	6,83	68	8,8	0,12	1,590	25,46		
2009/10/27		0,50	17,08	125	19,0	0,21	1,580	25,37		
2009/10/28		1,00	34,17	213	33,0	0,36	1,565	25,22		
2009/10/29		1,50	51,25	342	39,5	0,61	1,540	24,98		
2009/10/30		2,00	68,33	498	46,0	0,90	1,510	24,68		
2009/10/31		2,50	85,41	807	51,0	1,51	1,448	24,07		
2009/11/01		3,00	102,50	1 254	56,0	2,40	1,358	23,18		
2009/11/02		6,00	205,00	2 367	76,5	4,58	1,136	21,00		
2009/11/03		10,00	341,66	2 953	94,8	5,72	1,021	19,86		
2009/11/04		15,00	512,49	3 343	114,1	6,46	0,945	19,12		
2009/11/05		20,00	683,32	3 605	127,5	6,96	0,895	18,63		
2009/11/06		15,00	512,49	3 595	114,1	6,96	0,894	18,62		
2009/11/07		10,00	341,66	3 569	94,8	6,95	0,895	18,63		
2009/11/08		5,00	170,83	3 517	71,3	6,89	0,901	18,69		
2009/11/08		0,00	0,00	3 042	0,0	6,08	0,983	19,50		



σ'p = 76 kPa
Cc = 0,8205
Cr = 0,0358

Remarques : —

Préparé par : ______________________ Date :
Isabelle Gauthier, tech. Chef labo

Vérifié par : ______________________ Date :
Salomon O'Ngandée, ing., M.Sc.A.

Notes : Le résultat s'applique exclusivement à l'échantillon analysé. Ce rapport ne doit pas être reproduit, sinon en entier, sans l'autorisation écrite de Labo S.M. inc.

QUÉFORMAT LTÉE

COMPRESSION TRIAXIALE NON DRAINÉE (CIU)

ASTM D4767-04

DOSSIER : **15756-G**
CLIENT : **Labo S.M. inc.**
PROJET : **ALCOA / F099382-100**

SONDAGE **BH-09-05**
ÉCHANT. : **ST-3**
PROF. (m) **2.10 - 2.20**

ESSAI No **15756-G-CIU-02** **Page 1 de 3**
FICHIER : 15756-G-02.CIU

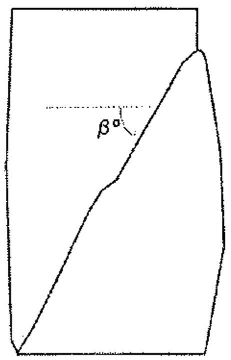
Échantillon : Intact
Description : Argile et silt, traces de sable

Unité : 1
Cellule : Tx-50A

ÉTAT INITIAL						ÉTAT FINAL					
Caractéristiques physiques			**Géométrie**			**Caractéristiques physiques**			**Géométrie**		
Masse initiale humide :	172.52	g	Longueur:	87.65	mm	Masse finale humide :	169.92	g	Déform :	Plan	70°
Teneur en eau initiale :	48.75	%	Diamètre :	37.89	mm	Masse finale sèche :	115.98	g	D_{F1} :		mm
Masse volum. humide :	1746	kg/m^3	Section :	11.28	cm^2	Teneur en eau finale :	46.51	%	D_{F2} :		mm
Degré de saturation :	100	%	Volume :	98.83	cm^3	Masse volum. humide :	1766	kg/m^3	Kt_F :	0.00	1/1 [1]

CONDITIONS D'ESSAI								
Consolidation isotrope			**Cisaillement**			**Membranes**		
Pression cellulaire, σ_{3C} :	425	kPa	Engrenages .WF :	BA5		Nb -Type :	2	Ramses00
Contrepression, CP :	400	kPa	V_{axiale} :	0.0122	mm / min	Epaisseur :	0.080	mm
Pression effective, σ'_{3C} :	25	kPa	$d\varepsilon_1/dt$:	0.86	% / heure	Circonf.	102.0	mm
Condition de drainage :	Radial et Bas		ε_1 max :	8.09	%	Module :	0.22	N / mm
						Comportement :	Plis	

Croquis du spécimen au démontage



PRINCIPAUX RÉSULTATS D'ESSAI									
Paramètre B [2]			**Cisaillement**						
Initial (σ_{3C} = 25 kPa) :	0.86		Paramètres		$(\sigma_1 - \sigma_3)_{max}$	$(\sigma'_1/\sigma'_3)_{max}$	Final		
Sous contrepression :	0.99		ε_1	(%)	0.63		8.09		
Après consolidation :	ND		$\sigma_1 - \sigma_3$	(kPa)	17		10		
Consolidation			σ'_1 / σ'_3	(1/1)	2.28		3.24		
ΔV_c :	2.60	cm^3	Δu_W	(kPa)	11.40		20.10		
ε_{VC} :	2.63	%	A_{Uw} [3]	(1/1)	0.759		2.481		
C_V :	11	m^2/an	ϕ' [4]	(deg)	23.0		31.9		

Remarques :

D_{RS} : 2.75*

[1] $Kt_F = (D_{F2} - D_{F1}) \tan(\beta) / \Delta L$ [2] $B = \Delta u / \Delta\sigma_3$ [3] $A_{Uw} = \Delta u_W / \Delta(\sigma_1 - \sigma_3)$ [4] $\phi' = \sin^{-1} [(\sigma_1 - \sigma_3) / (\sigma'_1 + \sigma'_3)]$ pour c' = 0

* Valeur estimée

Effectué par :	
A. Bustamante	09-11-23
Vérifié par	
Hélène Bilodeau, ing.	
Date :	2009-12-15

COMPRESSION TRIAXIALE NON DRAINÉE (CIU)

ASTM D4767-04

Essai : **15756-G-CIU-02** **Page 2 de 3**

ΔL_O : 1817.0 Fp_o : 0.0 Vi : 96.23 cc Li : 85.37 mm Déformation : Plan

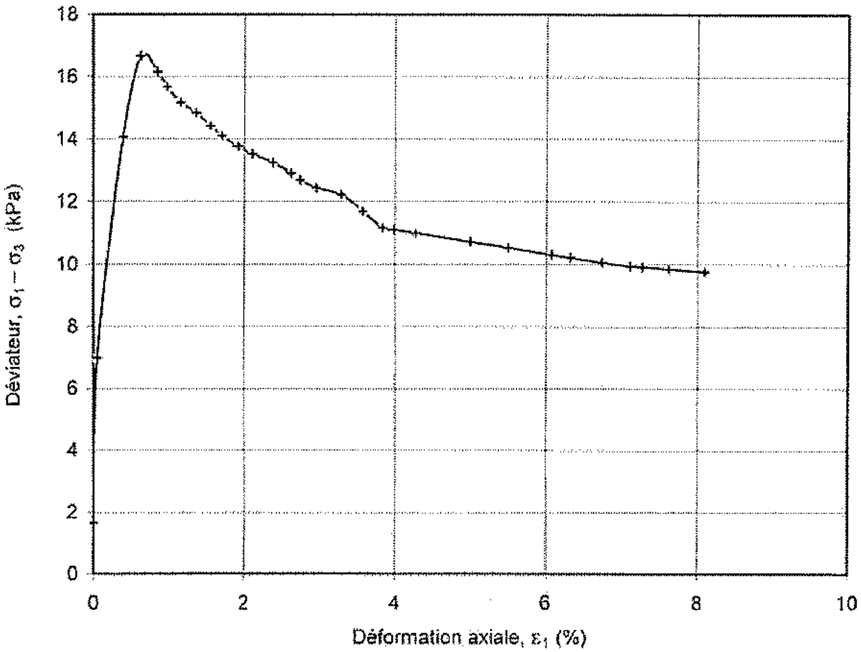
	Données expérimentales									Membrane		Contraintes corrigées								
Ligne	Date aa-mm-jj	Heure hh:mm	σ_3 kPa	ΔL 0.01mm	u_W kPa	Fa Newton	ε_1 %	Section cm²	Δu_w kPa	σ_{3m} kPa	σ_{1m} kPa	σ'_3 kPa	$\sigma_1 - \sigma_3$ kPa	σ'_1 kPa	σ'_1 / σ'_3 1/1	Au_w 1/1	$(\sigma'_1+\sigma'_3)/2$ kPa	$(\sigma_1-\sigma_3)/2$ kPa		Observ.
1	09-11-25	08:02	425	2045	403.0	3.0	0.00	11.272	0.0	2.4	1.4	24.4	1.6	26.0	1.068	0.000	25.2	0.8		
2				2049	405.4	9.0	0.05	11.277	2.4	2.4	1.4	22.0	7.0	29.0	1.319	0.449	25.5	3.5		
3				2079	412.2	17.0	0.40	11.317	9.2	2.4	1.4	15.2	14.1	29.2	1.928	0.741	22.2	7.0		
4				2099	414.4	20.0	0.63	11.344	11.4	2.4	1.4	13.0	16.7	29.6	2.285	0.759	21.3	8.3		
5				2118	415.9	19.5	0.86	11.369	12.9	2.4	1.4	11.5	16.2	27.6	2.409	0.889	19.5	8.1		
6				2129	416.5	19.0	0.98	11.384	13.5	2.4	1.3	10.9	15.7	26.5	2.442	0.963	18.7	7.8		
7				2144	416.8	18.5	1.16	11.404	13.8	2.4	1.3	10.6	15.2	25.7	2.435	1.021	18.2	7.6		
8				2162	417.8	18.2	1.37	11.429	14.8	2.4	1.3	9.6	14.8	24.4	2.550	1.123	17.0	7.4		
9		09:33		2178	418.6	17.8	1.56	11.451	15.6	2.4	1.2	8.8	14.4	23.2	2.645	1.221	16.0	7.2		
10				2191	418.9	17.5	1.71	11.468	15.9	2.4	1.2	8.5	14.1	22.6	2.665	1.277	15.5	7.1		
11				2209	419.4	17.2	1.92	11.493	16.4	2.4	1.2	8.0	13.8	21.7	2.728	1.353	14.9	6.9		
12				2225	419.5	17.0	2.11	11.515	16.5	2.4	1.1	7.9	13.5	21.4	2.718	1.390	14.6	6.8		
13				2248	420.0	16.8	2.38	11.547	17.0	2.4	1.1	7.4	13.2	20.6	2.798	1.466	14.0	6.6		
14				2269	420.3	16.5	2.62	11.576	17.3	2.4	1.0	7.1	12.9	20.0	2.824	1.538	13.5	6.4		
15				2279	420.4	16.3	2.74	11.590	17.4	2.4	1.0	7.0	12.7	19.6	2.819	1.578	13.3	6.3		
16		11:03		2297	420.6	16.1	2.95	11.615	17.6	2.4	0.9	6.8	12.4	19.2	2.836	1.633	13.0	6.2		
17				2325	420.9	16.0	3.28	11.654	17.9	2.4	0.9	6.5	12.2	18.7	2.889	1.694	12.6	6.1		
18				2349	421.1	15.5	3.56	11.688	18.1	2.4	0.8	6.3	11.7	17.9	2.864	1.804	12.1	5.8		
19				2372	421.4	15.0	3.83	11.721	18.4	2.4	0.7	6.0	11.2	17.1	2.869	1.936	11.5	5.6		
20				2385	421.4	15.0	3.98	11.740	18.4	2.4	0.7	6.0	11.1	17.1	2.859	1.948	11.5	5.5		
21				2409	421.5	15.0	4.26	11.774	18.5	2.4	0.6	5.9	11.0	16.9	2.873	1.981	11.4	5.5		
22				2471	421.8	15.0	4.99	11.864	18.8	2.4	0.4	5.6	10.7	16.3	2.924	2.074	10.9	5.4		
23		13:31		2514	422.1	15.0	5.49	11.927	19.1	2.4	0.3	5.3	10.5	15.8	2.997	2.153	10.5	5.3		
24				2563	422.4	15.0	6.07	12.000	19.4	2.4	0.2	5.0	10.3	15.3	3.074	2.242	10.1	5.2		
25				2584	422.5	15.0	6.31	12.032	19.5	2.4	0.1	4.9	10.2	15.1	3.097	2.278	10.0	5.1		
26				2620	422.7	15.0	6.74	12.086	19.7	2.4	0.0	4.7	10.0	14.7	3.152	2.346	9.7	5.0		
27				2652	422.8	15.0	7.11	12.135	19.8	2.4	0.0	4.6	9.9	14.5	3.170	2.388	9.6	5.0		
28				2666	422.9	15.0	7.27	12.156	19.9	2.4	0.0	4.5	9.9	14.4	3.206	2.409	9.4	5.0		
29				2695	423.0	15.0	7.61	12.201	20.0	2.4	0.0	4.4	9.8	14.3	3.230	2.440	9.3	4.9		
30				2736	423.1	15.0	8.09	12.265	20.1	2.4	0.0	4.3	9.8	14.1	3.243	2.481	9.2	4.9		

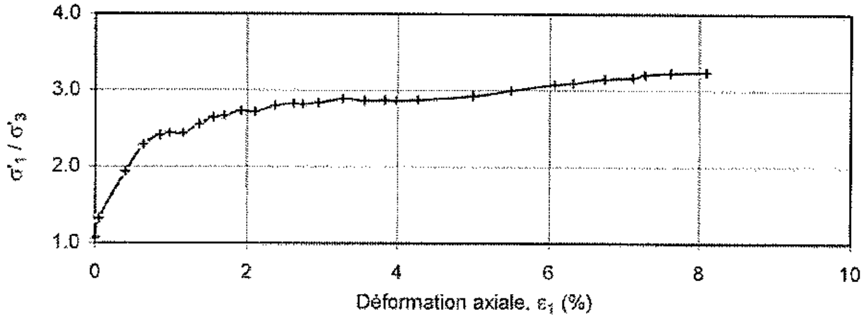
QUÉFORMAT LTÉE

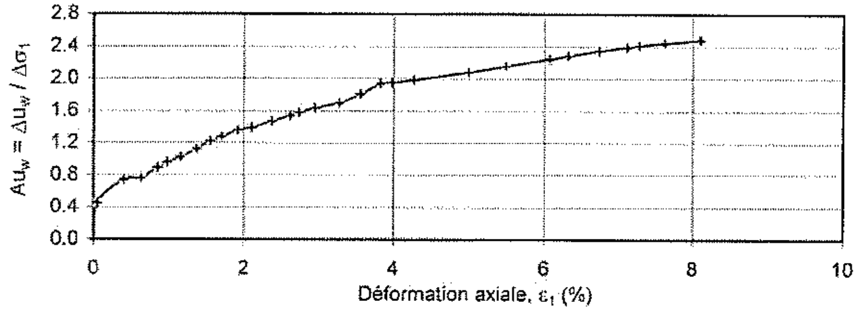
COMPRESSION TRIAXIALE NON DRAINÉE (CIU)

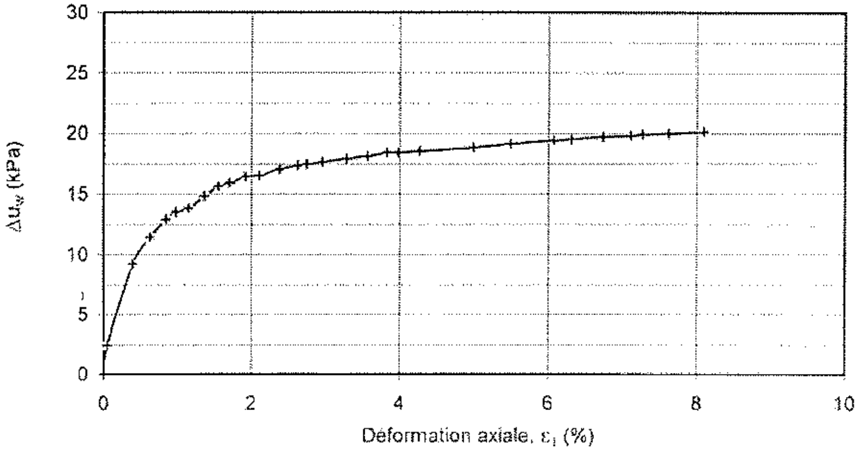
ASTM D4767-04

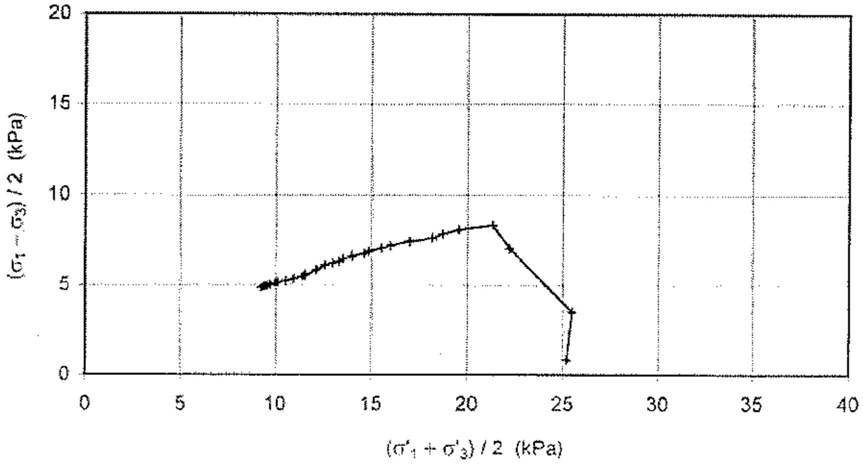
Essai : 15756-G-CIU-02 **Page 3 de 3**











QUÉFORMAT LTÉE

COMPRESSION NON CONSOLIDÉE - ASTM D2166-06

DOSSIER : **15756-G**
CLIENT : **Labo S.M. inc.**
PROJET : **ALCOA / F099382-100**

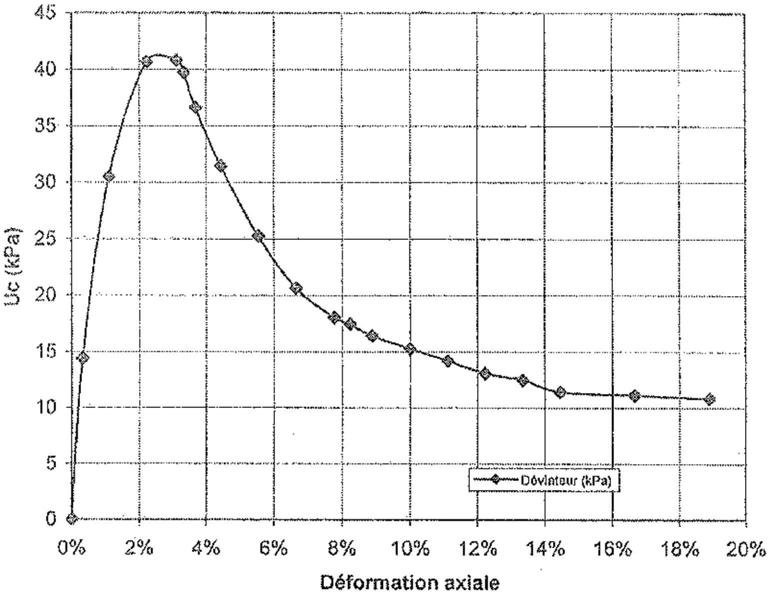
SONDAGE : **BH-09-05**
ECHANT. : **ST-06**
PROF. (m) : **5.57 - 5.67**

FICHIER : Comp15756-09-05-06.xls

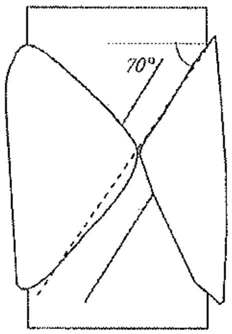
Compression non drainée

Longueur initiale, Hi (mm) :	89.90	Volume initial, Vi (cm³) :	175.00	Section initiale, Ai (cm²) :	19.47	Vit. déformation (mm/min) :	0.8
Longueur finale, Hf (mm) :	72.91	Volume final, Vf (cm³) :	175.00	Section finale, Af (cm²) :	24.00		

No.	Lectures ΔL (0,01mm)	 Fa (N)	Déformation ΔH/Hi (%)	Section (cm²)	Résistance en compression, Uc (kPa)	Résultats
1	1001	0	0.00%	19.47	0	
2	1030	28	0.32%	19.53	14	**Rupture :**
3	1100	60	1.10%	19.68	30	
4	1200	81	2.21%	19.91	41	Uc (kPa) : 41 kPa
5	1280	82	3.10%	20.09	41	ΔH/Hi (%) : 2.21 %
6	1300	80	3.33%	20.14	40	
7	1332	74	3.68%	20.21	37	
8	1400	64	4.44%	20.37	31	**Caractéristiques physiques :**
9	1500	52	5.55%	20.61	25	
10	1600	43	6.66%	20.86	21	Teneur en eau initiale : 16.83 %
11	1700	38	7.78%	21.11	18	Masse volumique humide : 2374 kg/m³
12	1741	37	8.23%	21.21	17	Masse volumique sèche : 2032 kg/m³
13	1800	35	8.89%	21.36	16	Teneur en eau finale : 16.37 %
14	1900	33	10.00%	21.63	15	
15	2000	31	11.11%	21.90	14	
16	2100	29	12.22%	22.18	13	**Remarques :**
17	2200	28	13.34%	22.46	12	
18	2300	26	14.45%	22.75	11	Rapport hauteur/diamètre
19	2500	26	16.67%	23.36	11	de l'échantillon au montage = 1.8
20	2700	26	18.90%	24.00	11	



Croquis :



Réalisé par : A. Bustamante
date : 2009-12-02

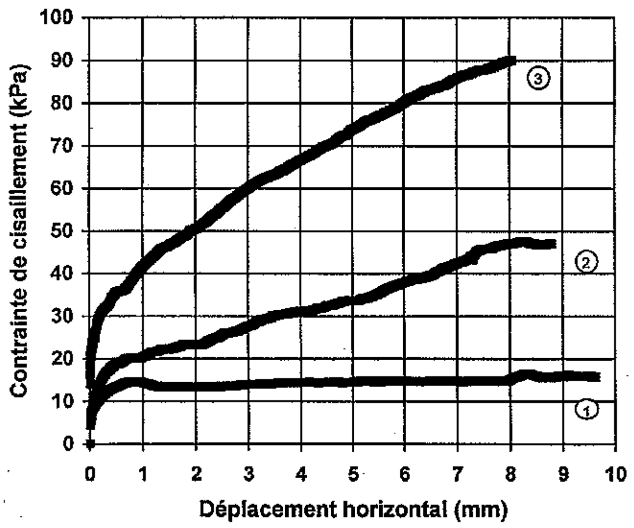
Vérifié par : Hélène Bilodeau, ing.
date : 2009-12-03

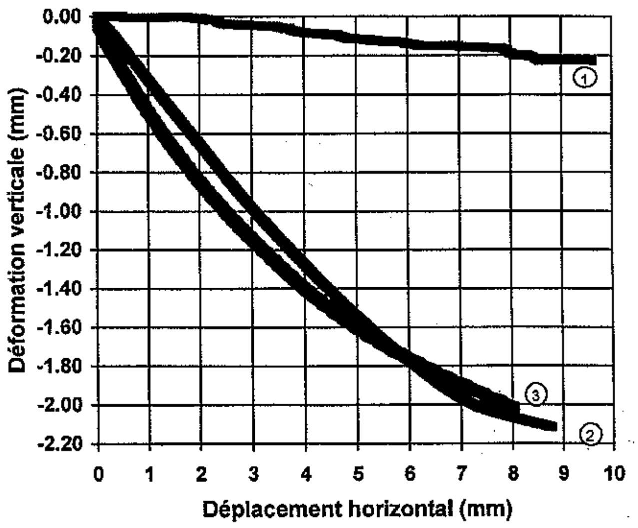
Qualitas

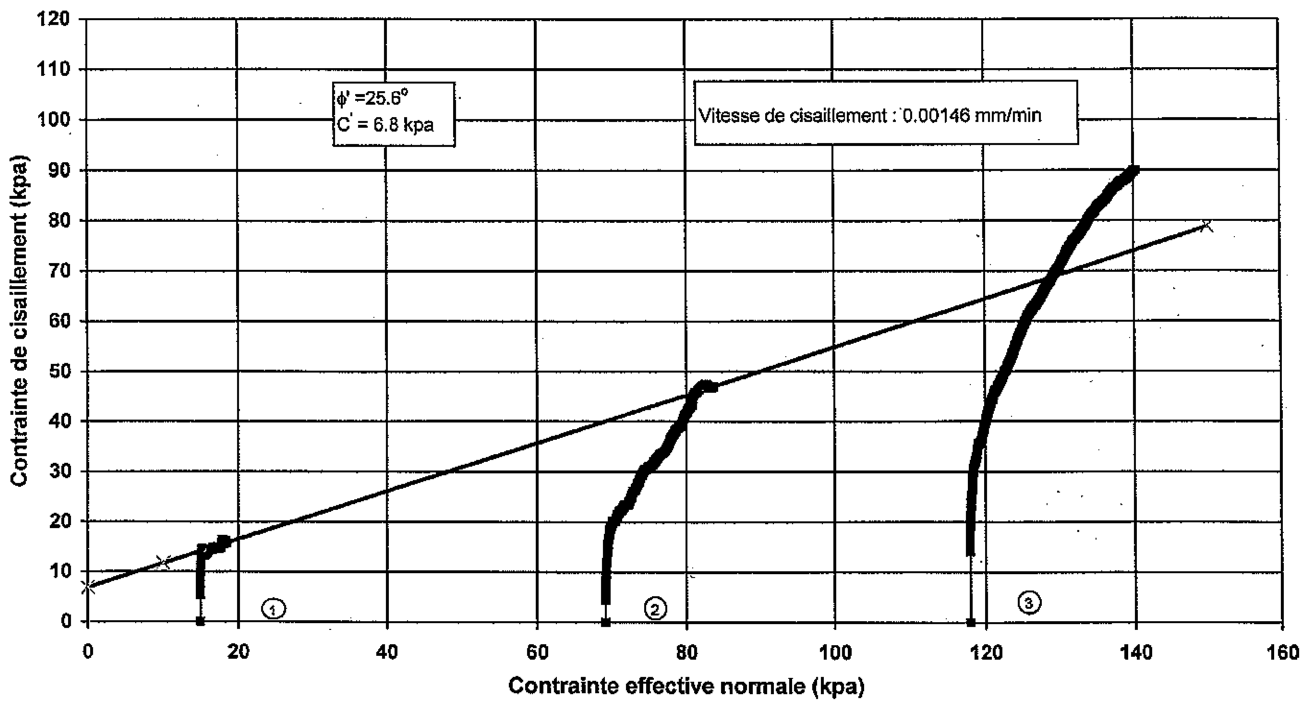
ESSAI DE CISAILLEMENT DIRECT ASTM D-3080-04

PROJET: Quéformat ltée (n/d 14653-G)
DOSSIER No: G09014-15
TECHNICIEN: R.C.
DATE (a-m-j): 2009-11-(09-13)
Vérifié par:

1 - ÉCHANT.No: BH-09-05,ST-3 PROFONDEUR (m): 1.90 à 2.00
2 - ÉCHANT.No: BH-09-07, ST-10 PROFONDEUR (m): 7.70 à 7.80
3 - ÉCHANT.No: BH-09-08A, ST-1 PROFONDEUR (m): 11.60 à 11.70






Cheminement de contraintes effectives

φ' =25.6°
C' = 6.8 kpa

Vitesse de cisaillement : 0.00146 mm/min

Qualitas

Groupe Qualitas Inc.
275, Benjamin-Hudon
Saint-Laurent (Québec) H4N 1J1
Téléphone: 514-331-6910
Télécopieur: 514-331-7632

Essai de cisaillement direct -consolidation ASTM D 3080-04

Projet desc.: **Qualitas-Quéformat (n/d 14653-G)**
Dossier no: **G09014-15**

Sondage : **BH-09-05**
Échantillon : **ST-3**
Profondeur: **1.90 à 2.00m**

Réalisé par : **R.C.**
Date: **2009-11-02**
Vérifié par :

Teneur en eau		**Initiale**	**Finale**	**Lavage**	**Auxiliaire**
Numéro de la tare :			64		2
Masse de la tare :	g	0.00	13.96	0.00	31.82
Masse du sol humide + tare :	g	136.23	148.18		69.72
Masse du sol sec + tare :	g	85.00	98.96	0.00	56.08
Teneur en eau du sol :	%	60.27	57.91		56.22

Poids volumique	
pv (kN/m3) :	16.39

Densité relative des grains	
Estimé:	2.750
Mesurée:	

Caractéristiques de l'essai			**Initiale**	**Finale**
Numéro de l'anneau :			2	
Diamètre de l'anneau :		mm	64.03	
Masse de l'ensemble (anneau + plaque) :		g	148.13	
Masse du sol humide + anneau + plaque :		g	284.36	
Masse totale du sol humide :		g	136.23	134.22
Hauteur du sol :	H_0	mm	25.31	25.045
Hauteur du sol sec :	H_S	mm	9.63	
Volume du spécimen	V_t	cm^3	81.50	80.65
Volume des solides	V_S	cm^3	31.00	
Indice des vides :			1.629	1.601
Degré de saturation :		%	101.8	99.4

Numéro de l'appareil :	**220**	
Levier de chargement:	**a**	4.980
	b	
Lecture de déformation:	0.001 mm	

Déformation de l'appareillage + pierres poreuses

Y = a+b*ln(x)+c*(ln(x))^2+d*(ln(x))^3+e*(ln(x))^4+f*(ln(x))^5

a		**d**	
b		**e**	
c		**f**	

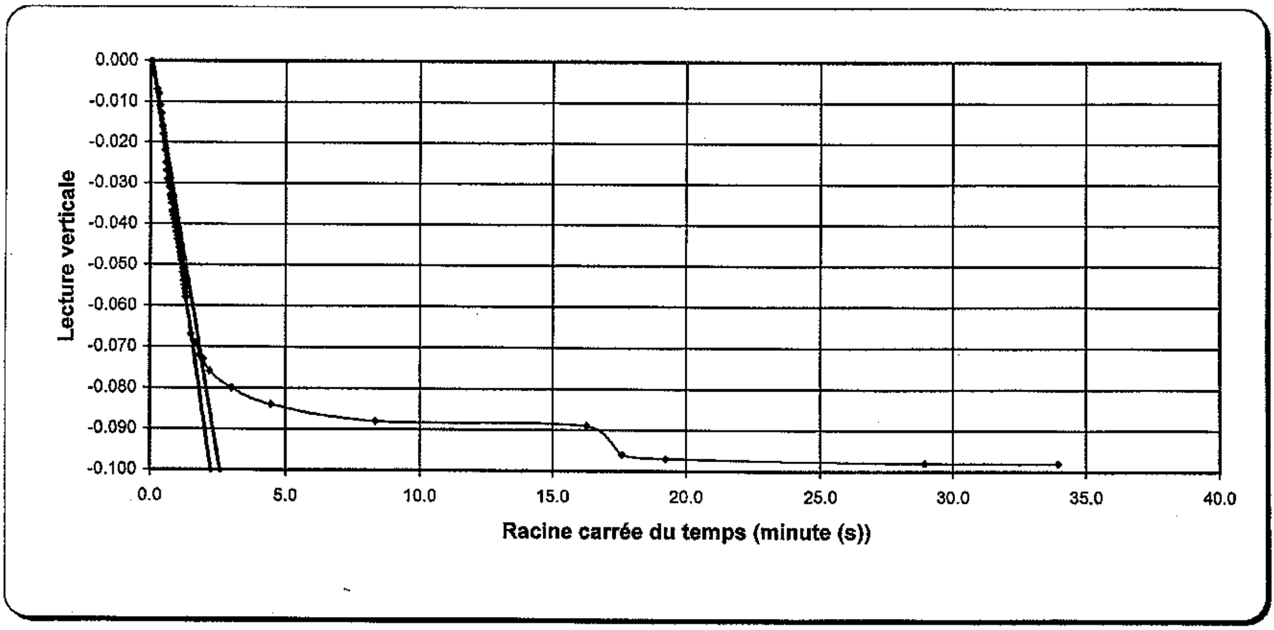
Contrainte	Chargement		Lecture	Lecture	ΔH/H	e	H	Compressibilité		
(kPa)	Date	Heure	Finale	corrigée	cum (%)	(1/1)	(mm)	Module M (kPa)	Cc	Cc / (1 + e_0)
0.0	02/11/2009	12:10:46	0.000		0.000	1.629	25.310			
13.5	02/11/2009	12:10:46	-0.098		0.387	1.619	25.212			
14.9	03/11/2009	7:29:47	-0.131		0.518	1.615	25.179			
14.9	13/11/2009	11:33:04	-0.265		1.047	1.602	25.045	FIN DE L'ESSAI		

Groupe Qualitas Inc.
275, Benjamin-Hudon
Saint-Laurent (Québec) H4N 1J1
Téléphone: 514-331-6910
Télécopieur: 514-331-7632

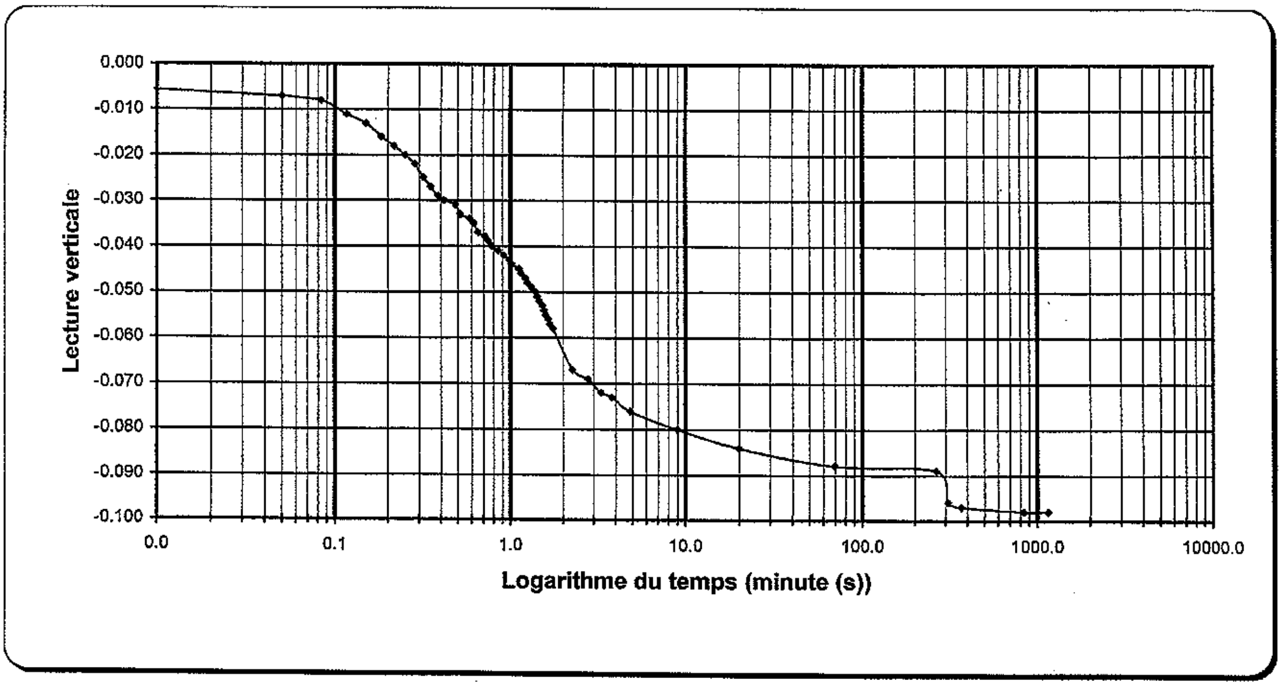
Essai de cisaillement direct -consolidation ASTM D 3080-04

Projet desc.:	Qualitas-Quéformat (n/d 14653-G)	**Sondage :**	BH-09-05	**Réalisé par :**	R.C.
Dossier no:	G09014-15	**Échantillon :**	ST-3	**Date:**	2009-11-02
		Profondeur:	1.90 à 2.00m	**Vérifié par :**	

Mesure du coefficient de consolidation par la méthode Taylor	**Contrainte : 0.0 à 13.5 kPa**



Mesure du coefficient de consolidation par la méthode Casagrande	**Contrainte : 0.0 à 13.5 kPa**



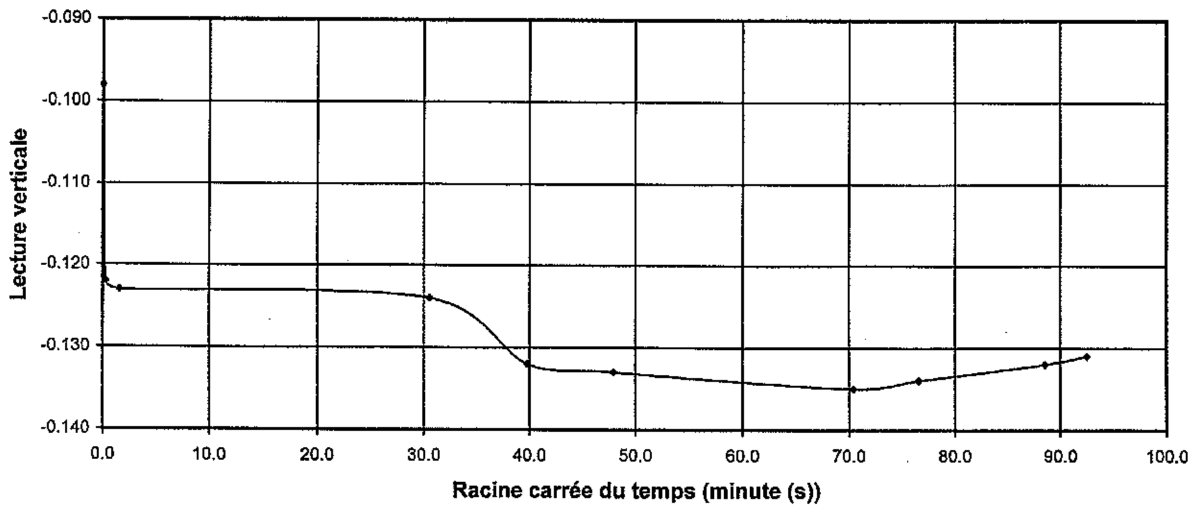
Qualitas

Groupe Qualitas inc.
275, Benjamin-Hudon
Saint-Laurent (Québec) H4N 1J1
Téléphone: 514-331-6910
Télécopieur: 514-331-7632

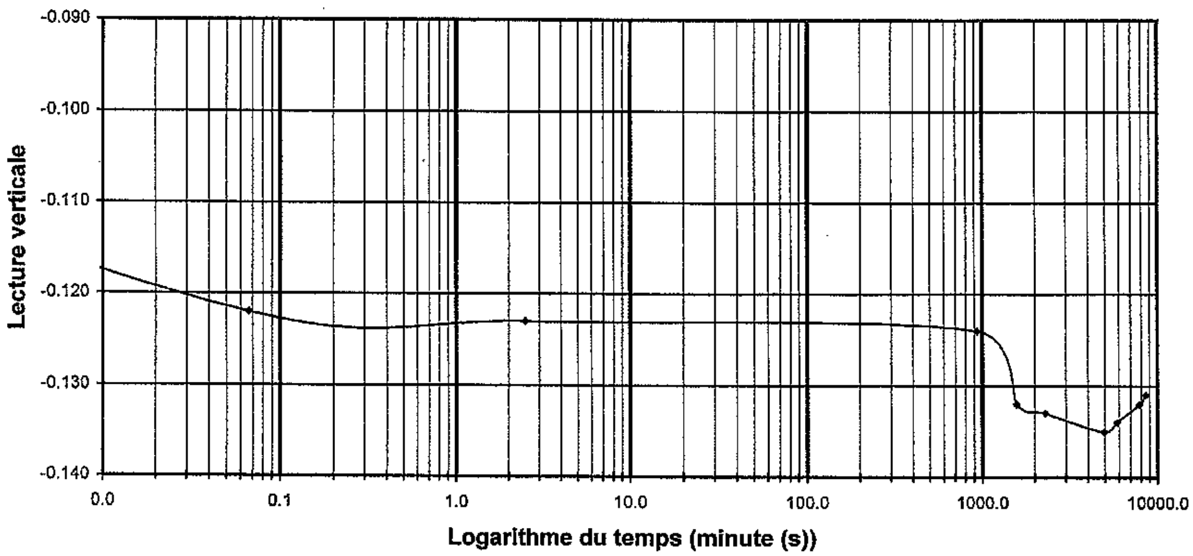
Essai de cisaillement direct -consolidation ASTM D 3080-04

Projet desc.: Qualitas-Quéformat (n/d 14653-G)
Dossier no: G09014-15
Sondage : BH-09-05
Échantillon : ST-3
Profondeur: 1.90 à 2.00m
Réalisé par : R.C.
Date: 2009-11-03
Vérifié par :

Mesure du coefficient de consolidation par la méthode Taylor	**Contrainte : 13.5 à 14.9 kPa**



Mesure du coefficient de consolidation par la méthode Casagrande	**Contrainte : 13.5 à 14.9 kPa**



SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2241

File Number : F099382200
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : 09-2089
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-05, SS-4, Depth.: 2,4 to 3,0m.
Tests completed on : 2009-09-30

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.
C.U.
Unified Classification:
Fineness Module: 0,14

% Gravel: 0
% Sand: 29
% Silt: 49
% Clay: 22

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements
Atterberg Limits (3pts)	BNQ2501-092		
Liquid Limit (%):		26	------
Plastic Limit (%):		17	------
Plasticity index (%):		9	------
Water Content (%):	LC21-201	32,7	------

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: 2009-09-30
Sylvie Daigle, Tech.

Verified by: 2009-09-30
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

This report must not be copied, in part or in full, without written authorization from Labo S.M. inc.

FLS-051b (00-05) rév. 1

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
1,250	100
0,630	99
0,3150	96,0
0,1600	92,0
0,0834	72,5
0,0612	63,7
0,0441	58,8
0,0318	52,9
0,0206	47,0
0,0120	42,1
0,0084	39,2
0,0061	34,3
0,0044	30,4
0,0031	27,4
0,0013	17,6

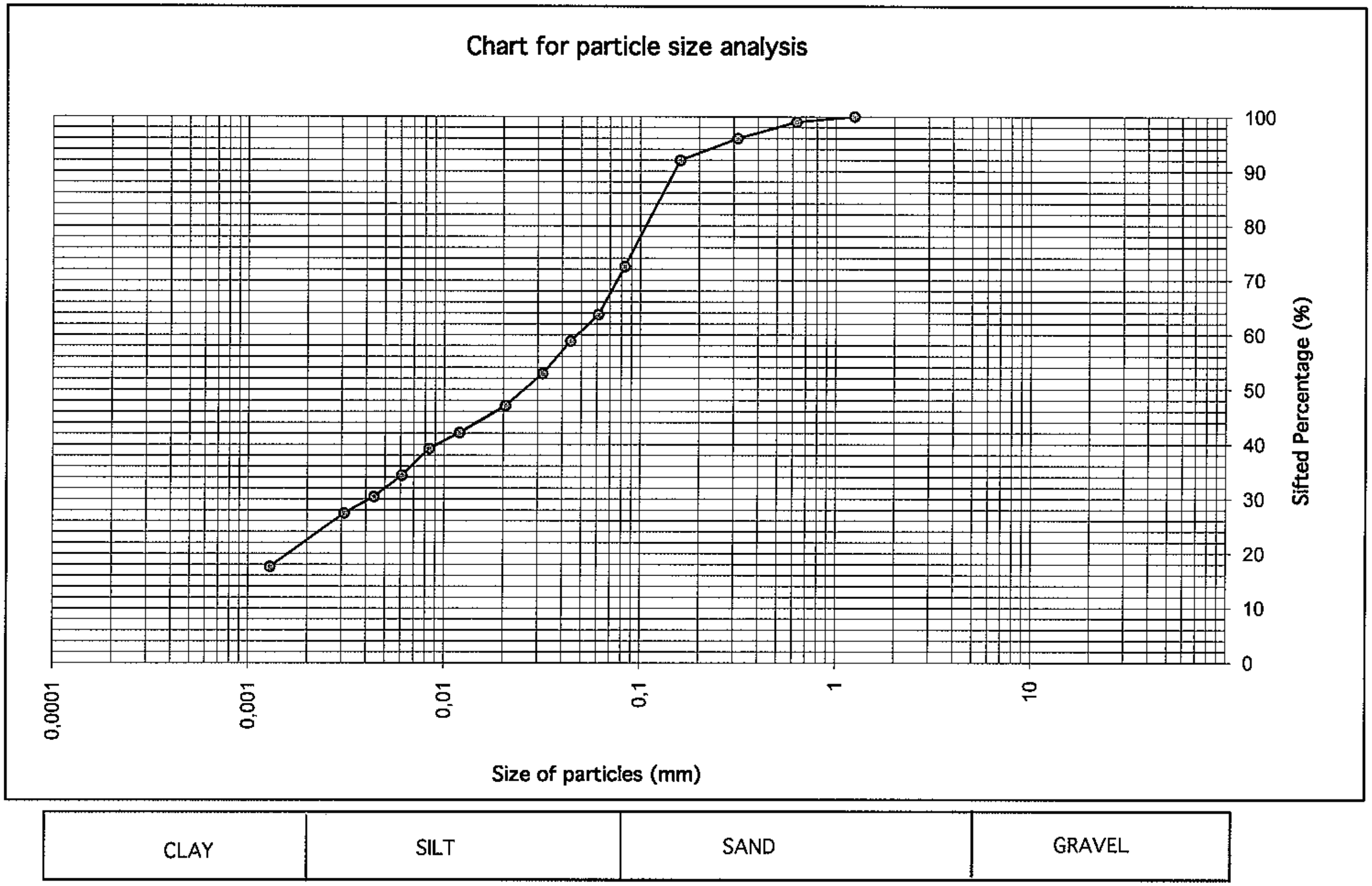


Chart for particle size analysis

Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2089

Type of material: Clayey sandy silt.

Source: Material on site, 09-05,SS-4 , Depth: 2,4 to 3,0 m.

Approuved by :________ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2258

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2099**
Sample No. : -----

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-05, SS-7, Depth.:6 to 6,7 m.
Tests completed on : 2009-09-30

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 3,59
C.U. 15,701
Unified Classification:
Fineness Module: 0,16

% Gravel: 0
% Sand: 55
% Silt: 38
% Clay: 7

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

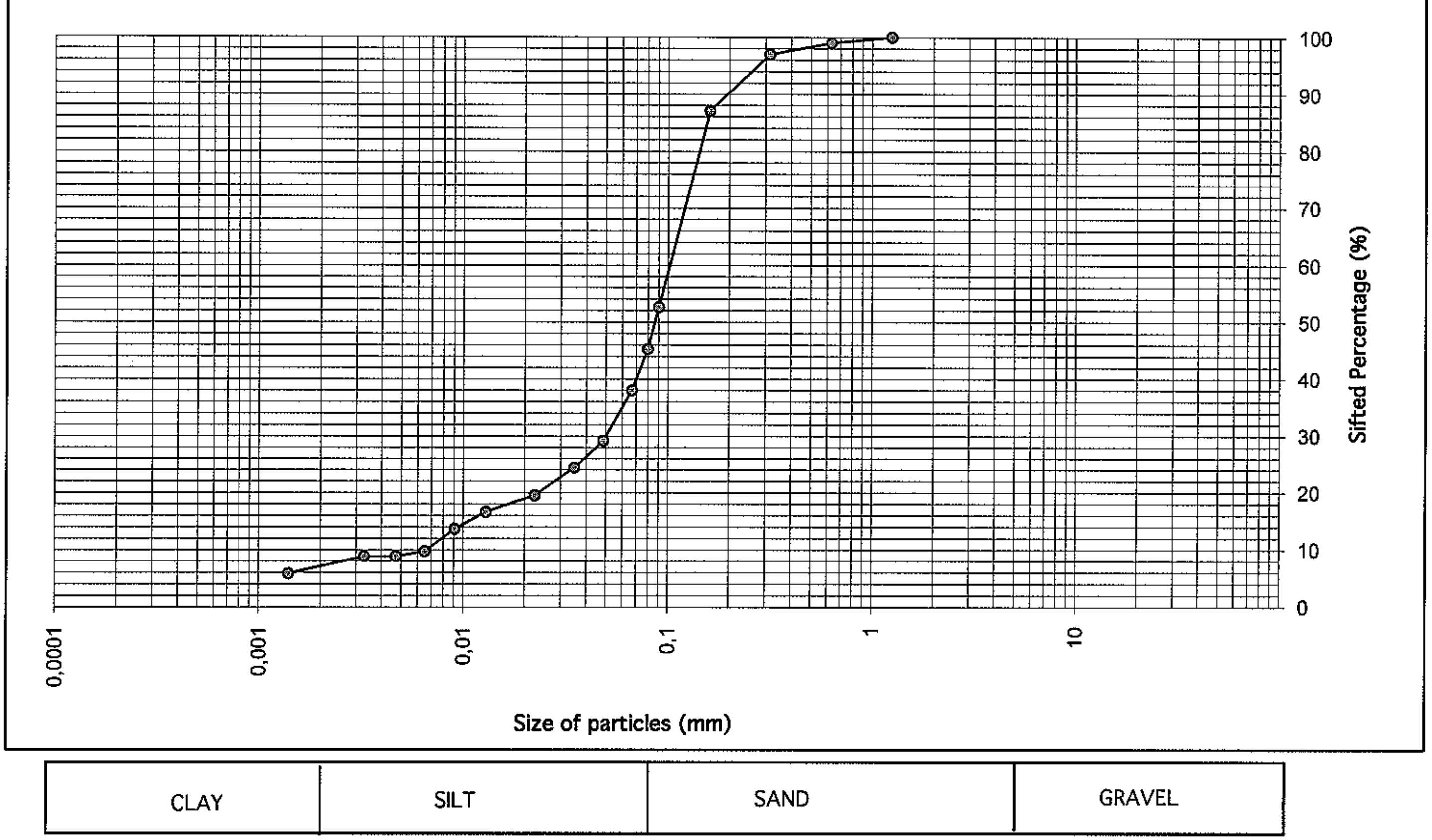
Prepared by: Sylvie Daigle, Tech. 2009-09-30

Verified by: Sonya Graveline, Ing. 2009-09-30

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
1,250	100
0,630	99
0,3150	97,0
0,1600	87,0
0,0902	52,6
0,0800	45,3
0,0670	38,0
0,0486	29,2
0,0349	24,4
0,0224	19,5
0,0130	16,6
0,0091	13,6
0,0065	9,7
0,0047	8,8
0,0033	8,8
0,0014	5,8

Chart for particle size analysis



Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2099

Type of material: Sand & silt, traces clay.

Source: Material on site, 09-05,SS-7, Depth: 6 to 6,7 m.

Approuved by :______ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3176

File Number	: **F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: ------
City	: Baie-Comeau (Québec)	Uses	: ------
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	: **09-3001**	Source	: 09-05, SS-8 & SS-9, Depth.: 6,8 to 8,2 m.
Sample No.	: ------	Tests completed on	: 2009-12-01

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	3,04	% Gravel:	
C.U.	9,927	% Sand:	71
Unified Classification:		% Silt:	25
Fineness Module: 0,52		% Clay:	4

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: Sylvie Daigle, Tech. 2009-12-08

Verified by: Sonya Graveline, Ing. 2009-12-08

N.B. These results are exclusively for analysis sampled.

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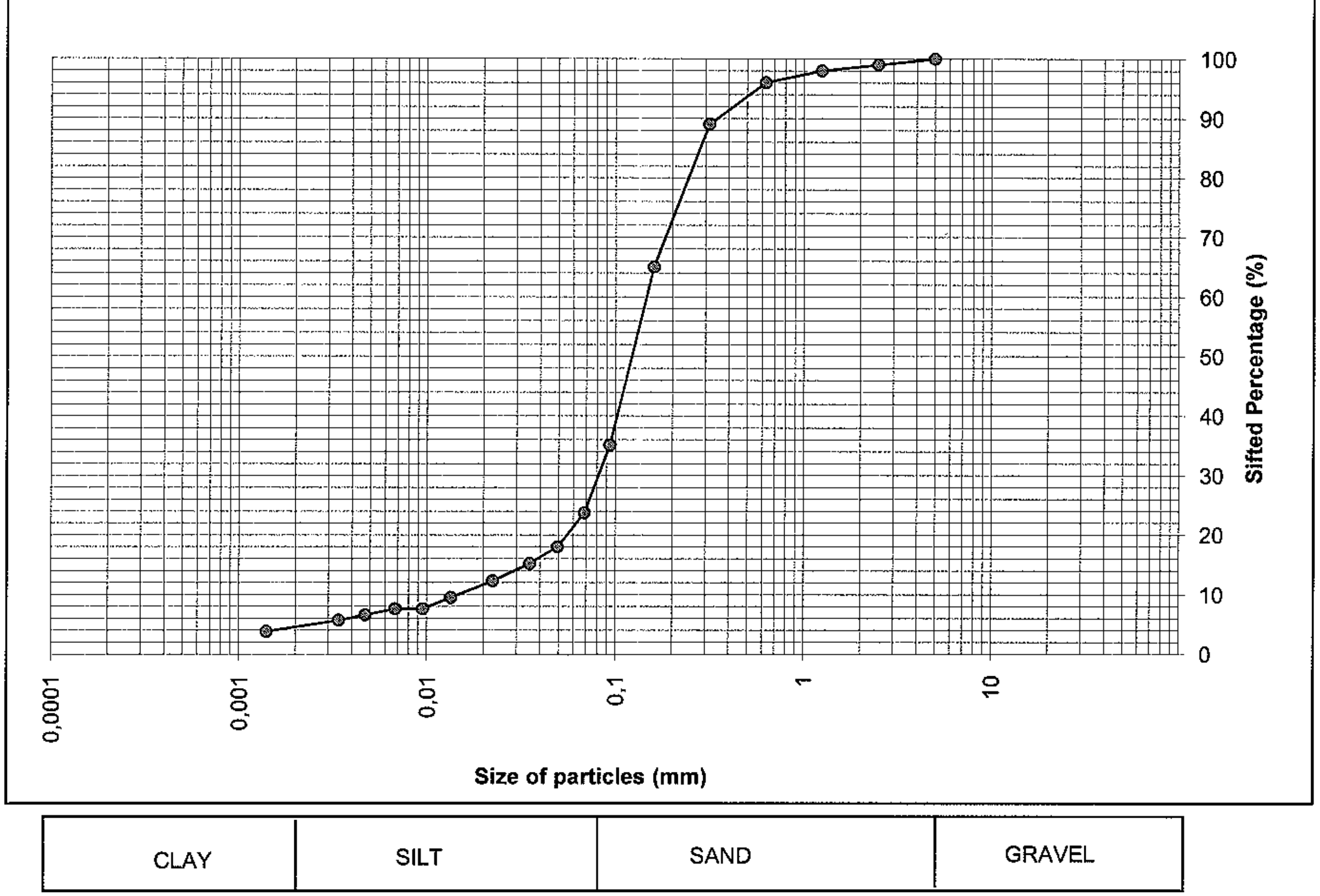
Sediments Analysis
NQ 2501-025

Size (mm)	% Sifted (%)
5,0	100
2,5	99
1,250	98
0,630	96
0,3150	89
0,1600	65
0,0935	35,1
0,0686	23,7
0,0494	18,0
0,0352	15,2
0,0224	12,3
0,0134	9,5
0,0095	7,6
0,0068	7,6
0,0047	6,6
0,0034	5,7
0,0014	3,8

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-3001

Type of material: Silty sand,traces clay.

File #: **F099382200**

Source: Material on site, 09-05, SS-8 & SS-9, Depth: 6,8 to 8,2 m.

Customer: **Alcoa**

Approuved by : ________________ Date : __________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

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LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2260

File Number	: **F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: ------
City	: Baie-Comeau (Québec)	Uses	: ------
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	: **09-2098**	Source	: 09-05, SS-14, Depth.:11,4 to 12 m.
Sample No.	: ------	Tests completed on	: 2009-09-30

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 5,794 % Gravel: 1
C.U. 58,762 % Sand: 68
Unified Classification: % Silt: 23
Fineness Module: 1,03 % Clay: 8

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: 2009-09-30
Sylvie Daigle, Tech.

Verified by: 2009-09-30
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

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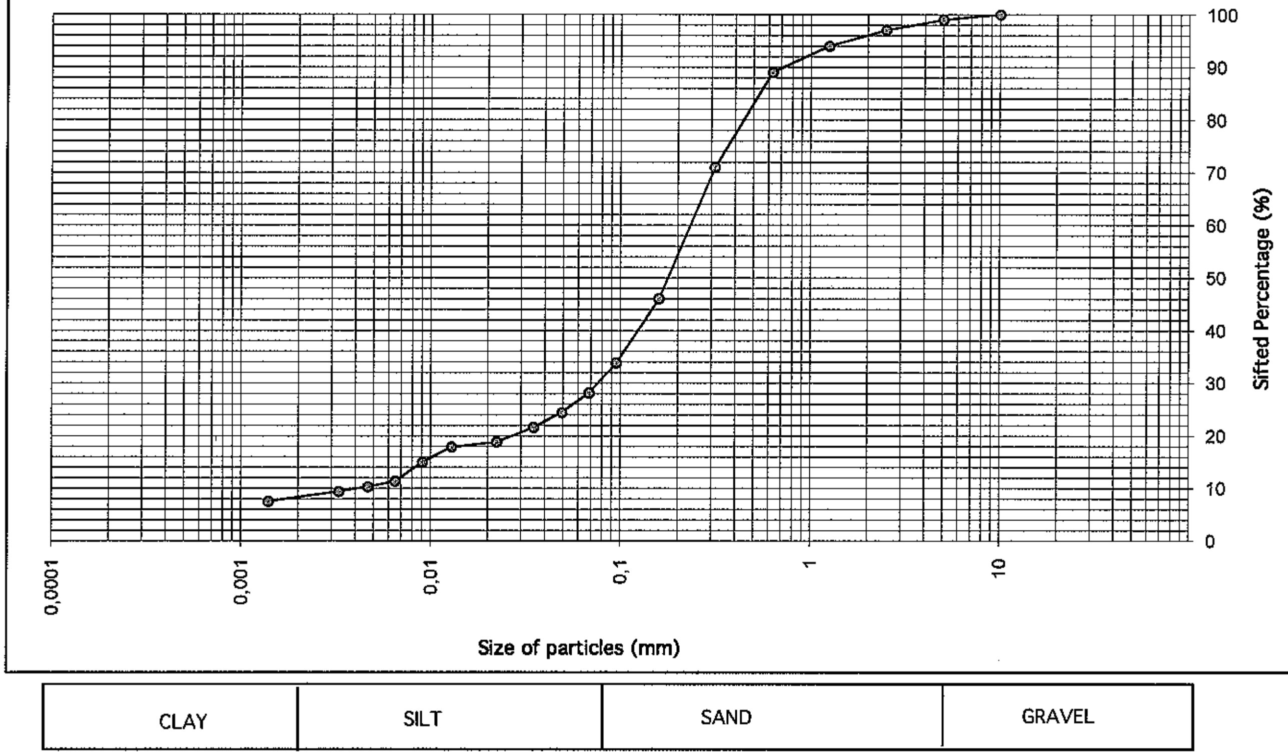
FLS-051b (00-05) rév. 1

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
10,0	100
5,00	99
2,500	97
1,250	94
0,630	89
0,3150	71,0
0,1600	46,0
0,0953	33,8
0,0686	28,1
0,0492	24,4
0,0350	21,6
0,0224	18,8
0,0129	17,8
0,0091	15,0
0,0065	11,3
0,0047	10,3
0,0033	9,4
0,0014	7,5

Chart for particle size analysis



Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2098

Type of material: Silty sand, traces clay & gravel.

Source: Material on site, 09-05,SS-14, Depth: 11,4 to 12 m.

Approuved by :________ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

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LABO S.M. INC

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2265

File Number	**: F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: ------
City	: Baie-Comeau (Québec)	Uses	: ------
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	**: 09-2097**	Source	: 09-05, SS-17, Depth.:13,7 to 14,3 m.
Sample No.	: ------	Tests completed on	: 2009-09-30

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 1,044
C.U. 6,227
Unified Classification:
Fineness Module: 2,51

% Gravel: 15
% Sand: 78
% Silt: 6
% Clay: 1

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: 2009-09-30
Sylvie Daigle, Tech.

Verified by: 2009-09-30
Sonya Graveline, Ing.

SM

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Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
20	100
14,0	94
10,0	92
5,00	85
2,500	80
1,250	72
0,630	60
0,3150	36,0
0,1600	16,0
0,1028	7,5
0,0728	6,7
0,0517	5,2
0,0367	4,5
0,0233	3,7
0,0134	3,7
0,0094	2,2
0,0066	1,5
0,0048	0,7
0,0034	0,7
0,0014	0,7

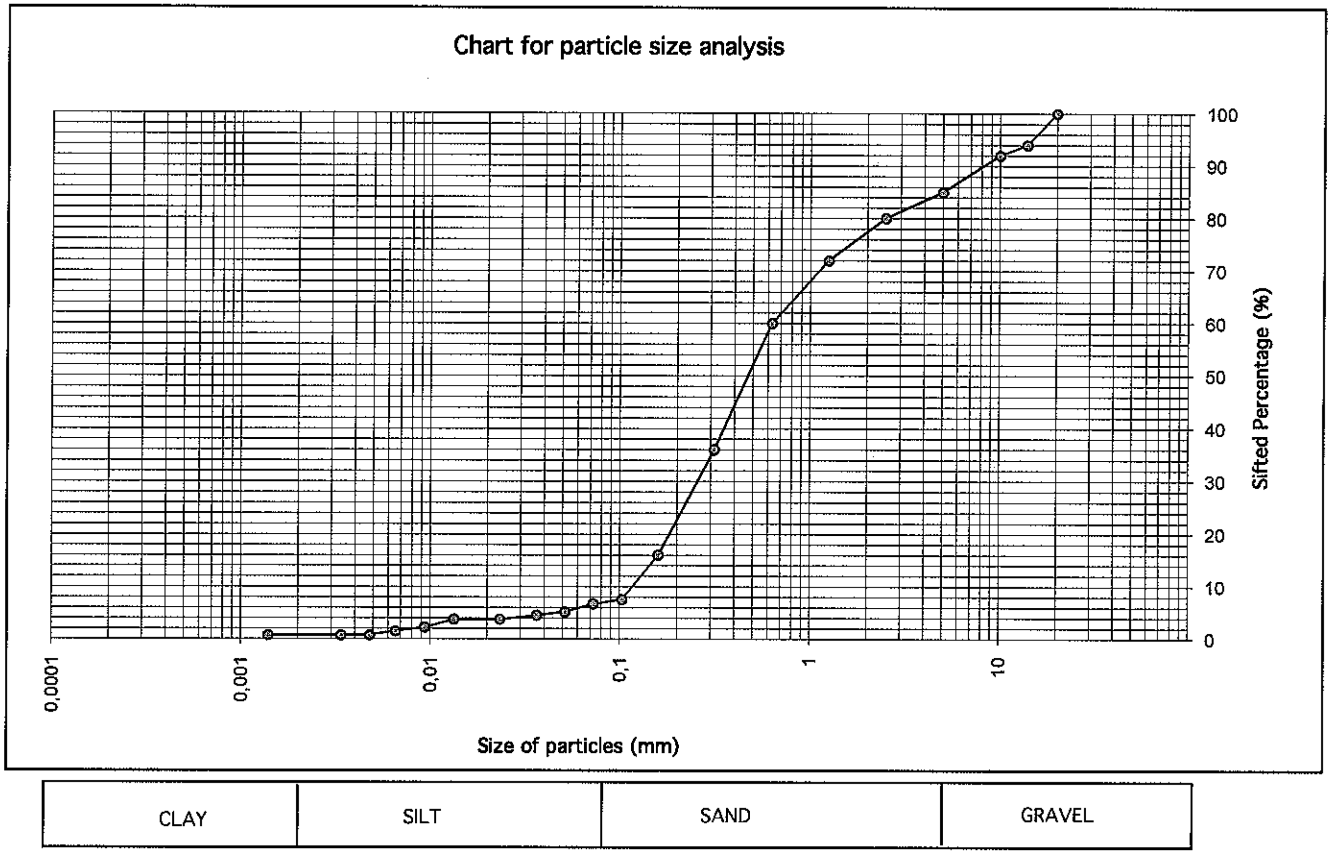

Chart for particle size analysis

Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2097

Type of material: Sand, some gravel, traces silt & clay.

Source: Material on site, 09-05,SS-17, Depth: 13,7 to 14,3m.

Approuved by : ______________ Date : 30/10/2009.

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2246

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2096**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-05, SS-26, Depth.:21,3 to 21,6 m.
Tests completed on : 2009-09-30

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)
112,000	100	
80,000	100	
56,000	100	
40,000	100	
31,500	85	
20,000	49	
14,000	41	
10,000	37	
5,000	28	
2,500	24	
1,250	21	
0,630	17	
0,315	11	
0,160	7	
0,080	4,2	

C.C.	5,48	% Gravel:	71,8
C.U.	87,07	% Sand:	23,9
Unified Classification:		% Silt:	4,2
Fineness Module:	0,53	% Clay:	0

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks:

Prepared by: 2009-09-30
Sylvie Daigle, Tech.

Verified by: 2009-09-30
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

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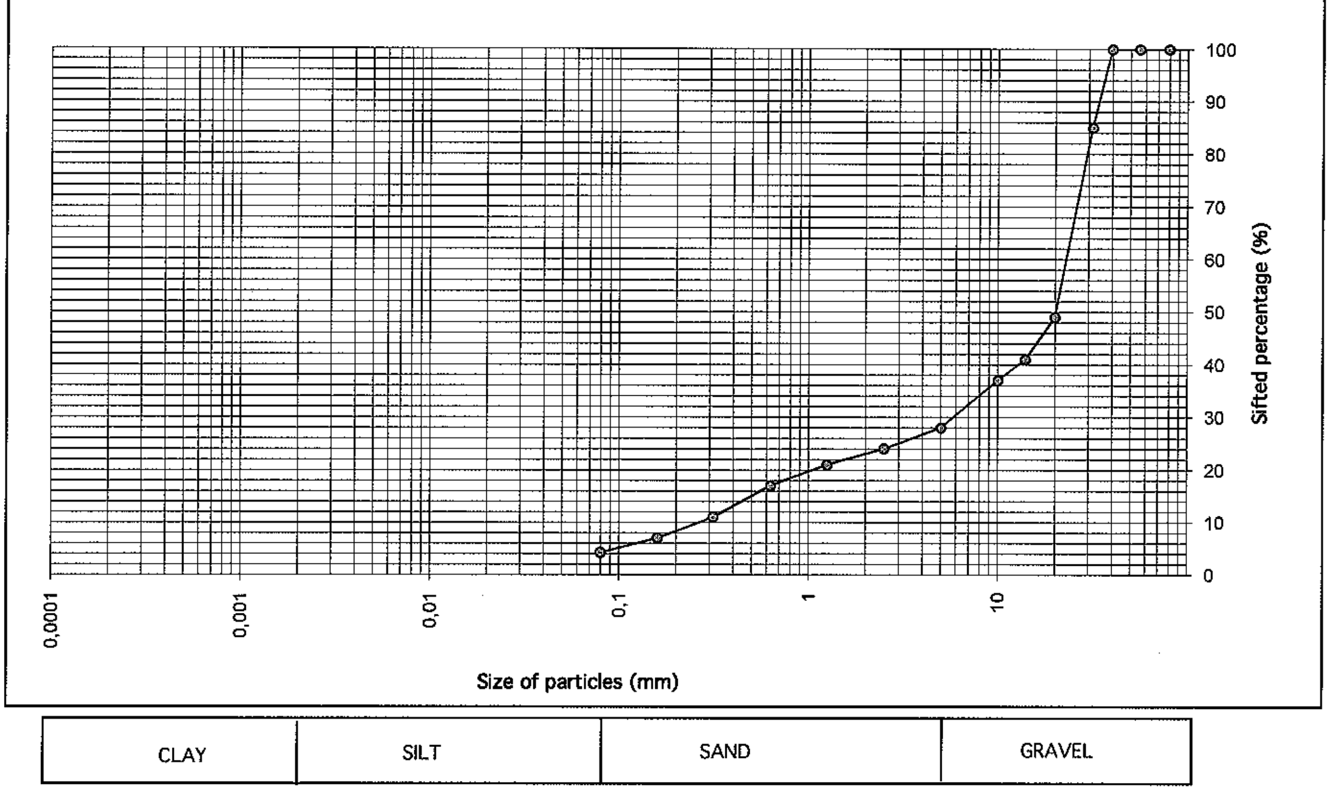
ANNEXE A

Particle size analysis NQ 2501-025	
Size (mm)	% sifted (%)
112	100
80	100
56,0	100
40,0	100
31,5	85
20	49
14,0	41
10,0	37
5,00	28
2,500	24
1,250	21
0,630	17
0,3150	11,0
0,1600	7,0
0,0800	4,2

PARTICLE SIZE ANALYSIS



Project: New Baie-Comeau Wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No.: 09-2096

Type of material: Sandy gravel, traces silt.

Source Material on site, 09-05, SS-26, Depth:21,3 to 21,6 m.

Approuved by : Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMI
LABO S.M. INC

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2253

File Number	**: F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: ------
City	: Baie-Comeau (Québec)	Uses	: ------
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	**: 09-2095**	Source	: 09-05, SS-31, Depth.:27,4 to 28 m.
Sample No.	: ------	Tests completed on	: 2009-09-30

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 1,241
C.U. 3,75
Unified Classification:
Fineness Module: 1,79

% Gravel: 1
% Sand: 89
% Silt: 6
% Clay: 4

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: ______________ 2009-09-30
Sylvie Daigle, Tech.

Verified by: ______________ 2009-09-30
Sonya Graveline, Ing.

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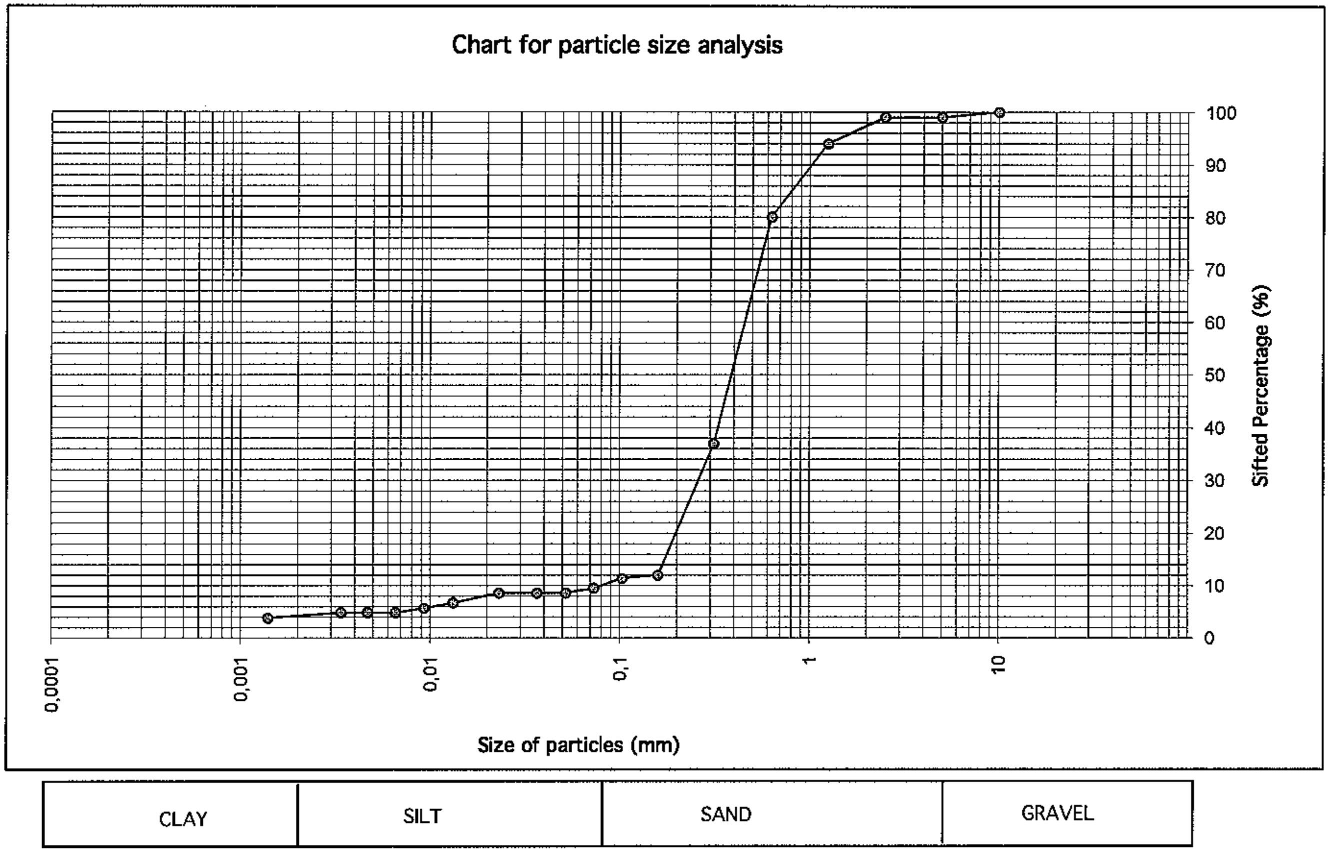
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
10,0	100
5,00	99
2,500	99
1,250	94
0,630	80
0,3150	37,0
0,1600	12,0
0,1031	11,4
0,0734	9,5
0,0520	8,6
0,0368	8,6
0,0232	8,6
0,0133	6,7
0,0093	5,7
0,0066	4,8
0,0047	4,8
0,0034	4,8
0,0014	3,8

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2095

Type of material: Sand, traces silt, clay & gravel.

File #: **F099382200**

Source: Material on site, 09-05,SS-31, Depth: 27,4 to 28 m.

Customer: **Alcoa**

Approuved by :

Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2252

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2094**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-05, SS-38, Depth.: 42,6 to 43,3 m.
Tests completed on : 2009-09-30

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	0,569	% Gravel:	9
C.U.	7,235	% Sand:	87
Unified Classification:		% Silt:	4
Fineness Module: 2,75		% Clay:	0

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: Sylvie Daigle, Tech. 2009-09-30

Verified by: Sonya Graveline, Ing. 2009-09-30

N.B. These results are exclusively for analysis sampled.

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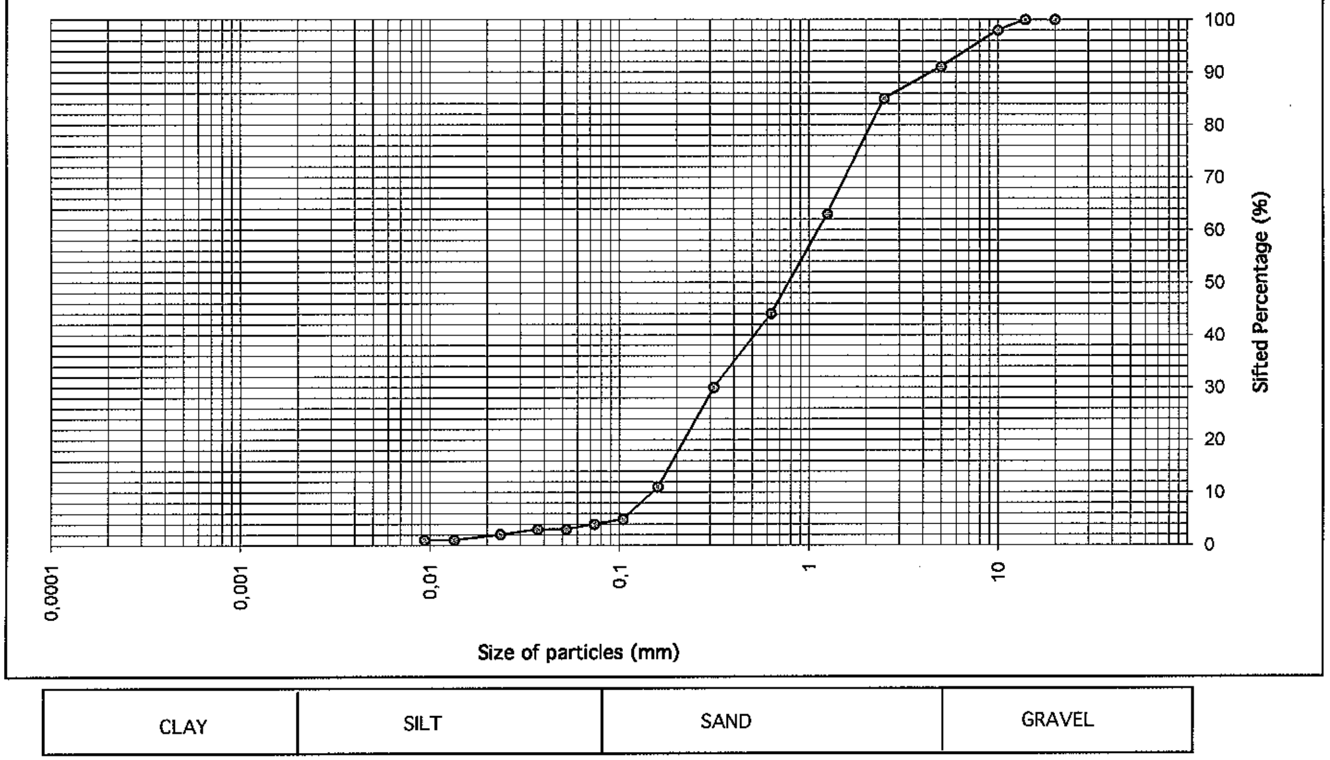
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
20	100
14,0	100
10,0	98
5,00	91
2,500	85
1,250	63
0,630	44
0,3150	30,0
0,1600	11,0
0,1043	4,9
0,0740	4,0
0,0524	3,0
0,0371	3,0
0,0235	2,0
0,0135	1,0
0,0094	1,0

Chart for particle size analysis



Project: New Baie-Comeau wharf
File #: **F099382200**
Customer: **Alcoa**

Laboratory No. : 09-2094

Type of material: Sand, traces gravel & silt.
Source: Material on site, 09-05,SS-38 , Depth: 42,6 to 43,3 m.
Approuved by :
Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-07
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 1 of 2
LOCATION OF BOREHOLE: X : 258787,32 Y : 5457039,25		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL**	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -10.71	**BORING DATE** **START:** 2009-09-24 13:00:00	**END:** 2009-09-25 02:00:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◨	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value
Nd:	DCPT Nd-Value
Su:	Field Vane
GSA:	Grain size analysis
CU:	Uniformity coefficient
W:	Water Content
Wp:	Plastic limit
Wl:	Liquid limit
Ip:	Plasticity index:
D:	Specific density
Cu:	Swedish cone
C:	Consolidation
PP:	Preconsolidation pressure
Cc:	Compression Index
Ccr:	Recompression index
UC:	Unconfined compression
DS:	Direct shear
Phi':	Angle of internal friction
c':	Cohesion
CUT:	Consolidation undrained triaxial

Water level

Date:	Time:	Elev.(m):

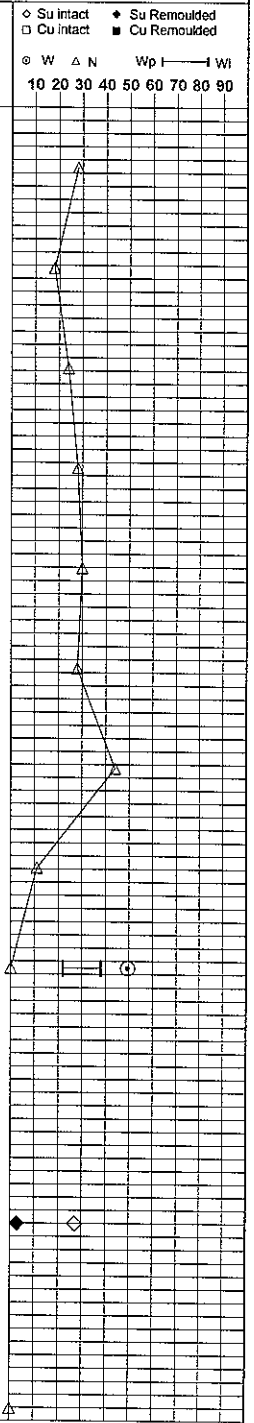
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
	-10.71 0.00	Gray fine sand with some silt, trace clay; occasionally sea shell; dense		☒	SS-1	B	83	28	14-15-13-16		
1				☒	SS-2	B	67	18	5-9-9-10		Combined SS-1/2/3: GSA, DS CU=2.0, Phi'=XXX, c'=0
2				☒	SS-3	B	58	24	11-12-12-15		
3				☒	SS-4	B	62	28	10-12-16-15		SS-4: GSA, CU=2.5
				☒	SS-5	B	42	30	10-14-16-16		
4				☒	SS-6	B	54	28	13-11-17-14		
5				☒	SS-7	B	62	44	20-20-24-24		
	-16.12 5.41	Gray fine sand with some silt and sea shell; medium dense		☒	SS-8	B	46	11	12-8-3-3		
6	-16.88 6.17	Gray clay and silt, trace sand; firm		☒	SS-9	B	62	0	0-0-0-0		SS-9: GSA, CU=nd, W=49.5%, Wp=22%, Wl=38%, Ip=16%
7											
8				▨	ST-10		100				ST-10: GSA, C, CUT, DS CU=XXX, W=XXX, Wp=XXX, Wl=XXX, Ip=XXX, D=2.77, UC=32kPa, PP=94 kPa, Cc=0.643, Ccr=0.053, Phi'=XXX, c'=XXX
9				▨	ST-11		100				ST-11: GSA, C, CU=XXX, W=XXX, Wp=XXX, Wl=XXX, Ip=XXX, D=2.74, PP=XXX,
				☒	SS-12		100	0	0-0-0-0		



Notes:

Approved by :

Sonya Graveline, ing.

SM Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-07
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 2 of 2
LOCATION OF BOREHOLE: X : 258787,32 Y : 5457039,25		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL**	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -10.71	**BORING DATE START:** 2009-09-24 13:00:00	**END:** 2009-09-25 02:00:00	

Type of Sampler

SS: Split Spoon
DC: Diamond Core
WS: Wash Sample
HT: Hydraulic Trust
HW: Hammer Weight
SP: Shelby and Piston
AS: Auger Sampler
ST: Thin Walled Shelby Tube

☒ Remoulded
▨ Intact
■ Lost
◧ Rock Core

Laboratory and in situ tests - Parameters

N: SPT N-Value
Nd: DCPT Nd-Value
Su: Field Vane
GSA: Grain size analysis
CU: Uniformity coefficient
W: Water Content
Wp: Plastic limit
Wl: Liquid limit
Ip: Plasticity index:
D: Specific density
Cu: Swedish cone
C: Consolidation
PP: Preconsolidation pressure
Cc: Compression index
Ccr: Recompression index
UC: Unconfined compression
DS: Direct shear
Phi': Angle of internal friction
c': Cohesion
CUT: Consolidation undrained triaxial

Water level

Date:	Time:	Elev.(m):

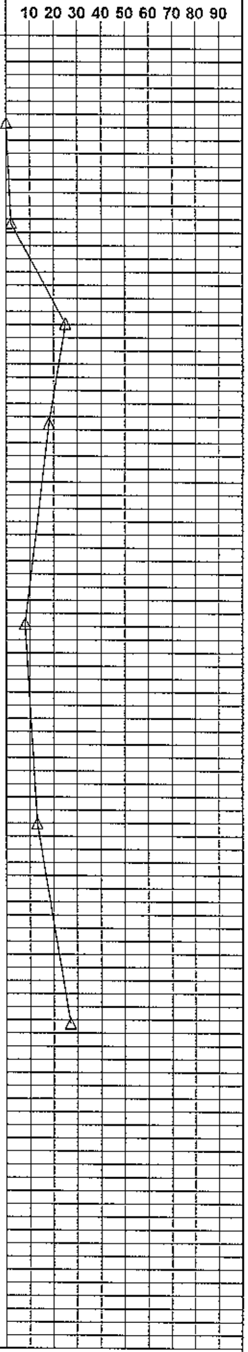
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
	-20.92 10.21	Gray sand with some silt and clay; very loose			SS-13	B	100	0	0-0-0-12		Cc=XXX, Ccr=XXX, UC=28kPa SS-13: GSA, CU>150, W=22.5, Wp=16%, Wl=20%, Ip=4
11	-21.76 11.05	Gray silt and sand, very loose			SS-14	B	12	2	0-0-2-3		
12	-22.52 11.81	Gray clayey silt stratified with layers of sand; very loose									
	-22.90 12.19	Gray silty sand stratified with layers of silt; loose to medium dense			SS-15	B	75	25	4-11-14-13		
13					SS-16	B	50	18	8-8-10-9		Spacing of the sampling due to bad meteorological conditions
14					SS-17	B	67	8	4-3-5-5		GSA, CU=12.6
15											
16					SS-18	B	17	13	0-5-8-7		
17					SS-19	B	25	27	10-8-19-12		
18	-29.30 18.59	Refusal on the boulder; end of borehole 09-07. See the borehole 09-07B for the following									
19											



Notes:

Approved by :
Sonya Graveline, ing.

SM **Labo S.M. inc**

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-07B
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 1 of 6
LOCATION OF BOREHOLE: X : 258790,38 Y : 5457039,42		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL** HQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -10.79	**BORING DATE** **START:** 2009-11-13 14:00:00	**END:** 2009-11-16 16:00:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

⌧	Remoulded
▨	Intact
■	Lost
◨	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value
Nd:	DCPT Nd-Value
Su:	Field Vane
GSA:	Grain size analysis
CU:	Uniformity coefficient
W:	Water Content
Wp:	Plastic limit
Wl:	Liquid limit
Ip:	Plasticity index:
D:	Specific density
Cu:	Swedish cone
Cf:	Consolidation
PP:	Preconsolidation pressure
Cc:	Compression index
Ccr:	Recompression index
UC:	Unconfined compression
DS:	Direct shear
Phi':	Angle of internal friction
c':	Cohesion
CUT:	Consolidation undrained triaxial

Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY					SAMPLES						LABO AND IN SITU TESTS		
Depth	Elev. Depth -10.79	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks	◇ Su intact ◆ Su Remoulded □ Cu intact ■ Cu Remoulded ⊙ W △ N Wp ├──┤ Wl 10 20 30 40 50 60 70 80 90
		See stratigraphy descriptions on borehole 09-07										
1												
2												
3												
4												
5												
6												
7												
8												
9												

Notes:

Approved by :

Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-07B
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 2 of 6
LOCATION OF BOREHOLE: X : 258790,38 Y : 5457039,42		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL** HQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -10.79	**BORING DATE START:** 2009-11-13 14:00:00	**END:** 2009-11-16 16:00:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◨	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

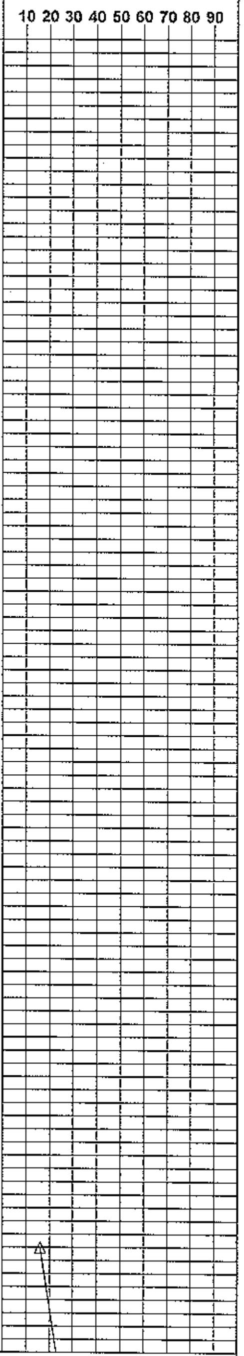
Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY | SAMPLES | LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
11											
12											
13											
14											
15											
16											
17											
18	18.29	Gray sand with some silt, trace gravel; medium dense to very dense									
19				☒	SS-1	B	100	16	6-8-8-13		Spacing of the sampling following instructions of HATCH



Notes:

Approved by :
Sonya Graveline, ing.

BORING LOG

PROJECT: New wharf #4	**BOREHOLE:** 09-07B
SITE: Alcoa - Baie-Comeau smelter (Quebec)	**PAGE:** 3 of 6
LOCATION OF BOREHOLE: X : 258790,38 Y : 5457039,42 — **CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50 — **SAMPLER:** Indicated — **CORE BARREL** HQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -10.79 — **BORING DATE START:** 2009-11-13 14:00:00 **END:** 2009-11-16 16:00:00	

Type of Sampler

SS:	Split Spoon	☒	Remoulded
DC:	Diamond Core	▨	Intact
WS:	Wash Sample	■	Lost
HT:	Hydraulic Trust	◫	Rock Core
HW:	Hammer Weight		
SP:	Shelby and Piston		
AS:	Auger Sampler		
ST:	Thin Walled Shelby Tube		

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

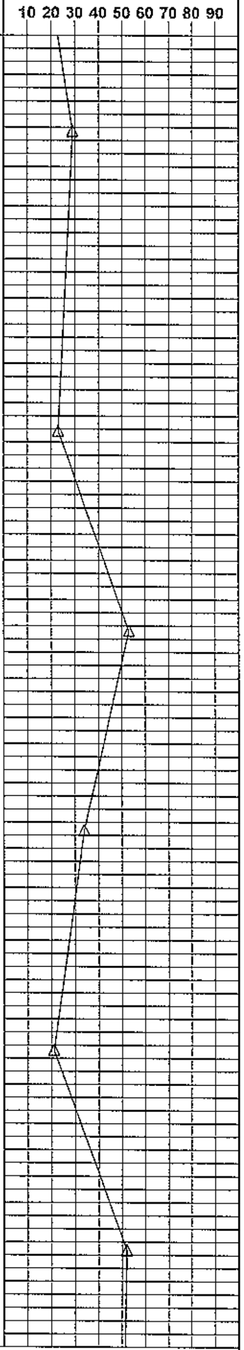
Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY — SAMPLES — LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
				☒	SS-2	B	54	29	9-10-19-21		
21											
22		150 mm thick granit cobble at 21,8m depth		◫	DC-3	HQ	84				
23				☒	SS-4	B	75	23	8-8-15-16		GSA, CU=16.3
24											
				☒	SS-5	B	12	53	32-29-24-39		
25											
26				☒	SS-6	B	50	34	11-10-24-30		
27											
				☒	SS-7	B	92	21	19-11-10-12		
28											
29											
	-40.05 29.26	Gray gravely sand with trace silt; very dense		☒	SS-8	B	54	52	10-27-25-25		GSA, CU=XXX



Notes:

Approved by :

Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4		**BOREHOLE:**	09-07B
SITE: Alcoa - Baie-Comeau smelter (Quebec)		**PAGE:**	4 of 6
LOCATION OF BOREHOLE: X : 258790,38 Y : 5457039,42	**CASING:** HW	**FILE NO:**	F099382300
EQUIPEMENT USED: D-50 / **SAMPLER:** Indicated	**CORE BARREL**HQ	**TECHNICIAN:**	Simon Marois, tech.
SURFACE ELEVATION (m): -10.79	**BORING DATE START:** 2009-11-13 14:00:00 **END:** 2009-11-16 16:00:00		

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◧	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value
Nd:	DCPT Nd-Value
Su:	Field Vane
GSA:	Grain size analysis
CU:	Uniformity coefficient
W:	Water Content
Wp:	Plastic limit
Wl:	Liquid limit
Ip:	Plasticity index:
D:	Specific density
Cu:	Swedish cone
C:	Consolidation
PP:	Preconsolidation pressure
Cc:	Compression index
Ccr:	Recompression index
UC:	Unconfined compression
DS:	Direct shear
Phi':	Angle of internal friction
c':	Cohesion
CUT:	Consolidation undrained triaxial

Water level

Date:	Time:	Elev.(m):

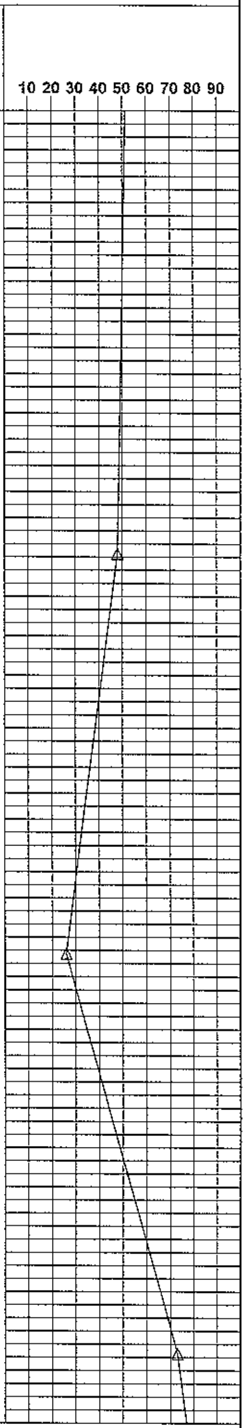
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
31											
32											
				■	DC-9	HQ	100				
33	-43.86 33.07	Gray sand with some silt and gravel; very dense. Fine sand between 38 m and 41 m depth		☒	SS-10	B	75	48	2-16-32-22		
34											
35											
36											
				☒	SS-11	B	42	26	15-11-15-15		
37											
38											
39											
				☒	SS-12	B	21	73	29-32-41-36		



Notes:

Approved by :
Sonya Graveline, ing.

SM Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-07B
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 5 of 6
LOCATION OF BOREHOLE: X : 258790,38 Y : 5457039,42		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL** HQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -10.79	**BORING DATE** **START:** 2009-11-13 14:00:00	**END:** 2009-11-16 16:00:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◧	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

Water level

Date:	Time:	Elev.(m):

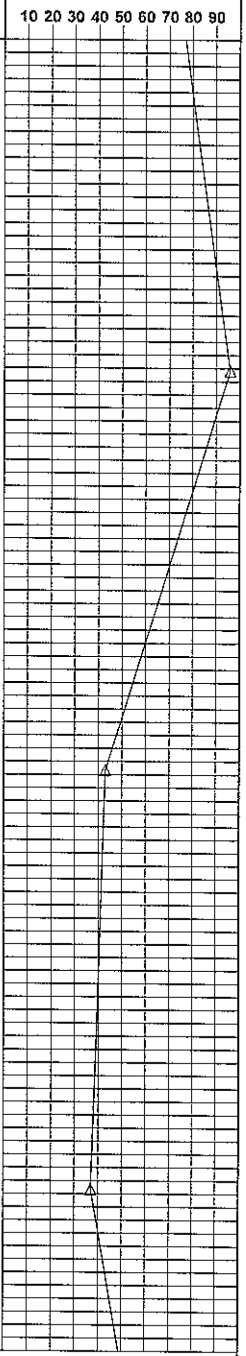
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
41											
42											
				☒	SS-13	B	29	96	40-49-47-44		GSA, CU=XXX
43											
44											
45											
				☒	SS-14	B	38	43	10-17-26-36		
46											
47											
48											
				☒	SS-15	B	46	37	9-17-20-25		
49											



Notes:

Approved by :
Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-07B
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 6 of 6
LOCATION OF BOREHOLE: X : 258790,38 Y : 5457039,42		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL** HQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -10.79	**BORING DATE START:** 2009-11-13 14:00:00	**END:** 2009-11-16 16:00:00	

Type of Sampler

SS:	Split Spoon	☒	Remoulded
DC:	Diamond Core	▨	Intact
WS:	Wash Sample	■	Lost
HT:	Hydraulic Trust	◧	Rock Core
HW:	Hammer Weight		
SP:	Shelby and Piston		
AS:	Auger Sampler		
ST:	Thin Walled Shelby Tube		

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

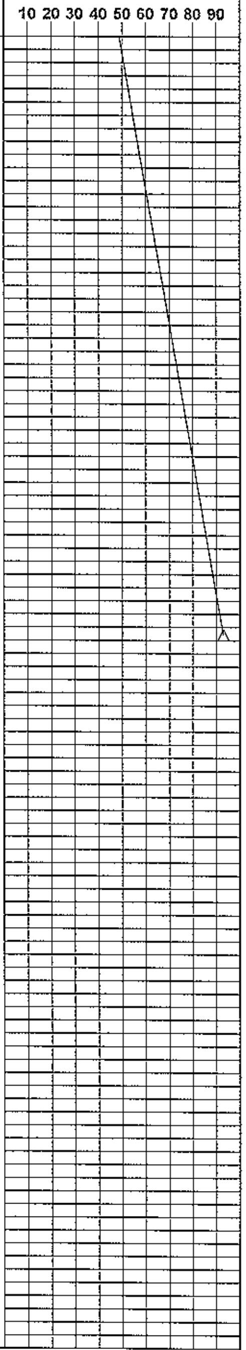
Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY | SAMPLES | LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
51											
52				☒	SS-16	B	100		10-50 /refusal		
53											
54				☒	SS-17	B	87	93	39-50-43-50 /refusal		GSA, CU=XXX
55											
56	-66.72 55.93	Rock or boulder	+	■	DC-18	HQ	100				End of borehole, our barge had to move because a boat was waiting to draw alongslide Alcoa's wharf
	-67.10 56.31	End of borehole to rock or on a boulder									
57											
58											
59											



Notes:

Approved by :
Sonya Graveline, ing.

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3182

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2999**
Sample No. : ------

Type of Mat : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-07A, SS-1,SS-2 & SS-3, Depth.: 0,16 to 2,9 m
Tests completed on : 2009-12-07

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 1,075
C.U. 2,017
Unified Classification:
Fineness Module: 0,46

% Gravel:
% Sand: 86
% Silt: 11
% Clay: 3

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

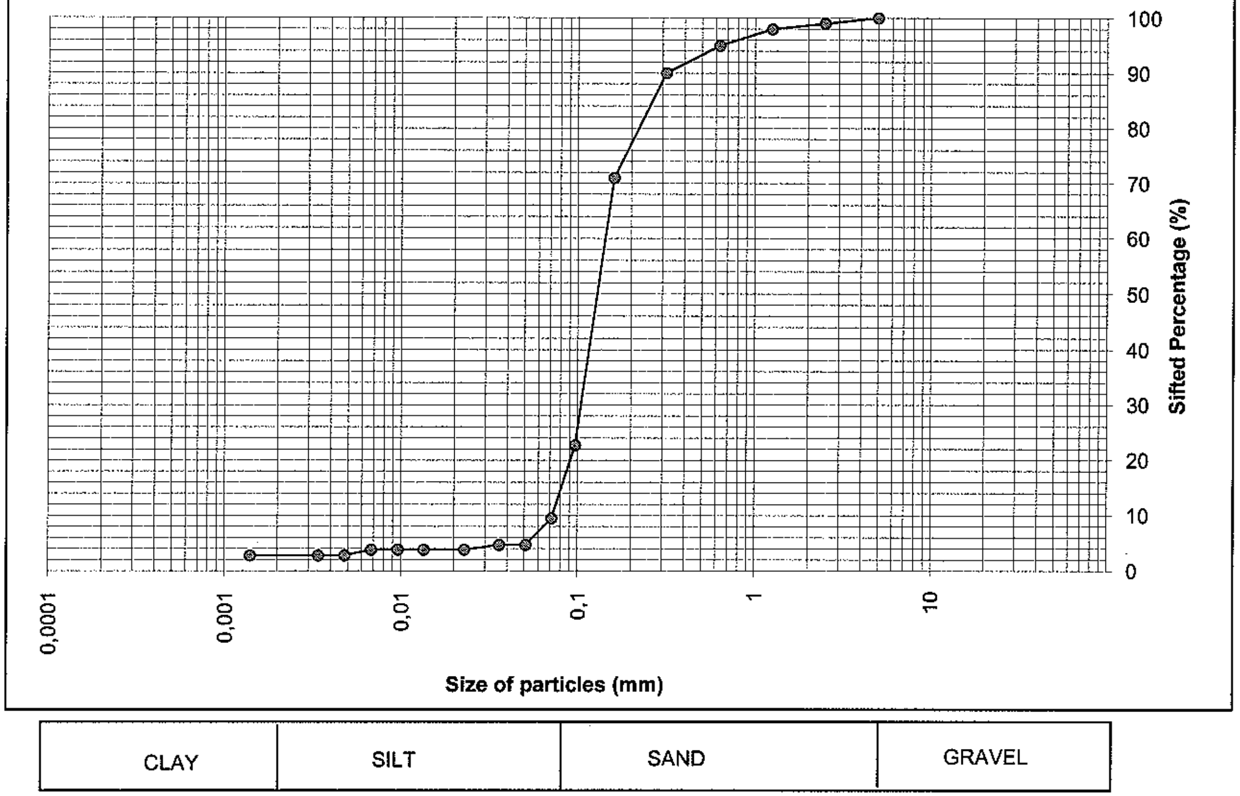
Prepared by: 2009-12-10
Sylvie Daigle, Tech.

Verified by: 2009-12-10
Sonya Graveline, Ing.

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
5,0	100
2,5	99
1,250	98
0,630	95
0,3150	90
0,1600	71
0,0967	22,7
0,0712	9,5
0,0510	4,7
0,0360	4,7
0,0229	3,8
0,0135	3,8
0,0096	3,8
0,0068	3,8
0,0048	2,8
0,0034	2,8
0,0014	2,8

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2999

Type of material: Sand,some silt,traces clay.

File #: **F099382200**

Source: Material on site, 09-07A,SS-1, SS-2 & SS-3, Depth: 0,16 to 2,9 m.

Customer: **Alcoa**

Approuved by :_________________ Date : __________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2496

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2300**
Sample No. : ------

Type of Material : -----
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-07, SS-4, Depth.: 2,4 to 3,0 m.
Tests completed on : 2009-10-19

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 1,011
C.U. 2,498
Unified Classification:
Fineness Module: 0,98

% Gravel: 7
% Sand: 75
% Silt: 18
% Clay:

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: Sylvie Daigle, Tech. 2009-10-21

Verified by: Sonya Graveline, Ing. 2009-10-21

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
20,0	100
14,0	95
10,0	95
5,00	93
2,500	91
1,250	89
0,630	86
0,3150	80,0
0,1600	63,0
0,0946	28,1
0,0705	12,3
0,0505	7,0
0,0359	5,3
0,0229	3,5
0,0134	3,5
0,0095	3,5
0,0066	1,8
0,0046	1,8
0,0033	0,9

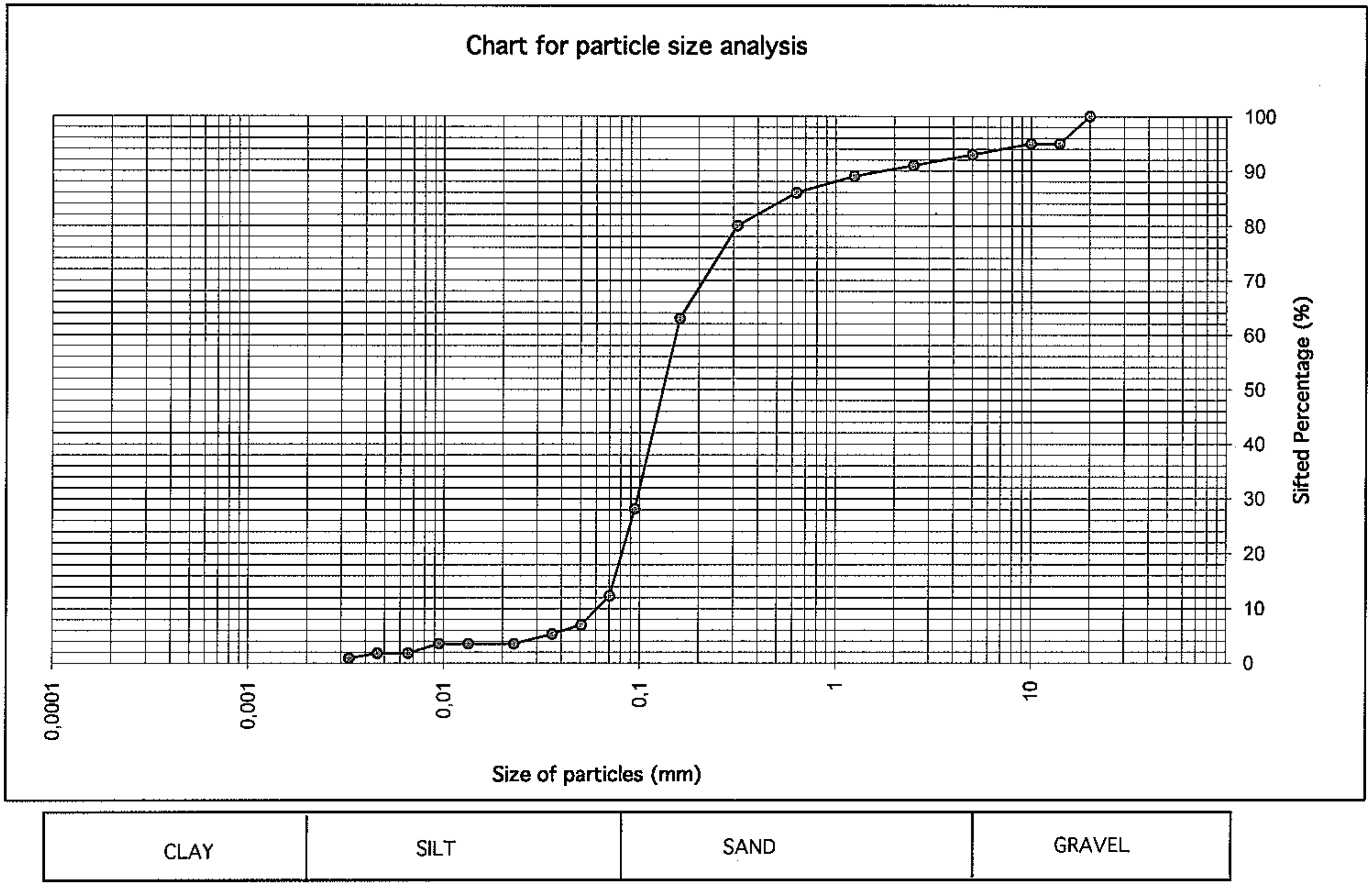


Chart for particle size analysis

Project: New Baie-Comeau wharf

Laboratory No. : 09-2300

Type of material: Sand, some silt, traces gravel.

File #: **F099382200**

Source: Material on site, 09-07, SS-4, Depth: 2,4 to 3,0 m.

Customer: **Alcoa**

Approuved by :________ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2549

File Number	: **F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: -----
City	: Baie-Comeau (Québec)	Uses	: -----
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	: **09-2301**	Source	: 09-07, SS-9, Depth.: 6,2 to 6,9 m.
Sample No.	: -----	Tests completed on	: 2009-10-21

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.
C.U.
Unified Classification:
Fineness Module: 0,29

% Gravel:	
% Sand:	8
% Silt:	43
% Clay:	49

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements
Atterberg Limits (3pts)	BNQ2501-092		
Liquid Limit (%):		38	-----
Plastic Limit (%):		22	-----
Plasticity index (%):		16	------
Water Content (%):	LC21-201	49,48	------

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: ____________ 2009-10-21
Sylvie Daigle, Tech.

Verified by: ____________ 2009-10-21
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

SM*i*
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
1,250	100
0,630	98
0,3150	95,0
0,1600	93,0
0,0761	92,0
0,0539	90,0
0,0386	87,1
0,0277	83,1
0,0180	77,2
0,0107	75,2
0,0076	72,2
0,0054	68,3
0,0039	62,3
0,0028	57,4
0,0012	36,6

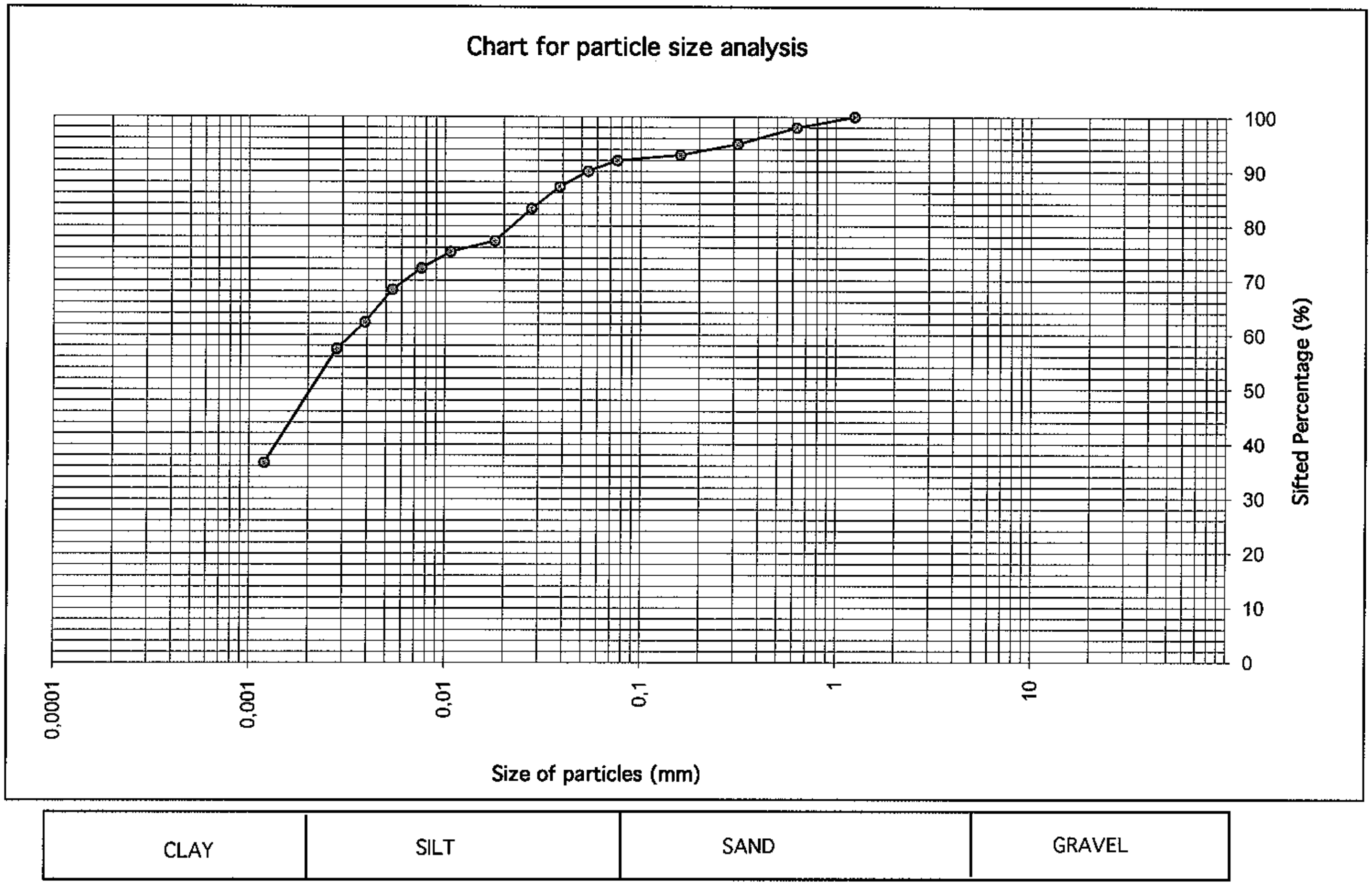


Chart for particle size analysis

Project: New Baie-Comeau wharf

Laboratory No. : 09-2301

Type of material: Clay and silt, traces sand.

File #: **F099382200**

Source: Material on site, 09-07, SS-9, Depth: 6,2 to 6,9 m.

Customer: **Alcoa**

Approuved by : ______ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

QUÉFORMAT LTÉE

COMPRESSION NON CONSOLIDÉE - ASTM D2166

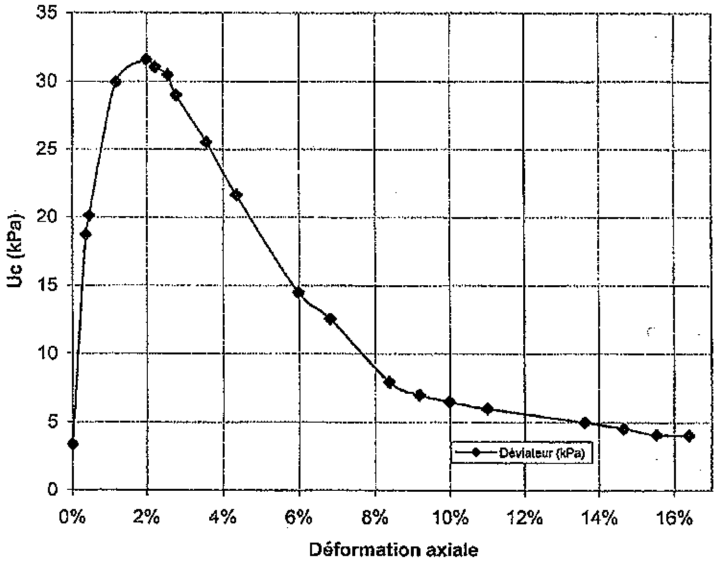
DOSSIER : 15756-G
CLIENT : Labo S.M. Inc.
PROJET : ALCOA / F099382-100

SONDAGE : BH-09-07
ÉCHANT. : ST-10
PROF. (m) : 7.40 - 7.50
FICHIER : Comp15756-09-07.xls

Compression non drainée

Longueur initiale, Hi (mm) : 102.14	Volume initial, Vi (cm³) : 212.35	Section initiale, Ai (cm²) : 20.79	Vit. déformation (mm/min) : 0.8
Longueur finale, Hf (mm) : 85.4	Volume final, Vf (cm³) : 212.35	Section finale, Af (cm²) : 24.87	

No.	Lectures ΔL (0,01mm)	Lectures Fa (N)	Déformation ΔH/Hi (%)	Section (cm²)	Résistance en compression, Uc (kPa)	Résultats
1	1964	7.0	0.00%	20.79	3	
2	2000	39.0	0.35%	20.86	19	Rupture :
3	2009	42.0	0.44%	20.88	20	
4	2084	63.0	1.17%	21.04	30	Uc (kPa) : 32 kPa
5	2167	67.0	1.99%	21.21	32	ΔH/Hi (%) : 1.99 %
6	2190	66.0	2.21%	21.26	31	
7	2225	65.0	2.56%	21.34	30	
8	2248	62.0	2.78%	21.38	29	
9	2329	55.0	3.57%	21.56	26	
10	2409	47.0	4.36%	21.74	22	
11	2575	32.0	5.98%	22.11	14	Caractéristiques physiques :
12	2660	28.0	6.81%	22.31	13	
13	2820	18.0	8.38%	22.69	8	Teneur en eau initiale : 50.97 %
14	2902	16.0	9.18%	22.89	7	
15	2984	15.0	9.99%	23.10	6	Masse volumique humide : 1709 kg/m³
16	3088	14.0	11.00%	23.36	6	Masse volumique sèche : 1132 kg/m³
17	3355	12.0	13.62%	24.07	5	
18	3461	11.0	14.66%	24.36	5	
19	3550	10.0	15.53%	24.61	4	Teneur en eau finale : 50.88 %
20	3638	10.0	16.39%	24.87	4	



Remarques :

Réalisé par : A. Bustamante
date : 2009-11-02

Vérifié par : Hélène Bilodeau, ing.
date : 2009-11-10

SM LABO S.M. INC.

Rapport no. : *09LL1695*

Rapport D'essai
CONSOLIDATION OEDOMETRIQUE
ASTM D2435-90

No Dossier :	**F99382100**	Sondage :	**BH-09-07**	
Client :	**Alcoa**	Échantillon :	**ST-10**	
Adresse :	100, rue Maritime	Prof. (m) :	7,60	**7,60@7,70**
Ville :	Baie-Comeau (Québec)			
Code postal :	G4Z 2L6			
Projet no :	Usine Alcoa de Baie-Comeau/Nouveau quai			

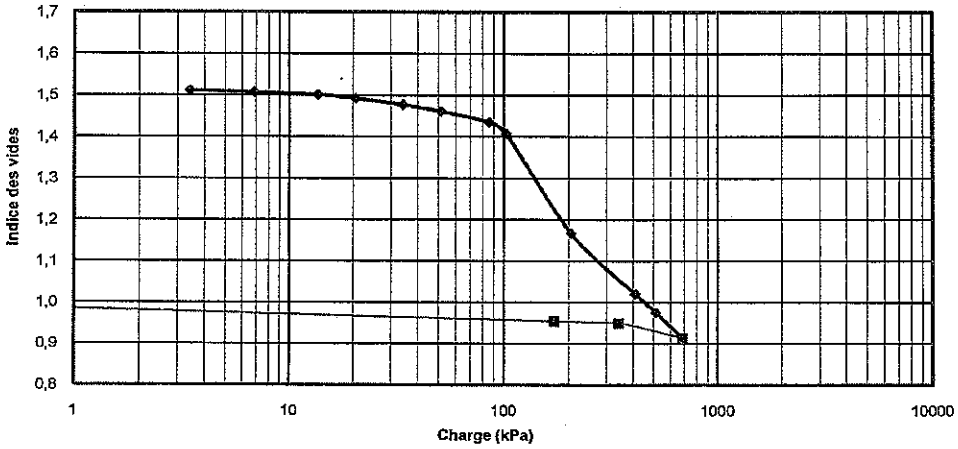
Analysé par : IG

Caractéristiques de l'anneau		
Numéro :		3
Masse :	(g)	109,08
Hauteur :	(mm)	25,48
Diamètre :	(mm)	63,48
Surface :	(cm^2)	31,65
Volume :	(cm^3)	80,64

Caractéristiques de l'appareil		
Numéro de l'appareil :		6
Calibration de l'extensomètre :	(div./mm)	500,00
Bras de levier :		11,03
Déformation = b * Pression ^ m		
Facteur de correction b :	(div)	10,00
Facteur de correction m :		0,50

Caractéristiques physiques		Initial	Final	Lavage
Numéro de la tare :		Anneau	Anneau	
Masse de la tare (anneau) :	(g)	109,08	109,08	
Masse du sol humide + tare :	(g)	246,02	230,54	
Masse du sol sec + tare :		197,94	197,94	
Masse du sol humide :	(g)	136,94	121,46	
Masse du sol sec :	(g)	88,86	88,86	
Teneur en eau du sol :	(%)	54,11	36,69	
Hauteur du sol humide :	(mm)	25,48	20,44	
Hauteur du sol sec :	(mm)	10,14	10,14	
Masse volumique humide :	(kg/m^3)	1 698	1 878	
Masse volumique sèche :	(kg/m^3)	1 102	1 374	
Indice des vides :		1,514	1,017	
Degré de saturation :	(%)	99,01	100,00	
Densité relative calculée :	Estimée	2,77	2,77	Calculée

Date (aaaa/mm/j)	Heure (hh:mm)	Charge (kg)	Pression (kPa)	Lecture (0,002mm)	Correction de lecture	ΔH (mm)	Indice des vides	Hauteur (mm)	t50 (min)	Cv (m^2/s)
2009/10/24		0,00	0,00	0	0,0	0,00	1,514	25,48		
2009/10/25		0,10	3,42	20	4,4	0,03	1,511	25,45		
2009/10/26		0,20	6,84	43	8,8	0,07	1,507	25,41		
2009/10/27		0,40	13,67	82	15,8	0,13	1,501	25,35		
2009/10/28		0,60	20,51	132	21,8	0,22	1,492	25,26		
2009/10/29		1,00	34,18	222	33,0	0,38	1,477	25,10		
2009/10/30		1,50	51,27	306	39,5	0,53	1,461	24,95		
2009/10/31		2,50	85,44	450	51,0	0,80	1,435	24,68		
2009/11/01		3,00	102,53	598	56,0	1,08	1,407	24,40		
2009/11/02		6,00	205,06	1 836	76,5	3,52	1,167	21,96		
2009/11/03		12,00	410,12	2 603	102,5	5,00	1,020	20,48		
2009/11/04		15,00	512,65	2 843	114,1	5,46	0,975	20,02		
2009/11/05		20,00	683,53	3 173	127,5	6,09	0,913	19,39		
2009/11/06		15,00	512,65	3 120	114,1	6,01	0,921	19,47		
2009/11/07		10,00	341,77	2 956	94,8	5,72	0,949	19,76		
2009/11/08		5,00	170,88	2 908	71,3	5,67	0,954	19,81		
2009/11/09		0,00	0,00	2 518	0,0	5,04	1,017	20,44		



σ'p = 94 kPa
Cc = 0,6428
Cr = 0,0527

Remarques : ----

Préparé par : ______________________ Date :
Isabelle Gauthier, tech. Chef labo

Vérifié par : ______________________ Date :
Salomon O'Ngandée, ing., M.Sc.A.

Notes : Le résultat s'applique exclusivement à l'échantillon analysé. Ce rapport ne doit pas être reproduit, sinon en entier, sans l'autorisation écrite de Labo S.M. inc.

QUÉFORMAT LTÉE

COMPRESSION TRIAXIALE NON DRAINÉE (CIU)

ASTM D4767-04

DOSSIER : **15756-G**
CLIENT : **Labo S.M. inc.**
PROJET : **ALCOA / F099382-100**

SONDAGE **BH-09-07**
ÉCHANT. : **ST-10**
PROF. (m) **7.50 - 7.60**

ESSAI No **15756-G-CIU-01** **Page 1 de 3**
FICHIER : 15756-G-01.CIU

Échantillon : Intact
Description : Argile et silt, traces de sable

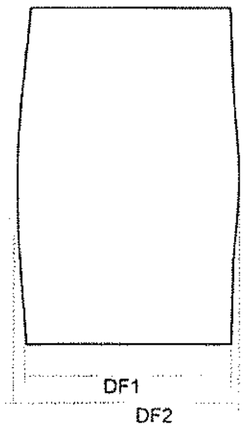
Unité : 1
Cellule : Tx-50A

ÉTAT INITIAL						ÉTAT FINAL					
Caractéristiques physiques			Géométrie			Caractéristiques physiques			Géométrie		
Masse initiale humide :	168.88	g	Longueur:	87.55	mm	Masse finale humide :	162.56	g	Déform :	Cylindre	
Teneur en eau initiale :	54.12	%	Diamètre :	37.98	mm	Masse finale sèche :	109.58	g	D_{F1} :	36.8	mm
Masse volum. humide :	1703	kg/m³	Section :	11.33	cm²	Teneur en eau finale :	48.35	%	D_{F2} :	38.0	mm
Degré de saturation :	100	%	Volume :	99.19	cm³	Masse volum. humide :	1750	kg/m³	Kt_F :	1/1 (1)	

CONDITIONS D'ESSAI								
Consolidation isotrope			Cisaillement			Membranes		
Pression cellulaire, σ_{3C} :	500	kPa	Engrenages .WF :	BA5		Nb -Type :	2	Ramses00
Contrepression, CP :	400	kPa	V_{axiale} :	0.0122	mm / min	Épaisseur :	0.080	mm
Pression effective, σ'_{3C} :	100	kPa	$d\varepsilon_1/dt$:	0.86	% / heure	Circonf.	102.0	mm
Condition de drainage :	Radial et Bas		ε_1 max :	8.59	%	Module :	0.22	N / mm
						Comportement :	Plis	

PRINCIPAUX RÉSULTATS D'ESSAI									
Paramètre B (2)			Cisaillement						
Initial (σ_{3C} = 25 kPa) :	0.78		Paramètres		$(\sigma_1 - \sigma_3)_{max}$	$(\sigma'_1/\sigma'_3)_{max}$	Final		
Sous contrepression :	0.97		ε_1	(%)	1.08	5.50	8.59		
Après consolidation :	ND		$\sigma_1 - \sigma_3$	(kPa)	64	46	37		
Consolidation			σ'_1 / σ'_3	(1/1)	2.23	2.97	2.91		
ΔV_c :	6.32	cm³	Δu_W	(kPa)	47.00	75.90	80.20		
ε_{vc} :	6.37	%	A_{Uw} (3)	(1/1)	0.744	1.693	2.259		
C_v :	11	m²/an	ϕ' (4)	(deg)	22.4	29.8	29.2		

Croquis du spécimen au démontage



Remarques :

D_{RS} : 2.75*

(1) $Kt_F = (D_{F2} - D_{F1}) \tan(\beta) / \Delta L$ (2) $B = \Delta u / \Delta\sigma_3$ (3) $A_{Uw} = \Delta u_W / \Delta(\sigma_1 - \sigma_3)$ (4) $\phi' = \sin^{-1} [(\sigma_1 - \sigma_3) / (\sigma'_1 + \sigma'_3)]$ pour c' = 0

* Valeur estimée

Effectué par :
A. Bustamante 09-11-12
Vérifié par
Hélène Bilodeau, ing.
Date : 2009-12-15

QUÉFORMAT

COMPRESSION TRIAXIALE NON DRAINÉE (CIU)

ASTM D4767-04

Essai : **15756-G-CIU-01**

ΔL_O : 1800.0 Fp_c : 0.0 Vi : 92.87 cc Li : 85.22 mm Déformation : Cylindre

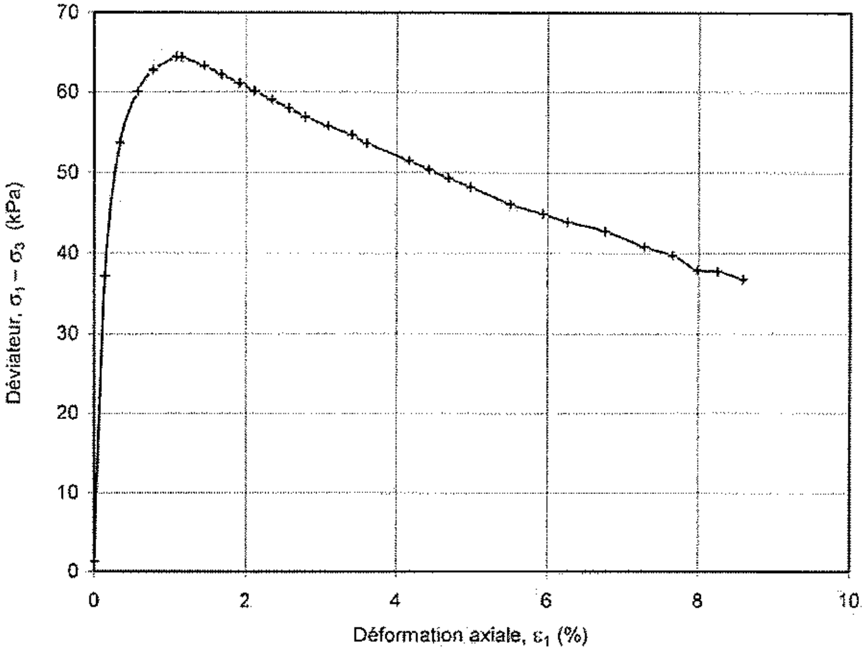
	Données expérimentales									Membrane		Contraintes corrigées								
Ligne	Date	Heure	σ_3	ΔL	u_W	Fa	ε_1	Section	Δu_w	σ_{3m}	σ_{1m}	σ'_3	$\sigma_1 - \sigma_3$	σ'_1	σ'_1 / σ'_3	Au_w	$(\sigma'_1+\sigma'_3)/2$	$(\sigma_1-\sigma_3)/2$		Observ.
	aa-mm-jj	hh:mm	kPa	0.01mm	kPa	Newton	%	cm²	kPa	kPa	kPa	kPa	kPa	kPa	1/1	1/1	kPa	kPa		
1	09-11-19	07:54	500	2033	402.9	4.0	0.00	10.897	0.0	2.2	-0.2	99.3	1.3	100.5	1.013	0.000	99.9	0.6		
2				2045	414.6	43.0	0.14	10.913	11.7	2.2	-0.1	87.6	37.2	124.7	1.424	0.326	106.2	18.6		
3				2062	426.8	61.0	0.34	10.935	23.9	2.2	0.1	75.4	53.7	129.1	1.713	0.456	102.2	26.9		
4				2082	436.5	68.0	0.57	10.960	33.6	2.2	0.2	65.7	60.1	125.8	1.915	0.571	95.7	30.0		
5				2099	442.8	71.0	0.77	10.982	39.9	2.2	0.3	59.4	62.8	122.1	2.057	0.649	90.7	31.4		
6				2125	449.9	73.0	1.08	11.016	47.0	2.2	0.3	52.3	64.4	116.7	2.232	0.744	84.5	32.2		
7				2131	451.2	73.0	1.15	11.024	48.3	2.2	0.3	51.0	64.4	115.3	2.263	0.765	83.2	32.2		
8		09:32		2157	456.5	72.0	1.46	11.058	53.6	2.2	0.3	45.7	63.3	109.0	2.386	0.864	77.3	31.6		
9				2176	459.6	71.0	1.68	11.083	56.7	2.2	0.3	42.6	62.2	104.8	2.462	0.930	73.7	31.1		
10				2196	462.3	70.0	1.91	11.110	59.4	2.2	0.3	39.9	61.2	101.0	2.534	0.991	70.5	30.6		
11				2213	464.2	69.0	2.11	11.132	61.3	2.2	0.3	38.0	60.1	98.1	2.583	1.041	68.0	30.1		
12				2232	466.1	68.0	2.34	11.158	63.2	2.2	0.3	36.1	59.1	95.1	2.637	1.093	65.6	29.5		
13				2252	467.7	67.0	2.57	11.185	64.8	2.2	0.3	34.5	58.0	92.5	2.682	1.142	63.5	29.0		
14				2271	469.2	66.0	2.79	11.210	66.3	2.2	0.2	33.0	56.9	89.9	2.727	1.191	61.4	28.5		
15		11:20		2296	470.9	65.0	3.09	11.244	68.0	2.2	0.2	31.3	55.8	87.1	2.785	1.246	59.2	27.9		
16				2323	472.6	64.0	3.40	11.281	69.7	2.2	0.1	29.6	54.7	84.3	2.850	1.304	56.9	27.3		
17				2340	473.4	63.0	3.60	11.305	70.5	2.2	0.1	28.8	53.7	82.4	2.865	1.345	55.6	26.8		
18				2388	475.3	61.0	4.17	11.371	72.4	2.2	0.0	26.9	51.5	78.3	2.915	1.442	52.6	25.7		
19				2410	475.9	60.0	4.42	11.402	73.0	2.2	-0.1	26.3	50.4	76.6	2.918	1.486	51.5	25.2		
20				2432	476.6	59.0	4.68	11.433	73.7	2.2	-0.1	25.6	49.3	74.9	2.928	1.534	50.2	24.7		
21				2457	477.5	58.0	4.98	11.468	74.6	2.2	-0.2	24.7	48.2	72.9	2.954	1.589	48.8	24.1		
22		13:57		2502	478.8	56.0	5.50	11.532	75.9	2.2	-0.3	23.4	46.1	69.5	2.972	1.693	46.4	23.0		
23				2539	479.3	55.0	5.94	11.585	76.4	2.2	-0.4	22.9	44.9	67.8	2.963	1.750	45.3	22.5		
24				2567	479.9	54.0	6.27	11.626	77.0	2.2	-0.4	22.3	43.9	66.2	2.967	1.806	44.2	21.9		
25				2609	480.3	53.0	6.76	11.687	77.4	2.2	-0.4	21.9	42.8	64.7	2.949	1.865	43.3	21.4		
26				2654	480.9	51.0	7.29	11.754	78.0	2.3	-0.3	21.4	40.8	62.1	2.908	1.974	41.8	20.4		
27				2686	481.5	50.0	7.66	11.802	78.6	2.3	-0.3	20.8	39.7	60.5	2.910	2.042	40.7	19.9		
28				2714	482.1	48.0	7.99	11.844	79.2	2.3	-0.3	20.2	37.9	58.1	2.873	2.162	39.2	18.9		
29				2736	482.4	48.0	8.25	11.877	79.5	2.3	-0.3	19.9	37.8	57.7	2.894	2.178	38.8	18.9		
30	09-11-19	17:20		2765	483.1	47.0	8.59	11.921	80.2	2.4	-0.3	19.3	36.8	56.0	2.908	2.259	37.6	18.4		

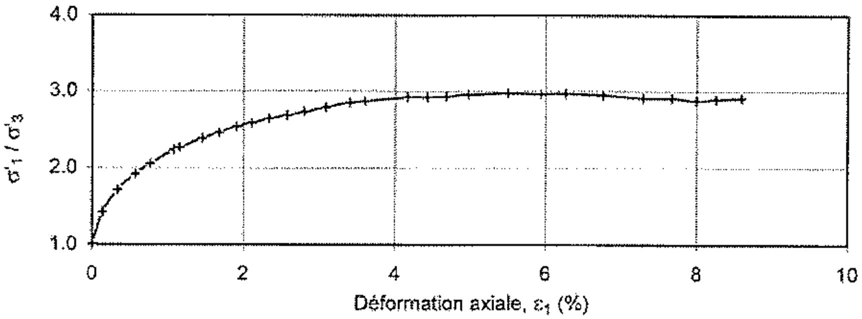
QUÉFORMAT LTÉE

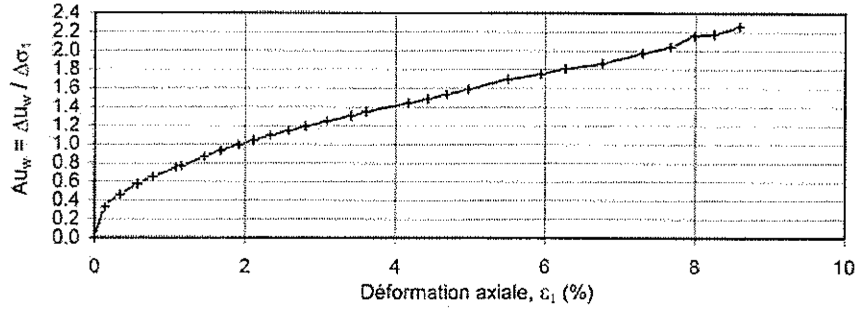
COMPRESSION TRIAXIALE NON DRAINÉE (CIU)

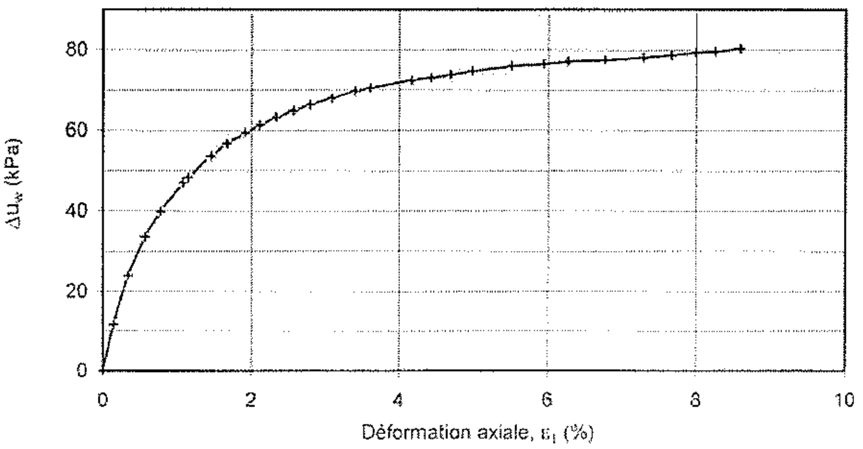
ASTM D4767-04

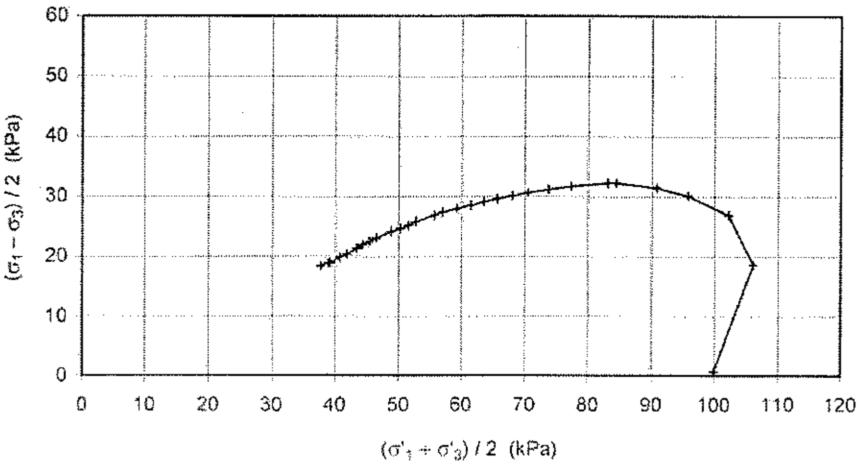
Essai : **15756-G-CIU-01**









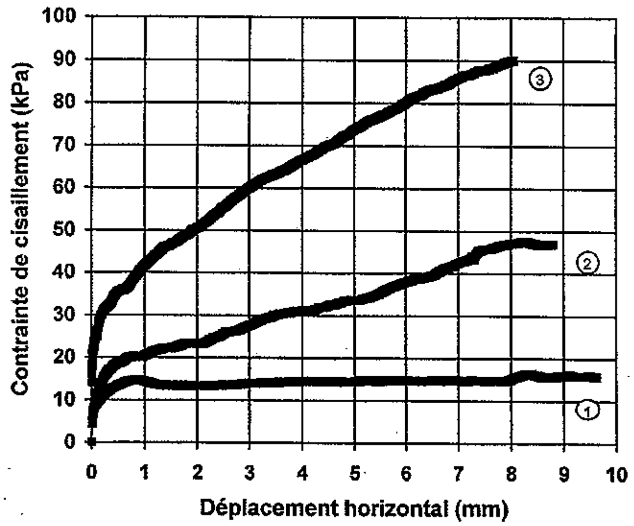


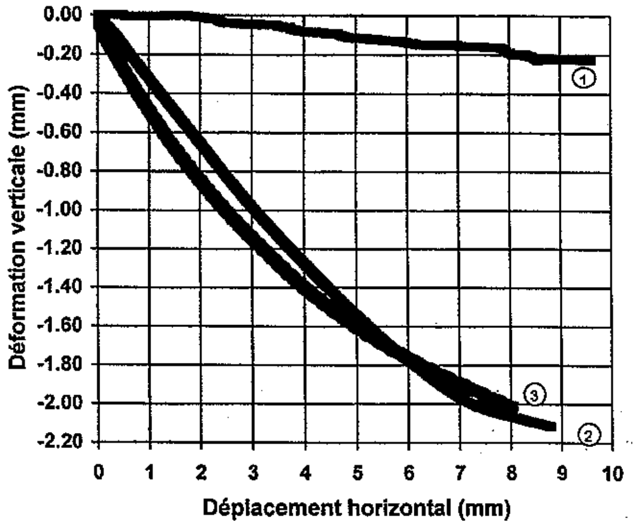
Qualitas

ESSAI DE CISAILLEMENT DIRECT ASTM D-3080-04

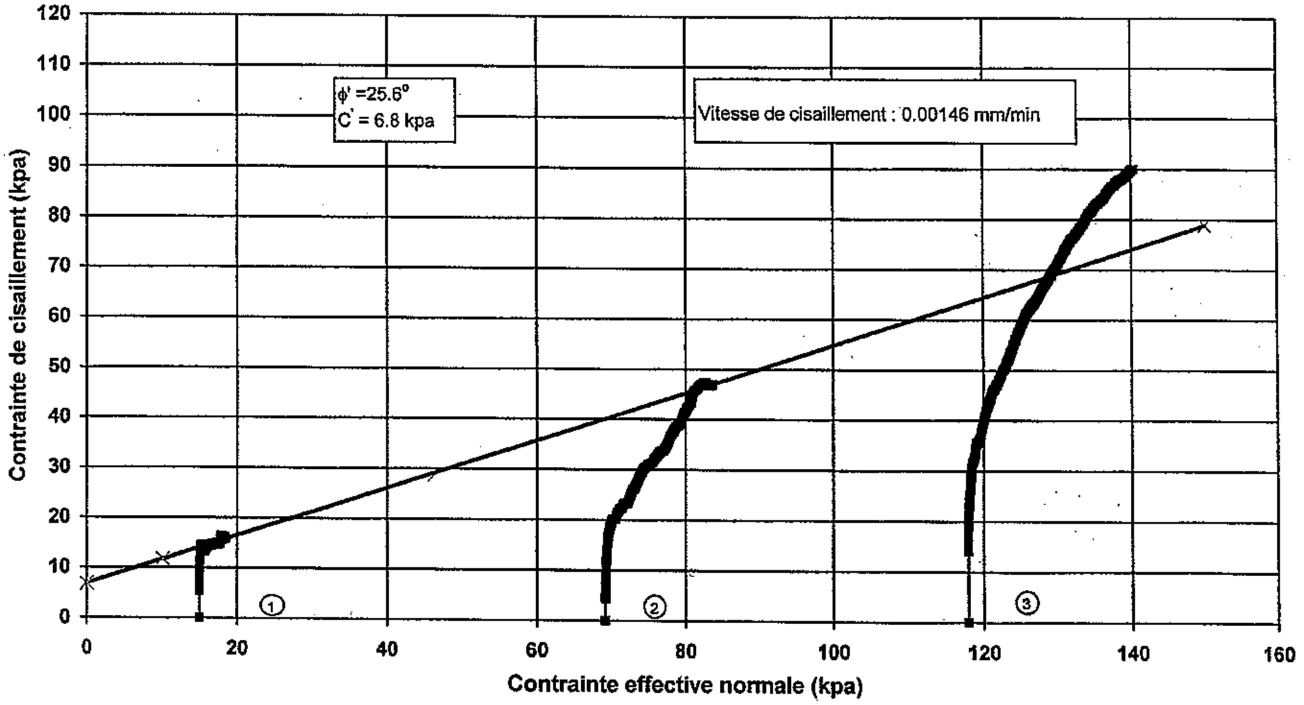
PROJET: Quéformat ltée (n/d 14653-G)
DOSSIER No: G09014-15
TECHNICIEN: R.C.
DATE (a-m-j): 2009-11-(09-13)
Vérifié par:

1 - ÉCHANT.No: BH-09-05,ST-3 PROFONDEUR (m): 1.90 à 2.00
2 - ÉCHANT.No: BH-09-07, ST-10 PROFONDEUR (m): 7.70 à 7.80
3 - ÉCHANT.No: BH-09-08A, ST-1 PROFONDEUR (m): 11.60 à 11.70





Cheminement de contraintes effectives



Qualitas

Groupe Qualitas inc.
275, Benjamin-Hudon
Saint-Laurent (Québec) H4N 1J1
Téléphone: 514-331-6910
Télécopieur: 514-331-7632

Essai de cisaillement direct -consolidation ASTM D 3080-04

Projet desc.: **Qualitas-Quéformat**
Dossier no: **G09014-15**
Sondage : **BH-09-07**
Échantillon : **ST-10**
Profondeur: **7.70 à 7.80m**
Réalisé par : **R.C.**
Date: **2009-11-02**
Vérifié par :

Teneur en eau		Initiale	Finale	Lavage	Auxiliaire
Numéro de la tare :			65		90
Masse de la tare :	g	0.00	13.92	0.00	35.23
Masse du sol humide + tare :	g	138.51	143.57		74.70
Masse du sol sec + tare :	g	88.75	102.67	0.00	61.41
Teneur en eau du sol :	%	56.07	46.08		50.76

Poids volumique	
pv (kN/m3) :	16.67

Densité relative des grains	
Estimé:	2.750
Mesurée:	

Caractéristiques de l'essai			Initiale	Finale
Numéro de l'anneau :			2	
Diamètre de l'anneau :		mm	64.03	
Masse de l'ensemble (anneau + plaque) :		g	148.07	
Masse du sol humide + anneau + plaque :		g	286.58	
Masse totale du sol humide :		g	138.51	129.65
Hauteur du sol :	H_0	mm	25.31	22.573
Hauteur du sol sec :	H_S	mm	10.05	
Volume du spécimen	V_t	cm^3	81.50	72.69
Volume des solides	V_S	cm^3	32.37	
Indice des vides :			1.518	1.245
Degré de saturation :		%	101.6	101.8

Numéro de l'appareil :	**522**	
Levier de chargement:	a	9.923
	b	
Lecture de déformation:	0.001 mm	

Déformation de l'appareillage + pierres poreuses

Y = a+b*ln(x)+c*(ln(x))^2+d*(ln(x))^3+e*(ln(x))^4+f*(ln(x))^5

a		d	
b		e	
c		f	

Contrainte (kPa)	Chargement Date	Heure	Lecture Finale	Lecture corrigée	ΔH/H cum (%)	e (1/1)	H (mm)	Compressibilité Module M (kPa)	Cc	Cc / (1 + e_0)
0.0	02/11/2009	12:59:33	0.000		0.000	1.518	25.310			
20.8	02/11/2009	12:59:33	-0.193		0.763	1.499	25.117			
34.2	03/11/2009	7:32:02	-0.312		1.233	1.487	24.998			
69.1	04/11/2009	7:00:01	-0.604		2.386	1.458	24.706			
69.1	13/11/2009	13:17:57	-2.737		10.814	1.246	22.573	FIN DE L'ESSAI		

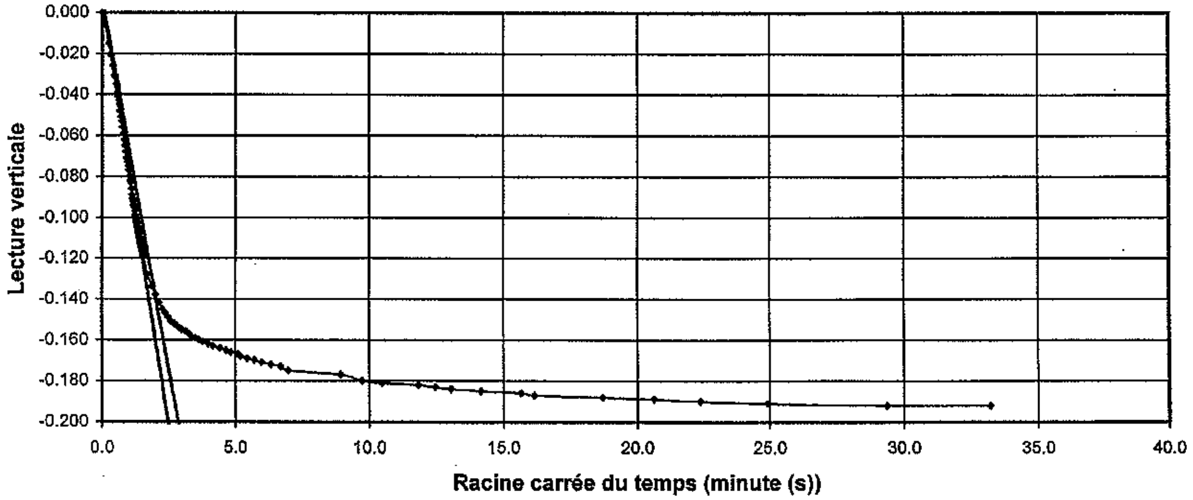
Qualitas

Groupe Qualitas inc.
275, Benjamin-Hudon
Saint-Laurent (Québec) H4N 1J1
Téléphone: 514-331-6910
Télécopieur: 514-331-7632

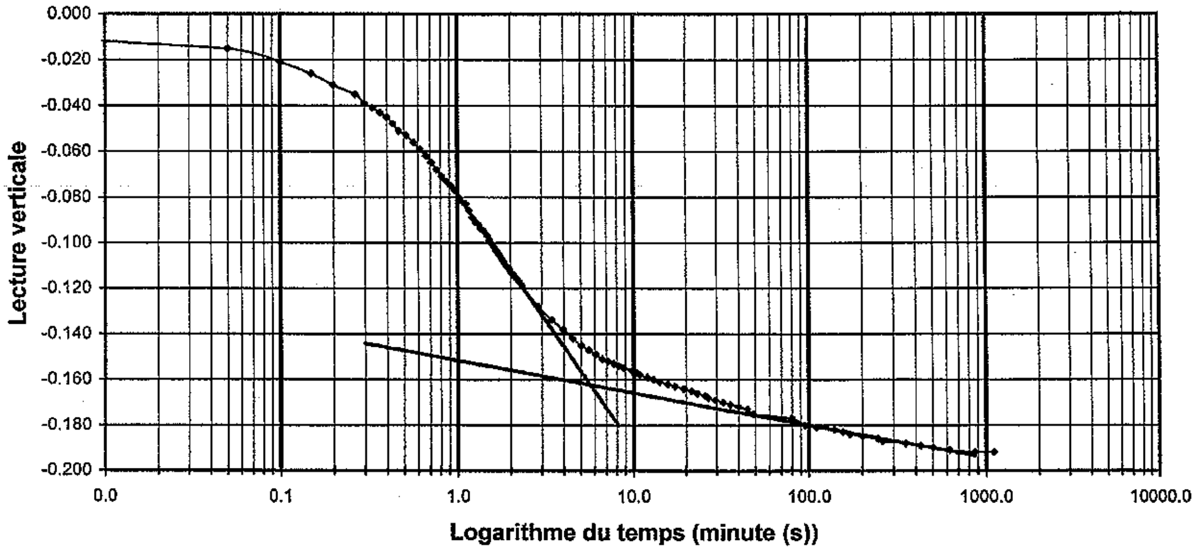
Essai de cisaillement direct -consolidation ASTM D 3080-04

Projet desc.:	Qualitas-Quéformat	**Sondage :**	BH-09-07	**Réalisé par :**	R.C.
Dossier no:	G09014-15	**Échantillon :**	ST-10	**Date:**	2009-11-02
		Profondeur:	7.70 à 7.80m	**Vérifié par :**	

Mesure du coefficient de consolidation par la méthode Taylor — **Contrainte : 0.0 à 20.8 kPa**



Mesure du coefficient de consolidation par la méthode Casagrande — **Contrainte : 0.0 à 20.8 kPa**



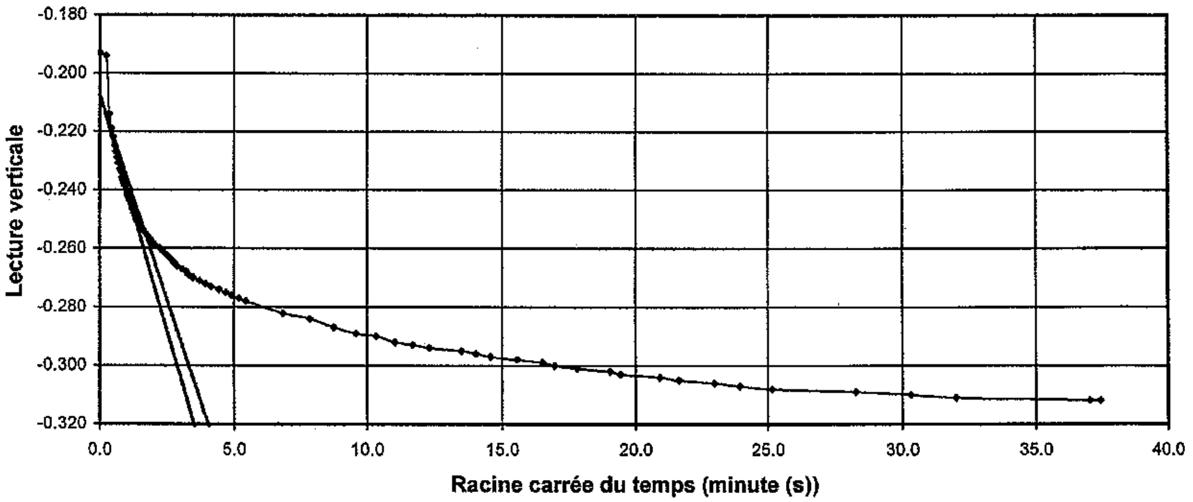
Qualitas

Groupe Qualitas inc.
275, Benjamin-Hudon
Saint-Laurent (Québec) H4N 1J1
Téléphone: 514-331-6910
Télécopieur: 514-331-7632

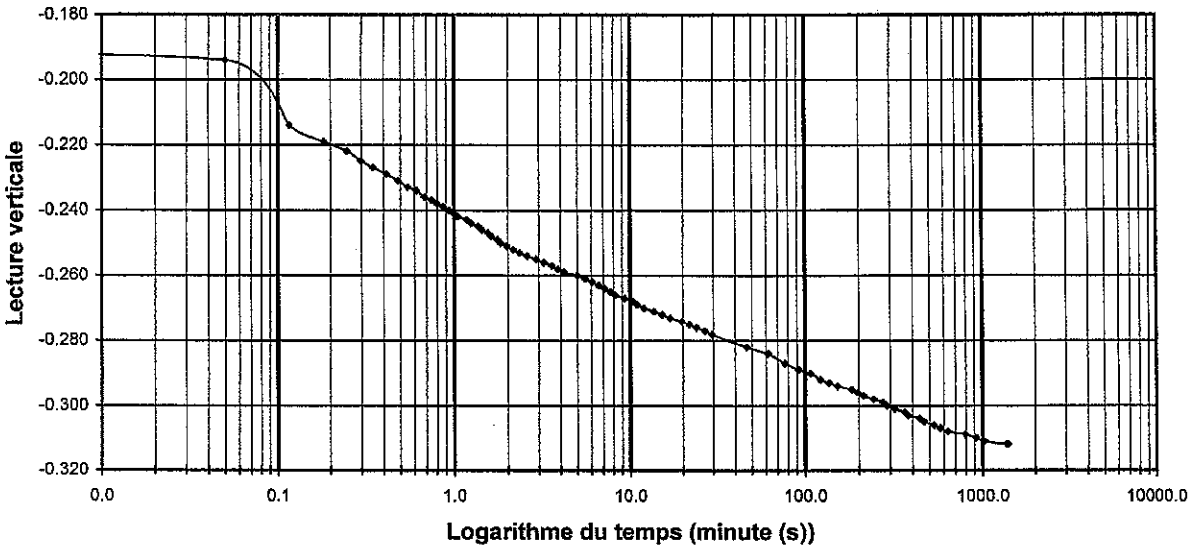
Essai de cisaillement direct -consolidation ASTM D 3080-04

Projet desc.:	Qualitas-Quéformat	**Sondage :**	BH-09-07	**Réalisé par :**	R.C.
Dossier no:	G09014-15	**Échantillon :**	ST-10	**Date:**	2009-11-03
		Profondeur:	7.70 à 7.80m	**Vérifié par :**	

Mesure du coefficient de consolidation par la méthode Taylor — **Contrainte : 20.8 à 34.2 kPa**



Mesure du coefficient de consolidation par la méthode Casagrande — **Contrainte : 20.8 à 34.2 kPa**

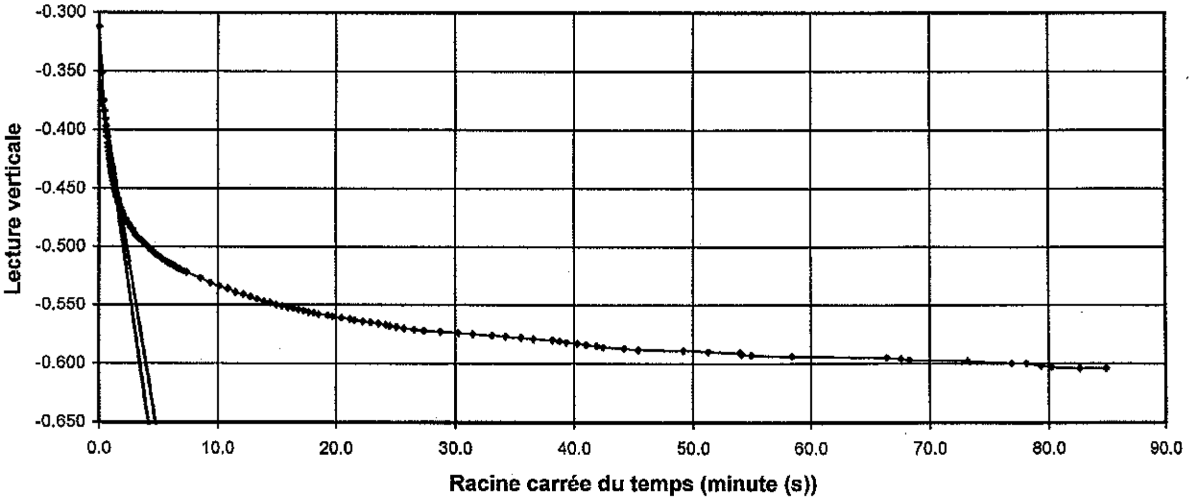


Groupe Qualitas Inc.
275, Benjamin-Hudon
Saint-Laurent (Québec) H4N 1J1
Téléphone: 514-331-6910
Télécopieur: 514-331-7632

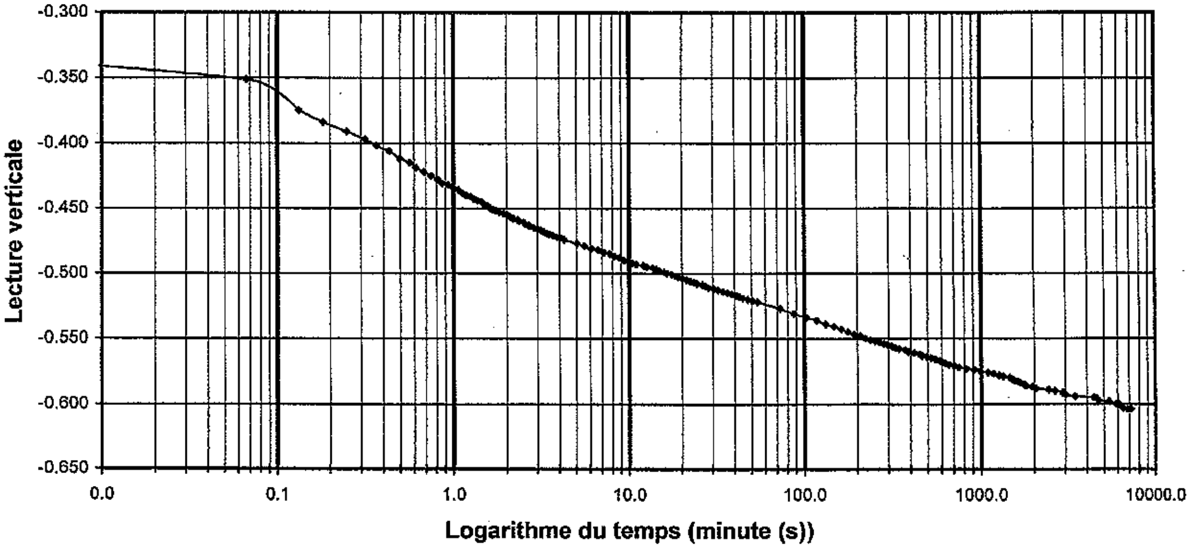
Essai de cisaillement direct -consolidation ASTM D 3080-04

Projet desc.:	**Qualitas-Quéformat**	**Sondage :**	**BH-09-07**	**Réalisé par :**	**R.C.**
Dossier no:	**G09014-15**	**Échantillon :**	**ST-10**	**Date:**	**2009-11-04**
		Profondeur:	**7.70 à 7.80m**	**Vérifié par :**	

Mesure du coefficient de consolidation par la méthode Taylor	**Contrainte : 34.2 à 69.1 kPa**



Mesure du coefficient de consolidation par la méthode Casagrande	**Contrainte : 34.2 à 69.1 kPa**



QUÉFORMAT LTÉE

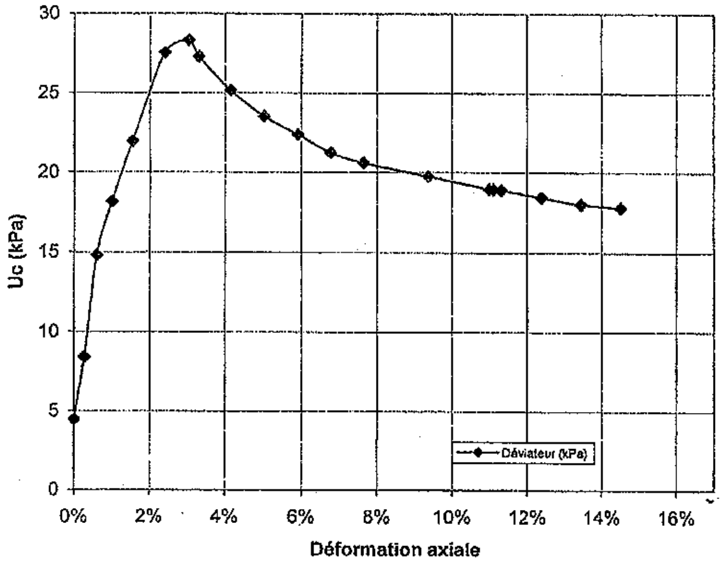
COMPRESSION NON CONSOLIDÉE - ASTM D2166

DOSSIER :	15756-G	SONDAGE :	BH-09-07
CLIENT :	Labo S.M. inc.	ECHANT. :	ST-11
PROJET :	ALCOA / F099382-100	PROF. (m) :	9.10 - 9.20
		FICHIER :	Comp15756-09-07-11.xls

Compression non drainée

Longueur initiale, Hi (mm) :	93.24	Volume initial, Vi (cm³) :	188.24	Section initiale, Ai (cm²) :	20.19	Vit. déformation (mm/min) :	0.8
Longueur finale, Hf (mm) :	79.70	Volume final, Vf (cm³) :	188.24	Section finale, Af (cm²) :	23.62		

No.	Lectures ΔL (0,01mm)	Lectures Fa (N)	Déformation ΔH/Hi (%)	Section (cm²)	Résistance en compression, Uc (kPa)	Résultats
1	546	9.0	0.00%	20.19	4	
2	570	17.0	0.26%	20.24	8	Rupture :
3	601	30.0	0.59%	20.31	15	
4	638	37.0	0.99%	20.39	18	Uc (kPa) : 28 kPa
5	690	45.0	1.54%	20.51	22	ΔH/Hi (%) : 3.05 %
6	771	57.0	2.41%	20.69	28	
7	830	59.0	3.05%	20.82	28	
8	855	57.0	3.31%	20.88	27	
9	933	53.0	4.15%	21.06	25	
10	1015	50.0	5.03%	21.26	24	
11	1097	48.0	5.91%	21.46	22	Caractéristiques physiques :
12	1178	46.0	6.78%	21.66	21	
13	1259	45.0	7.65%	21.86	21	Teneur en eau initiale : 37.30 %
14	1420	44.0	9.37%	22.28	20	
15	1570	43.0	10.98%	22.68	19	Masse volumique humide : 1942 kg/m³
16	1580	43.0	11.09%	22.71	19	Masse volumique sèche : 1414 kg/m³
17	1600	43.0	11.30%	22.76	19	
18	1700	42.5	12.38%	23.04	18	
19	1800	42.0	13.45%	23.33	18	Teneur en eau finale : 36.97 %
20	1900	42.0	14.52%	23.62	18	



Remarques :

Réalisé par : A. Bustamante
date : 2009-11-02

Vérifié par : Hélène Bilodeau, ing.
date : 2009-11-12

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2493

File Number	**: F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: ------
City	: Baie-Comeau (Québec)	Uses	: ------
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	**: 09-2302**	Source	: 09-07, SS-13, Depth.: 10,4 to 11,0 m.
Sample No.	: ------	Tests completed on	: 2009-10-18

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	% Gravel:	1,0
C.U.	% Sand:	69
Unified Classification:	% Silt:	17
Fineness Module: 0,96	% Clay:	13

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements
Atterberg Limits (3pts)	BNQ2501-092		
Liquid Limit (%):		20	------
Plastic Limit (%):		16	------
Plasticity index (%):		4	------
Water Content (%):	LC21-201	22,49	------

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: ______________ 2009-10-21
Sylvie Daigle, Tech.

Verified by: ______________ 2009-10-21
Sonya Graveline, Ing.

SM*i*
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
10,0	100
5,00	99
2,500	98
1,250	96
0,630	92
0,3150	78,0
0,1600	41,0
0,0941	32,3
0,0672	28,5
0,0479	26,6
0,0340	25,6
0,0216	23,7
0,0127	22,8
0,0090	20,9
0,0063	19,9
0,0044	18,0
0,0032	16,1
0,0013	10,4

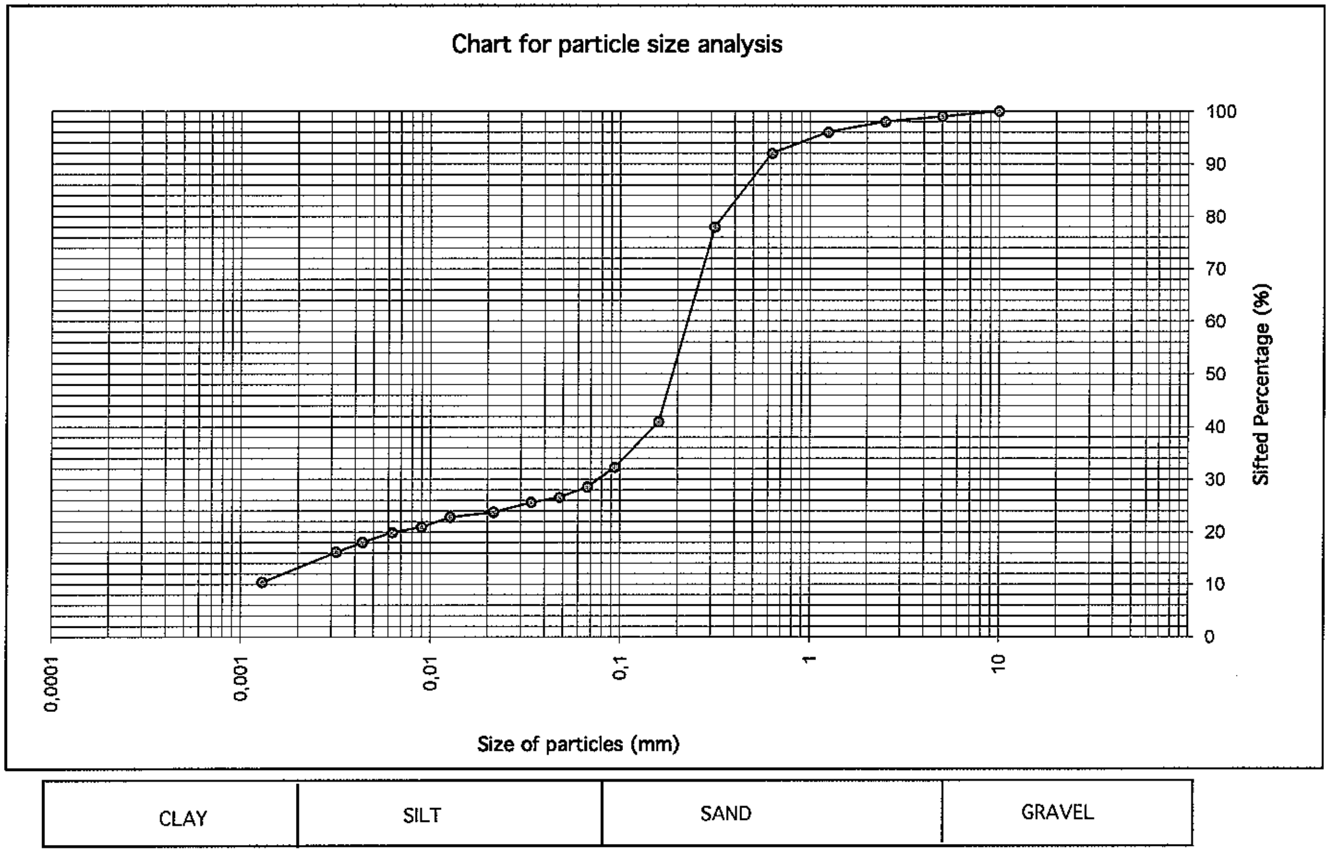


Chart for particle size analysis

Project: New Baie-Comeau wharf
Laboratory No. : 09-2302
Type of material: Sand, some silt & clay, traces gravel.

File #: **F099382200**
Source: Material on site, 09-07, SS-13, Depth: 10,4 to 11,0 m.

Customer: **Alcoa**
Approuved by : ______
Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMI
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2502

File Number	: **F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: ------
City	: Baie-Comeau (Québec)	Uses	: ------
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	: **09-2303**	Source	: 09-07, SS-17, Depth.: 14,2 to 14,8 m.
Sample No.	: ------	Tests completed on	: 2009-10-19

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 3,307
C.U. 12,605
Unified Classification:
Fineness Module: 0,59

% Gravel:
% Sand: 67
% Silt: 29
% Clay: 4

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

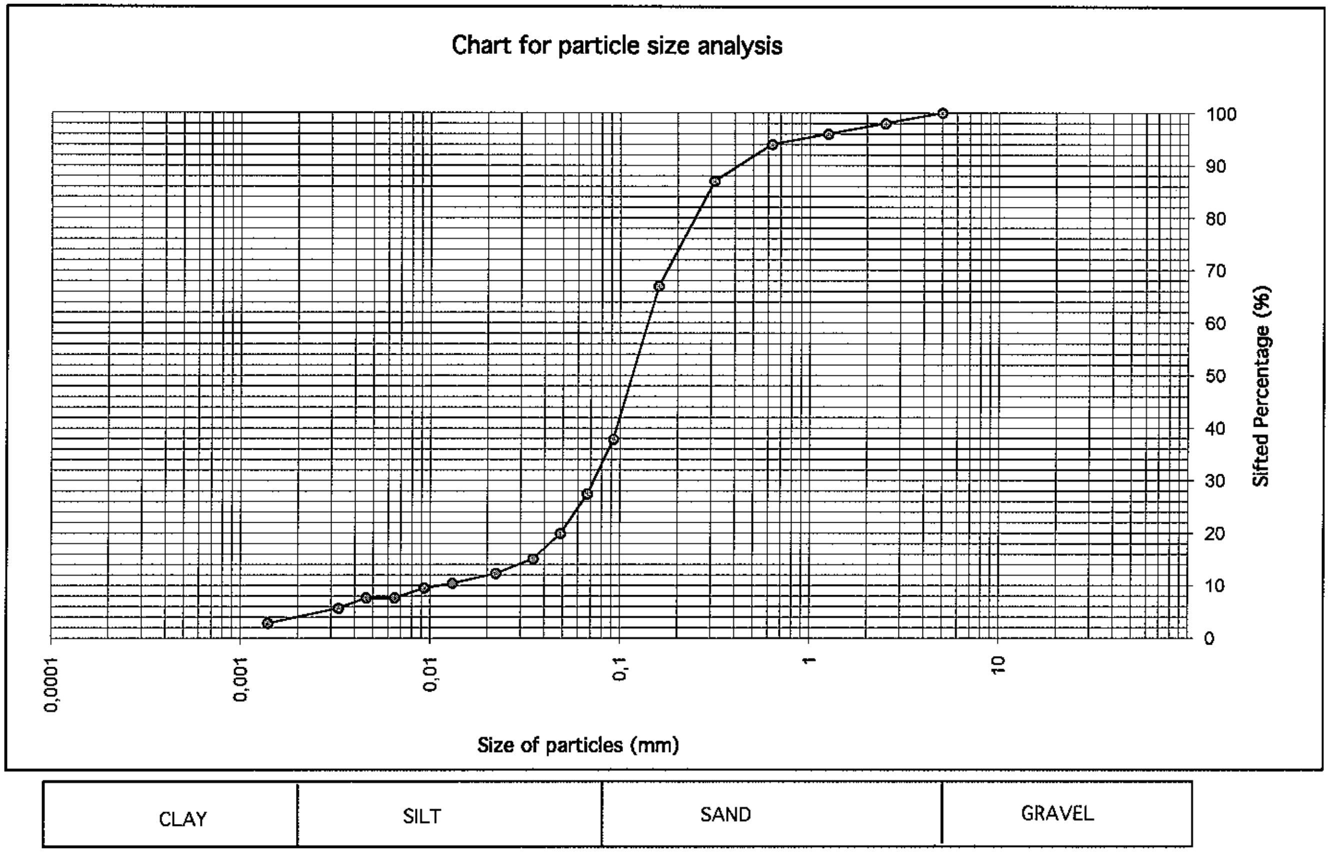
Remarks: See following chart for sediments analysis.

Prepared by: ____________ 2009-10-21
Sylvie Daigle, Tech.

Verified by: ____________ 2009-10-21
Sonya Graveline, Ing.

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
5,00	100
2,500	98
1,250	96
0,630	94
0,3150	87,0
0,1600	67,0
0,0922	37,8
0,0674	27,4
0,0488	19,9
0,0350	15,1
0,0223	12,3
0,0131	10,4
0,0093	9,5
0,0065	7,6
0,0046	7,6
0,0033	5,7
0,0014	2,8



Project: New Baie-Comeau wharf

Laboratory No. : 09-2303

Type of material: Silty sand, traces clay.

File #: **F099382200**

Source: Material on site, 09-07,SS-17, Depth: 14,2 to 14,8 m.

Customer: **Alcoa**

Approuved by : ______ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3099

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2930**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-07B, SS-4 Depth: 22,7 to 23,3 m.
Tests completed on : 2009-12-01

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 3,469
C.U. 16,27
Unified Classification:
Fineness Module: 1,32

% Gravel:
% Sand: 81
% Silt: 15
% Clay: 4

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

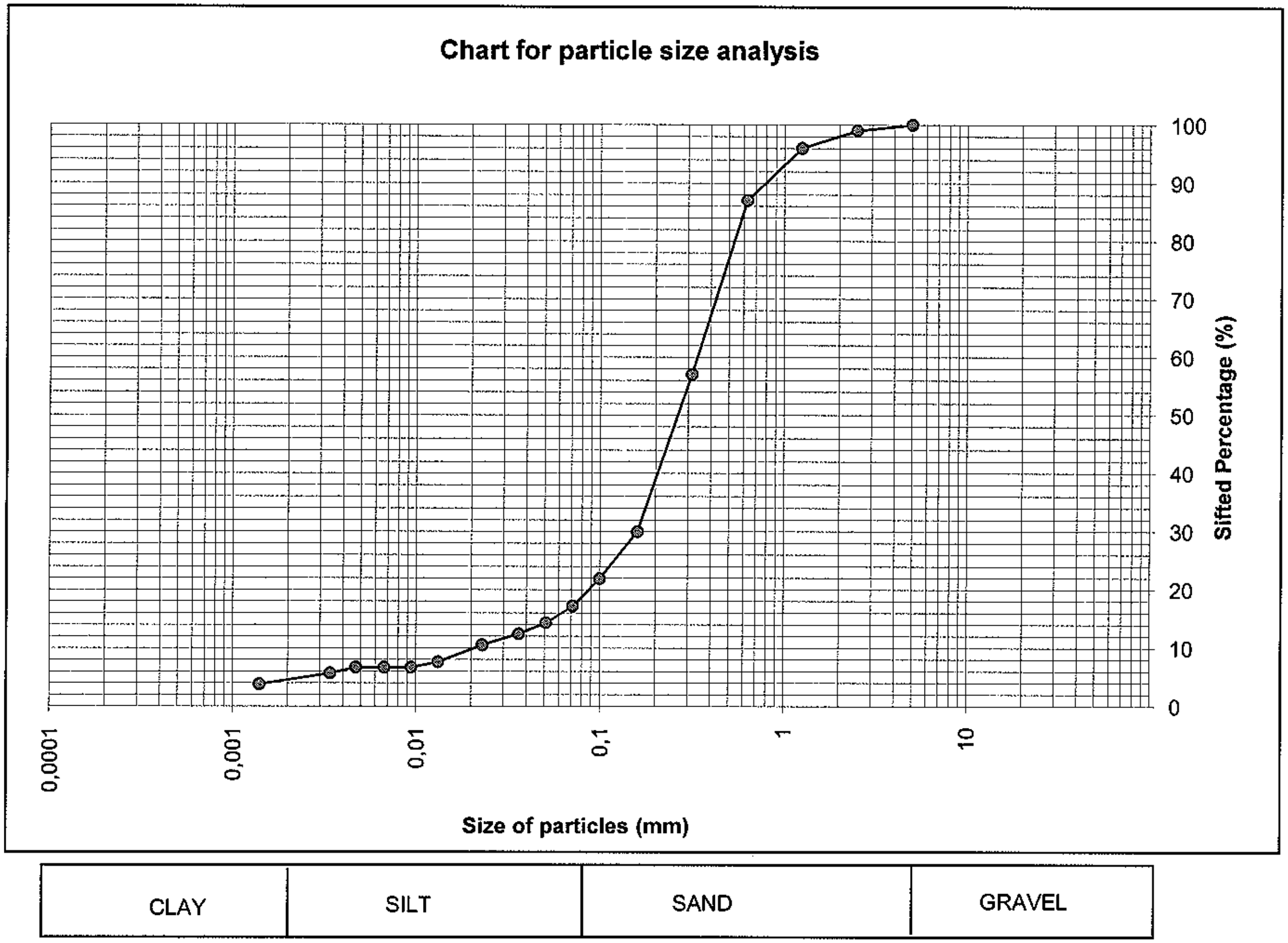
Prepared by: 2009-12-07
Sylvie Daigle, Tech.

Verified by: 2009-12-07
Sonya Graveline, Ing.

SM*i*

LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
5,0	100
2,5	99
1,250	96
0,630	87
0,3150	57
0,1600	30
0,0996	21,9
0,0714	17,2
0,0510	14,3
0,0363	12,4
0,0230	10,5
0,0132	7,6
0,0094	6,7
0,0067	6,7
0,0047	6,7
0,0034	5,7
0,0014	3,8



Project: New Baie-Comeau wharf

Laboratory No. : 09-2930

Type of material: Sand,some silt,traces clay

File #: **F099382200**

Source: Material on site, 09-07B,SS-4, Depth: 22,7 to 23,3 m.

Customer: **Alcoa**

Approuved by :__________ Date : __________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3088

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2933**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-07B, SS-8, Depth.: 29,2 to 29,5 m.
Tests completed on : 2009-12-01

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	0,686	% Gravel:	28,0
C.U.	12,66	% Sand:	66
Unified Classification:		% Silt:	6
Fineness Module: 3,14		% Clay:	

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

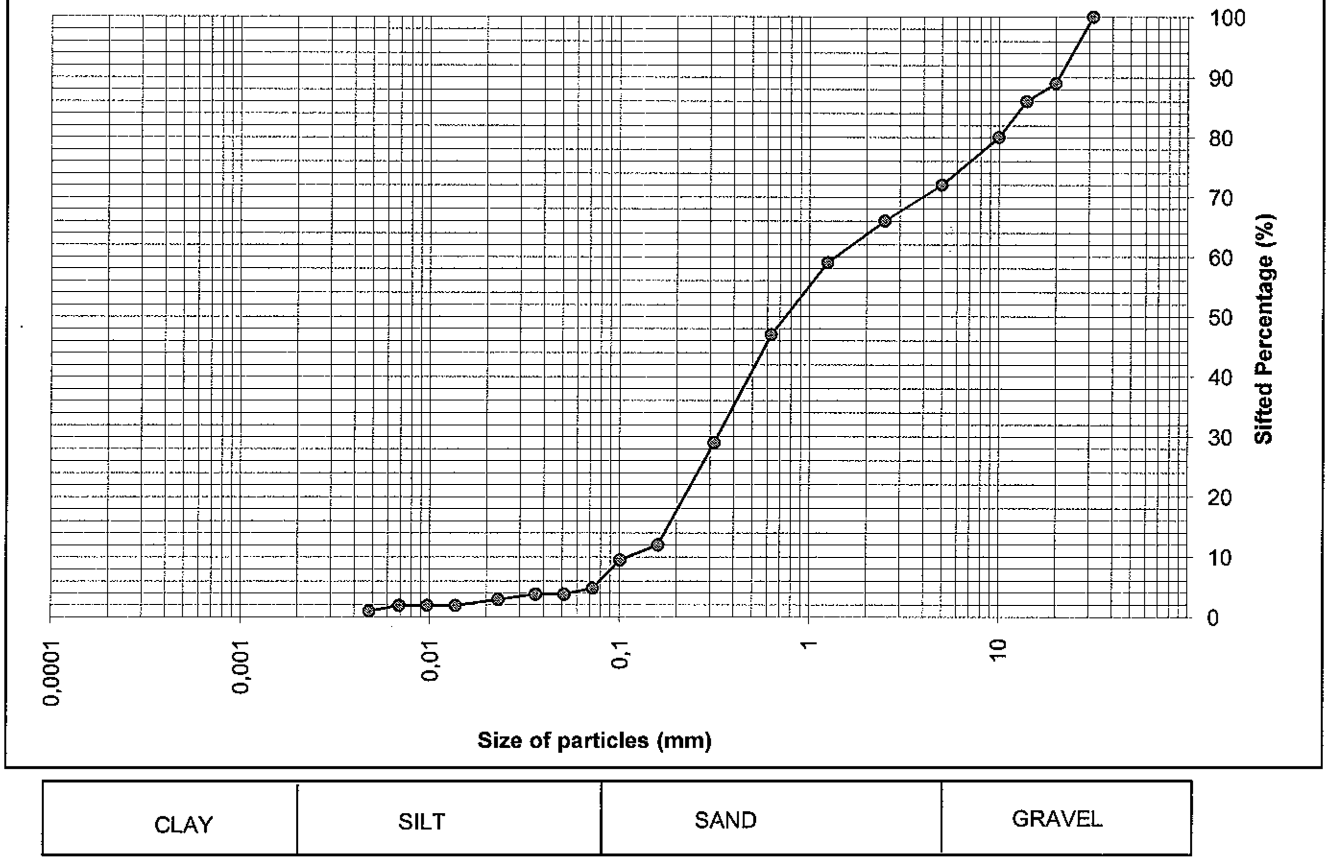
Prepared by: 2009-12-08
Sylvie Daigle, Tech.

Verified by: 2009-12-08
Sonya Graveline, Ing.

SM
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
31,5	100
20,0	89
14,0	86
10,0	80
5,0	72
2,5	66
1,250	59
0,630	47
0,3150	29
0,1600	12
0,1010	9,5
0,0724	4,8
0,0513	3,8
0,0363	3,8
0,0230	2,9
0,0137	1,9
0,0097	1,9
0,0069	1,9
0,0048	1,0

Chart for particle size analysis



Project: New Baie-Comeau wharf
Laboratory No. : 09-2933
Type of material: Gravely sand,traces silt.

File #: **F099382200**
Source: Material on site, 09-07B, SS-8, Depth: 29,2 to 29,5 m.

Customer: **Alcoa**
Approuved by :_______________ Date : __________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3097

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2932**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-07B, SS-13, Depth.: 42,2 to 42,8 m.
Tests completed on : 2009-12-01

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	1,274	% Gravel:	31
C.U.	14,19	% Sand:	51
Unified Classification:		% Silt:	16
Fineness Module: 2,41		% Clay:	2

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: 2009-12-08
Sylvie Daigle, Tech.

Verified by: 2009-12-08
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
31,5	100
20,0	70
14,0	70
10,0	70
5,0	69
2,5	68
1,250	67
0,630	66
0,3150	55
0,1600	34
0,0947	22,5
0,0694	14,6
0,0496	11,9
0,0353	10,6
0,0225	8,0
0,0134	6,0
0,0095	5,3
0,0068	4,6
0,0048	4,0
0,0034	3,3
0,0014	2,0

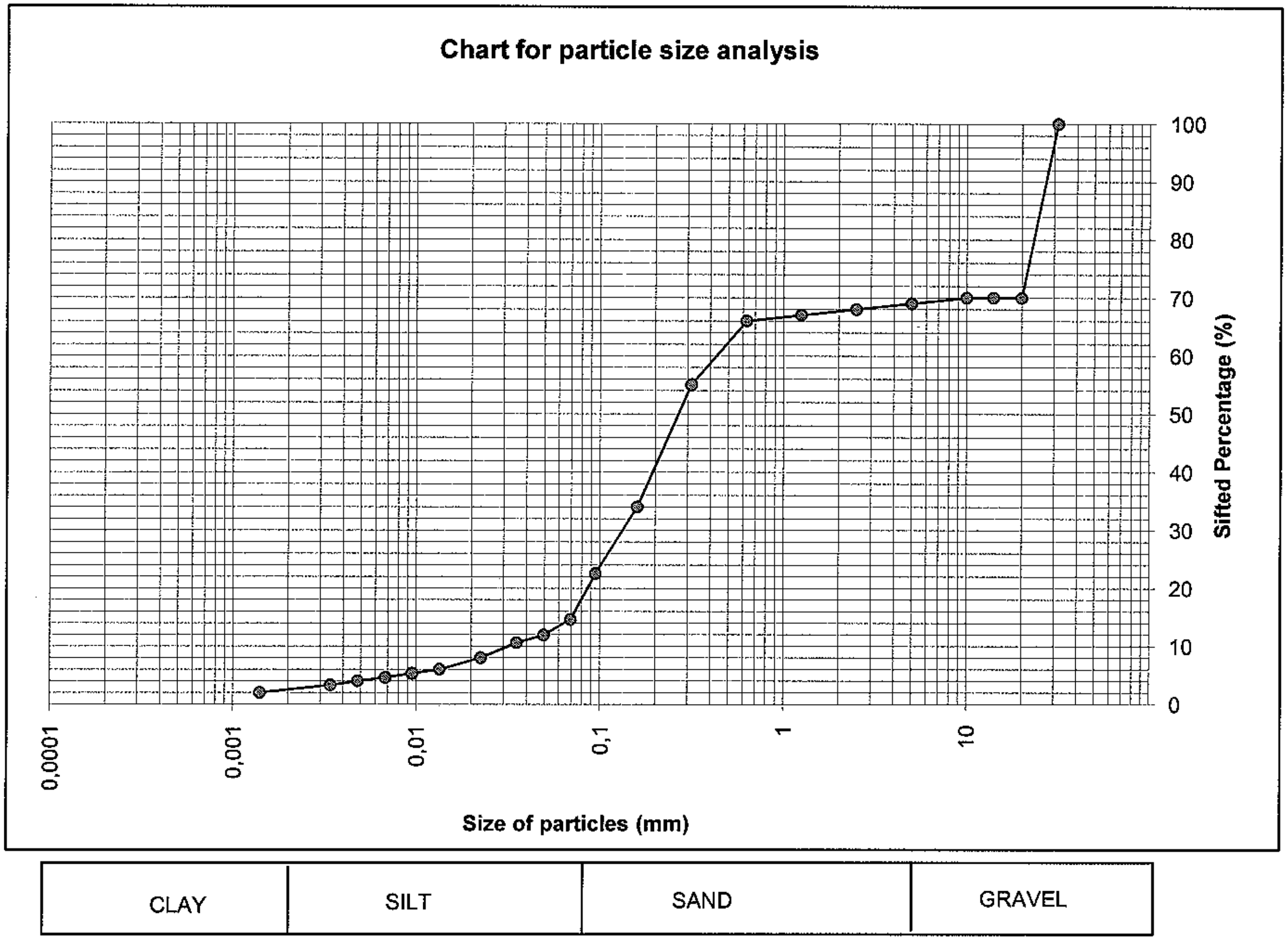


Chart for particle size analysis

Project: New Baie-Comeau wharf

Laboratory No. : 09-2932

Type of material: Gravely sand,some silt,traces clay.

File #: **F099382200**

Source: Material on site, 09-07B, SS-13, Depth: 42,2 to 42,8 m.

Customer: **Alcoa**

Approuved by :________________ Date : __________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.
740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3089

File Number	: **F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: ------
City	: Baie-Comeau (Québec)	Uses	: ------
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	: **09-2931**	Source	: 09-07B, SS-17, Depth.: 54,2 to 54,8 m.
Sample No.	: ------	Tests completed on	: 2009-12-01

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	2,08	% Gravel:	23,0
C.U.	18,51	% Sand:	52
Unified Classification:		% Silt:	21
Fineness Module: 1,96		% Clay:	4

Legend : *** =Results not in conformity**

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Remarks: **See following chart for sediments analysis.**

Prepared by: ______________ 2009-12-08
Sylvie Daigle, Tech.

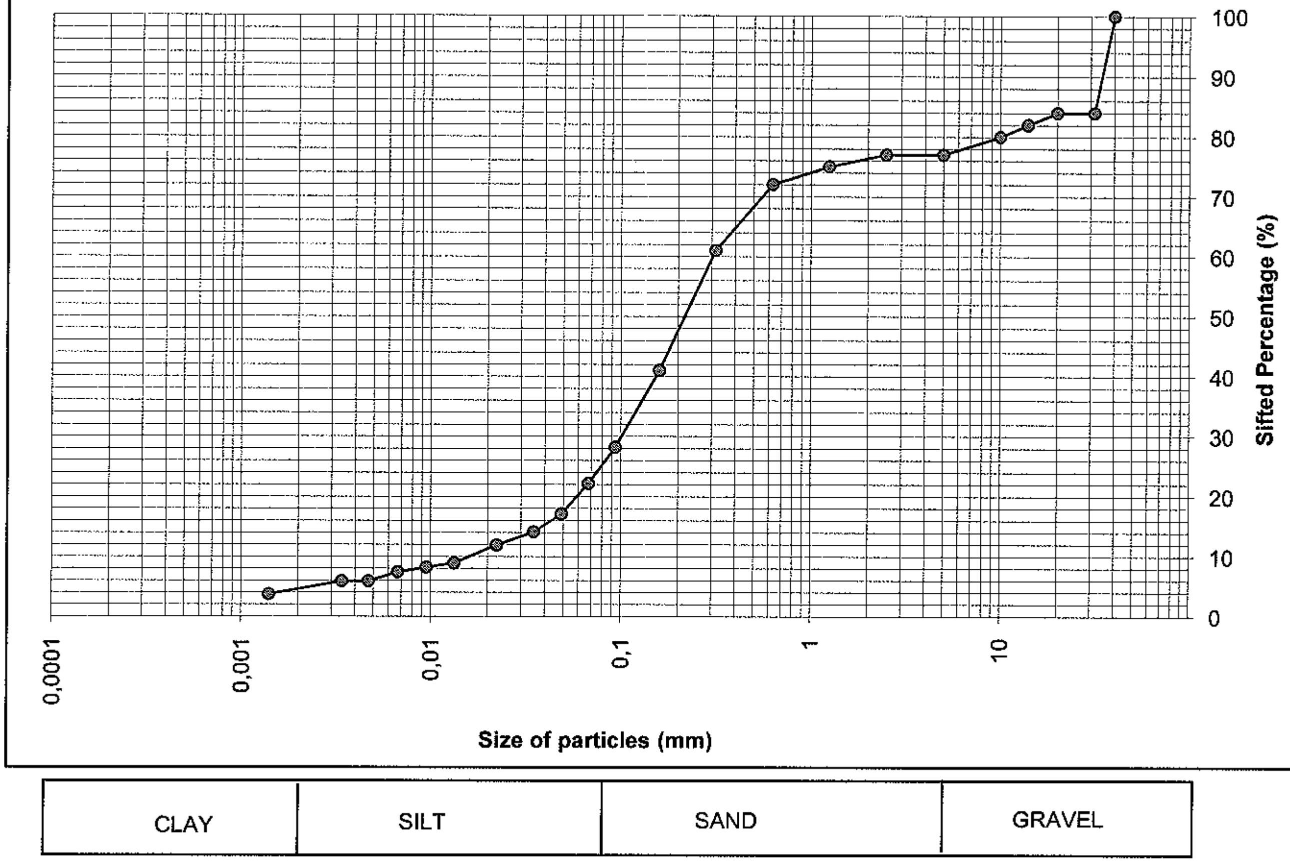
Verified by: ______________ 2009-12-08
Sonya Graveline, Ing.

SM*i*

LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
40,0	100
31,5	84
20,0	84
14,0	82
10,0	80
5,0	77
2,5	77
1,250	75
0,630	72
0,3150	61
0,1600	41
0,0937	28,2
0,0677	22,2
0,0489	17,1
0,0350	14,1
0,0223	11,9
0,0133	8,9
0,0095	8,2
0,0067	7,4
0,0047	5,9
0,0034	5,9
0,0014	3,7

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2931

Type of material: Gravely & silty sand,traces clay

File #: **F099382200**

Source: Material on site, 09-07B, SS-17, Depth: 54,2 to 54,8 m.

Customer: **Alcoa**

Approuved by :_______________ Date : _________

'FLS-079 (06-2007) rév. 1

SM Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-08
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 1 of 4
LOCATION OF BOREHOLE: X : 258813,48 Y : 5457051,75		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL**NX/HQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -10.49	**BORING DATE** **START:** 2009-09-26 06:30:00	**END:** 2009-09-27 16:30:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◫	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value
Nd:	DCPT Nd-Value
Su:	Field Vane
GSA:	Grain size analysis
CU:	Uniformity coefficient
W:	Water Content
Wp:	Plastic limit
Wl:	Liquid limit
Ip:	Plasticity index:
D:	Specific density
Cu:	Swedish cone
C:	Consolidation
PP:	Preconsolidation pressure
Cc:	Compression index
Ccr:	Recompression Index
UC:	Unconfined compression
DS:	Direct shear
Phi':	Angle of internal friction
c':	Cohesion
CUT:	Consolidation undrained triaxial

Water level

Date:	Time:	Elev.(m):

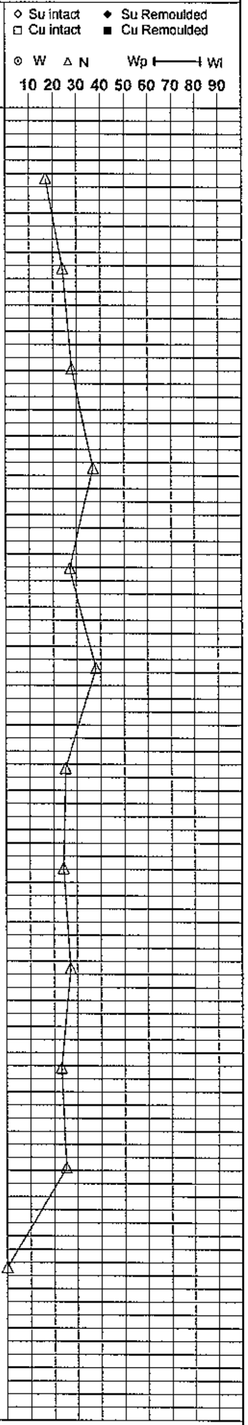
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth -10.49	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
	0.00	Gray sand with some silt and trace gravel; occasionnally sea shell; medium dense to dense		☒	SS-1	B	96	17	10-8-9-9		
1				☒	SS-2	B	67	24	7-11-13-13		
2				☒	SS-3	B	62	28	11-15-13-19		
3				☒	SS-4	B	54	37	15-17-20-23		
				☒	SS-5	B	67	27	8-12-15-19		
4				☒	SS-6	B	38	38	10-18-20-20		
5				☒	SS-7	B	79	25	7-12-13-14		
6				☒	SS-8	B	62	24	12-10-14-14		GSA, CU=3.8
				☒	SS-9	B	21	27	9-13-14-21		Combined SS-9/10: GSA, DS, CU=3.0, Phi'=XXX, c'=0
7				☒	SS-10	B	62	23	11-11-12-17		
8	-18.64 8.15	Gray gravelly silty sand, some clay; dense		☒	SS-11	B	83	25	11-14-11-6		GSA, CU=146
9	-18.95 8.46	Gray clayey silt, some sand occasionally stratified with thin layers of sand; firm to stiff		■	SS-12	B	0	0	0-0-0-0		



Notes:

Approved by :
Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-08
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 2 of 4
LOCATION OF BOREHOLE: X : 258813,48 Y : 5457051,75		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL** NX/HQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -10.49	**BORING DATE START:** 2009-09-26 06:30:00	**END:** 2009-09-27 16:30:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◫	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value
Nd:	DCPT Nd-Value
Su:	Field Vane
GSA:	Grain size analysis
CU:	Uniformity coefficient
W:	Water Content
Wp:	Plastic limit
Wl:	Liquid limit
Ip:	Plasticity index:
D:	Specific density
Cu:	Swedish cone
C:	Consolidation
PP:	Preconsolidation pressure
Cc:	Compression index
Ccr:	Recompression index
UC:	Unconfined compression
DS:	Direct shear
Phi':	Angle of internal friction
c':	Cohesion
CUT:	Consolidation undrained triaxial

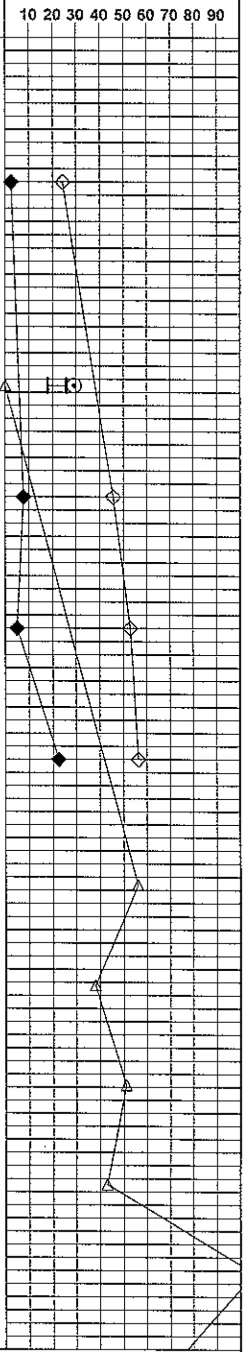
Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY | SAMPLES | LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
				▨	ST-13		100				ST-13: GSA, CUT CU=XXX, D= 2.73, W=xxx, Wp=xxx, Wl=xxx, Ip=xxx, UC=45kPa
11											
				▨	ST-14		96				ST-14: GSA,C, DS CU=XXX, W=xxx, Wp=xxx, Wl=xxx, Ip=xxx, UC=39kPa, PP=98 kPa, Ccr=0.046, Phi'=25.6°, c'6.8kPa
12											
				☒	SS-15	B	100	0	0-0-0-0		SS-15: GSA, CU>15, W=29.4%, Wp=18%, Wl=26%, Ip=8%
13											
14											
15											
	-26.19 15.70	Gray sand with some silt, trace gravel and clay; dense			ST-16		0		/refusal		
16											
				☒	SS-17	B	58	56	34-27-29-28		
17											
				☒	SS-18	B	50	38	27-20-18-18		
18				☒	SS-19	B	50	51	27-28-23-30		
				☒	SS-20	B	54	43	23-21-22-29		
19											
				☒	SS-21	B	47	106	50-55-51 /refusal		GSA, CU=16.3
	-30.30 19.81	Cobbles up to 170mmØ									



Notes:

Approved by :
Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-08
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 3 of 4
LOCATION OF BOREHOLE: X : 258813,48 Y : 5457051,75		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL** NX/HQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -10.49	**BORING DATE START:** 2009-09-26 06:30:00	**END:** 2009-09-27 16:30:00	

Type of Sampler

SS: Split Spoon
DC: Diamond Core
WS: Wash Sample
HT: Hydraulic Trust
HW: Hammer Weight
SP: Shelby and Piston
AS: Auger Sampler
ST: Thin Walled Shelby Tube

☒ Remouled
▨ Intact
■ Lost
◨ Rock Core

Laboratory and in situ tests - Parameters

N: SPT N-Value
Nd: DCPT Nd-Value
Su: Field Vane
GSA: Grain size analysis
CU: Uniformity coefficient
W: Water Content
Wp: Plastic limit
Wl: Liquid limit

Ip: Plasticity index:
D: Specific density
Cu: Swedish cone
C: Consolidation
PP: Preconsolidation pressure
Cc: Compression index
Ccr: Recompression index
UC: Unconfined compression

DS: Direct shear
Phi': Angle of internal friction
c': Cohesion
CUT: Consolidation undrained triaxial

Water level

Date: Time: Elev.(m):

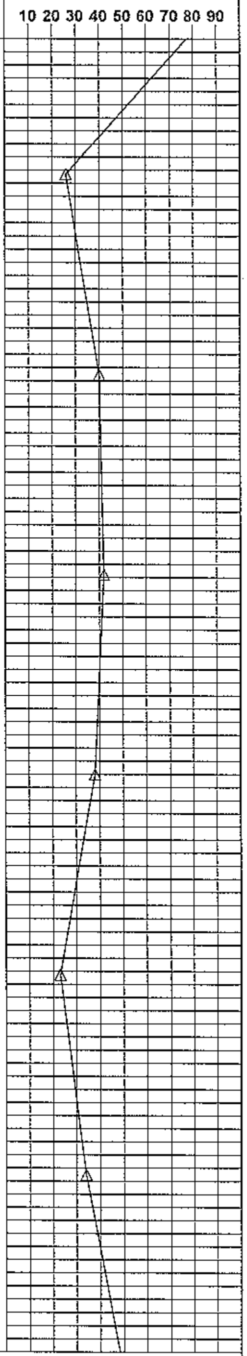
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
			DC-22	NX	100				
			DC-23	HQ	100				
			DC-24	HQ	100				
	-31.09 20.60	Gray sand with some silt and trace clay and gravel; dense							
21			SS-25	B	62	26	11-10-16-17		
22			SS-26	B	71	40	16-18-22-28		GSA, CU=25.4
23									
24			SS-27	B	25	42	22-18-24-23		
25			SS-28	B	54	38	15-18-20-27		
26									
27			SS-29	B	46	23	16-13-10-12		
28	-38.38 27.89	Gray silty sand stratified with layers of sand; dense	SS-30	N	100	34	5-12-22-27		
29	-39.45 28.96	Gravel and cobbles							
	-40.36								



Notes:

Approved by :
Sonya Graveline, ing.

SM Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-08
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 4 of 4
LOCATION OF BOREHOLE: X : 258813,48 Y : 5457051,75		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL** NX/HQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -10.49	**BORING DATE** **START:** 2009-09-26 06:30:00 **END:** 2009-09-27 16:30:00		

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◧	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

Water level

Date:	Time:	Elev.(m):

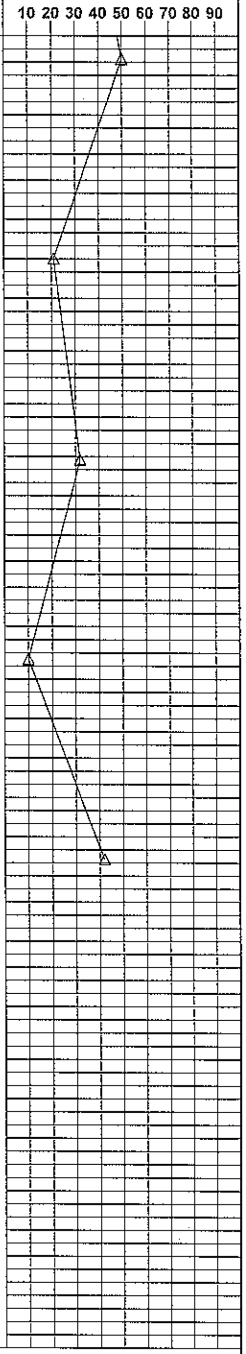
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
		Gray sand with some silt stratified with thin layers of sand; dense		☒	SS-31	B	46	50	14-20-30-26		
31											
				☒	SS-32	B	75	21	18-11-10-11		
32											
	-42.95 32.46	Gray gravelly sand, some silt and clay stratified with thin layers of sand; dense									
33											
				☒	SS-33	B	50	32	22-18-14-20		
34											
				☒	SS-34	B	25	10	5-4-6-23		GSA, CU=10.4
35											
36											
				☒	SS-35	N	54	42	26-21-21-22		
	-47.07 36.58	End of borehole because of bad weather conditions									
37											
38											
39											



Notes:

Approved by :
Sonya Graveline, ing.

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2553

File Number	**: F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: ------
City	: Baie-Comeau (Québec)	Uses	: ------
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	**: 09-2348**	Source	: 09-08A, SS-8, Depth.: 5,5 to 6,0 m.
Sample No.	: ------	Tests completed on	: 2009-10-21

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 0,725
C.U. 3,808
Unified Classification:
Fineness Module: 1,54

% Gravel: 12
% Sand: 72
% Silt: 16
% Clay:

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: 2009-10-21
Sylvie Daigle, Tech.

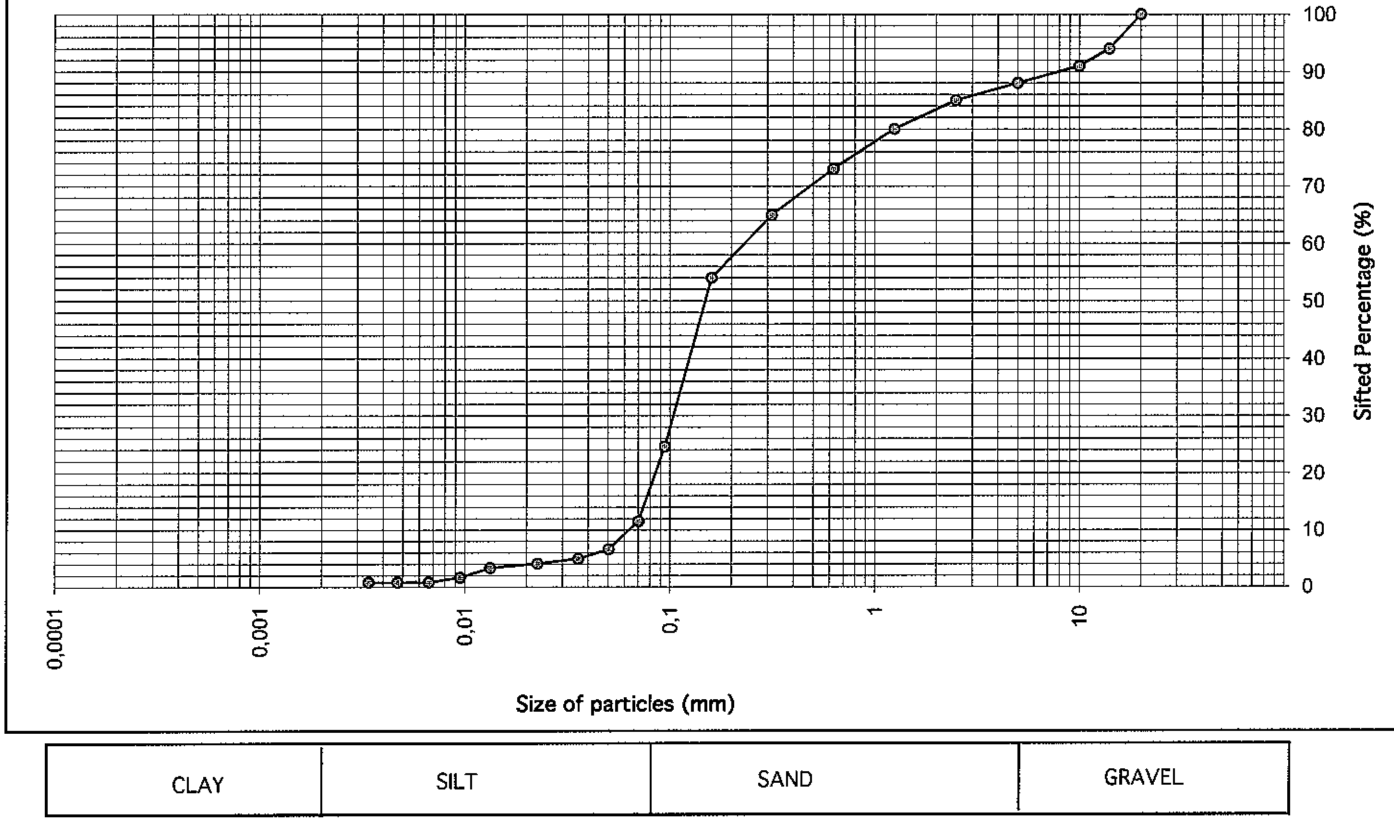
Verified by: 2009-10-21
Sonya Graveline, Ing.

SMi
LABO S.M. INC.

Sediments Analysis
NQ 2501-025

Size (mm)	% Sifted (%)
20,0	100
14,0	94
10,0	91
5,0	88
2,5	85
1,250	80
0,630	73
0,3150	65
0,1600	54
0,0947	24,6
0,0703	11,5
0,0504	6,6
0,0358	4,9
0,0227	4,1
0,0133	3,3
0,0095	1,6
0,0067	0,8
0,0047	0,8
0,0034	0,8

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2348

Type of material: Sand,some silt & gravel.

File #: **F099382200**

Source: Material on site, 09-08A,SS-8, Depth: 5,5 to 6,0 m.

Customer: **Alcoa**

Approuved by : ______ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3177

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-3000**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-08, SS-9 & SS-10, Depth.: 6,2 to 7,6 n
Tests completed on : 2009-12-01

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	1,469	% Gravel:	1
C.U.	2,981	% Sand:	79
Unified Classification:		% Silt:	19
Fineness Module: 0,71		% Clay:	1

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: ____________ 2009-12-08
Sylvie Daigle, Tech.

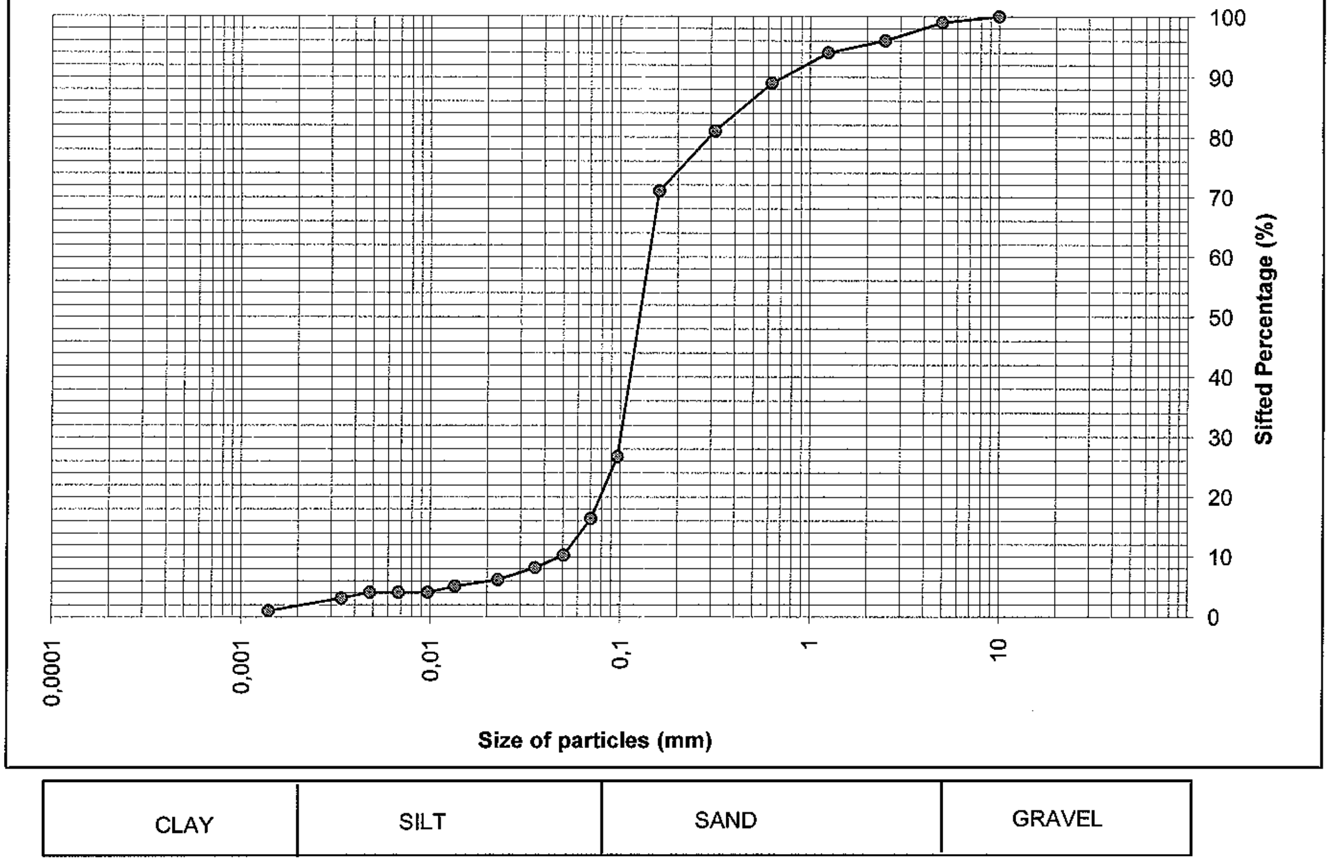
Verified by: ____________ 2009-12-08
Sonya Graveline, Ing.

SM*i*

LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
10,0	100
5,0	99
2,5	96
1,250	94
0,630	89
0,3150	81
0,1600	71
0,0966	26,7
0,0702	16,4
0,0505	10,3
0,0358	8,2
0,0228	6,2
0,0135	5,1
0,0097	4,1
0,0068	4,1
0,0048	4,1
0,0034	3,1
0,0014	1,0

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-3000

Type of material: Sand, some silt,traces clay & gravel.

File #: **F099382200**

Source: Material on site, 09-08, SS-9 & SS-10, Depth: 6,2 to 7,6 m.

Customer: **Alcoa**

Approuved by :________________ Date : _________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMI
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2552

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2349**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-08A, SS-11, Depth.: 8,2 to 8,4 m.
Tests completed on : 2009-10-21

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	6,874	% Gravel:	24
C.U.	146,24	% Sand:	36
Unified Classification:		% Silt:	29
Fineness Module:	1,83	% Clay:	11

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: 2009-10-21
Sylvie Daigle, Tech.

Verified by: 2009-10-21
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
40,0	100
31,5	76
20,0	76
14,0	76
10,0	76
5,0	76
2,5	76
1,250	75
0,630	73
0,3150	66
0,1600	52
0,0873	41,6
0,0641	33,4
0,0464	27,5
0,0333	24,5
0,0213	21,5
0,0125	20,0
0,0089	18,6
0,0063	17,8
0,0045	16,3
0,0032	14,1
0,0013	8,9

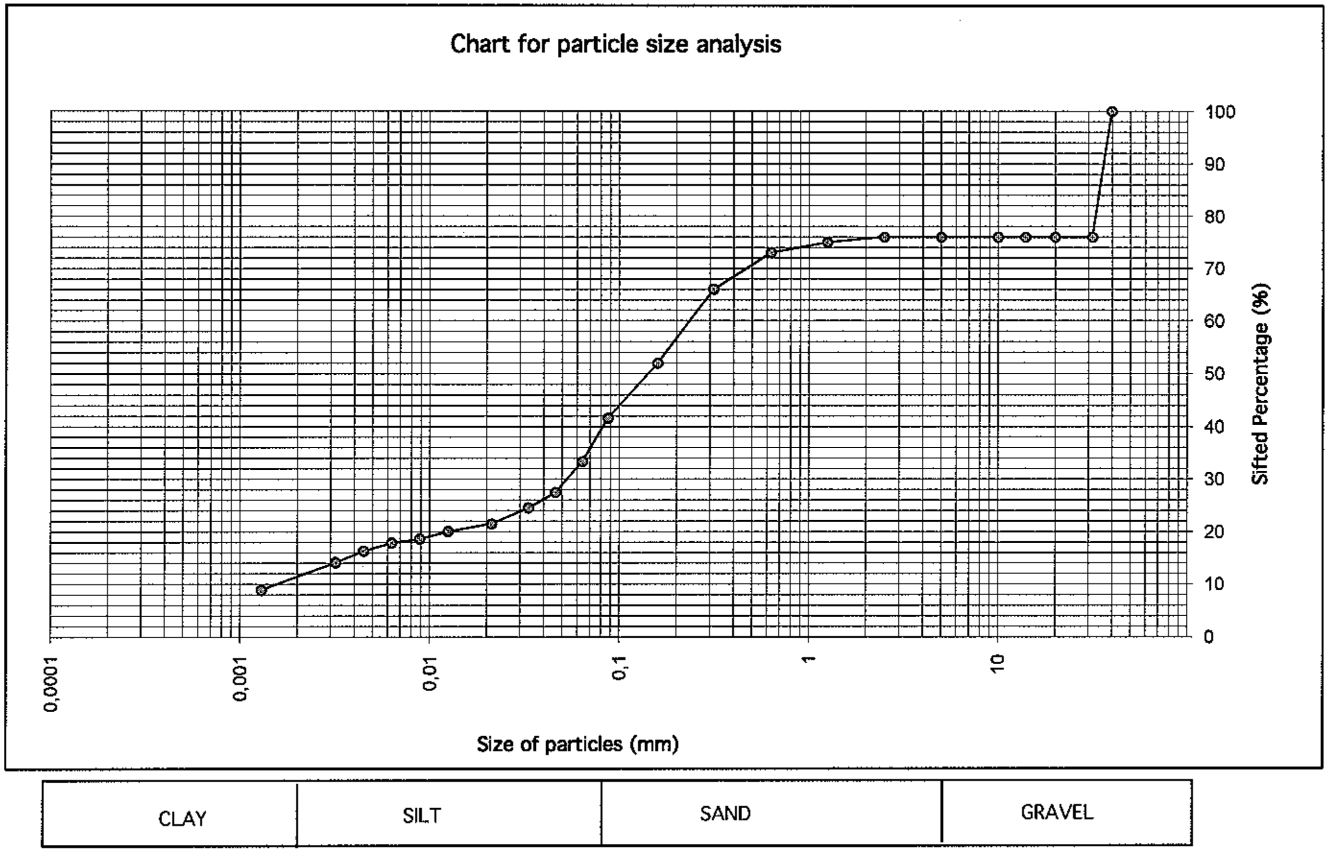


Chart for particle size analysis

Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2349

Type of material: Gravelly silty sand, some clay.

Source: Material on site, 09-08A,SS-11, Depth: 8,2 to 8,4 m.

Approuved by :________ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

QUÉFORMAT LTÉE

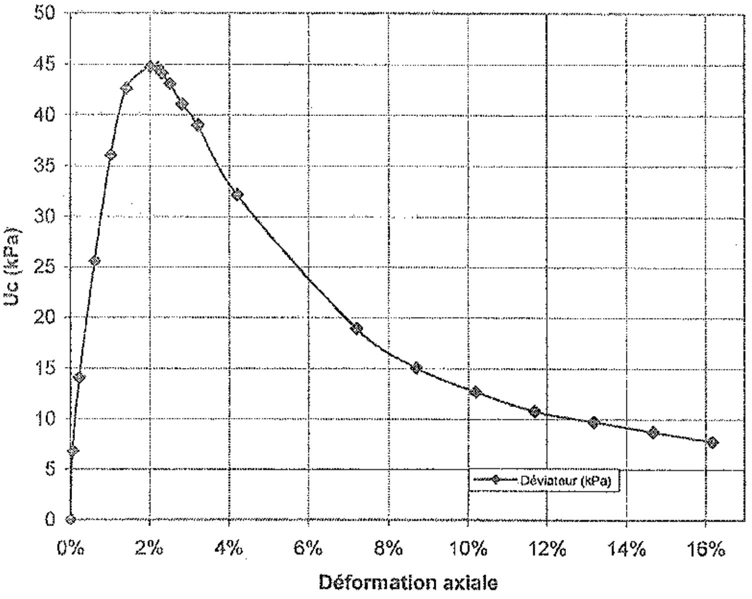
COMPRESSION NON CONSOLIDÉE - ASTM D2166-06

DOSSIER :	15756-G	SONDAGE :	BH-09-08A
CLIENT :	Labo S.M. inc.	ECHANT. :	ST-13
PROJET :	ALCOA / F099382-100	PROF. (m) :	10.50 - 10.60
		FICHIER :	Comp15756-09-08A-13.xls

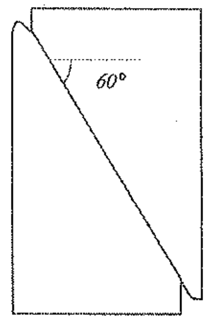
Compression non drainée

Longueur initiale, Hi (mm) :	100.29	Volume initial, Vi (cm³) :	206.60	Section initiale, Ai (cm²) :	20.60	Vit. déformation (mm/min) :	0.8
Longueur finale, Hf (mm) :	84.07	Volume final, Vf (cm³) :	206.60	Section finale, Af (cm²) :	24.57		

No.	Lectures ΔL (0,01mm)	Lectures Fa (N)	Déformation ΔH/Hi (%)	Section (cm²)	Résistance en compression, Uc (kPa)	Résultats
1	1578	0	0.00%	20.60	0	
2	1583	14	0.05%	20.61	7	**Rupture :**
3	1600	29	0.22%	20.65	14	
4	1640	53	0.62%	20.73	26	Uc (kPa) : 45 kPa
5	1680	75	1.02%	20.81	36	ΔH/Hi (%) : 2.21 %
6	1720	89	1.42%	20.90	43	
7	1780	94	2.01%	21.02	45	
8	1800	94	2.21%	21.07	45	**Caractéristiques physiques :**
9	1810	93	2.31%	21.09	44	
10	1830	91	2.51%	21.13	43	Teneur en eau initiale : 49.52 %
11	1860	87	2.81%	21.20	41	Masse volumique humide : 1745 kg/m³
12	1900	83	3.21%	21.28	39	Masse volumique sèche : 1167 kg/m³
13	2000	69	4.21%	21.51	32	Teneur en eau finale : 49.36 %
14	2300	42	7.20%	22.20	19	
15	2450	34	8.69%	22.56	15	
16	2600	29	10.19%	22.94	13	**Remarques :**
17	2750	25	11.69%	23.33	11	
18	2900	23	13.18%	23.73	10	Rapport hauteur/diamètre
19	3050	21	14.68%	24.14	9	de l'échantillon au montage = 2.0
20	3200	19	16.17%	24.57	8	



Croquis :



Réalisé par : A. Bustamante
date : 2009-11-30

Vérifié par : Hélène Bilodeau, ing.
date : 2009-12-03

QUÉFORMAT LTÉE

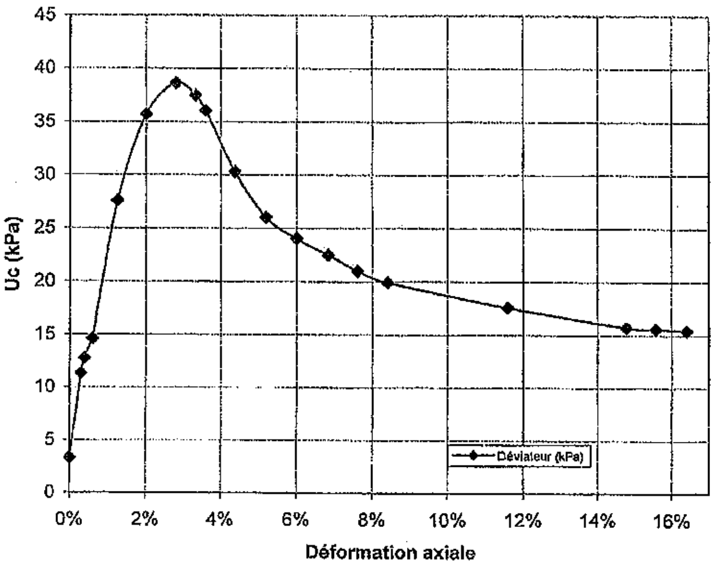
COMPRESSION NON CONSOLIDÉE - ASTM D2166

DOSSIER :	15756-G	SONDAGE :	BH-09-08A
CLIENT :	Labo S.M. Inc.	ECHANT. :	ST-14
PROJET :	ALCOA / F099382-100	PROF. (m) :	11.70 - 11.80
		FICHIER :	Comp15756-09-08A.xls

Compression non drainée

Longueur initiale, Hi (mm) :	101.92	Volume initial, Vi (cm³) :	215.41	Section initiale, Ai (cm²) :	21.14	Vit. déformation (mm/min) :	0.8
Longueur finale, Hf (mm) :	85.20	Volume final, Vf (cm³) :	215.41	Section finale, Af (cm²) :	25.28		

No.	Lectures ΔL (0,01mm)	Fa (N)	Déformation ΔH/Hi (%)	Section (cm²)	Résistance en compression, Uc (kPa)	Résultats
1	1870	7.0	0.00%	21.14	3	
2	1900	24.0	0.29%	21.20	11	Rupture :
3	1909	27.0	0.38%	21.22	13	
4	1931	31.0	0.60%	21.26	15	Uc (kPa) : 39 kPa
5	1931	31.0	0.60%	21.26	15	ΔH/Hi (%) : 2.80 %
6	1998	59.0	1.26%	21.40	28	
7	2075	77.0	2.01%	21.57	36	
8	2155	84.0	2.80%	21.74	39	
9	2210	82.0	3.34%	21.87	38	
10	2237	79.0	3.60%	21.93	36	
11	2317	67.0	4.39%	22.11	30	Caractéristiques physiques :
12	2400	58.0	5.20%	22.30	26	
13	2482	54.0	6.00%	22.49	24	Teneur en eau initiale : 43.57 %
14	2567	51.0	6.84%	22.69	22	
15	2646	48.0	7.61%	22.88	21	Masse volumique humide : 1800 kg/m³
16	2727	46.0	8.41%	23.08	20	Masse volumique sèche : 1254 kg/m³
17	3051	42.0	11.59%	23.91	18	
18	3377	39.0	14.79%	24.80	16	
19	3458	39.0	15.58%	25.04	16	Teneur en eau finale : 43.21 %
20	3542	39.0	16.41%	25.28	15	



Remarques :

Réalisé par : A. Bustamante
date : 2009-11-02

Vérifié par : Hélène Bilodeau, ing.
date : 2009-11-10

SM*i* LABO S.M. INC.

Rapport no. : *09LL1814*

Rapport D'essai

CONSOLIDATION OEDOMETRIQUE

ASTM D2435-90

No Dossier :	**F99382100**	Sondage :	**BH-09-08**	
Client :	**Alcoa**	Échantillon :	**ST-14**	
Adresse :	100, rue Maritime	Prof. (m) :	11,80	**11,80@11,90**
Ville :	Baie-Comeau (Québec)			
Code postal :	G4Z 2L6			
Projet no :	Usine Alcoa de Baie-Comeau/Nouveau quai			

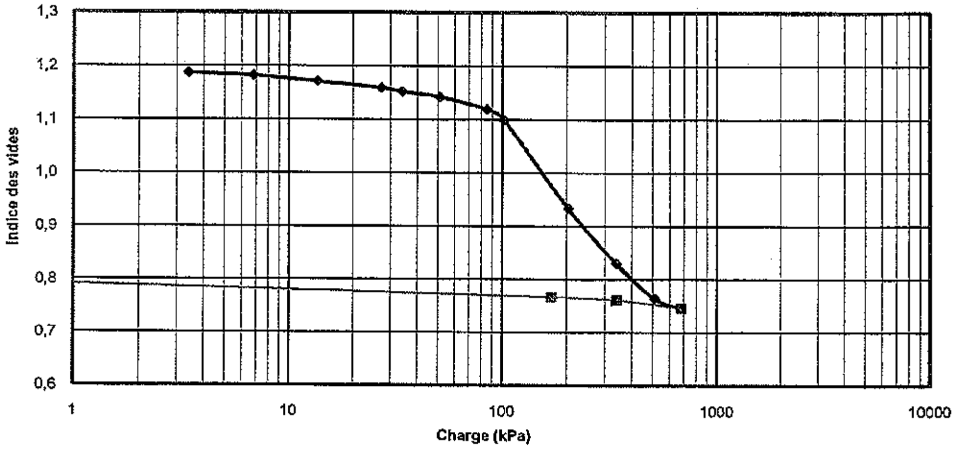
Analysé par : IG

Caractéristiques de l'anneau		
Numéro :		4
Masse :	(g)	107,15
Hauteur :	(mm)	25,40
Diamètre :	(mm)	63,44
Surface :	(cm^2)	31,61
Volume :	(cm^3)	80,29

Caractéristiques de l'appareil		
Numéro de l'appareil :		4
Calibration de l'extensomètre :	(div./mm)	500,00
Bras de levier :		10,97
Déformation = b * Pression ^ m		
Facteur de correction b :	(div)	10,00
Facteur de correction m :		0,50

Caractéristiques physiques		Initial	Final	Lavage
Numéro de la tare :		Anneau	Anneau	
Masse de la tare (anneau) :	(g)	107,15	107,15	
Masse du sol humide + tare :	(g)	251,02	237,83	
Masse du sol sec + tare :		207,90	207,90	
Masse du sol humide :	(g)	143,87	130,68	
Masse du sol sec :	(g)	100,75	100,75	
Teneur en eau du sol :	(%)	42,80	29,71	
Hauteur du sol humide :	(mm)	25,40	21,07	
Hauteur du sol sec :	(mm)	11,59	11,59	
Masse volumique humide :	(kg/m^3)	1 792	1 962	
Masse volumique sèche :	(kg/m^3)	1 255	1 513	
Indice des vides :		1,191	0,818	
Degré de saturation :	(%)	98,78	100,00	
Densité relative calculée :	Estimée	2,75	2,75	Calculée

Date (aaaa/mm/jj)	Heure (hh:mm)	Charge (kg)	Pression (kPa)	Lecture (0,002mm)	Correction de lecture	ΔH (mm)	Indice des vides	Hauteur (mm)	t50 (min)	Cv (m^2/s)
2009/10/24		0,00	0,00	0	0,0	0,00	1,191	25,40		
2009/10/25		0,10	3,40	29	4,4	0,05	1,187	25,35		
2009/10/26		0,20	6,81	61	8,8	0,10	1,182	25,30		
2009/10/27		0,40	13,61	132	15,8	0,23	1,171	25,17		
2009/10/28		0,80	27,23	215	27,4	0,38	1,159	25,02		
2009/10/29		1,00	34,03	263	33,0	0,46	1,152	24,94		
2009/10/29		1,50	51,05	324	39,0	0,57	1,142	24,83		
2009/10/30		2,50	85,08	470	50,3	0,84	1,119	24,56		
2009/10/31		3,00	102,10	592	55,5	1,07	1,099	24,33		
2009/11/01		6,00	204,20	1 576	77,0	3,00	0,933	22,40		
2009/11/02		10,00	340,34	2 189	95,8	4,19	0,830	21,21		
2009/11/03		15,00	510,51	2 593	115,1	4,98	0,764	20,44		
2009/11/04		20,00	680,67	2 709	129,5	5,16	0,746	20,24		
2009/11/05		15,00	510,51	2 643	115,1	5,06	0,755	20,34		
2009/11/06		10,00	340,34	2 593	95,8	4,99	0,761	20,41		
2009/11/07		5,00	170,17	2 532	71,5	4,92	0,767	20,48		
2009/11/08		0,00	0,00	2 163	0,0	4,33	0,818	21,07		



σ'p = 98 kPa
Cc = 0,5145
Cr = 0,0459

Remarques : Si aucune indication contraire n'est inscrit le CV est calculé selon la méthode Casagrande.

Préparé par : ____________________ Date : Vérifié par : ____________________ Date :

Isabelle Gauthier, tech. Chef labo

Salomon O'Ngandée, ing., M.Sc.A.

Notes : Le résultat s'applique exclusivement à l'échantillon analysé. Ce rapport ne doit pas être reproduit, sinon en entier, sans l'autorisation écrite de Labo S.M. inc.

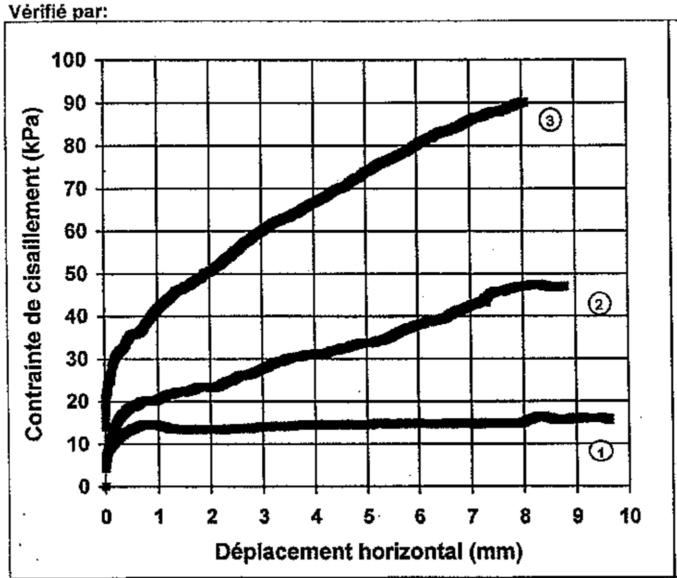
FLG-0204 02/10 rev. 0

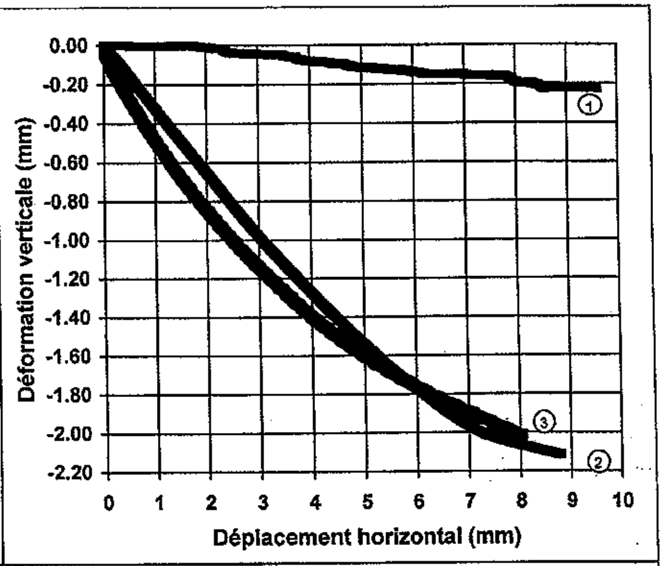
Qualitas

ESSAI DE CISAILLEMENT DIRECT ASTM D-3080-04

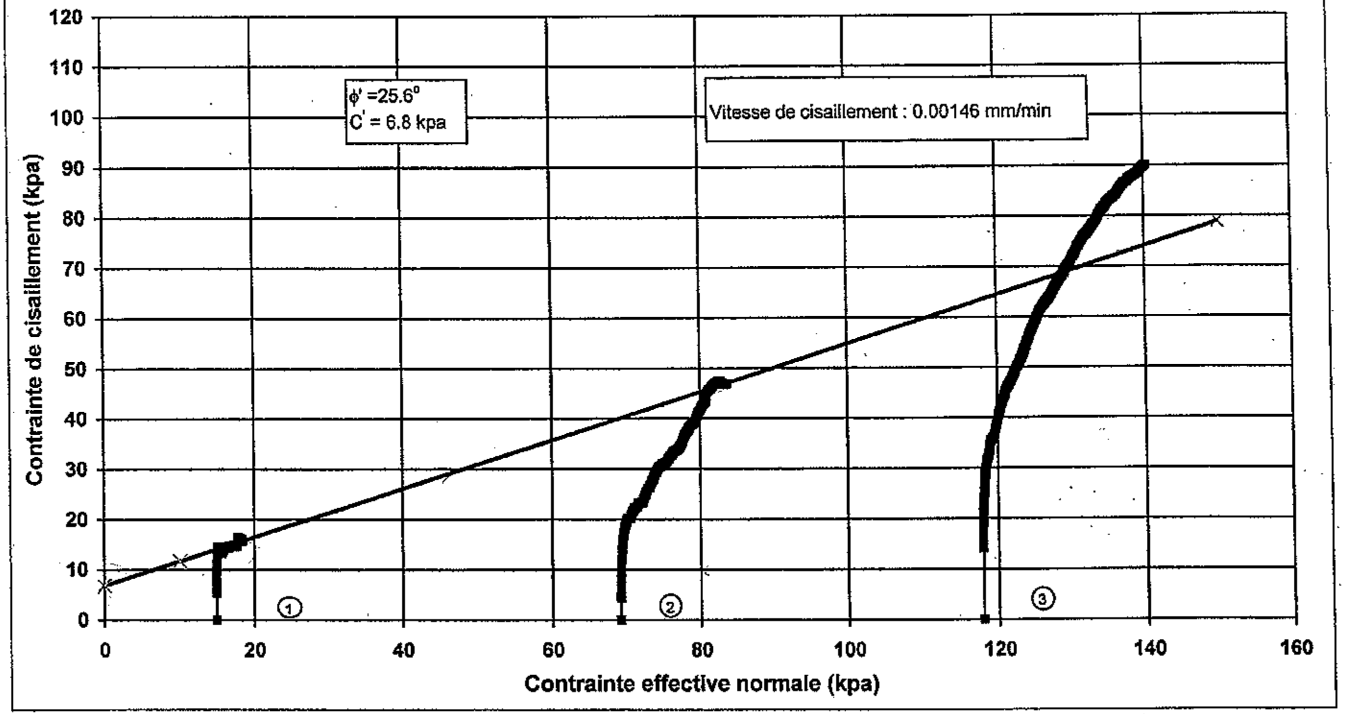
PROJET: Quéformat ltée (n/d 14653-G)
DOSSIER No: G09014-15
TECHNICIEN: R.C.
DATE (a-m-j): 2009-11-(09-13)
Vérifié par:

1 - ÉCHANT.No: BH-09-05,ST-3 PROFONDEUR (m): 1.90 à 2.00
2 - ÉCHANT.No: BH-09-07, ST-10 PROFONDEUR (m): 7.70 à 7.80
3 - ÉCHANT.No: BH-09-08A, ST-14 PROFONDEUR (m): 11.60 à 11.70





Cheminement de contraintes effectives



Groupe Qualitas inc.
275, Benjamin-Hudon
Saint-Laurent (Québec) H4N 1J1
Téléphone: 514-331-6910
Télécopieur: 514-331-7632

Essai de cisaillement direct -consolidation ASTM D 3080-04

Projet desc.:	**Qualitas-Quéformat**	Sondage :	**BH-09-08A**	Réalisé par :	**R.C.**
Dossier no:	**G09014-15**	Échantillon :	**ST-14**	Date:	**2009-11-02**
		Profondeur:	**11.60 à 11.70m**	Vérifié par :	

Teneur en eau		**Initiale**	**Finale**	**Lavage**	**Auxiliaire**
Numéro de la tare :			66		119
Masse de la tare :	g	0.00	13.94	0.00	37.05
Masse du sol humide + tare :	g	140.76	143.67		72.42
Masse du sol sec + tare :	g	93.11	107.05	0.00	59.83
Teneur en eau du sol :	%	51.18	39.33		55.27

Poids volumique	
pv (kN/m3) :	16.94
Densité relative des grains	
Estimé:	2.750
Mesurée:	

Caractéristiques de l'essai			**Initiale**	**Finale**
Numéro de l'anneau :			**2**	
Diamètre de l'anneau :		mm	64.03	
Masse de l'ensemble (anneau + plaque) :		g	148.11	
Masse du sol humide + anneau + plaque :		g	288.87	
Masse totale du sol humide :		g	140.76	129.73
Hauteur du sol :	H_0	mm	25.31	21.784
Hauteur du sol sec :	H_S	mm	10.55	
Volume du spécimen	V_t	cm^3	81.50	70.14
Volume des solides	V_S	cm^3	33.96	
Indice des vides :			1.400	1.066
Degré de saturation :		%	100.5	101.5

Numéro de l'appareil :	**684**	
Levier de chargement:	**a**	9.993
	b	
Lecture de déformation:	0.001 mm	

Déformation de l'appareillage + pierres poreuses

Y = a+b*ln(x)+c*(ln(x))^2+d*(ln(x))^3+e*(ln(x))^4+f*(ln(x))^5

a		**d**	
b		**e**	
c		**f**	

Contrainte (kPa)	Chargement		Lecture Finale	Lecture corrigée	ΔH/H cum (%)	e (1/1)	H (mm)	**Compressibilité**		
	Date	Heure						Module M (kPa)	Cc	Cc / (1 + e_0)
0.0	02/11/2009	13:51:32	0.000		0.000	1.400	25.310			
20.6	02/11/2009	13:51:32	-0.249		0.984	1.376	25.061			
34.4	03/11/2009	7:37:07	-0.381		1.505	1.364	24.929			
68.9	04/11/2009	7:04:59	-0.713		2.817	1.333	24.597			
118.0	05/11/2009	7:21:41	-1.497		5.915	1.259	24.813			
118.0	13/11/2009	13:19:26	-3.526		13.932	1.067	20.287	FIN DE L'ESSAI		

Groupe Qualitas inc.
275, Benjamin-Hudon
Saint-Laurent (Québec) H4N 1J1
Téléphone: 514-331-6910
Télécopieur: 514-331-7632

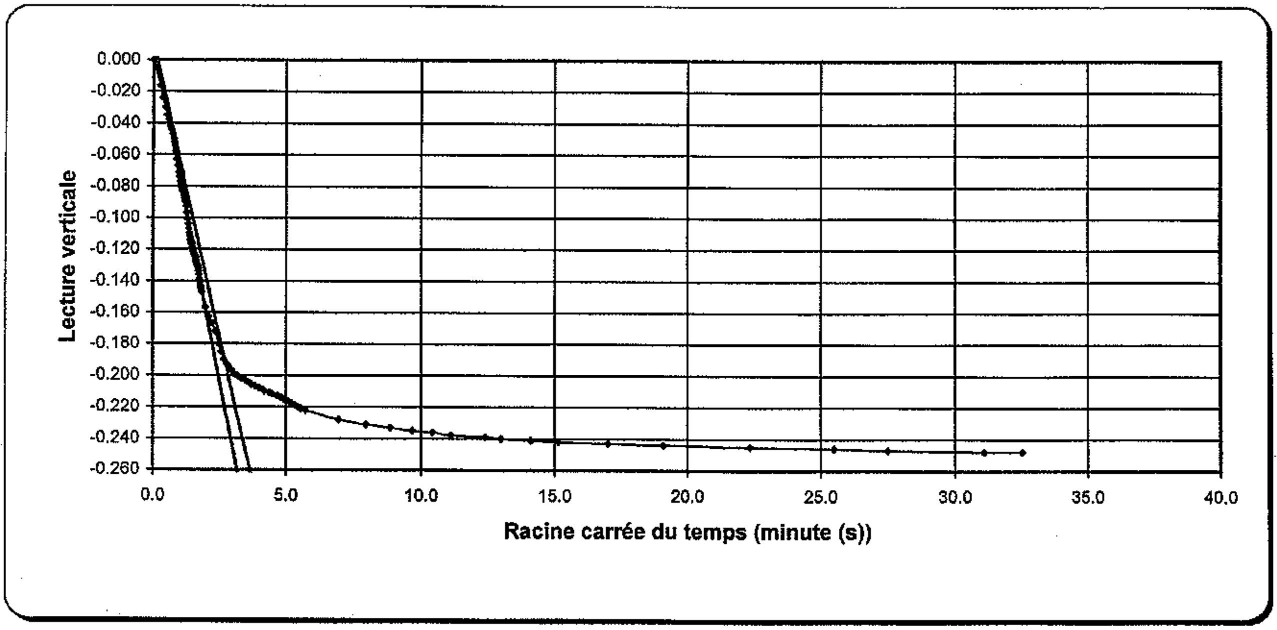
Essai de cisaillement direct -consolidation ASTM D 3080-04

Projet desc.: Qualitas-Quéformat
Dossier no: G09014-15

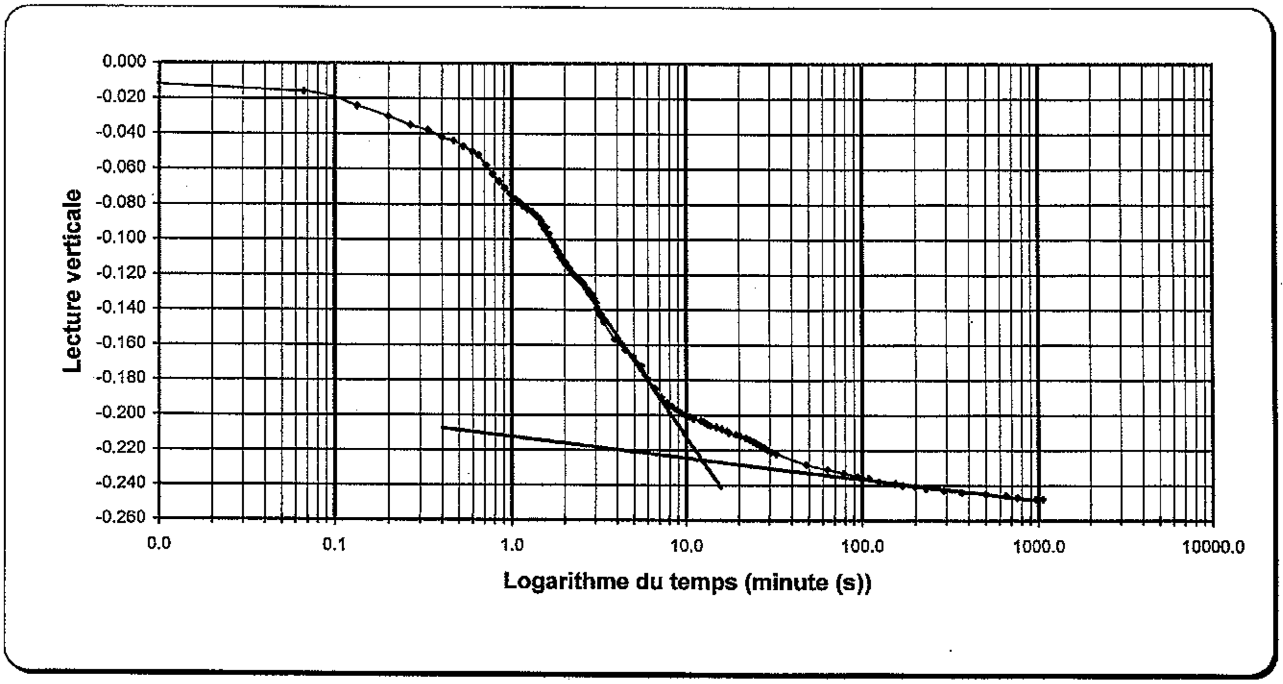
Sondage : BH-09-08A
Échantillon : ST-14
Profondeur: 11.60 à 11.70m

Réalisé par : R.C.
Date: 2009-11-02
Vérifié par :

Mesure du coefficient de consolidation par la méthode Taylor	Contrainte : 0.0 à 20.6 kPa



Mesure du coefficient de consolidation par la méthode Casagrande	Contrainte : 0.0 à 20.6 kPa



Qualitas

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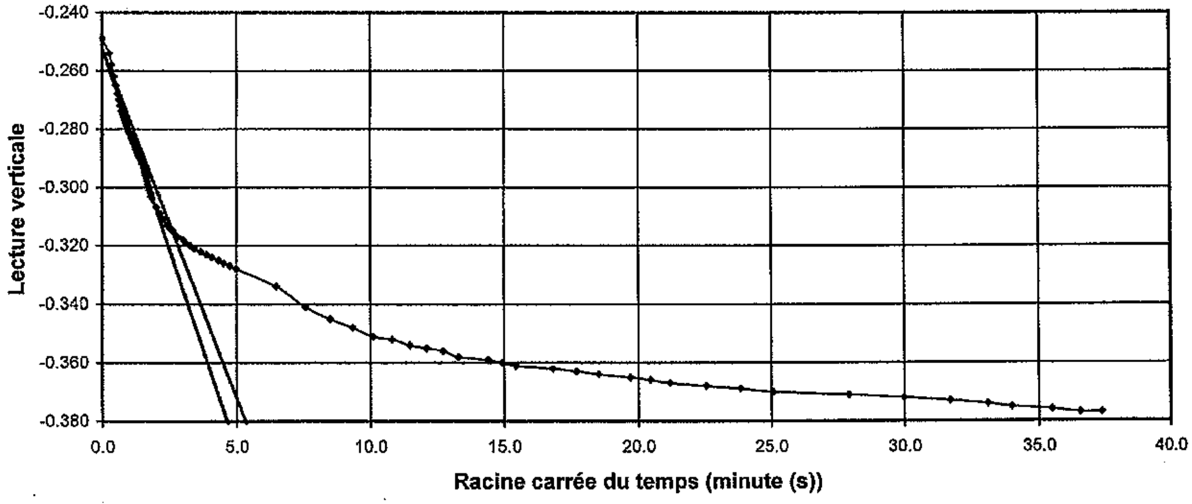
Télécopieur: 514-331-7632

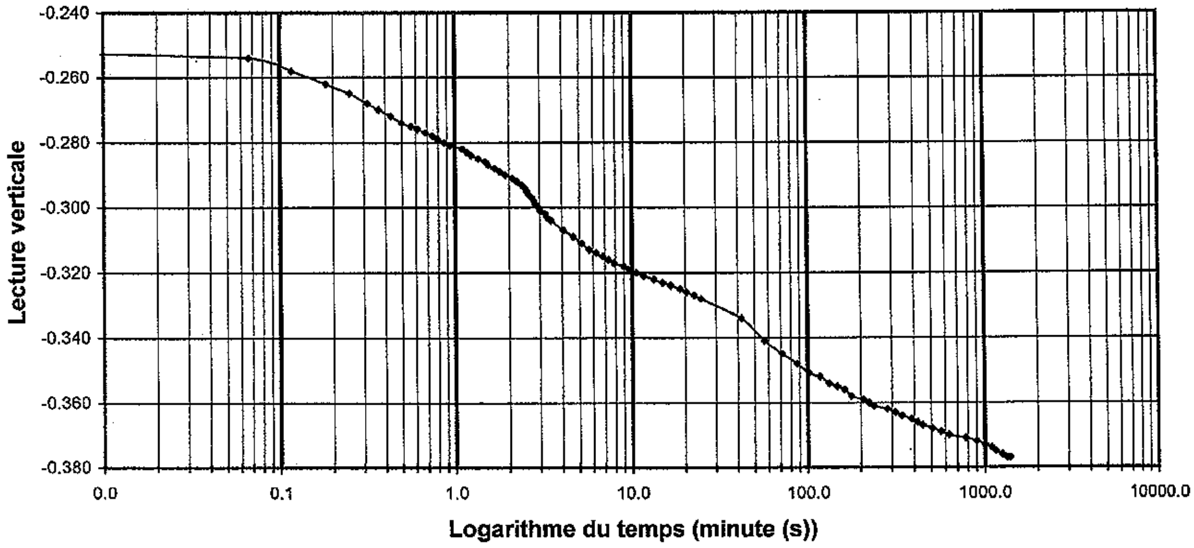
Essai de cisaillement direct -consolidation ASTM D 3080-04

Projet desc.:	Qualitas-Quéformat	**Sondage :**	BH-09-08A	**Réalisé par :**	R.C.
Dossier no:	G09014-15	**Échantillon :**	ST-14	**Date:**	2009-11-03
		Profondeur:	11.60 à 11.70m	**Vérifié par :**	

Mesure du coefficient de consolidation par la méthode Taylor	**Contrainte : 20.6 à 34.4 kPa**



Mesure du coefficient de consolidation par la méthode Casagrande	**Contrainte : 20.6 à 34.4 kPa**



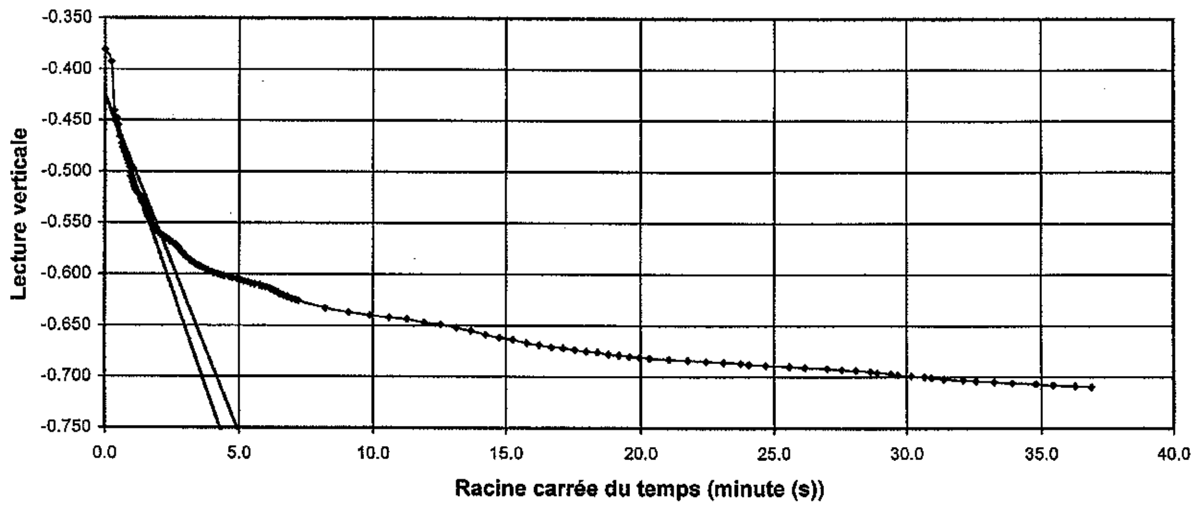
Qualitas

Groupe Qualitas inc.
275, Benjamin-Hudon
Saint-Laurent (Québec) H4N 1J1
Téléphone: 514-331-6910
Télécopieur: 514-331-7632

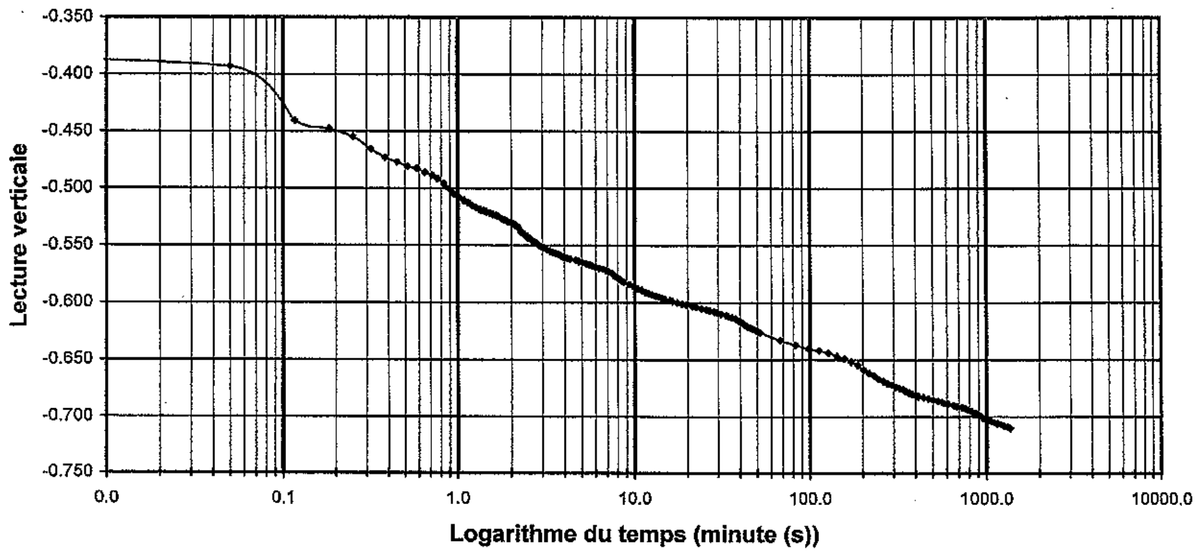
Essai de cisaillement direct -consolidation ASTM D 3080-04

Projet desc.:	Qualitas-Quéformat	**Sondage :**	BH-09-08A	**Réalisé par :**	R.C.
Dossier no:	G09014-15	**Échantillon :**	ST-14	**Date:**	2009-11-04
		Profondeur:	11.60 à 11.70m	**Vérifié par :**	

Mesure du coefficient de consolidation par la méthode Taylor	Contrainte : 34.4 à 68.9 kPa



Mesure du coefficient de consolidation par la méthode Casagrande	Contrainte : 34.4 à 68.9 kPa



Qualitas

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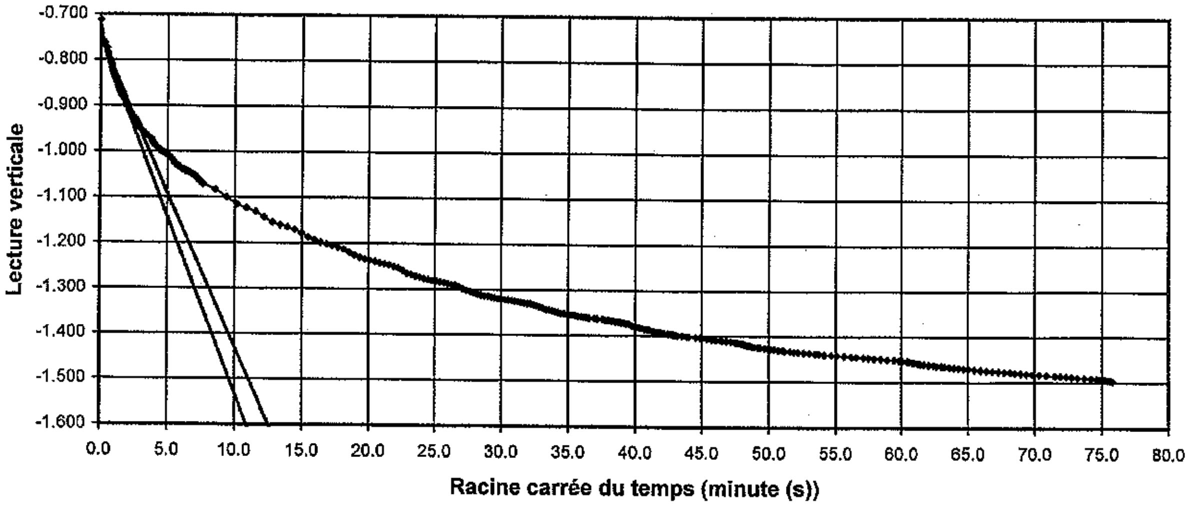
Téléphone: 514-331-6910
Télécopieur: 514-331-7632

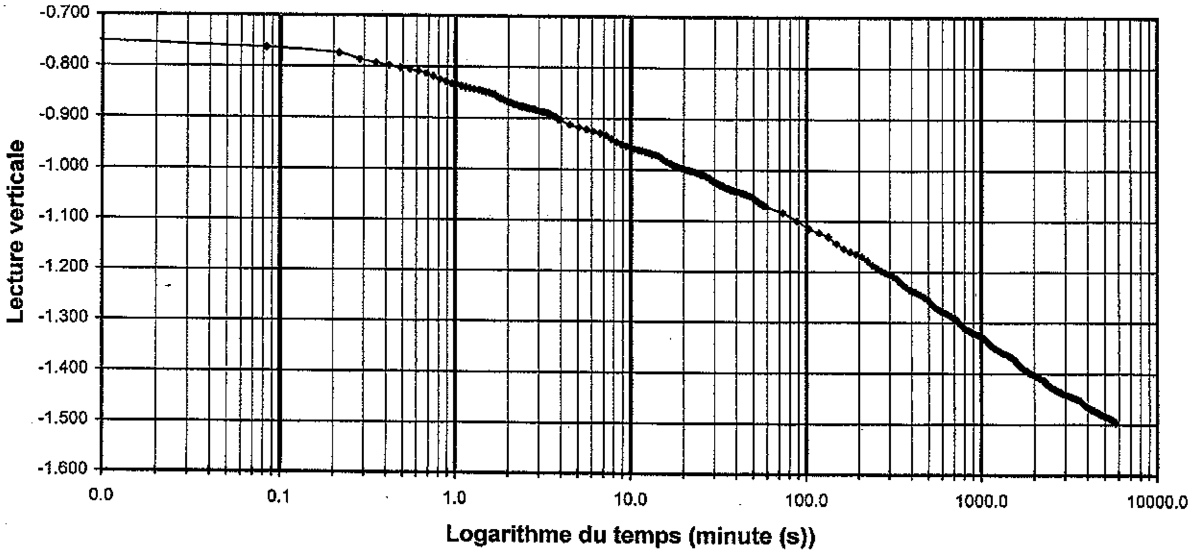
Essai de cisaillement direct -consolidation ASTM D 3080-04

Projet desc.:	Qualitas-Quéformat	**Sondage :**	BH-09-08A	**Réalisé par :**	R.C.
Dossier no:	G09014-15	**Échantillon :**	ST-14	**Date:**	2009-11-05
		Profondeur:	11.60 à 11.70m	**Vérifié par :**	

Mesure du coefficient de consolidation par la méthode Taylor | **Contrainte : 68.9 à 118.0 kPa**



Mesure du coefficient de consolidation par la méthode Casagrande | **Contrainte : 68.9 à 118.0 kPa**



SOIL MATERIALS ANALYSIS REPORT

SM
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2540

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2338**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-08A, SS-15, Depth.: 12,3 to 13 m.
Tests completed on : 2009-10-20

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.
C.U.
Unified Classification:
Fineness Module: 0,20

% Gravel:	
% Sand:	16
% Silt:	64
% Clay:	20

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements
Atterberg Limits (3pts)	BNQ2501-092		
Liquid Limit (%):		26	------
Plastic Limit (%):		18	------
Plasticity index (%):		8	------
Water Content (%):	LC21-201	29,36	------

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: ______ 2009-10-21
Sylvie Daigle, Tech.

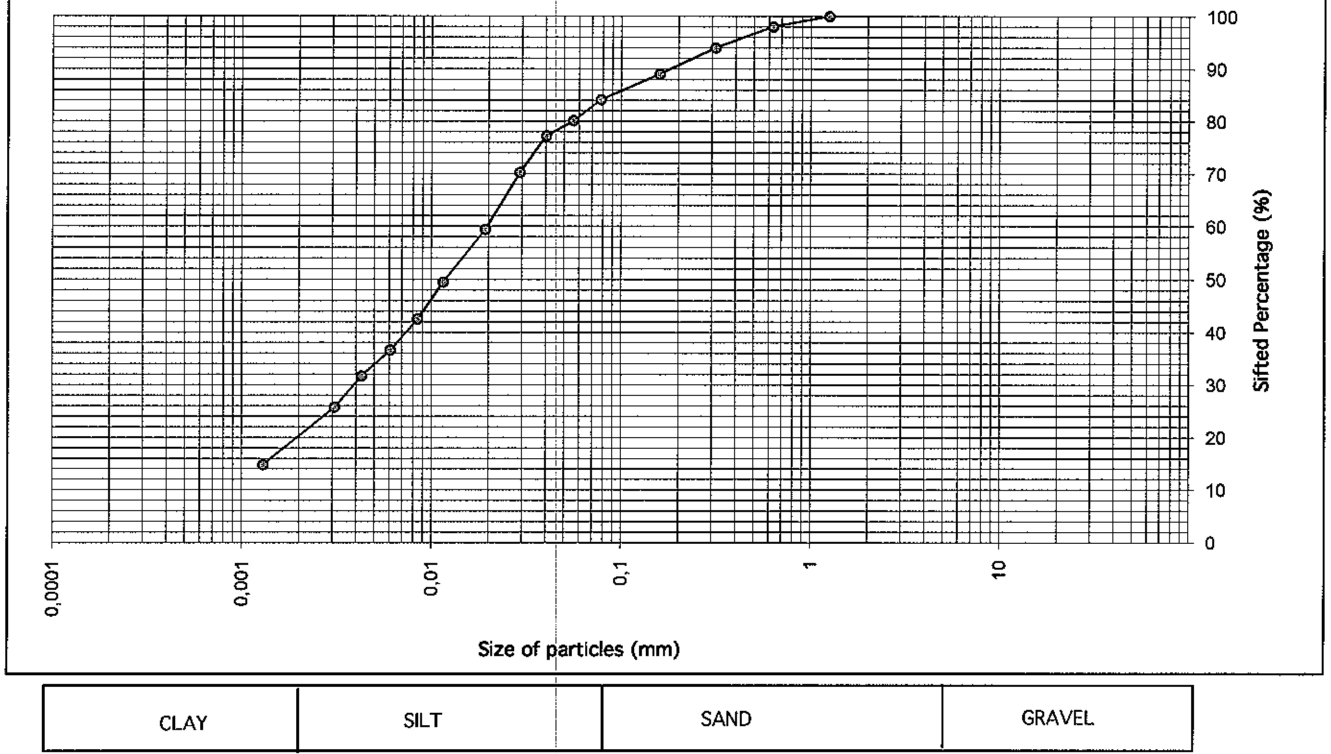
Verified by: ______ 2009-10-21
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
1,250	100
0,630	98
0,3150	94
0,1600	89
0,0779	84,1
0,0561	80,1
0,0402	77,2
0,0293	70,2
0,0193	59,4
0,0116	49,5
0,0085	42,5
0,0061	36,6
0,0043	31,7
0,0031	25,7
0,0013	14,8

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2338

Type of material: Clayey silt, some sand.

File #: **F099382200**

Source: Material on site, 09-08A,SS-15, Depth: 12,3 to 13 m.

Customer: **Alcoa**

Approuved by : ______ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2551

File Number	: **F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: ------
City	: Baie-Comeau (Québec)	Uses	: ------
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	: **09-2350**	Source	: 09-08A, SS-21, Depth.: 19,2 to 19,6 m.
Sample No.	: ------	Tests completed on	: 2009-10-21

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	3,097	% Gravel:	9
C.U.	16,274	% Sand:	74
Unified Classification:		% Silt:	14
Fineness Module:	1,69	% Clay:	3

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

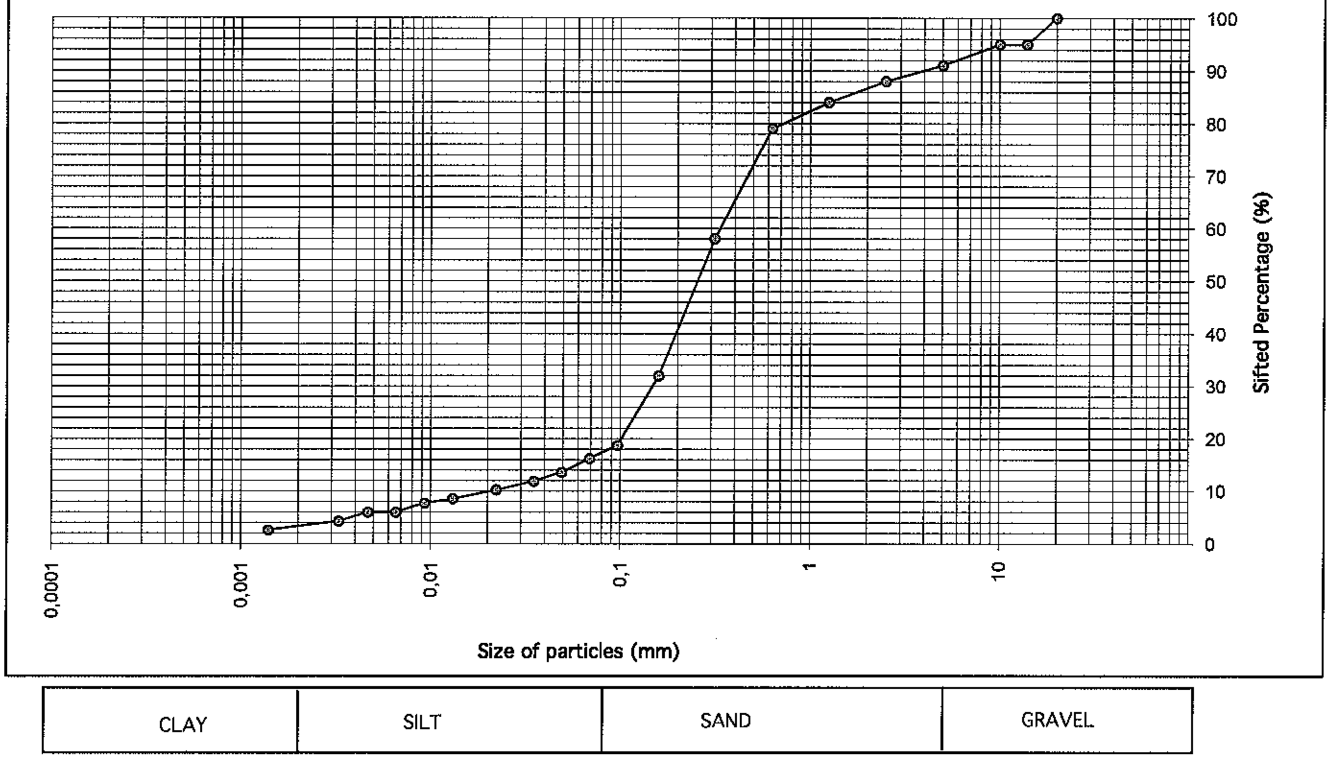
Prepared by: 2009-10-21
Sylvie Daigle, Tech.

Verified by: 2009-10-21
Sonya Graveline, Ing.

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
20,0	100
14,0	95
10,0	95
5,0	91
2,5	88
1,250	84
0,630	79
0,3150	58
0,1600	32
0,0970	18,7
0,0692	16,2
0,0493	13,6
0,0351	11,9
0,0223	10,2
0,0131	8,5
0,0093	7,7
0,0066	6,0
0,0047	6,0
0,0033	4,3
0,0014	2,6

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2350

Type of material: Sand, some silt, traces gravel & clay.

File #: **F099382200**

Source: Material on site, 09-08A,SS-21, Depth: 19,2 to 19,6 m.

Customer: **Alcoa**

Approuved by :__________ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC

☎ 740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2500

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2351**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-08A, SS-26, Depth.: 22,3 to 23 m.
Tests completed on : 2009-10-19

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 5,029
C.U. 25,444
Unified Classification:
Fineness Module: 1,00

% Gravel: 3
% Sand: 72
% Silt: 20
% Clay: 5

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: 2009-10-21
Sylvie Daigle, Tech.

Verified by: 2009-10-21
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025

Size (mm)	% Sifted (%)
20,0	100
14,0	98
10,0	98
5,00	97
2,500	96
1,250	94
0,630	90
0,3150	75,0
0,1600	48,0
0,0947	27,8
0,0684	21,3
0,0488	18,5
0,0348	15,8
0,0222	12,1
0,0131	12,1
0,0093	10,2
0,0065	8,3
0,0046	7,4
0,0033	6,5
0,0014	3,7

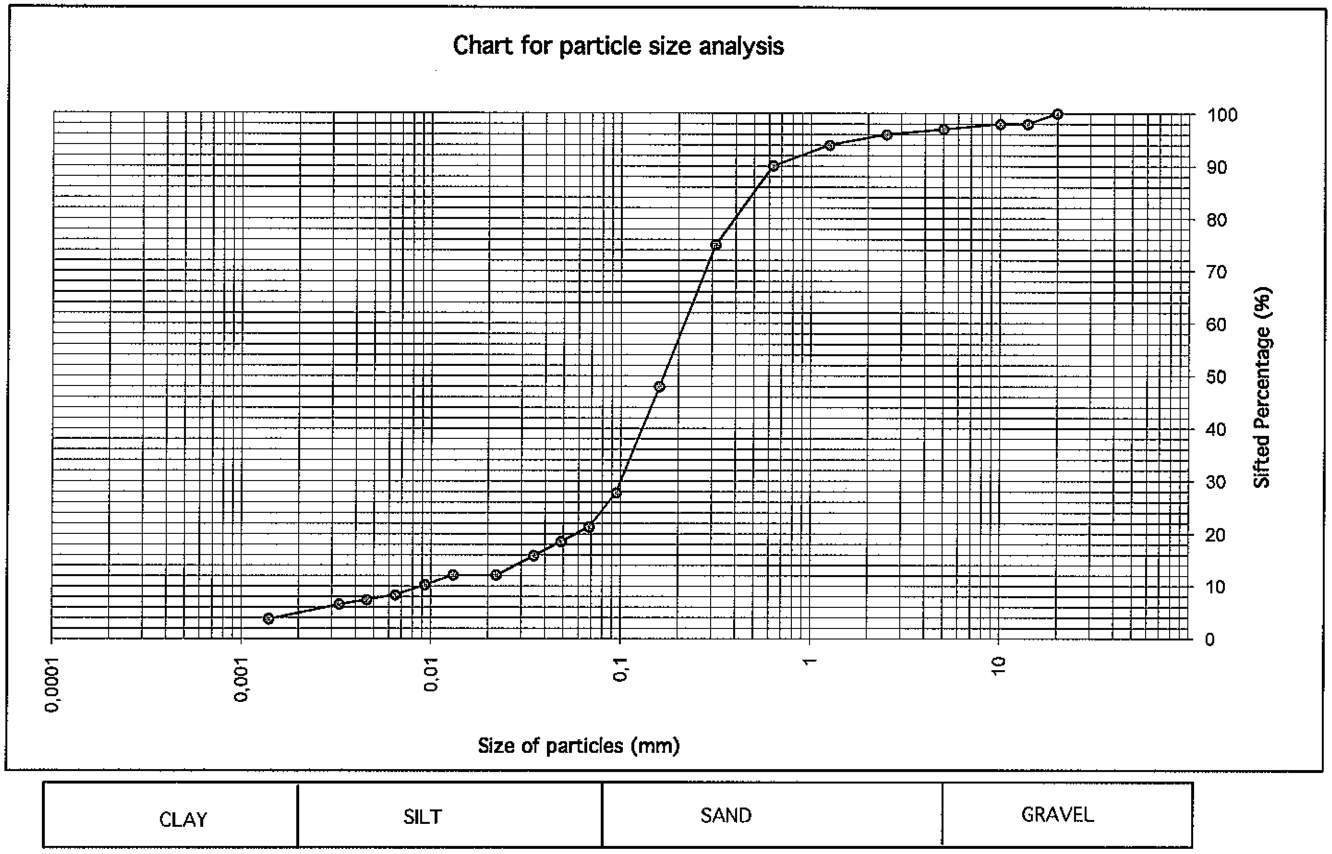


Chart for particle size analysis

Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2351

Type of material: Silty sand, traces clay & gravel.

Source: Material on site, 09-08A, SS-26, Depth: 22,3 to 23 m.

Approuved by : ____________ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2541

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2352**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-08A, SS-34, Depth.: 34,4 to 35,0 m.
Tests completed on : 2009-10-20

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	0,975	% Gravel:	33
C.U.	10,442	% Sand:	46
Unified Classification:		% Silt:	18
Fineness Module:	2,36	% Clay:	3

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: 2009-10-21
Sylvie Daigle, Tech.

Verified by: 2009-10-21
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

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Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
31,5	100
20,0	67
14,0	67
10,0	67
5,0	67
2,5	66
1,250	66
0,630	64
0,3150	59
0,1600	43
0,0939	23,7
0,0682	17,4
0,0492	12,5
0,0352	9,8
0,0225	7,0
0,0131	7,0
0,0093	6,3
0,0066	4,9
0,0047	4,2
0,0033	3,5
0,0014	2,1

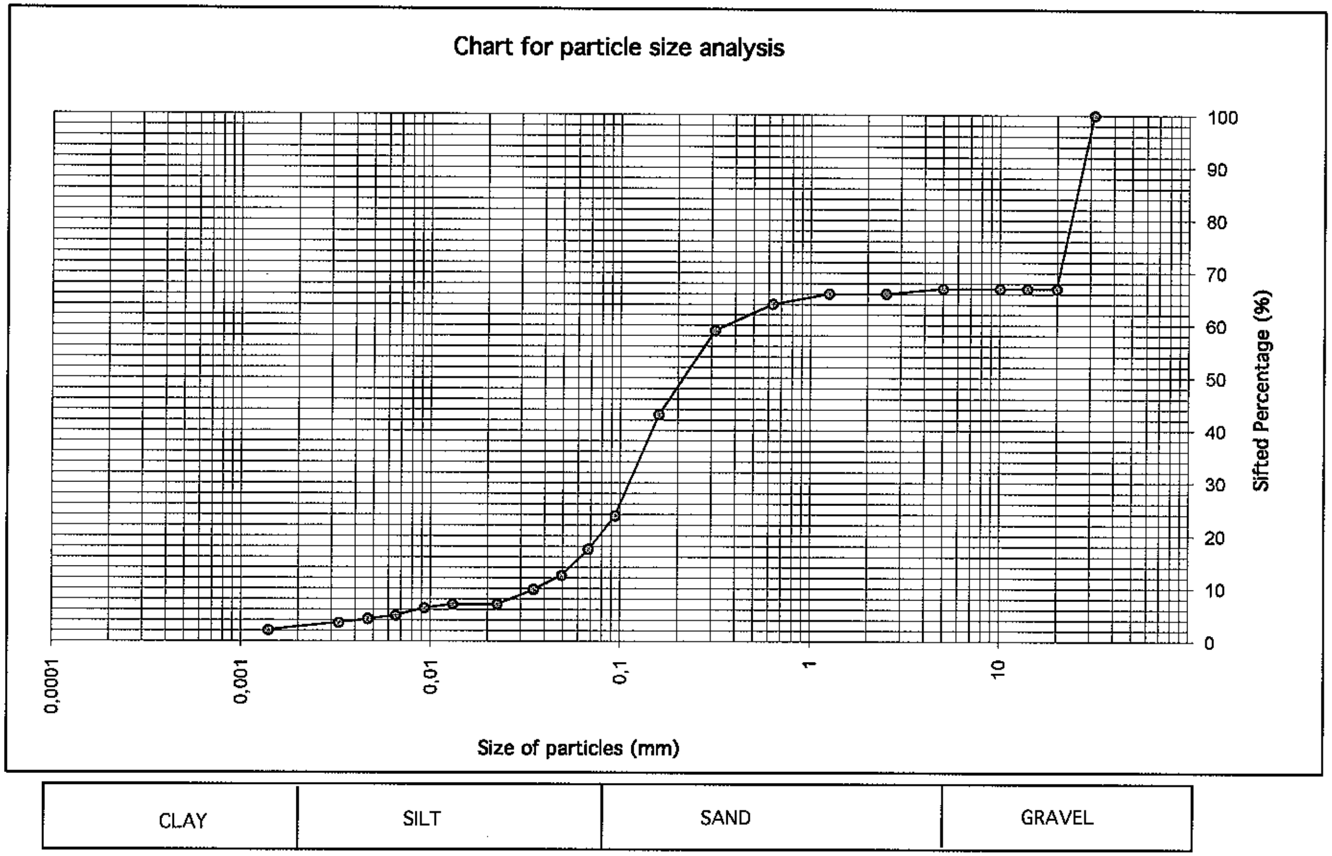
Chart for particle size analysis

Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2352

Type of material: Sand & gravel, some silt, traces clay.

Source: Material on site, 09-08A,SS-34, Depth: 34,4 to 35,0 m.

Approuved by :________ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

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BORING LOG

PROJECT: New wharf #4	**BOREHOLE:** 09-09
SITE: Alcoa - Baie-Comeau smelter (Quebec)	**PAGE:** 1 of 2
LOCATION OF BOREHOLE: X : 258842,76 Y : 5457012,86 — **CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50 — **SAMPLER:** Indicated — **CORE BARREL**	**TECHNICIAN:** Simon Marois, tech
SURFACE ELEVATION (m): -10.39 — **BORING DATE START:** 2009-08-28 06:30:00 **END:** 2009-08-29 03:30:00	

Type of Sampler

SS: Split Spoon
DC: Diamond Core
WS: Wash Sample
HT: Hydraulic Trust
HW: Hammer Weight
SP: Shelby and Piston
AS: Auger Sampler
ST: Thin Walled Shelby Tube

☒ Remoulded
▨ Intact
■ Lost
◧ Rock Core

Laboratory and in situ tests - Parameters

N: SPT N-Value
Nd: DCPT Nd-Value
Su: Field Vane
GSA: Grain size analysis
CU: Uniformity coefficient
W: Water Content
Wp: Plastic limit
Wl: Liquid limit
Ip: Plasticity index:
D: Specific density
Cu: Swedish cone
C: Consolidation
PP: Preconsolidation pressure
Cc: Compression index
Ccr: Recompression index
UC: Unconfined compression
DS: Direct shear
Phi': Angle of internal friction
c': Cohesion
CUT: Consolidation undrained triaxial

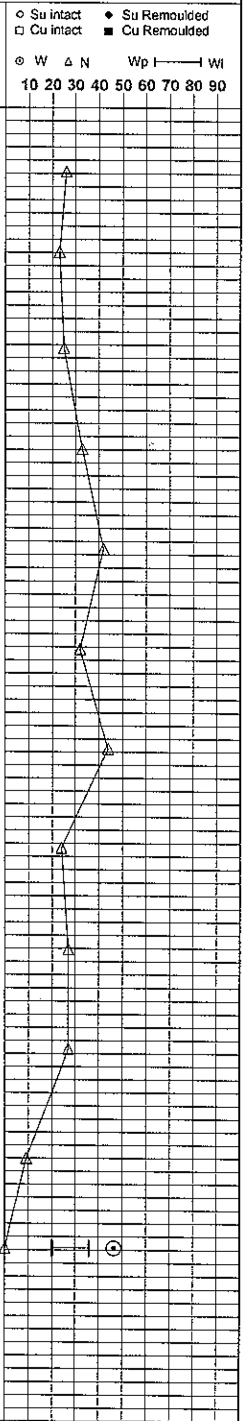
Water level

Date: Time: Elev.(m):

Installation:

STRATIGRAPHY / SAMPLES / LABO AND IN SITU TESTS

Depth	Elev. Depth -10.39	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
	0.00	Gray fine sand with some silt, trace gravel with occasionnal sea shell fragments; medium dense		☒	SS-1	B	8	26	16-14-12-12		
1											
				☒	SS-2	B	38	23	10-13-10-14		
2				☒	SS-3	B	46	25	11-12-13-15		
				☒	SS-4	B	46	33	9-15-18-21		
3											
				☒	SS-5	B	29	42	13-21-21-22		
4				☒	SS-6	B	54	32	11-15-17-17		GSA, CU=2.6
5				☒	SS-7	B	54	44	38-26-18-20		
				☒	SS-8	B	50	24	16-13-11-13		
6											
				☒	SS-9	B	42	27	11-12-15-13		
7				☒	SS-10	B	58	27	13-13-14-16		
8	-18.32 7.93	Gray sandy silt and clay with thins layers of silty sand; firm		☒	SS-11	B	47	9	10-6-3-1		
				☒	SS-12	B	79	0	0-0-0-0		GSA, CU=nd, W=46.6%, Wp=20%, Wl=36%, Ip=16%
9											



Notes:

Approved by :
Sonya Graveline, ing.

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BORING LOG

PROJECT: New wharf #4
SITE: Alcoa - Baie-Comeau smelter (Quebec)
BOREHOLE: 09-09
PAGE: 2 of 2
LOCATION OF BOREHOLE: X : 258842,76 Y : 5457012,86
CASING: HW
FILE NO: F099382300
EQUIPEMENT USED: D-50
SAMPLER: Indicated
CORE BARREL
TECHNICIAN: Simon Marois, tech
SURFACE ELEVATION (m): -10.39
BORING DATE START: 2009-08-28 06:30:00 END: 2009-08-29 03:30:00

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◧	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value
Nd:	DCPT Nd-Value
Su:	Field Vane
GSA:	Grain size analysis
CU:	Uniformity coefficient
W:	Water Content
Wp:	Plastic limit
Wl:	Liquid limit
Ip:	Plasticity index:
D:	Specific density
Cu:	Swedish cone
C:	Consolidation
PP:	Preconsolidation pressure
Cc:	Compression index
Ccr:	Recompression index
UC:	Unconfined compression
DS:	Direct shear
Phi':	Angle of internal friction
c':	Cohesion
CUT:	Consolidation undrained triaxial

Water level

Date:	Time:	Elev.(m):

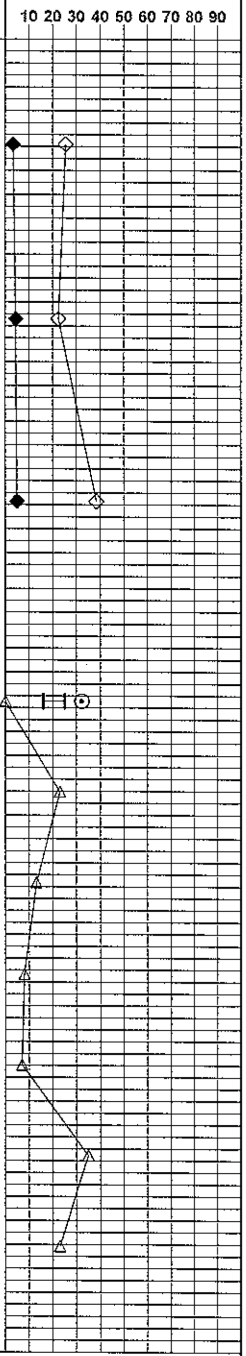
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
				▨	ST-13		100				UC=27 kPa
11											
				▨	ST-14		100				ST-14: GSA, C, DS CU=XXX, W=XXX, Wp=XXX, Wl=XXX, Ip=XXX, D=2.75, PP=74 kPa, Cc=0,729, Ccr=0.032
12											
13											
14											
				▨	ST-15		100				ST-15: GSA, C, CUT, DS CU=XXX, W=XXX, Wp=XXX, Wl=XXX, Ip=XXX, D=2.75, UC=34 kPa, PP=XXX kPa, Cc=XXX, Ccr=XXX
15	-25.45 15.06	Gray silty fine sand; very loose									
	-25.63 15.24	Gray silty clay with thins layers of silty sand		☒	SS-16	B	100	0	1-0-0-0		SS-16: W=32.3%, Wp=16%, Wl=25%, Ip=9
16	-26.54 16.15	Gray silty fine to medium sand, trace clay; loose to medium dense		☒	SS-17	B	50	23	16-12-11-8		
17				☒	SS-18	B	96	13	6-8-5-5		SS-18: GSA, CU=18.6
18				☒	SS-19	B	67	8	1-1-7-10		
				☒	SS-20	B	75	7	3-4-3-3		
19				☒	SS-21	B	100	35	4-19-16-10		
20				☒	SS-22	B	100	23	0-11-12-36		
	-30.94 20.55	End of borehole		☒	SS-23	B	100		50 /Refusal		Probably refusal on boulder



Notes:

Approved by :
Sonya Graveline, ing.

SOIL MATERIALS ANALYSIS REPORT

SMI
LABO S.M. INC

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS1818

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-1735**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-09, SS-6, Depth.:3,8 to 4,4m.
Tests completed on : 2009-09-02

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 1,208 % Gravel: 2
C.U. 2,361 % Sand: 81
Unified Classification: % Silt: 16
Fineness Module: 0,53 % Clay: 1

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: 2009-09-02
Sylvie Daigle, Tech.

Verified by: 2009-09-02
Sonya Graveline, Ing.

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Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
20	100
14,0	100
10,0	100
5,00	98
2,500	97
1,250	96
0,630	94
0,3150	90,0
0,1600	72,0
0,0959	25,2
0,0707	12,6
0,0506	7,2
0,0360	5,4
0,0230	4,5
0,0133	2,7
0,0095	1,8
0,0067	1,8
0,0047	0,9
0,0033	0,9
0,0014	0,9

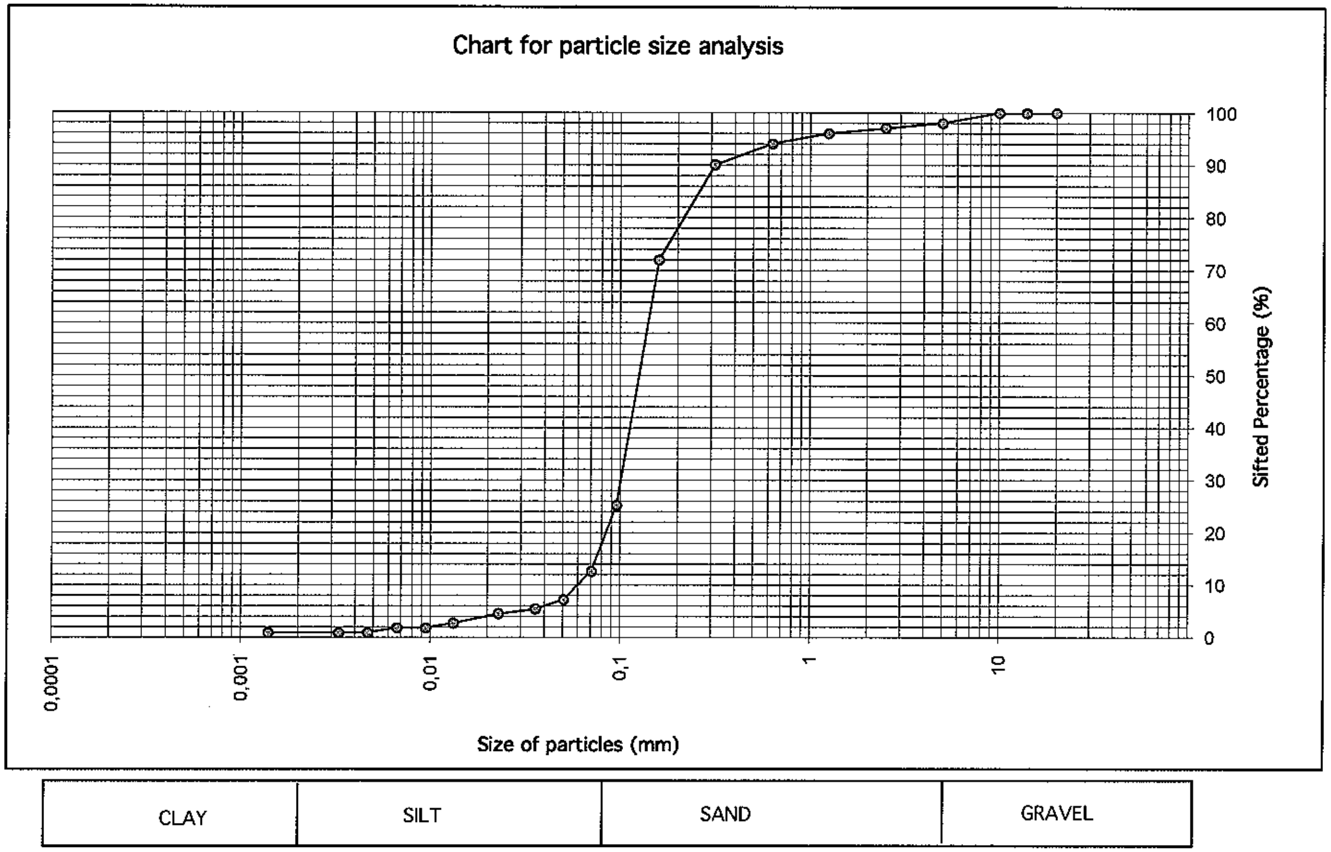

Chart for particle size analysis

Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-1735

Type of material: Sand, some silt,traces gravel & clay.

Source: Material on site, TF-09-09, CF-6, Depth:3,8 to 4,4 m.

Approuved by : ____________ Date : 10/11/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM
LABO S.M. INC

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS1873

File Number : F099382200
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : 09-1756
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-09, SS-12, Depth.: 8,4 to 9,0m.
Tests completed on : 2009-09-04

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.		% Gravel:	0
C.U.		% Sand:	21
Unified Classification:		% Silt:	40
Fineness Module:	0,21	% Clay:	39

Legend : *** =Results not in conformity**

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements
Atterberg Limits (3pts)	BNQ2501-092		
Liquid Limit (%):		36	------
Plastic Limit (%):		20	------
Plasticity index (%):		16	------
Water Content (%):	LC21-201	46,6	------

Remarks: **See following chart for sediments analysis.**

Prepared by: Sylvie Daigle, Tech. 2009-09-04

Verified by: Sonya Graveline, Ing. 2009-09-04

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LABO S.M. INC.

Sediments analysis NQ 2501-025	
Size (mm)	% Sifted (%)
20	100
14,0	100
10,0	100
5,00	100
2,500	100
1,250	100
0,630	99
0,3150	93,0
0,1600	87,0
0,0800	78,7
0,0571	76,7
0,0408	74,8
0,0293	70,8
0,0189	66,9
0,0111	62,0
0,0080	59,0
0,0056	57,1
0,0040	51,2
0,0029	46,2
0,0013	29,5

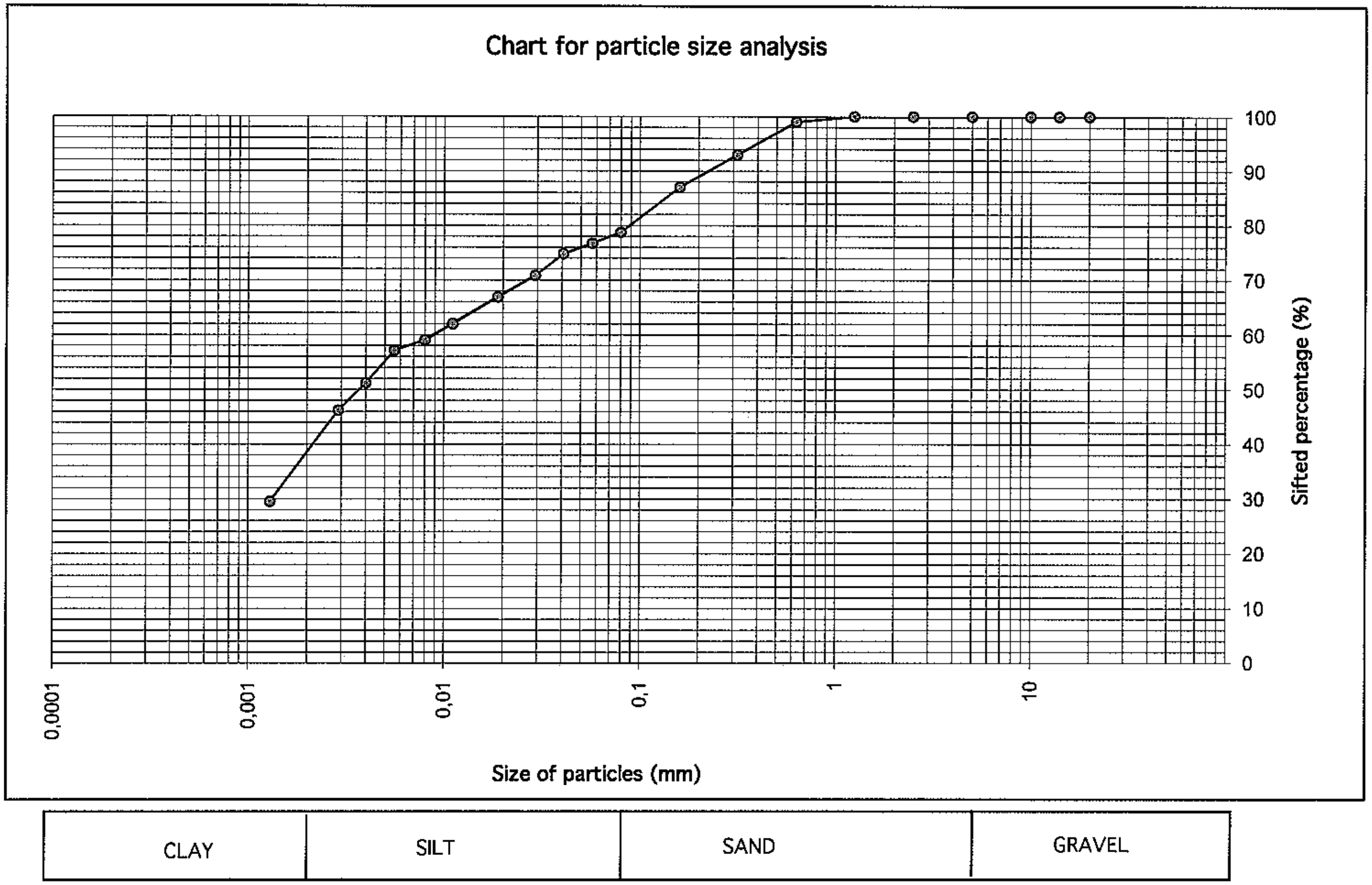


Chart for particle size analysis

Project: New Baie-Comeau wharf

Laboratory No.: 09-1756

Type of material: Sandy silt & clay.

File #: **F099382200**

Source Material on site
09-09, SS-12 Depth.: 8,4 to 9,0m.

Customer: **Alcoa**

Approuved by :______________ Date : 30/10/2009 .

'FLS-079 (06-2007) rév. 1

QUÉFORMAT LTÉE

COMPRESSION NON CONSOLIDÉE - ASTM D2166-06

DOSSIER : 15756-G
CLIENT : Labo S.M. inc.
PROJET : ALCOA / F099382-100

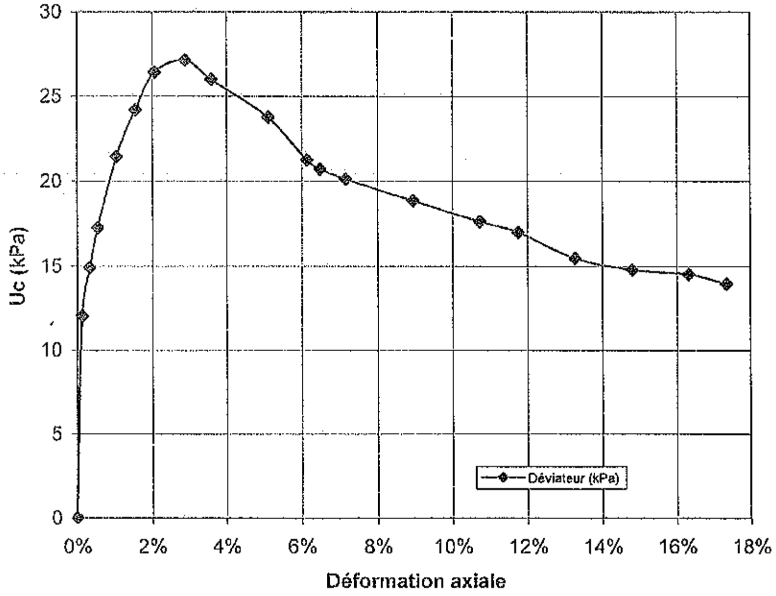
SONDAGE : BH-09-09
ECHANT. : ST-13
PROF. (m) : 10.10 - 10.20

FICHIER : Comp15756-09-09-13.xls

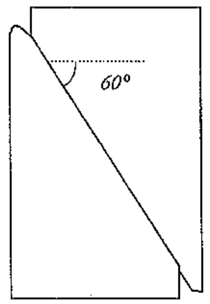
Compression non drainée

Longueur initiale, Hi (mm) :	98.19	Volume initial, Vi (cm³) :	203.84	Section initiale, Ai (cm²) :	20.76	Vit. déformation (mm/min) :	0.8
Longueur finale, Hf (mm) :	81.16	Volume final, Vf (cm³) :	203.84	Section finale, Af (cm²) :	25.12		

No.	Lectures ΔL (0,01mm)	Fa (N)	Déformation ΔH/Hi (%)	Section (cm²)	Résistance en compression, Uc (kPa)	Résultats
1	1597	0	0.00%	20.76	0	
2	1610	25	0.13%	20.79	12	**Rupture :**
3	1630	31	0.34%	20.83	15	
4	1650	36	0.54%	20.87	17	Uc (kPa) : 27 kPa
5	1700	45	1.05%	20.98	21	ΔH/Hi (%) : 2.88 %
6	1750	51	1.56%	21.09	24	
7	1800	56	2.07%	21.20	26	
8	1880	58	2.88%	21.38	27	**Caractéristiques physiques :**
9	1950	56	3.60%	21.53	26	
10	2100	52	5.12%	21.88	24	Teneur en eau initiale : 53.35 %
11	2200	47	6.14%	22.12	21	Masse volumique humide : 1709 kg/m³
12	2234	46	6.49%	22.20	21	Masse volumique sèche : 1114 kg/m³
13	2300	45	7.16%	22.36	20	Teneur en eau finale : 53.26 %
14	2476	43	8.95%	22.80	19	
15	2650	41	10.72%	23.25	18	
16	2750	40	11.74%	23.52	17	**Remarques :**
17	2900	37	13.27%	23.94	15	
18	3050	36	14.80%	24.37	15	Rapport hauteur/diamètre
19	3200	36	16.33%	24.81	15	de l'échantillon au montage = 1.9
20	3300	35	17.34%	25.12	14	



Croquis :



Réalisé par : A. Bustamante
date : 2009-11-30

Vérifié par : Hélène Bilodeau, ing.
date : 2009-12-03

SMi LABO S.M. INC.

Rapport no. : *09LL1695*

Rapport D'essai
CONSOLIDATION OEDOMETRIQUE
ASTM D2435-90

No Dossier : F99382100
Client : Alcoa
Adresse : 100, rue Maritime
Ville : Baie-Comeau (Québec)
Code postal : G4Z 2L6
Projet no : Usine Alcoa de Baie-Comeau/Nouveau quai

Sondage : BH-09-09
Échantillon : ST-14
Prof. (m) : 11,30 11,30@11,40

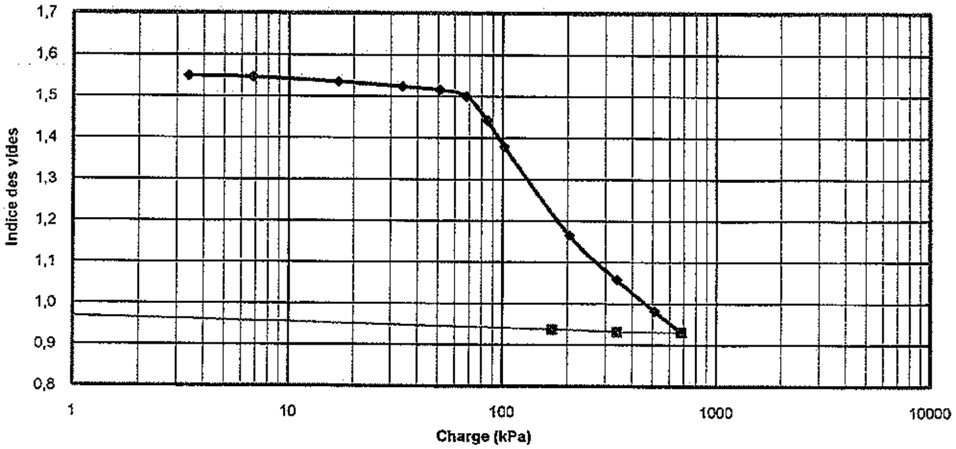
Analysé par : IG

Caractéristiques de l'anneau		
Numéro :		V-3387
Masse :	(g)	109,16
Hauteur :	(mm)	25,28
Diamètre :	(mm)	63,45
Surface :	(cm^2)	31,62
Volume :	(cm^3)	79,93

Caractéristiques de l'appareil		
Numéro de l'appareil :		4
Calibration de l'extensomètre :	(div./mm)	500,00
Bras de levier :		10,97
Déformation = b * Pression ^ m		
Facteur de correction b :	(div)	10,00
Facteur de correction m :		0,50

Caractéristiques physiques		Initial	Final	Lavage
Numéro de la tare :		Anneau	Anneau	
Masse de la tare (anneau) :	(g)	109,16	109,16	
Masse du sol humide + tare :	(g)	243,34	226,56	
Masse du sol sec + tare :		195,18	195,18	
Masse du sol humide :	(g)	134,18	117,40	
Masse du sol sec :	(g)	86,02	86,02	0,00
Teneur en eau du sol :	(%)	55,99	36,48	
Hauteur du sol humide :	(mm)	25,28	19,81	
Hauteur du sol sec :	(mm)	9,89	9,89	
Masse volumique humide :	(kg/m^3)	1 679	1 874	
Masse volumique sèche :	(kg/m^3)	1 076	1 373	
Indice des vides :		1,555	1,002	
Degré de saturation :	(%)	98,99	100,00	
Densité relative calculée :	Estimée	2,75	2,75	Calculée

Date (aaaa/mm/jj)	Heure (hh:mm)	Charge (kg)	Pression (kPa)	Lecture (0,002mm)	Correction de lecture	ΔH (mm)	Indice des vides	Hauteur (mm)	t50 (min)	Cv (m^2/s)
2009/10/24		0,00	0,00	0	0,0	0,00	1,555	25,28		
2009/10/25		0,10	3,40	35	4,4	0,06	1,549	25,22		
2009/10/26		0,20	6,80	57	8,8	0,10	1,546	25,18		
2009/10/27		0,50	17,01	122	19,0	0,21	1,535	25,07		
2009/10/28		1,00	34,02	186	33,0	0,31	1,524	24,97		
2009/10/29		1,50	51,03	234	39,0	0,39	1,516	24,89		
2009/10/30		2,00	68,05	321	45,0	0,55	1,500	24,73		
2009/10/31		2,50	85,06	609	50,3	1,12	1,442	24,16		
2009/11/01		3,00	102,07	930	55,5	1,75	1,379	23,53		
2009/11/02		6,00	204,14	2 006	77,0	3,86	1,165	21,42		
2009/11/03		10,00	340,23	2 558	95,8	4,92	1,058	20,36		
2009/11/04		15,00	510,34	2 950	115,1	5,67	0,982	19,61		
2009/11/05		20,00	680,46	3 216	129,5	6,17	0,931	19,11		
2009/11/06		15,00	510,34	3 204	115,1	6,18	0,931	19,10		
2009/11/07		10,00	340,23	3 180	95,8	6,17	0,932	19,11		
2009/11/08		5,00	170,11	3 126	71,5	6,11	0,938	19,17		
2009/11/08		0,00	0,00	2 733	0,0	5,47	1,003	19,81		



σ'p = 74 kPa
Cc = 0,7286
Cr = 0,0315

Remarques : —

Préparé par : ______________________ Date :
Isabelle Gauthier, tech. Chef labo

Vérifié par : ______________________ Date :
Salomon O'Ngandée, ing., M.Sc.A.

Notes : Le résultat s'applique exclusivement à l'échantillon analysé. Ce rapport ne doit pas être reproduit, sinon en entier, sans l'autorisation écrite de Labo S.M. inc.

QUÉFORMAT LTÉE

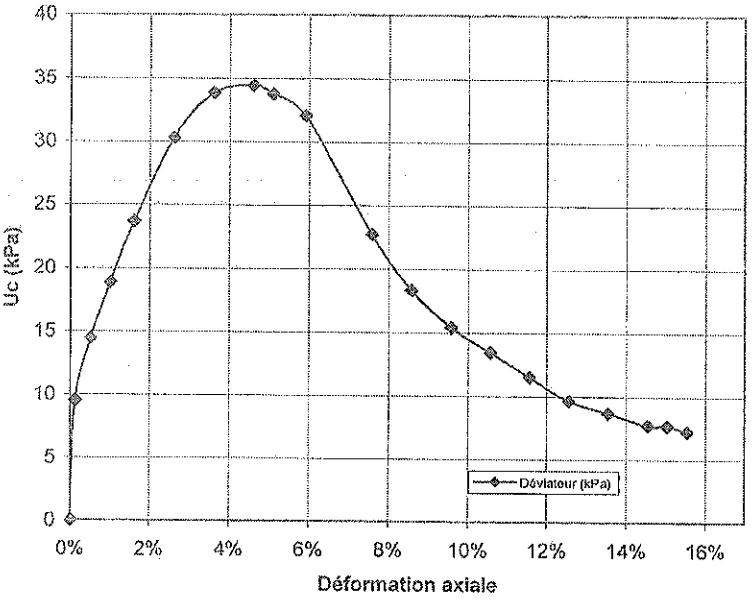
COMPRESSION NON CONSOLIDÉE - ASTM D2166-06

DOSSIER :	15756-G	SONDAGE :	BH-09-09
CLIENT :	Labo S.M. inc.	ECHANT. :	ST-15
PROJET :	ALCOA / F099382-100	PROF. (m) :	14.80 - 14.90
		FICHIER :	Comp15756-09-09-15.xls

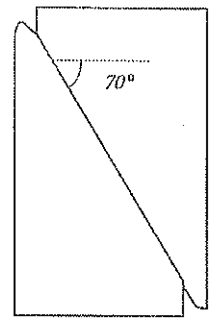
Compression non drainée

Longueur initiale, Hi (mm) : 100.55	Volume initial, Vi (cm³) : 200.60	Section initiale, Ai (cm²) : 19.95	Vit. déformation (mm/min) : 0.8
Longueur finale, Hf (mm) : 84.93	Volume final, Vf (cm³) : 200.60	Section finale, Af (cm²) : 23.62	

No.	Lectures ΔL (0,01mm)	Lectures Fa (N)	Déformation ΔH/Hi (%)	Section (cm²)	Résistance en compression, Uc (kPa)	Résultats
1	1538	0	0.00%	19.95	0	
2	1550	19	0.12%	19.97	10	**Rupture :**
3	1590	29	0.52%	20.05	14	
4	1640	38	1.01%	20.15	19	Uc (kPa) : 34 kPa
5	1700	48	1.61%	20.28	24	ΔH/Hi (%) : 4.59 %
6	1800	62	2.61%	20.48	30	
7	1900	70	3.60%	20.70	34	
8	2000	72	4.59%	20.91	34	**Caractéristiques physiques :**
9	2051	71	5.10%	21.02	34	
10	2133	68	5.92%	21.21	32	Teneur en eau initiale : 23.75 %
11	2300	49	7.58%	21.59	23	Masse volumique humide : 2095 kg/m³
12	2400	40	8.57%	21.82	18	Masse volumique sèche : 1693 kg/m³
13	2500	34	9.57%	22.06	15	Teneur en eau finale : 23.63 %
14	2600	30	10.56%	22.31	13	
15	2700	26	11.56%	22.56	12	
16	2800	22	12.55%	22.81	10	**Remarques :**
17	2900	20	13.55%	23.06	9	
18	3000	18	14.54%	23.34	8	Rapport hauteur/diamètre
19	3050	18	15.04%	23.48	8	de l'échantillon au montage = 2.0
20	3100	17	15.53%	23.62	7	



Croquis :



Réalisé par : A. Bustamante
date : 2009-11-30

Vérifié par : Hélène Bilodeau, ing.
date : 2009-12-03

QUÉFORMAT LTÉE

COMPRESSION TRIAXIALE NON DRAINÉE (CIU)

ASTM D4767-04

DOSSIER : **15756-G**
CLIENT : **Labo S.M. inc.**
PROJET : **ALCOA / F099382-100**

SONDAGE **BH-09-09**
ÉCHANT. : **ST-15**
PROF. (m) **14.60 - 14.70**

ESSAI No **15756-G-CIU-03** **Page 1 de 3**
FICHIER : 15756-G-03.CIU

Échantillon : Intact
Description : Silt argileux, traces de sable

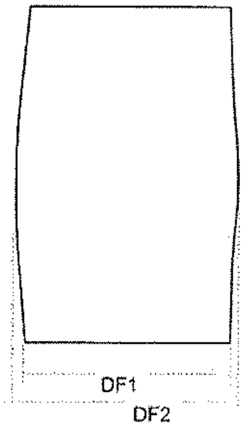
Unité : 1
Cellule : Tx-50A

ÉTAT INITIAL						ÉTAT FINAL					
Caractéristiques physiques			Géométrie			Caractéristiques physiques			Géométrie		
Masse initiale humide :	195.61	g	Longueur:	89.51	mm	Masse finale humide :	183.94	g	Déform :	Cylindre	
Teneur en eau initiale :	30.88	%	Diamètre :	37.84	mm	Masse finale sèche :	149.46	g	D_{F1} :	36.7	mm
Masse volum. humide :	1943	kg/m^3	Section :	11.25	cm^2	Teneur en eau finale :	23.07	%	D_{F2} :	38.5	mm
Degré de saturation :	100	%	Volume :	100.66	cm^3	Masse volum. humide :	2067	kg/m^3	Kt_F :	1/1 [1]	

CONDITIONS D'ESSAI								
Consolidation isotrope			Cisaillement			Membranes		
Pression cellulaire, σ_{3C} :	780	kPa	Engrenages .WF :	BA5		Nb -Type :	2	Ramses00
Contrepression, CP :	330	kPa	V_{axiale} :	0.0122	mm / min	Épaisseur :	0.080	mm
Pression effective, σ'_{3C} :	450	kPa	$d\varepsilon_1/dt$:	0.86	% / heure	Circonf.	102.0	mm
Condition de drainage :	Radial et Bas		ε_1 max :	8.46	%	Module :	0.22	N / mm
						Comportement :	Plis	

PRINCIPAUX RÉSULTATS D'ESSAI									
Paramètre B [2]			Cisaillement						
			Paramètres		$(\sigma_1 - \sigma_3)_{max}$	$(\sigma'_1/\sigma'_3)_{max}$	Final		
Initial (σ_{3C} = 25 kPa) :	0.85		ε_1	(%)	2.75		8.46		
Sous contrepression :	0.95		$\sigma_1 - \sigma_3$	(kPa)	303		270		
Après consolidation :	ND		σ'_1 / σ'_3	(1/1)	2.87		3.53		
Consolidation			Δu_W	(kPa)	289.40		345.30		
ΔV_c :	11.67	cm^3	A_{Uw} [3]	(1/1)	0.942		1.260		
ε_{vc} :	11.59	%	ϕ' [4]	(deg)	28.9		33.9		
C_v :	13	m^2/an							

Croquis du spécimen au démontage



Remarques :

D_{RS} : 2.75*

[1] $Kt_F = (D_{F2} - D_{F1}) \tan(\beta) / \Delta L$ [2] $B = \Delta u / \Delta\sigma_3$ [3] $A_{Uw} = \Delta u_W / \Delta(\sigma_1 - \sigma_3)$ [4] $\phi' = \sin^{-1}[(\sigma_1 - \sigma_3)/(\sigma'_1 + \sigma'_3)]$ pour c' = 0

* Valeur estimée

Effectué par :
A. Bustamante 09-12-03
Vérifié par
Hélène Bilodeau, ing.
Date : 2009-12-15

QUÉFORMAT LTÉE

COMPRESSION TRIAXIALE NON DRAINÉE (CIU)

ASTM D4767-04

Essai : 15756-G-CIU-03 **Page 2 de 3**

ΔL_o : 1157.0 Fp_o : 0.0 Vi : 88.99 cc Li : 85.44 mm Cylindre

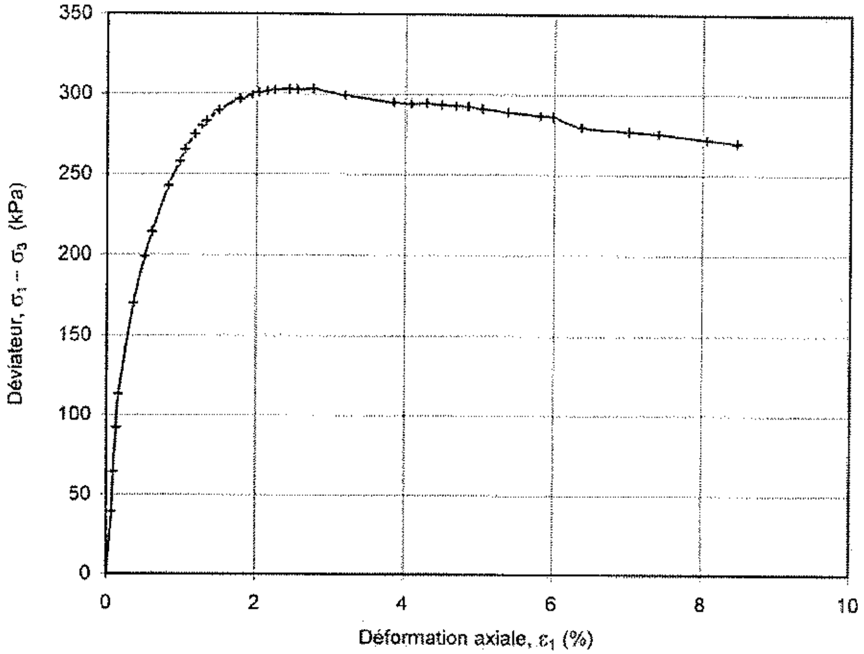
Ligne	Date	Heure	σ_3	ΔL	u_W	Fa	ε_1	Section	Δu_w	σ_{3m}	σ_{1m}	σ'_3	$\sigma_1 - \sigma_3$	σ'_1	σ'_1 / σ'_3	Au_w	$(\sigma'_1+\sigma'_3)/2$	$(\sigma_1-\sigma_3)/2$		Observ.
	aa-mm-jj	hh:mm	kPa	0.01mm	kPa	Newton	%	cm²	kPa	kPa	kPa	kPa	kPa	kPa	1/1	1/1	kPa	kPa		
1	09-12-08	09:00	780	1564	330.1	6.0	0.00	10.416	0.0	1.7	-8.1	451.6	-4.1	447.5	0.991	0.000	449.6	-2.0		
2				1570	332.4	51.0	0.07	10.423	2.3	1.7	-8.1	449.3	39.1	488.4	1.087	0.053	468.9	19.6		
3				1572	334.7	77.0	0.09	10.425	4.6	1.7	-8.1	447.0	64.1	511.1	1.143	0.067	479.1	32.0		
4				1575	339.9	106.0	0.13	10.429	9.8	1.7	-8.0	441.8	91.9	533.8	1.208	0.102	487.8	46.0		
5				1578	345.7	128.0	0.16	10.433	15.6	1.7	-7.9	436.0	113.1	549.1	1.259	0.133	492.6	56.5		
6				1595	377.4	187.0	0.36	10.454	47.3	1.7	-7.3	404.3	169.8	574.2	1.420	0.272	489.3	84.9		
7		09:33		1608	402.1	217.0	0.51	10.470	72.0	1.7	-6.9	379.6	198.7	578.3	1.523	0.355	479.0	99.3		
8				1616	418.9	233.0	0.61	10.479	88.8	1.7	-6.6	362.8	214.0	576.9	1.590	0.407	469.9	107.0		
9				1635	453.0	263.0	0.83	10.503	122.9	1.7	-6.0	328.7	242.7	571.4	1.738	0.498	450.1	121.3		
10				1648	475.2	279.0	0.98	10.519	145.1	1.7	-5.6	306.5	257.9	564.4	1.841	0.554	435.5	128.9		
11				1654	486.8	287.0	1.05	10.527	156.7	1.7	-5.4	294.9	265.5	560.4	1.900	0.581	427.7	132.8		
12				1665	504.4	297.0	1.18	10.540	174.3	1.7	-5.1	277.3	274.9	552.3	1.991	0.625	414.8	137.5		
13		11:03		1673	515.7	303.0	1.28	10.550	185.6	1.7	-4.9	266.0	280.6	546.6	2.055	0.652	406.3	140.3		
14				1678	522.4	306.0	1.33	10.557	192.3	1.7	-4.8	259.3	283.3	542.7	2.093	0.669	401.0	141.7		
15				1692	539.3	313.0	1.50	10.574	209.2	1.7	-4.5	242.4	289.8	532.2	2.195	0.712	387.3	144.9		
16				1716	563.8	321.0	1.78	10.604	233.7	1.7	-4.1	217.9	296.8	514.8	2.362	0.777	366.4	148.4		
17				1730	575.8	324.0	1.94	10.622	245.7	1.7	-3.9	205.9	299.4	505.3	2.454	0.810	355.6	149.7		
18		13:31		1737	581.8	326.0	2.02	10.631	251.7	1.8	-3.8	200.0	301.1	501.1	2.506	0.825	350.5	150.6		
19				1747	589.6	327.0	2.14	10.644	259.5	1.8	-3.6	192.2	301.8	494.0	2.571	0.848	343.1	150.9		
20				1755	594.6	328.0	2.24	10.654	264.5	1.8	-3.5	187.2	302.6	489.7	2.617	0.863	338.4	151.3		
21				1772	605.9	329.0	2.43	10.676	275.8	1.8	-3.3	175.9	303.1	478.9	2.723	0.898	327.4	151.5		
22				1781	611.4	329.0	2.54	10.687	281.3	1.8	-3.2	170.4	302.8	473.2	2.777	0.917	321.8	151.4		
23				1799	619.5	330.0	2.75	10.710	289.4	1.8	-3.1	162.3	303.2	465.5	2.868	0.942	313.9	151.6		
24				1799	619.5	330.0	2.75	10.710	289.4	1.8	-3.1	162.3	303.2	465.5	2.868	0.942	313.9	151.6		
25				1836	633.2	327.0	3.18	10.758	303.1	1.8	-2.8	148.6	299.3	447.9	3.014	0.999	298.3	149.7		
26				1892	648.3	324.0	3.84	10.831	318.2	1.9	-2.5	133.6	294.7	428.3	3.206	1.065	280.9	147.4		
27				1912	651.1	324.0	4.07	10.858	321.0	1.9	-2.5	130.8	294.0	424.8	3.248	1.077	277.8	147.0		
28				1930	651.7	325.0	4.28	10.882	321.6	1.9	-2.5	130.2	294.3	424.5	3.260	1.078	277.4	147.1		
29				1947	651.7	325.0	4.48	10.904	321.6	1.9	-2.5	130.2	293.7	423.9	3.255	1.080	277.1	146.8		
30				1964	653.3	325.0	4.68	10.927	323.2	1.9	-2.4	128.6	293.1	421.7	3.278	1.088	275.2	146.5		
31				1978	654.8	325.0	4.85	10.946	324.7	1.9	-2.4	127.1	292.6	419.7	3.301	1.095	273.4	146.3		
32				1994	656.0	324.0	5.03	10.968	325.9	2.0	-2.4	126.0	291.1	417.0	3.311	1.104	271.5	145.5		
33				2023	658.0	323.0	5.37	11.007	327.9	2.0	-2.3	124.0	289.1	413.1	3.332	1.118	268.5	144.6		
34				2060	662.3	322.0	5.81	11.058	332.2	2.0	-2.3	119.7	286.9	406.6	3.397	1.141	263.2	143.5		
35				2075	664.4	322.0	5.98	11.078	334.3	2.0	-2.2	117.6	286.4	404.0	3.435	1.151	260.8	143.2		
36				2108	666.4	316.0	6.37	11.124	336.3	2.1	-2.2	115.7	279.8	395.5	3.420	1.184	255.6	139.9		
37				2162	670.1	315.0	7.00	11.200	340.0	2.1	-2.1	112.0	277.1	389.1	3.474	1.209	250.5	138.5		
38				2196	672.2	315.0	7.40	11.248	342.1	2.1	-2.1	109.9	275.9	385.8	3.510	1.222	247.9	137.9		
39				2252	674.2	313.0	8.05	11.328	344.1	2.2	-2.0	108.0	272.1	380.1	3.520	1.246	244.0	136.1		
40	09-12-08	18:26		2287	675.4	312.0	8.46	11.379	345.3	2.2	-2.0	106.8	270.0	376.8	3.528	1.260	241.8	135.0		

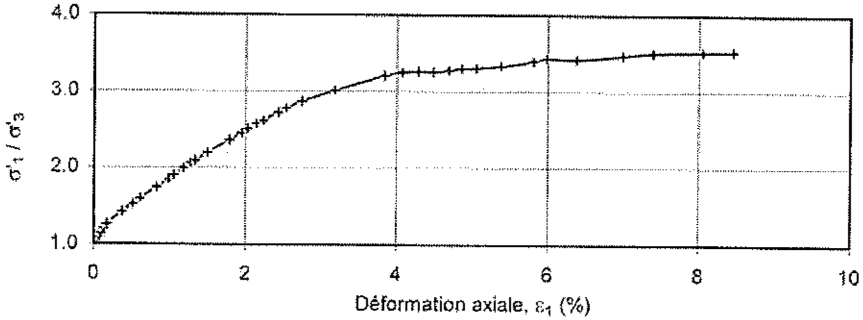
QUÉFORMAT LTÉE

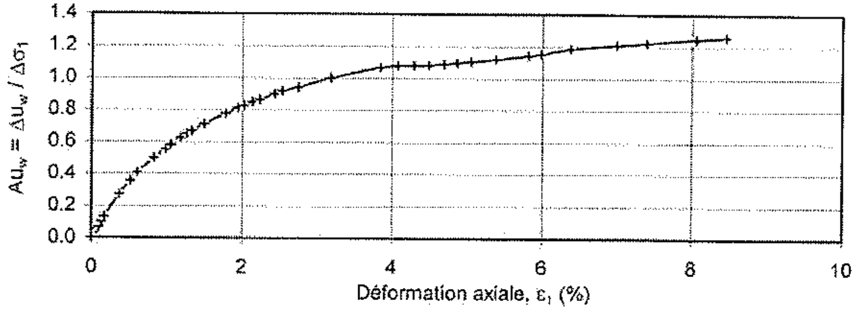
COMPRESSION TRIAXIALE NON DRAINÉE (CIU)

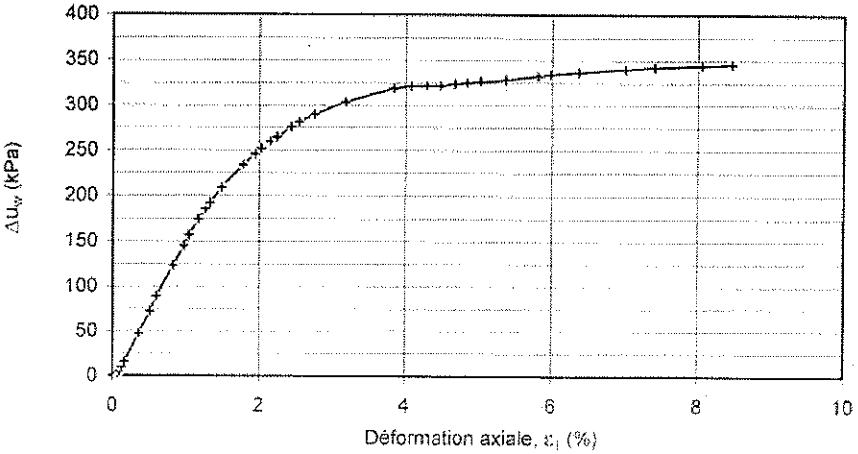
ASTM D4767-04

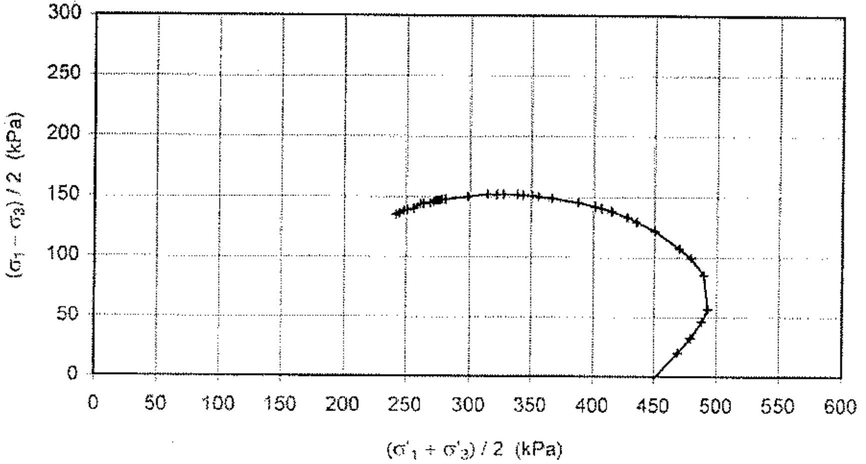
Essai : 15756-G-CIU-03 **Page 3 de 3**











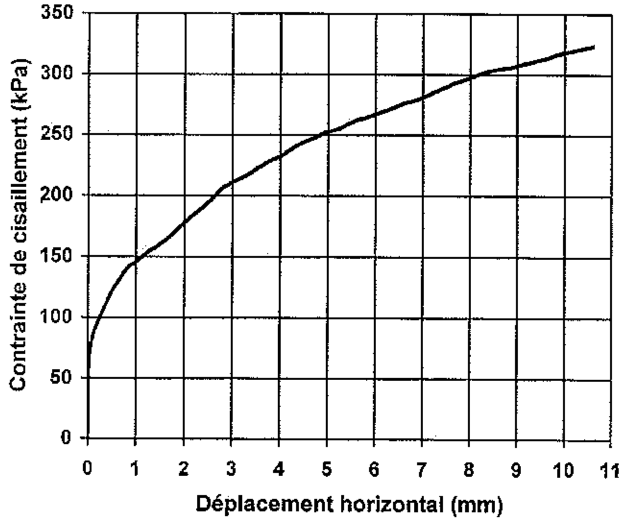
Qualitas

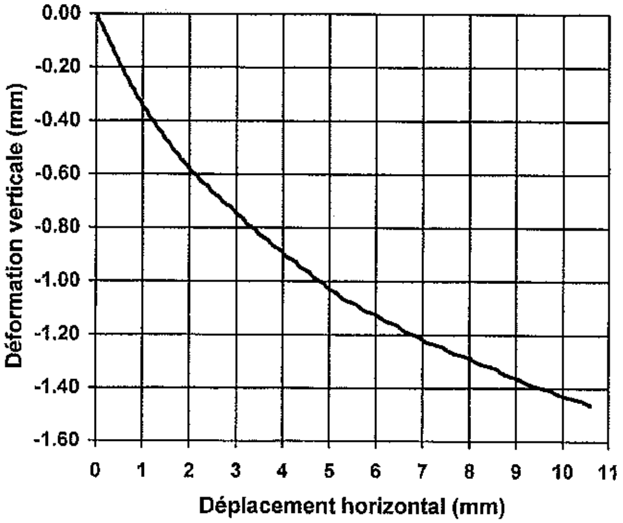
Certifié ISO 9001

ESSAI DE CISAILLEMENT DIRECT ASTM D-3080-04

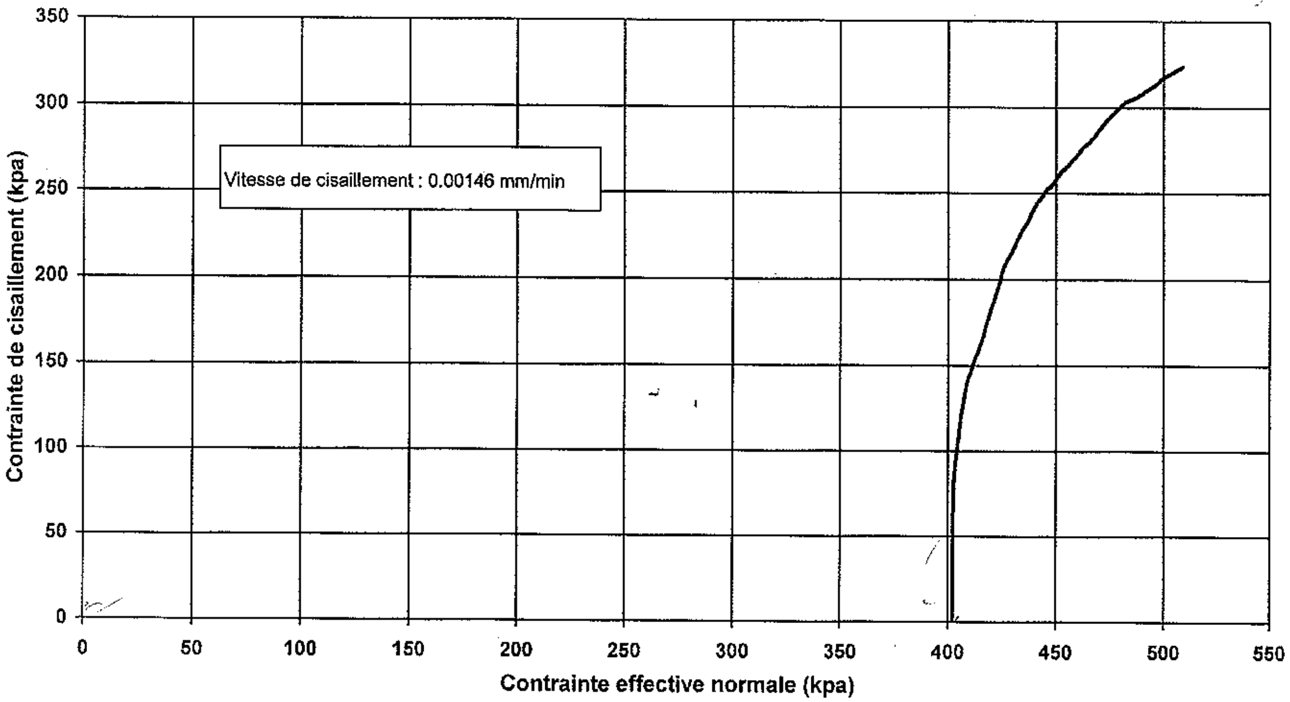
Projet: Quéformat ltée (n/d 14653-G)
Dossier no: G09014-15
Technicien: R.C.
Date (a-m-j): 2009-12-(04-10)
Vérifié par:

Sondage no: BH-09-09
Échant. no: ST-15
Prof. (m): 14.50 à 14.60





Cheminement de contraintes effectives


Vitesse de cisaillement : 0.00146 mm/min

Qualitas

Groupe Qualitas inc.
275, Benjamin-Hudon
Saint-Laurent (Québec) H4N 1J1
Téléphone: 514-331-6910
Télécopieur: 514-331-7632

Essai de cisaillement direct -consolidation ASTM D 3080-04

Projet desc.: **Qualitas-Quéformat**
Dossier no: **G09014-15**
Sondage : **BH-09-09**
Échantillon : **ST-15**
Profondeur: **14.50 à 14.60m**
Réalisé par : **R.C.**
Date: **2009-11-26**
Vérifié par :

Teneur en eau		Initiale	Finale	Lavage	Auxiliaire
Numéro de la tare :			277		63
Masse de la tare :	g	0.00	13.51	0.00	38.35
Masse du sol humide + tare :	g	153.34	152.52		81.04
Masse du sol sec + tare :	g	114.88	128.39	0.00	70.05
Teneur en eau du sol :	%	33.48	21.00		34.67

Poids volumique	
pv (kN/m3) :	18.45

Densité relative des grains	
Estimé:	2.750
Mesurée:	

Caractéristiques de l'essai			Initiale	Finale
Numéro de l'anneau :			2	
Diamètre de l'anneau :		mm	64.03	
Masse de l'ensemble (anneau + plaque) :		g	148.03	
Masse du sol humide + anneau + plaque :		g	301.37	
Masse totale du sol humide :		g	153.34	139.01
Hauteur du sol :	H_0	mm	25.31	20.559
Hauteur du sol sec :	H_S	mm	13.01	
Volume du spécimen	V_t	cm^3	81.50	66.20
Volume des solides	V_S	cm^3	41.90	
Indice des vides :			0.945	0.580
Degré de saturation :		%	97.4	99.6

Numéro de l'appareil :	**684**	
Levier de chargement:	a	9.993
	b	
Lecture de déformation:	0.001 mm	

Déformation de l'appareillage + pierres poreuses

Y = a+b*ln(x)+c*(ln(x))^2+d*(ln(x))^3+e*(ln(x))^4+f*(ln(x))^5

a		d	
b		e	
c		f	

Contrainte (kPa)	Chargement		Lecture Finale	Lecture corrigée	ΔH/H cum (%)	e (1/1)	H (mm)	Compressibilité		
	Date	Heure						Module M (kPa)	Cc	Cc / (1 + e_0)
0.0	26/11/2009	8:37:12	0.000		0.000	0.945	25.310			
20.6	26/11/2009	8:37:12	-0.161		0.636	0.933	25.149			
112.6	26/11/2009	11:36:43	-1.173		4.635	0.855	24.137			
198.4	27/11/2009	7:42:13	-2.041		8.064	0.788	23.269			
302.0	30/11/2009	6:52:14	-2.692		10.636	0.738	22.618			
402.1	01/12/2009	7:21:10	-3.211		12.687	0.698	22.099			
402.1	10/12/2009	6:51:00	-4.751		18.771	0.580	20.559	FIN DE L'ESSAI		

Qualitas

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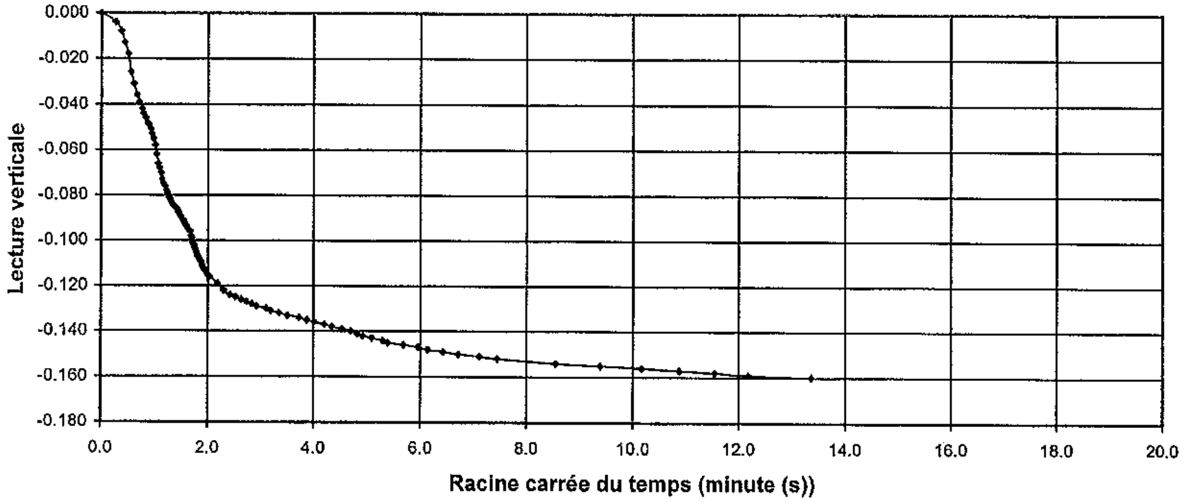
Essai de cisaillement direct -consolidation ASTM D 3080-04

Projet desc.:	Qualitas-Quéformat	**Sondage :**	BH-09-09	**Réalisé par :**	R.C.
Dossier no:	G09014-15	**Échantillon :**	ST-15	**Date:**	2009-11-26
		Profondeur:	14.50 à 14.60m	**Vérifié par :**	

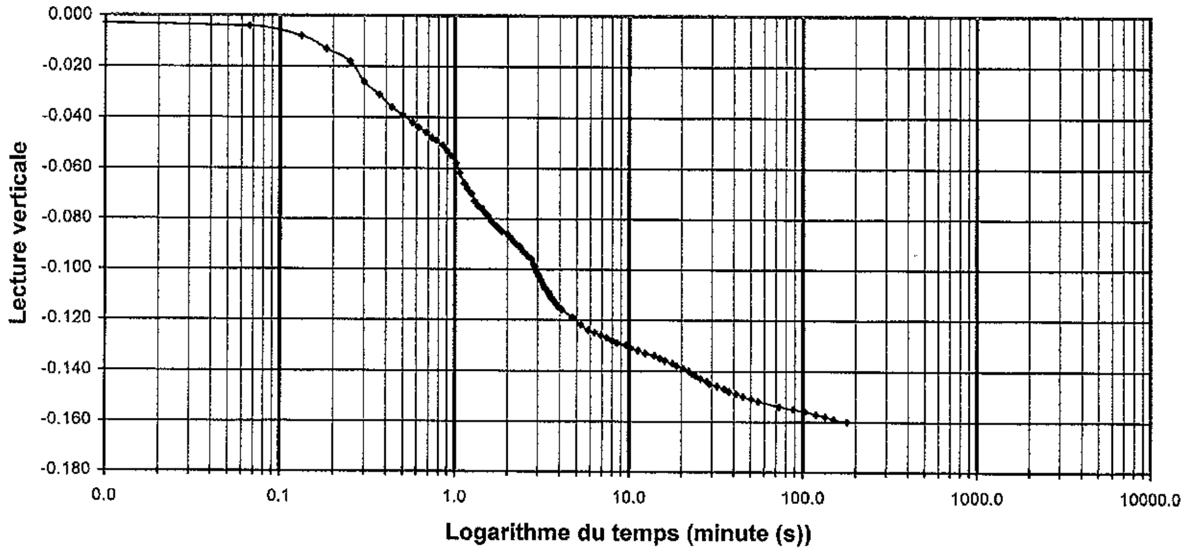
Mesure du coefficient de consolidation par la méthode Taylor

Contrainte : 0.0 à 20.6 kPa



Mesure du coefficient de consolidation par la méthode Casagrande

Contrainte : 0.0 à 20.6 kPa



Qualitas

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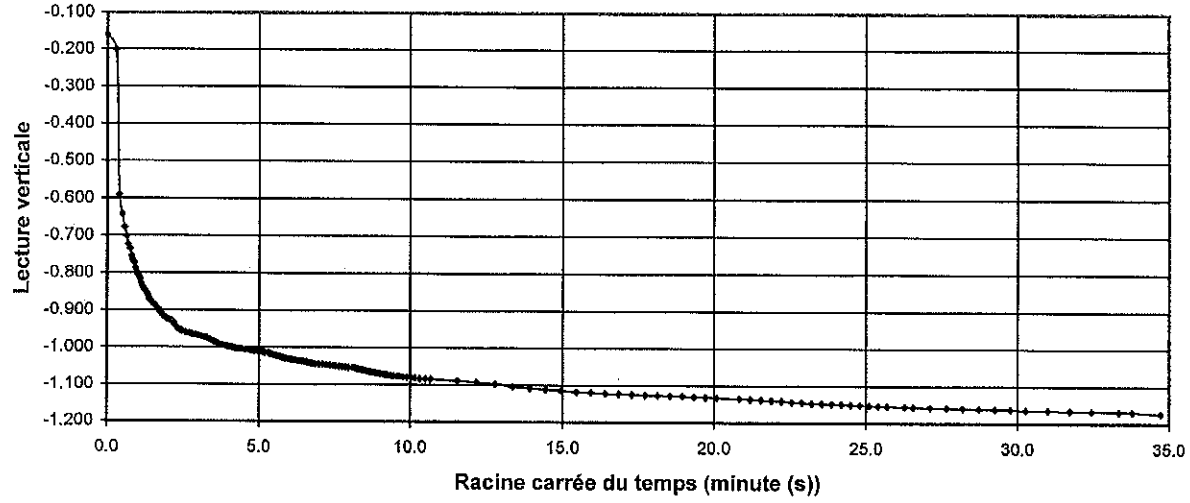
Essai de cisaillement direct -consolidation ASTM D 3080-04

Projet desc.: Qualitas-Québformat
Dossier no: G09014-15

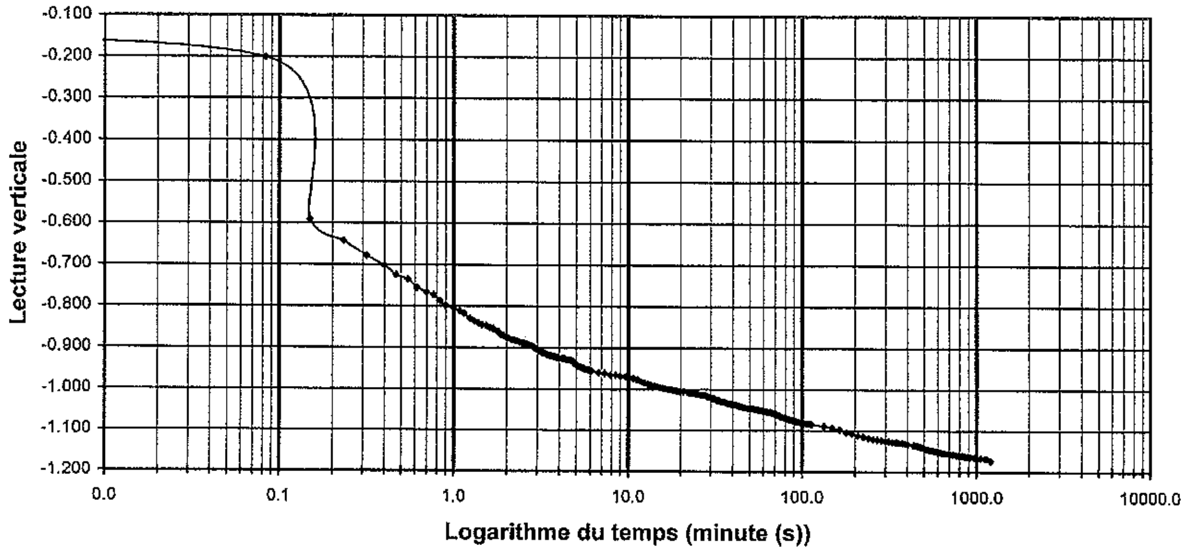
Sondage : BH-09-09
Échantillon : ST-15
Profondeur: 14.50 à 14.60m

Réalisé par : R.C.
Date: 2009-11-26
Vérifié par :

Mesure du coefficient de consolidation par la méthode Taylor	Contrainte : 20.6 à 112.6 kPa



Mesure du coefficient de consolidation par la méthode Casagrande	Contrainte : 20.6 à 112.6 kPa



Qualitas

Groupe Qualitas Inc.
275, Benjamin-Hudon
Saint-Laurent (Québec) H4N 1J1
Téléphone: 514-331-6910
Télécopieur: 514-331-7632

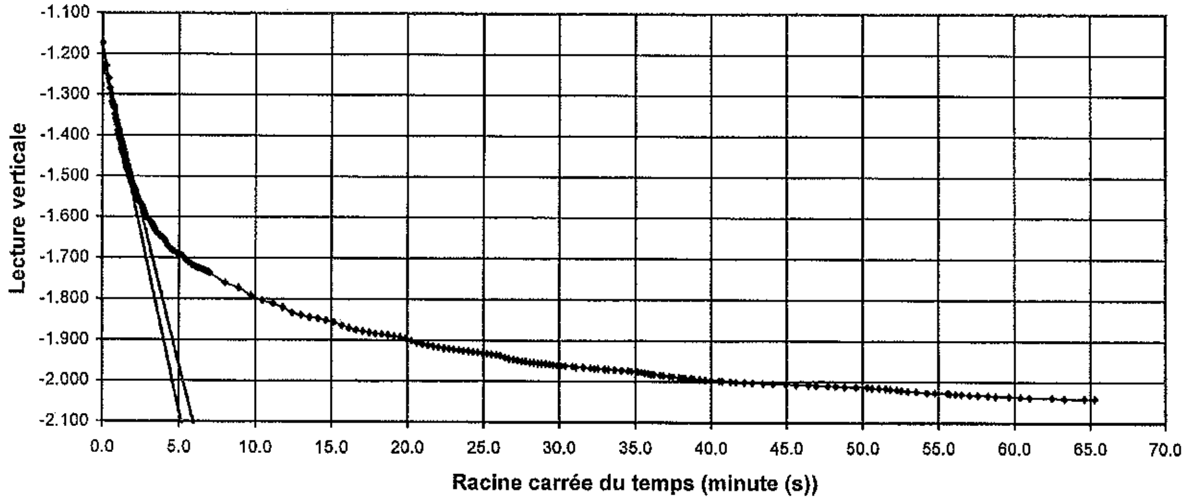
Essai de cisaillement direct -consolidation ASTM D 3080-04

Projet desc.: Qualitas-Quéformat
Dossier no: G09014-15

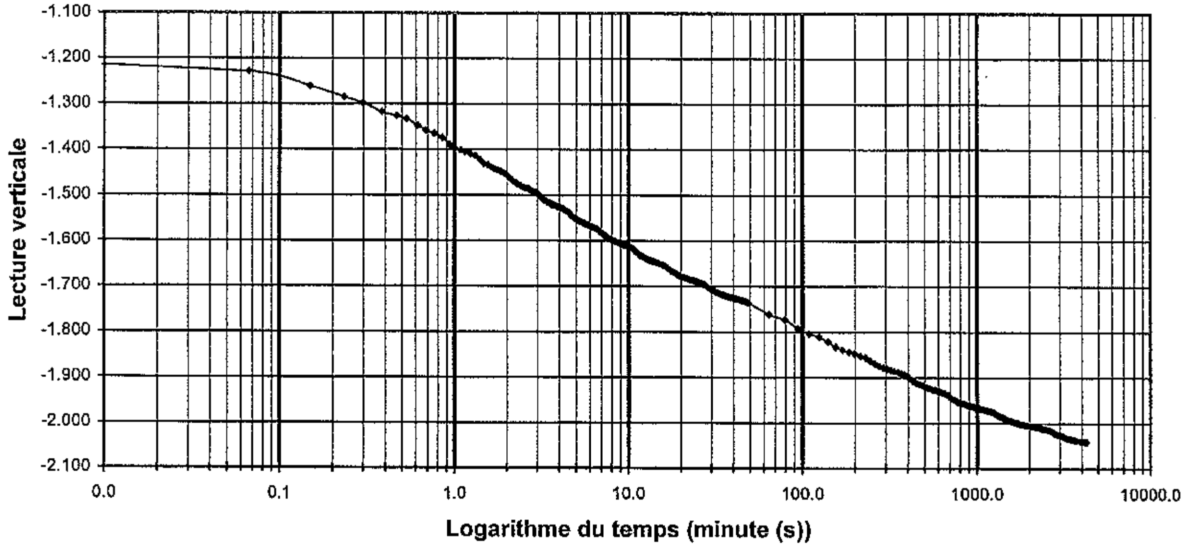
Sondage : BH-09-09
Échantillon : ST-15
Profondeur: 14.50 à 14.60m

Réalisé par : R.C.
Date: 2009-11-26
Vérifié par :

Mesure du coefficient de consolidation par la méthode Taylor	**Contrainte :** 112.6 à 198.4 kPa



Mesure du coefficient de consolidation par la méthode Casagrande	**Contrainte :** 10.7 kPa



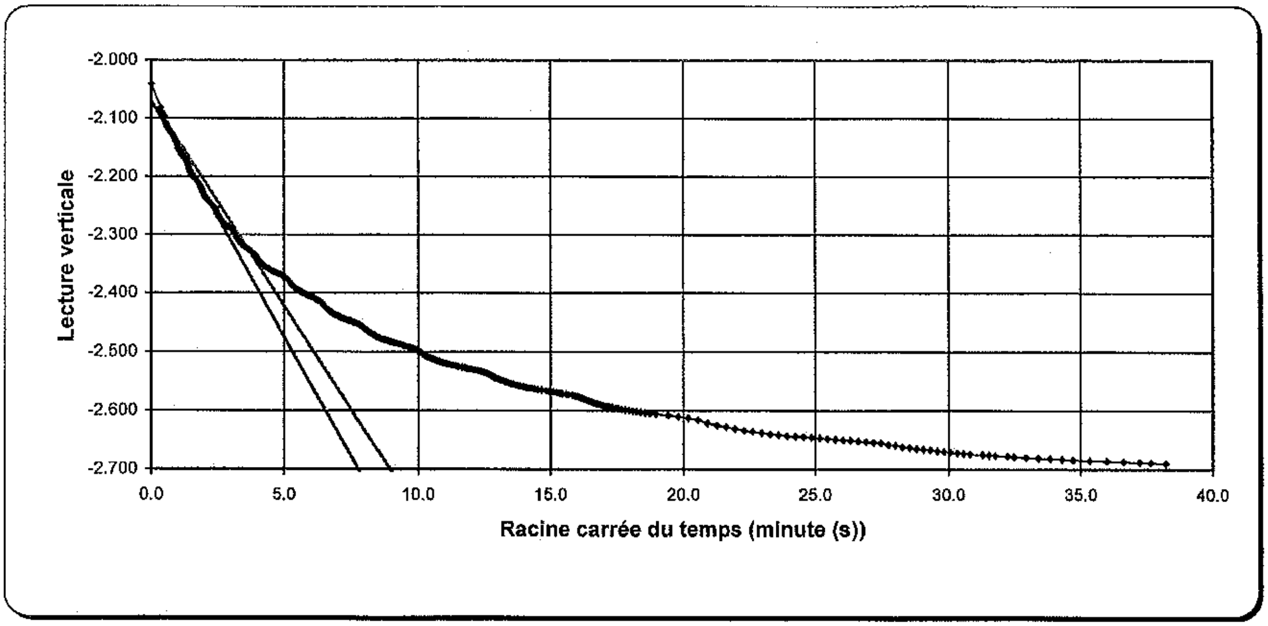
Qualitas

Groupe Qualitas inc.
275, Benjamin-Hudon
Saint-Laurent (Québec) H4N 1J1
Téléphone: 514-331-6910
Télécopieur: 514-331-7632

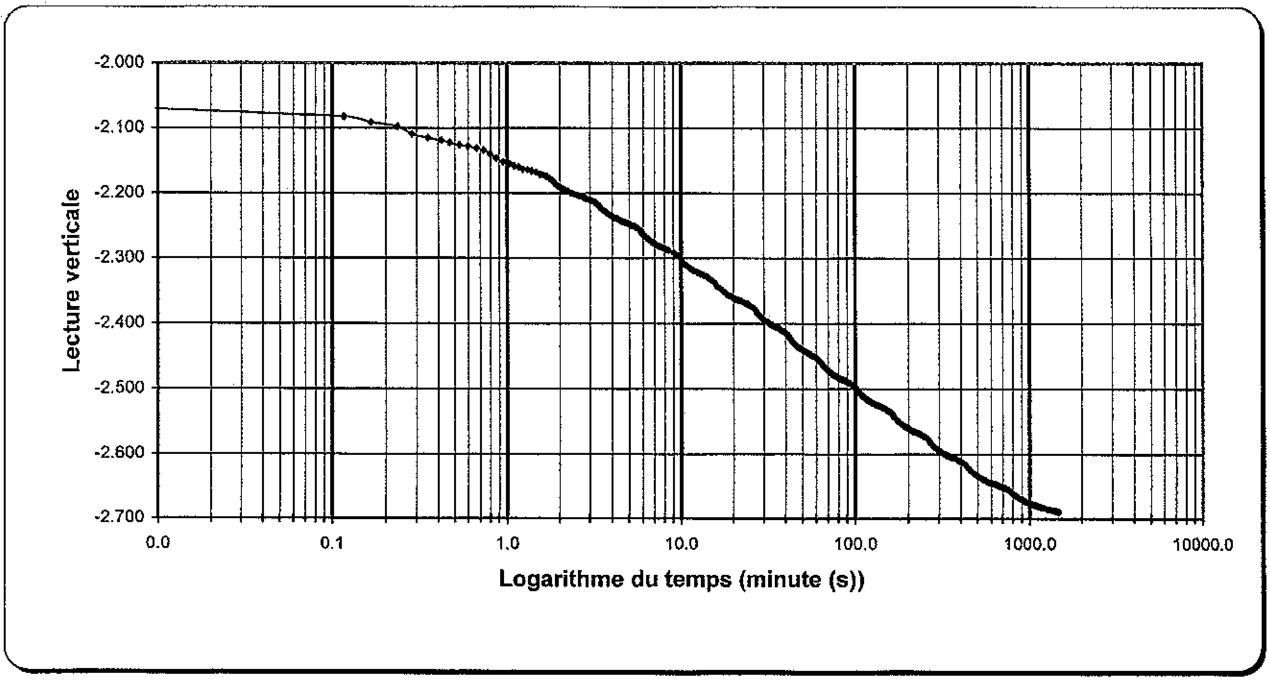
Essai de cisaillement direct -consolidation ASTM D 3080-04

Projet desc.:	Qualitas-Quéformat	**Sondage :**	BH-09-09	**Réalisé par :**	R.C.
Dossier no:	G09014-15	**Échantillon :**	ST-15	**Date:**	2009-11-26
		Profondeur:	14.50 à 14.60m	**Vérifié par :**	

Mesure du coefficient de consolidation par la méthode Taylor	Contrainte : 198.4 à 302.2 kPa



Mesure du coefficient de consolidation par la méthode Casagrande	Contrainte : 198.4 à 302.2 kPa



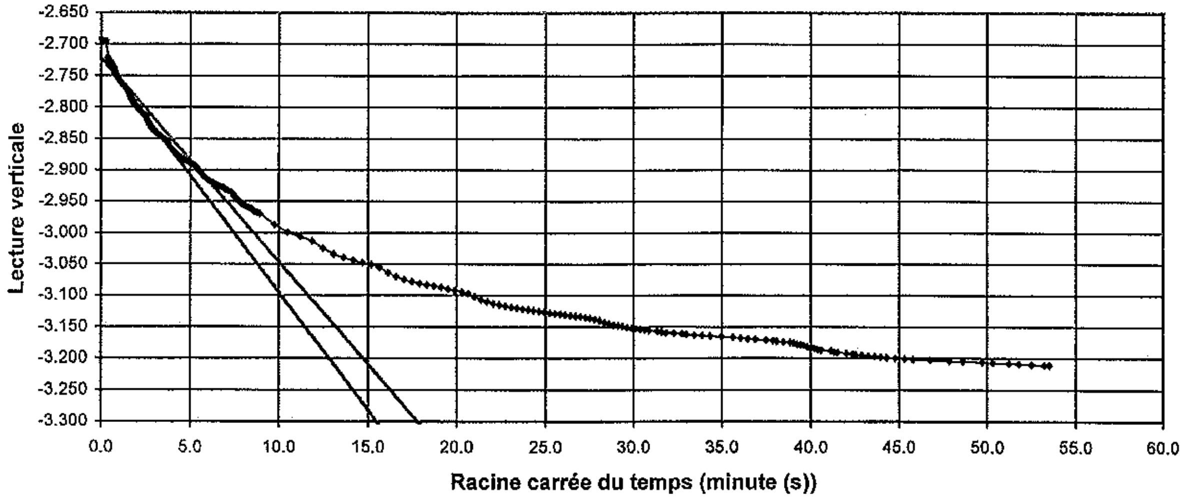
Qualitas

Groupe Qualitas Inc.
275, Benjamin-Hudon
Saint-Laurent (Québec) H4N 1J1
Téléphone: 514-331-6910
Télécopieur: 514-331-7632

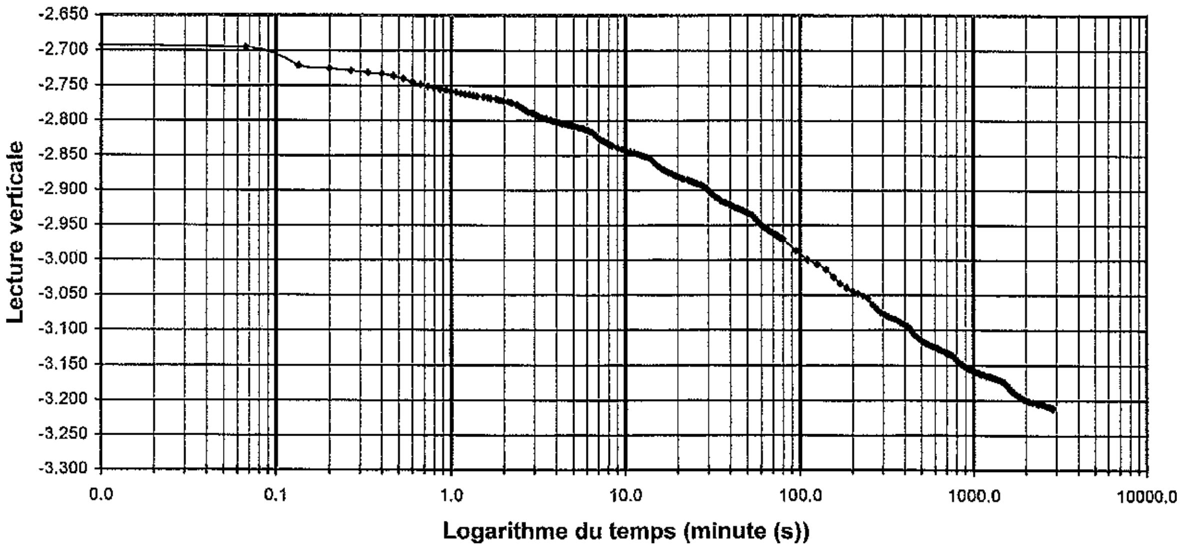
Essai de cisaillement direct -consolidation ASTM D 3080-04

Projet desc.:	Qualitas-Quéformat	**Sondage :**	BH-09-09	**Réalisé par :**	R.C.
Dossier no:	G09014-15	**Échantillon :**	ST-15	**Date:**	2009-11-26
		Profondeur:	14.50 à 14.60m	**Vérifié par :**	

Mesure du coefficient de consolidation par la méthode Taylor | **Contrainte : 302.2 à 402.1 kPa**



Mesure du coefficient de consolidation par la méthode Casagrande | **Contrainte : 302.2 à 402.1 kPa**



SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS1874

File Number	**: F099382200**			
Customer	: Alcoa	Type of Material	:	------
Address	: 100, route Maritime	Caliber	:	------
City	: Baie-Comeau (Québec)	Uses	:	
Postal Code	:	Sampled by	:	Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:	
Site	:		:	
Laboratory No.	**: 09-1757**	Location	:	09-09, SS-16, Depth.:15,5 to 15,8m.
Sample No.	: ------	Tests completed on	:	2009-09-04

Particle Size Analysis
LC 21 040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements
Atterberg Limits (3pts)	BNQ2501-092		
Liquid Limit (%):		25	------
Plastic Limit (%):		16	------
Plasticity index (%):		9	------
Water Content (%):	LC21-201	32,31	------

Legend : *** =Results not in conformity**

Remarks:

Prepared by: ______________ 2009-09-04
Sylvie Daigle, Tech.

Verified by: ______________ 2009-09-04
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

This report must not be copied, in part or in full, without written authorization from Labo S.M. inc.

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS1823

File Number	**: F099382200**		
Customer	: Alcoa	Type of Material	: -----
Address	: 100, route Maritime	Caliber	: -----
City	: Baie-Comeau (Québec)	Uses	: -----
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	**: 09-1737**	Source	: 09-09, SS-18, Depth.:16,8 to 17,4m.
Sample No.	: ------	Tests completed on	: 2009-09-03

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 4,474 — % Gravel: 1
C.U. 18,556 — % Sand: 69
Unified Classification: — % Silt: 25
Fineness Module: 0,77 — % Clay: 5

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: 2009-09-04
Sylvie Daigle, Tech.

Verified by: 2009-09-04
Sonya Graveline,Ing.

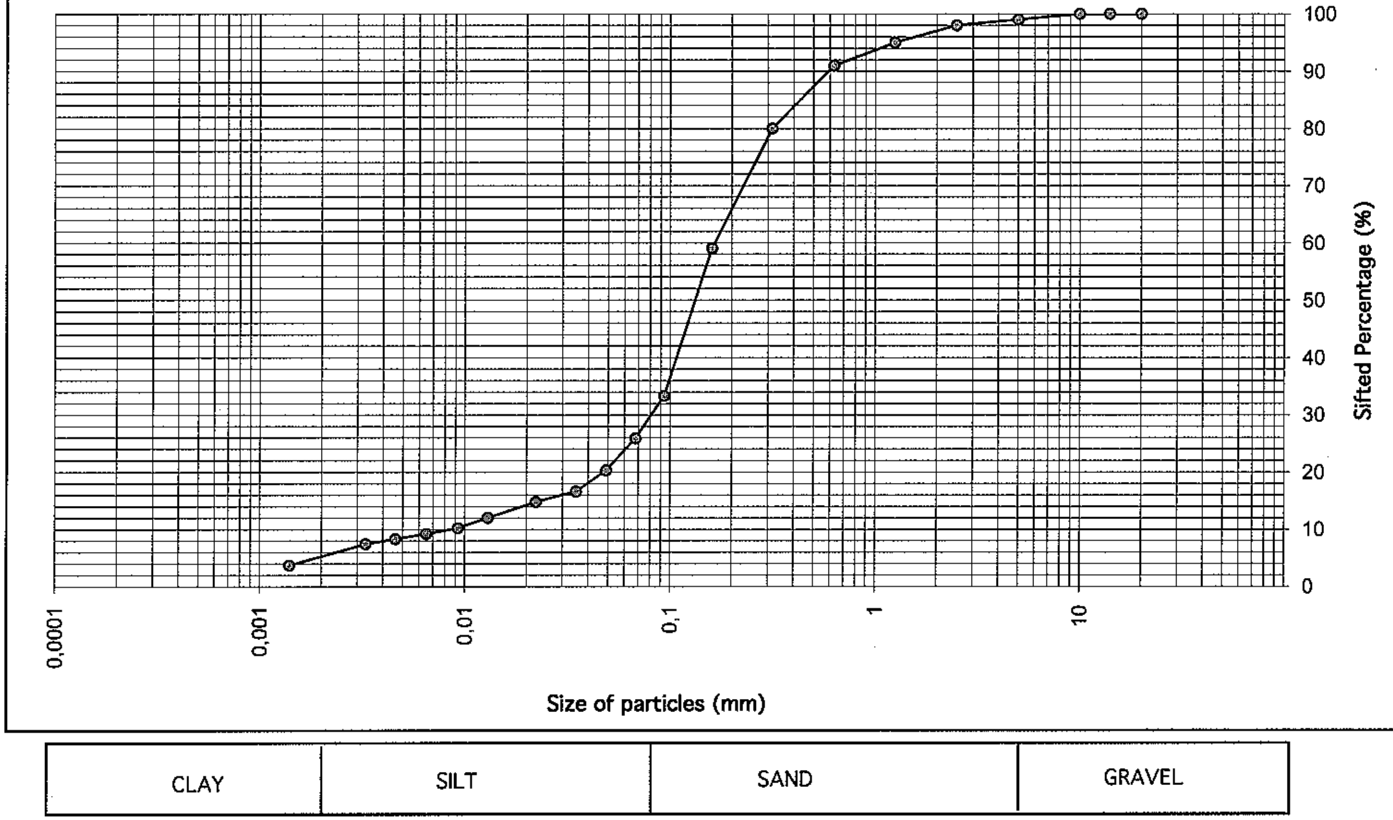
N.B. These results are exclusively for analysis sampled.

This report must not be copied, in part or in full, without written authorization from Labo S.M. inc.

SMi
LABO S.M. INC.

Sediments analysis NQ 2501-025	
Size (mm)	% Sifted (%)
20	100
14,0	100
10,0	100
5,00	99
2,500	98
1,250	95
0,630	91
0,3150	80,0
0,1600	59,0
0,0937	33,3
0,0679	25,9
0,0489	20,3
0,0349	16,6
0,0223	14,8
0,0130	12,0
0,0093	10,2
0,0065	9,2
0,0046	8,3
0,0033	7,4
0,0014	3,7

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-1737

Type of material: Sand,some silt, traces clay & gravel.

File #: **F099382200**

Provenance: Material on site,
09-09, SS-18 Depth.:16,8 to 17,4 m.

Customer: **Alcoa**

Approuved by : ____________ Date : 30/10/2009.

'FLS-079 (06-2007) rév. 1

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-11
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 1 of 7
LOCATION OF BOREHOLE: X : 258877,57 Y : 5457028,41		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL**HQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -13.64	**BORING DATE** **START:** 2009-10-01 11:00:00	**END:** 2009-10-03 11:30:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

⊠	Remoulded
▨	Intact
■	Lost
◧	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	'Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

Water level

Date:	Time:	Elev.(m):

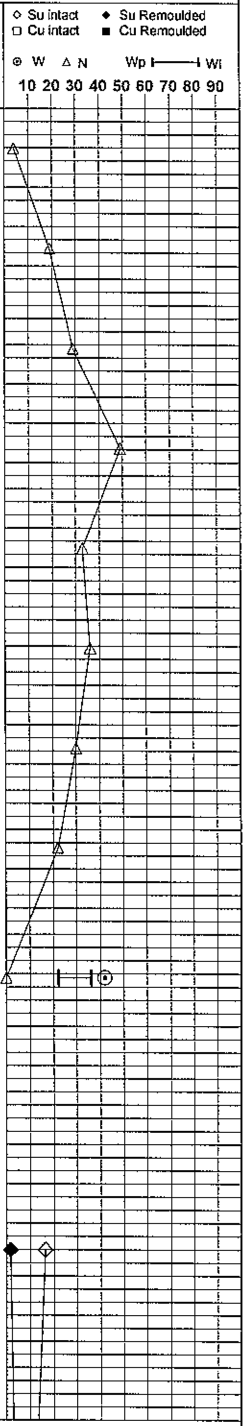
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth -13.64	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
	0.00	Gray fine sand with some silt and occasionally trace of sea shell; dense		⊠	SS-1	B	42	4	0-0-4-5		
1				⊠	SS-2	B	71	19	5-8-11-12		GSA, CU=1.9
2				⊠	SS-3	B	58	29	11-14-15-22		
				⊠	SS-4	B	62	49	12-24-25-25		
3				⊠	SS-5	B	46	33	7-13-20-18		
4				⊠	SS-6	B	71	36	13-17-19-20		
5				⊠	SS-7	B	50	30	12-14-16-18		
				⊠	SS-8	B	92	22	5-10-12-7		
6	-19.66 6.02	Gray silt and clay, some sand, stratified with thin layers of sand; soft		⊠	SS-9	B	38	0	1-0-0-0		GSA, CU=nd, W=41.9%, Wp=22%, Wl=36%, Ip=14%
7											
8				▨	ST-10		87				ST-10: GSA, C, DS CU=XXX, W=XXX, Wp=XXX, Wl=XXX, Ip=XXX, UC=16 kPa, PP=53, Cc=0.589, Ccr=0.026, Phi'=XXX, c'=XXX
9				▨	ST-11		83				ST-11: GSA, CUT CU=XXX, W=XXX, Wp=XXX, Wl=XXX,



Notes:

Approved by :
Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-11
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 2 of 7
LOCATION OF BOREHOLE: X : 258877,57 Y : 5457028,41		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL**HQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -13.64	**BORING DATE START:** 2009-10-01 11:00:00	**END:** 2009-10-03 11:30:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◧	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

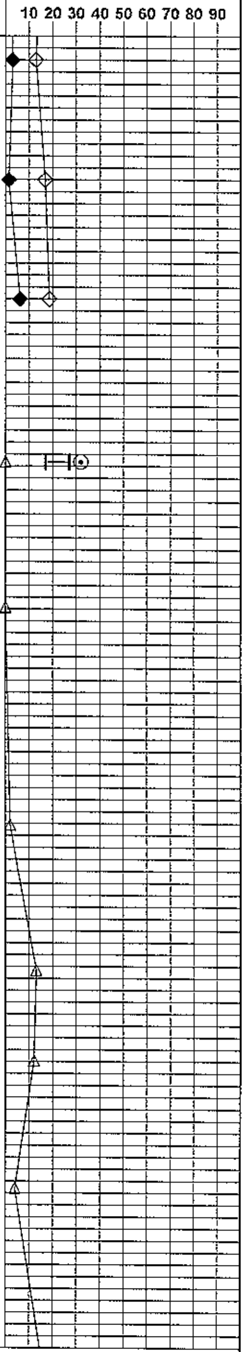
Water level

Date: Time: Elev.(m):

Installation:

STRATIGRAPHY | SAMPLES | LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
											Wp=XXX, Wl=XXX, Ip=XXX, UC=18 kPa
11	-24.84 11.20	Gray clayey sandy silt; very loose									
12											
13				▨	ST-12		96				ST-12: GSA, C CU=XXX, W=XXX, Wp=XXX, Wl=XXX, Ip=XXX, UC=53 kPa, PP=XXX, Ccr=XXX
				☒	SS-13	B	100	0	0-0-0-0		SS-13: GSA, CU=nd, W=32.1%, Wp=17%. Wl=27%, Ip=10%
14											
				☒	SS-14	B	100	0	0-0-0-0		SS-14: GSA, DS CU=nd, Phi'=XXX, c'=XXX
15											
				▨	ST-15		71				
	-29.21 15.57	Gravel and cobbles up to 200 mmØ									
16				■	DC-16	HQ	50				
	-29.95 16.31	Gray silt and sand with trace gravel; very loose		☒	SS-17	B	100	2	4-1-1		
17											
	-31.09 17.45	Gray sand with some silt and gravel, trace clay; medium dense									
18				☒	SS-18	B	83	13	9-5-8-3		SS-18: GSA, CU=19.8
				☒	SS-19	B	75	12	0-4-8-12		
19	-32.77 19.13	Gray silt and sand; very loose									
				☒	SS-20	B	100	4	0-3-1-1		Combined SS-21/22/23 GSA, DS, CU=XXX, Phi'=XXX, c'=XXX
20											
	-34.07 20.42	Gray silty sand with trace clay; loose to medium dense		☒							



Notes:

Approved by :
Sonya Graveline, ing.

SM Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-11
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 3 of 7
LOCATION OF BOREHOLE: X : 258877,57 Y : 5457028,41		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL**HQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -13.64	**BORING DATE** **START:** 2009-10-01 11:00:00 **END:** 2009-10-03 11:30:00		

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◧	Rock Core

Laboratory and in situ tests - Parameters

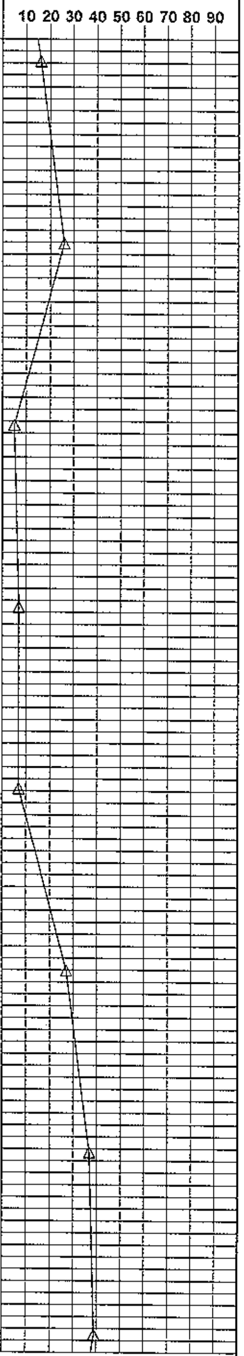
N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY				SAMPLES						LABO AND IN SITU TESTS	
Depth	Elev. / Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
				☒	SS-21	B	62	16	0-10-6-2		
22											
				☒	SS-22	B	25	26	9-14-12-7		
23											
24											
				☒	SS-23	B	42	5	3-1-4-1		
25											
				☒	SS-24	B	75	7	9-3-4-24		GSA, CU=42.8
26											
27											
				☒	SS-25	B	100	7	2-4-3-24		
28	-41.69 28.04	Gray sand, some silt and gravel, occasionally stratified with thin layers of sand; dense									
				☒	SS-26	B	50	27	26-13-14-9		
29											
30											
				☒	SS-27	B	58	37	29-13-24-20		
31											
				☒	SS-28	B	87	39	27-25-14-11		GSA, CU=4.5



Notes:

Approved by :
Sonya Graveline, ing.

SM Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-11
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 4 of 7
LOCATION OF BOREHOLE: X : 258877,57 Y : 5457028,41		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL** HQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -13.64	**BORING DATE** **START:** 2009-10-01 11:00:00 **END:** 2009-10-03 11:30:00		

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒ Remoulded
▨ Intact
■ Lost
◧ Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value
Nd:	DCPT Nd-Value
Su:	Field Vane
GSA:	Grain size analysis
CU:	Uniformity coefficient
W:	Water Content
Wp:	Plastic limit
Wl:	Liquid limit
Ip:	Plasticity index:
D:	Specific density
Cu:	Swedish cone
C:	Consolidation
PP:	Preconsolidation pressure
Cc:	Compression index
Ccr:	Recompression index
UC:	Unconfined compression
DS:	Direct shear
Phi':	Angle of internal friction
c':	Cohesion
CUT:	Consolidation undrained triaxial

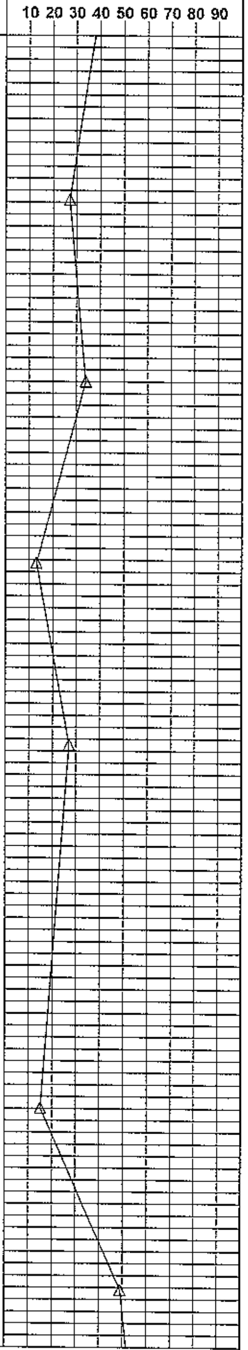
Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY — SAMPLES — LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
				☒							
33											
				☒	SS-29	B		27	38-15-12-11		
34											
35				☒	SS-30	B	87	34	18-21-13-18		
36											
				☒	SS-31	B	100	13	13-9-4-9		
37											
38				☒	SS-32	B	33	27	47-18-9-8		
39											
		Gravel and cobbles up to 250mmØ		☒	SS-33	N	100		50 /refusal		
40				■	DC-34	HQ	23				
41				☒	SS-35	B	100	15	12-4-11-15		
42											
				☒	SS-36	B	67	49	25-30-19-20		



Notes:

Approved by :
Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4
SITE: Alcoa - Baie-Comeau smelter (Quebec)
BOREHOLE: 09-11
PAGE: 5 of 7
LOCATION OF BOREHOLE: X : 258877,57 Y : 5457028,41
CASING: HW
FILE NO: F099382300
EQUIPEMENT USED: D-50
SAMPLER: Indicated
CORE BARREL HQ
TECHNICIAN: Simon Marois, tech.
SURFACE ELEVATION (m): -13.64
BORING DATE START: 2009-10-01 11:00:00 END: 2009-10-03 11:30:00

Type of Sampler
SS: Split Spoon
DC: Diamond Core
WS: Wash Sample
HT: Hydraulic Trust
HW: Hammer Weight
SP: Shelby and Piston
AS: Auger Sampler
ST: Thin Walled Shelby Tube

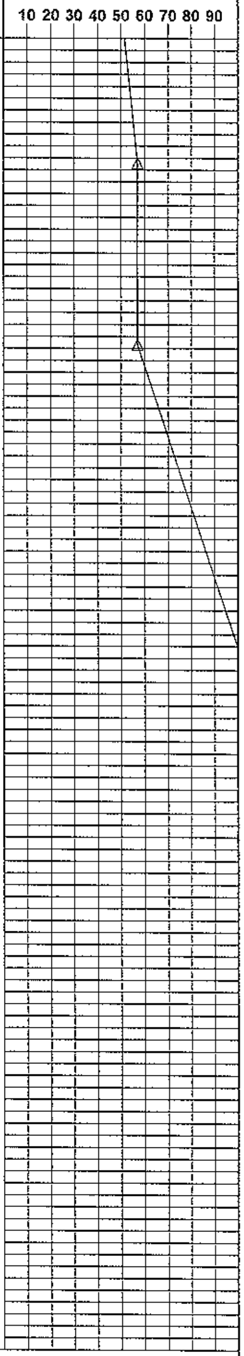
☒ Remoulded
▨ Intact
■ Lost
◨ Rock Core

Laboratory and in situ tests - Parameters
N: SPT N-Value
Nd: DCPT Nd-Value
Su: Field Vane
GSA: Grain size analysis
CU: Uniformity coefficient
W: Water Content
Wp: Plastic limit
Wl: Liquid limit
Ip: Plasticity index:
D: Specific density
Cu: Swedish cone
C: Consolidation
PP: Preconsolidation pressure
Cc: Compression index
Ccr: Recompression index
UC: Unconfined compression
DS: Direct shear
Phi': Angle of internal friction
c': Cohesion
CUT: Consolidation undrained triaxial

Water level
Date: Time: Elev.(m):
Installation:

STRATIGRAPHY | SAMPLES | LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
44				☒	SS-37	B	75	57	24-25-32-28		
	-58.14 44.50	Gray silty sand with trace clay; dense									
45											
				☒	SS-38	B	46	57	46-36-21-22		
46											
47				☒	SS-39	B	100		41-50 /refusal		GSA, CU=25.3
48											
				■	SS-40	B	0		70 /refusal		
49											
50				☒	SS-41	B	67	133	59-63-70		
	-64.24 50.60	Boulders and cobbles									
51											
				◨	DC-42	HQ	13				
52											
53	-66.52 52.88	Gray sand, trace to some silt and gravel; very dense		☒	SS-43	B	100	108	42-58-50 /refusal		Refusal on very dense soil



Notes:

Approved by :
Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4
BOREHOLE: 09-11
SITE: Alcoa - Baie-Comeau smelter (Quebec)
PAGE: 6 of 7
LOCATION OF BOREHOLE: X : 258877,57 Y : 5457028,41
CASING: HW
FILE NO: F099382300
EQUIPEMENT USED: D-50
SAMPLER: Indicated
CORE BARREL HQ
TECHNICIAN: Simon Marois, tech.
SURFACE ELEVATION (m): -13.64
BORING DATE START: 2009-10-01 11:00:00 **END:** 2009-10-03 11:30:00

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◧	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY				SAMPLES						LABO AND IN SITU TESTS		
Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks	10 20 30 40 50 60 70 80 90
55												
56	-69.88 56.24			☒	SS-44	B	67		58-60		Stop of sampling due to bad meteorological conditions	
57		The borehole has been continued without sampling										
58												
59												
60												
61												
62												
63												
64												

Notes:

Approved by :
Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-11
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 7 of 7
LOCATION OF BOREHOLE: X : 258877,57 Y : 5457028,41		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL** HQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -13.64	**BORING DATE START:** 2009-10-01 11:00:00	**END:** 2009-10-03 11:30:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◧	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

Water level

Date: Time: Elev.(m):

Installation:

STRATIGRAPHY | SAMPLES | LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks	10 20 30 40 50 60 70 80 90
66												
67												
68												
69												
70												
71												
		Cobble of 250mmØ		◧	DC-45	HQ	100					
72												
	-86.49 72.85	End of borehole because of bad weather conditions										
73												
74												
75												

Notes:

Approved by :
Sonya Graveline, ing.

SOIL MATERIALS ANALYSIS REPORT

LABO S.M. INC
740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2578

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2385**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-11A, SS-2, Depth.: 0,8 to 1,4 m.
Tests completed on : 2009-10-27

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 0,962
C.U. 1,918
Unified Classification:
Fineness Module: 0,33

% Gravel:
% Sand: 85
% Silt: 15
% Clay:

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: 2009-10-30
Sylvie Daigle, Tech.

Verified by: 2009-10-30
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

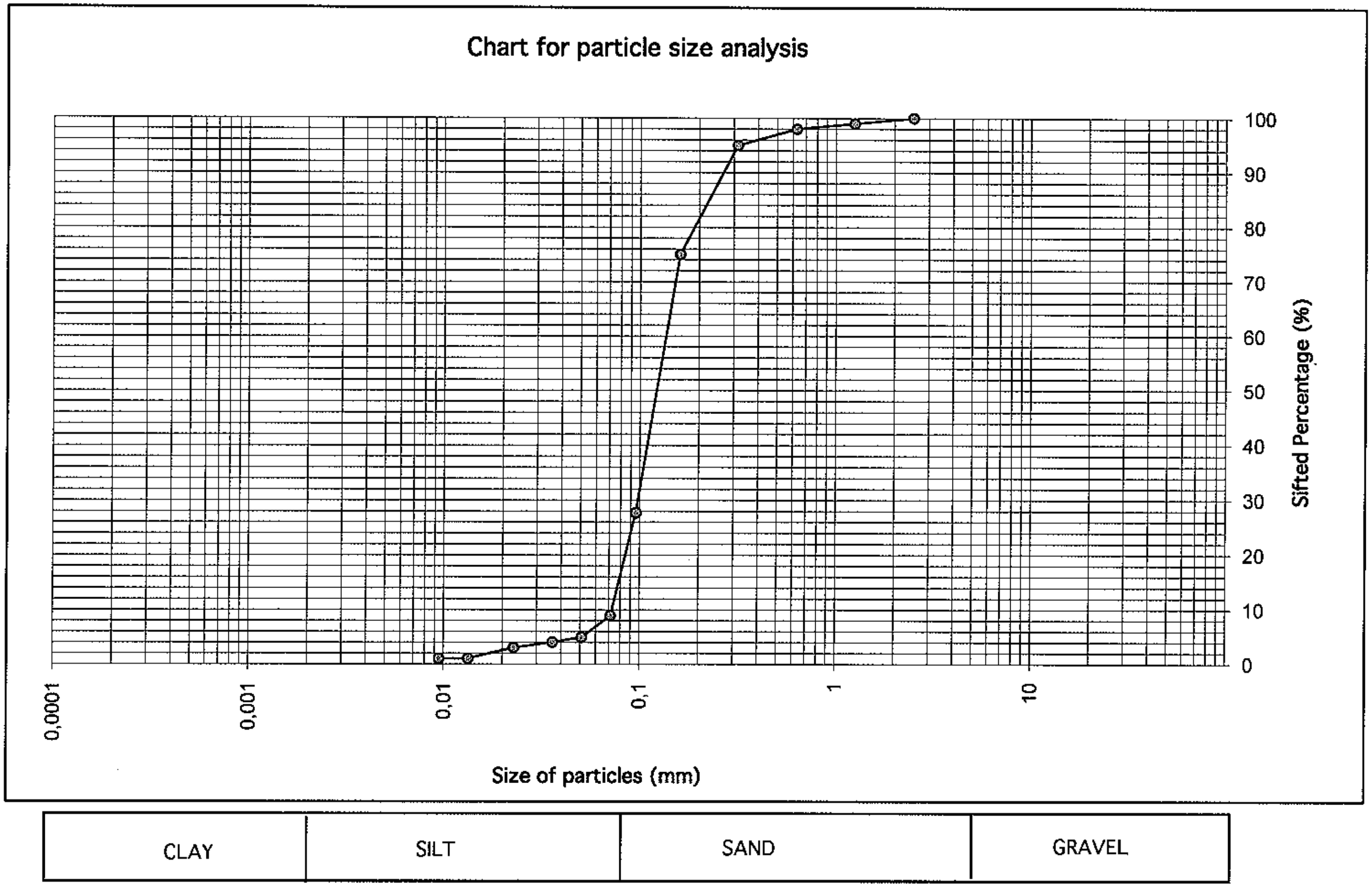
This report must not be copied, in part or in full, without written authorization from Labo S.M. inc.

SM*i*

LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
2,5	100
1,250	99
0,630	98
0,3150	95
0,1600	75
0,0958	27,7
0,0714	8,9
0,0510	4,9
0,0362	4,0
0,0229	3,0
0,0134	1,0
0,0095	1,0

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2385

Type of material: Sand,some silt.

File #: **F099382200**

Source: Material on site, 09-11A,SS-2, Depth: 0,8 to 1,4 m.

Customer: **Alcoa**

Approuved by : ______

Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2610

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2386**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-11A, SS-9, Depth.: 6,0 to 6,7 m.
Tests completed on : 2009-10-27

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.
C.U.
Unified Classification:
Fineness Module: 0,44

% Gravel:
% Sand: 20
% Silt: 43
% Clay: 37

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements
Atterberg Limits (3pts)	BNQ2501-092		
Liquid Limit (%):		36	------
Plastic Limit (%):		22	------
Plasticity index (%):		14	------
Water Content (%):	LC21-201	41,88	------

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: ______________ 2009-10-30
Sylvie Daigle, Tech.

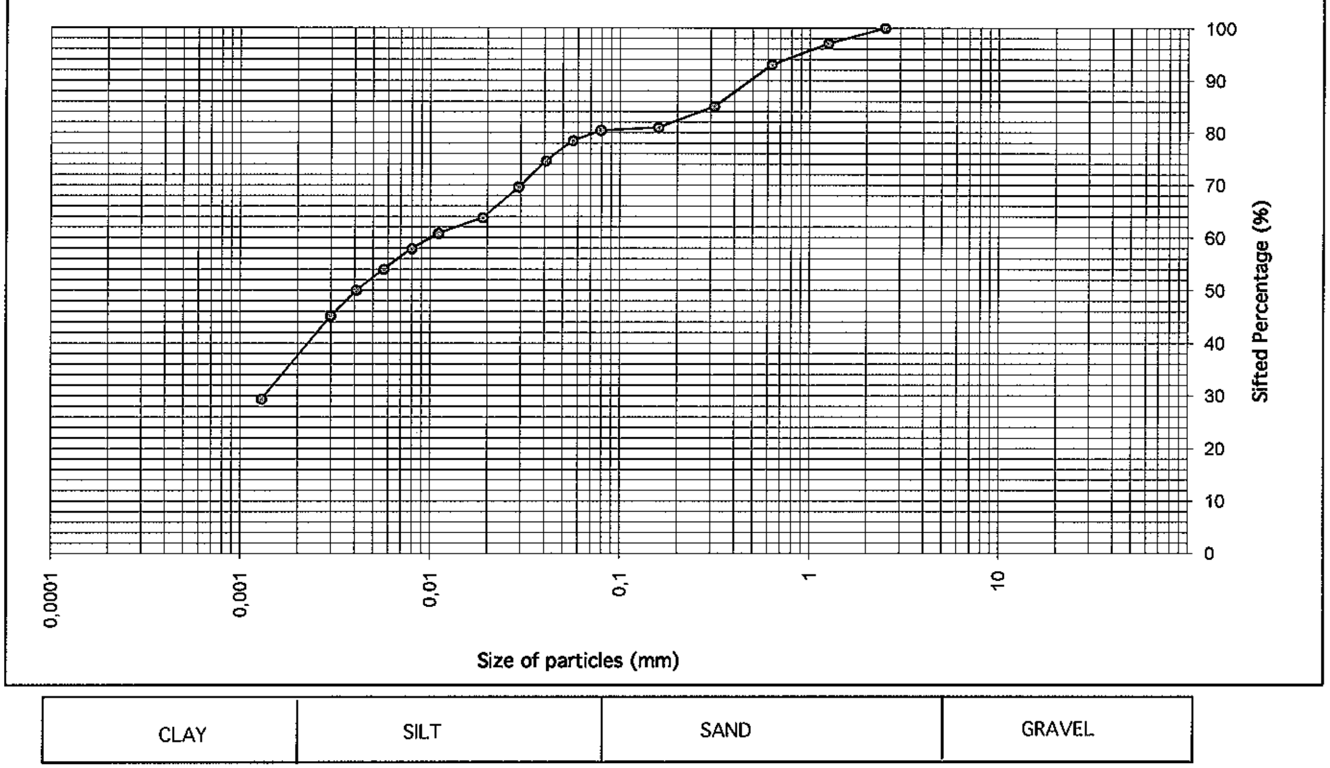
Verified by: ______________ 2009-10-30
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
2,500	100
1,250	97
0,630	93
0,3150	85,0
0,1600	81,0
0,0793	80,4
0,0564	78,5
0,0407	74,6
0,0293	69,6
0,0190	63,8
0,0111	60,8
0,0080	57,9
0,0057	54,0
0,0041	50,0
0,0030	45,1
0,0013	29,4

Chart for particle size analysis



Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2386

Type of material: Silt and clay,some sand.

Source: Material on site, 09-11A, SS-9, Depth: 6,0 to 6,7 m.

Approuved by : ______ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

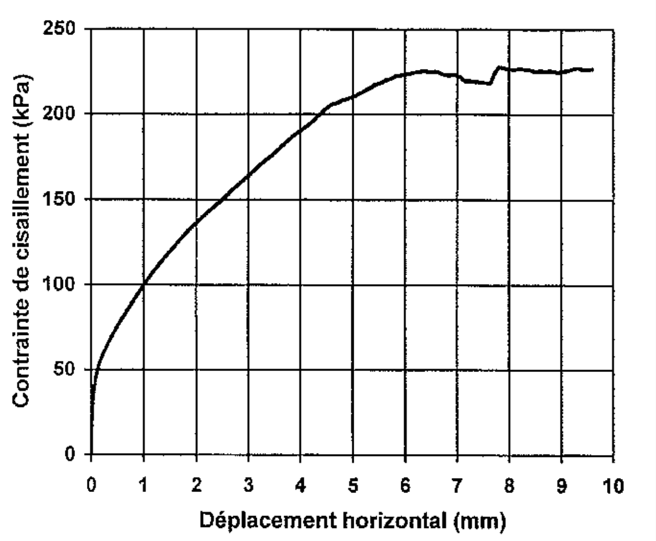
Qualitas

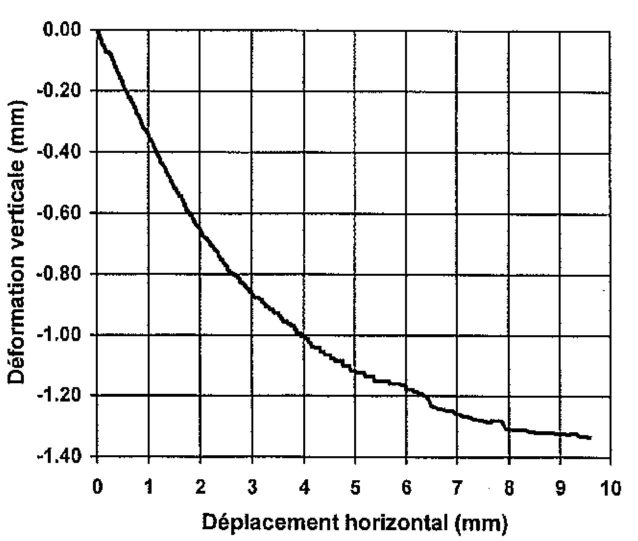
Certifié ISO 9001

ESSAI DE CISAILLEMENT DIRECT ASTM D-3080-04

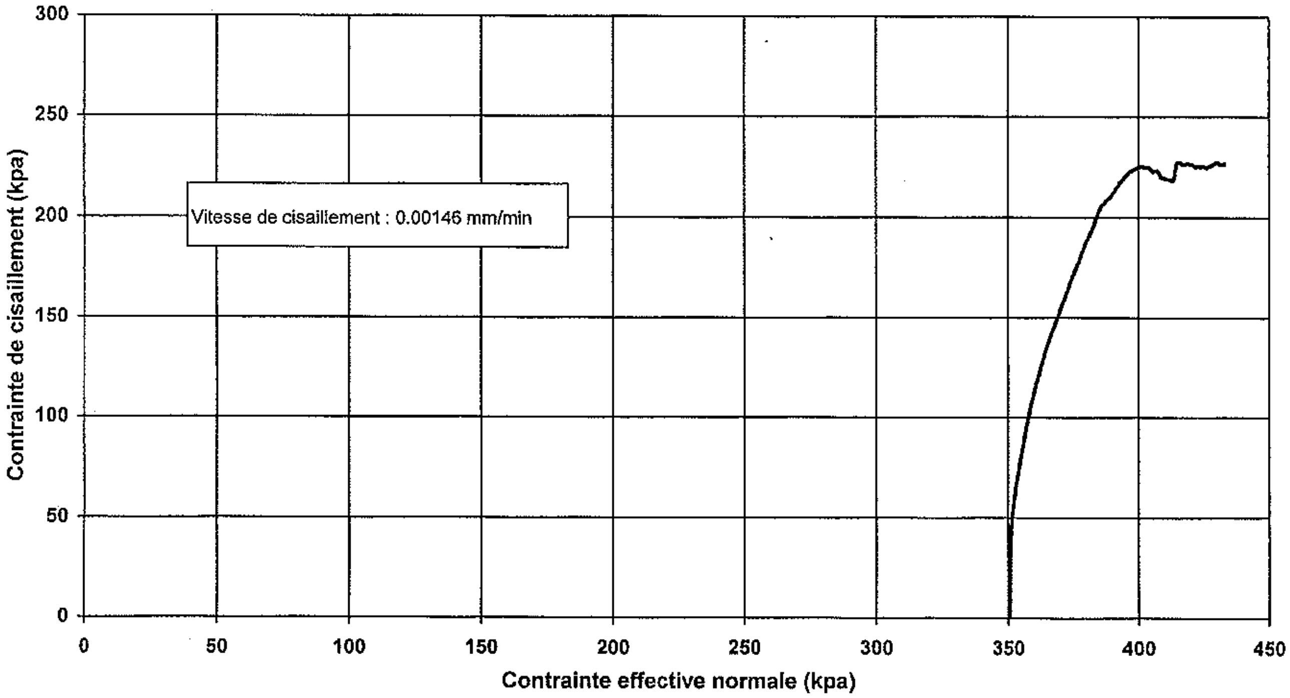
PROJET: Quéformat ltée (n/d 14653-G)
DOSSIER No: G09014-15
TECHNICIEN: R.C.
DATE (a-m-j): 2009-12-03 au 2009-12-09
Vérifié par:

Sondage no: BH-09-11
Échant. no: ST-10
Prof. (m): 7.80 à 7.90





Cheminement de contraintes effectives



Vitesse de cisaillement : 0.00146 mm/min

Groupe Qualitas inc.
275, Benjamin-Hudon
Saint-Laurent (Québec) H4N 1J1
Téléphone: 514-331-6910
Télécopieur: 514-331-7632

Essai de cisaillement direct -consolidation ASTM D 3080-04

Projet desc.: **Qualitas-Quéformat (n/d 14653-G)**
Dossier no: **G09014-15**

Sondage : **BH-09-11**
Échantillon : **ST-10**
Profondeur: **7.80 à 7.90m**

Réalisé par : **R.C.**
Date: **2009-11-26**
Vérifié par :

Teneur en eau		Initiale	Finale	Lavage	Auxiliaire
Numéro de la tare :			G5		128
Masse de la tare :	g	0.00	13.77	0.00	35.42
Masse du sol humide + tare :	g	135.92	126.55		85.59
Masse du sol sec + tare :	g	84.55	98.32	0.00	67.23
Teneur en eau du sol :	%	60.76	33.39		57.72

Poids volumique	
pv (kN/m3) :	16.36

Densité relative des grains	
Estimé:	2.750
Mesurée:	

Caractéristiques de l'essai			Initiale	Finale
Numéro de l'anneau :			2	
Diamètre de l'anneau :		mm	64.03	
Masse de l'ensemble (anneau + plaque) :		g	148.13	
Masse du sol humide + anneau + plaque :		g	284.05	
Masse totale du sol humide :		g	135.92	112.78
Hauteur du sol :	H_0	mm	25.31	18.249
Hauteur du sol sec :	H_S	mm	9.58	
Volume du spécimen	V_t	cm^3	81.50	58.76
Volume des solides	V_S	cm^3	30.84	
Indice des vides :			1.643	0.906
Degré de saturation :		%	101.7	101.4

Numéro de l'appareil :	**2 - GE-098**	
Levier de chargement:	a	4.980
	b	
Lecture de déformation:	0.001 mm	

Déformation de l'appareillage + pierres poreuses

Y = a+b*ln(x)+c*(ln(x))^2+d*(ln(x))^3+e*(ln(x))^4+f*(ln(x))^5

a		d	
b		e	
c		f	

Contrainte (kPa)	Chargement		Lecture Finale	Lecture corrigée	ΔH/H cum (%)	e (1/1)	H (mm)	Compressibilité		
	Date	Heure						Module M (kPa)	Cc	Cc / (1 + e_0)
0.0	26/11/2009	9:38:01	0.000		0.000	1.643	25.310			
13.5	26/11/2009	9:38:01	-0.244		0.964	1.617	25.066			
44.5	26/11/2009	11:44:23	-0.996		3.935	1.539	24.314			
99.5	27/11/2009	7:58:52	-2.965		11.715	1.333	22.345			
195.8	30/11/2009	7:01:15	-4.492		17.748	1.174	20.818			
350.6	01/12/2009	7:31:06	-5.719		22.596	1.046	19.591			
350.6	09/12/2009	6:42:13	-7.061		27.898	0.906	18.249	FIN DE L'ESSAI		

Qualitas

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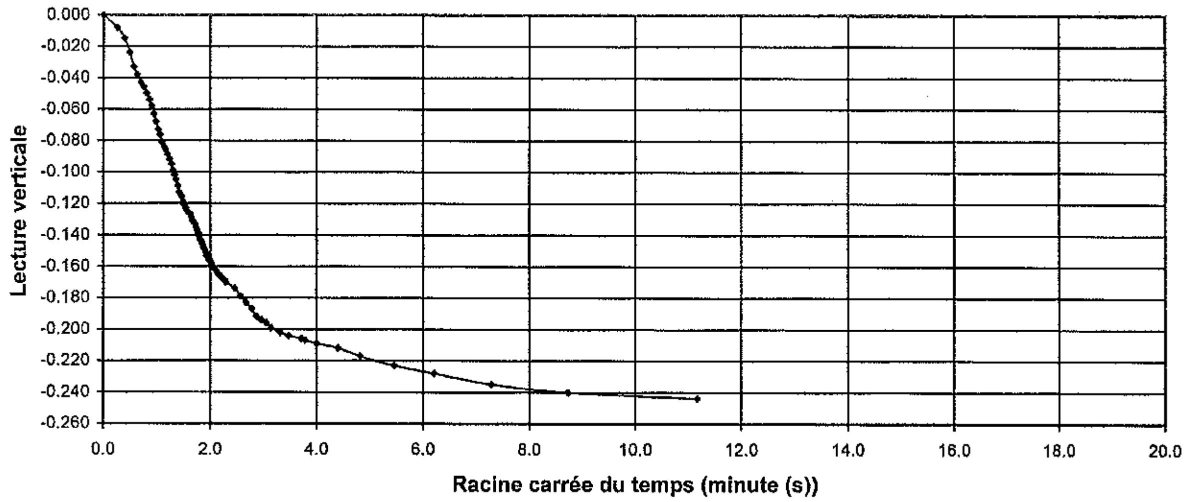
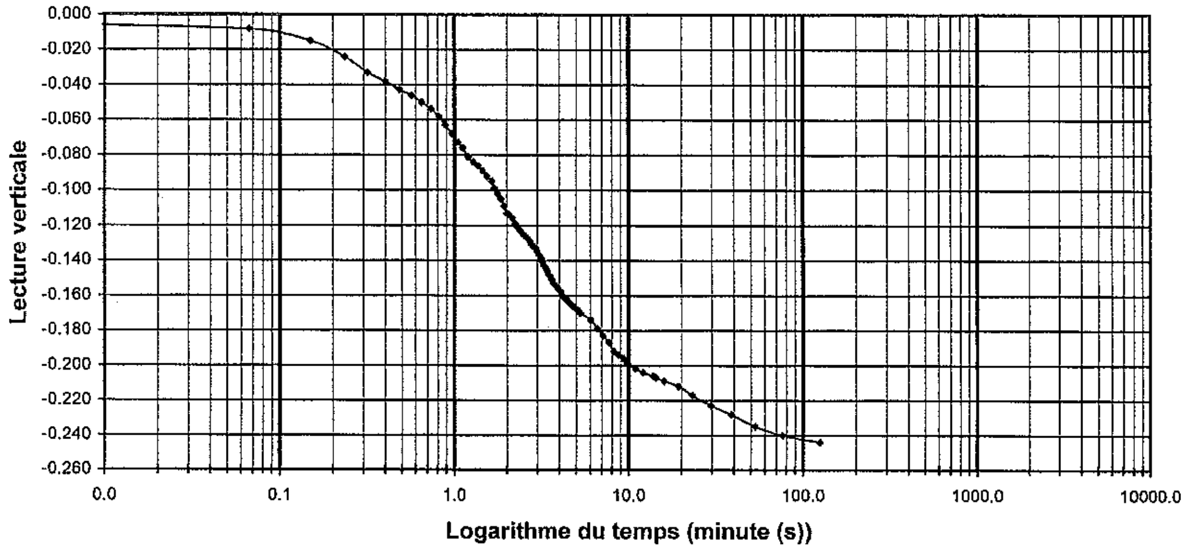
Essai de cisaillement direct -consolidation ASTM D 3080-04

Projet desc.:	Qualitas-Quéformat (n/d 14653-G)	**Sondage :**	BH-09-11	**Réalisé par :**	R.C.
Dossier no:	G09014-15	**Échantillon :**	ST-10	**Date:**	2009-11-26
		Profondeur:	7.80 à 7.90m	**Vérifié par :**	

Mesure du coefficient de consolidation par la méthode Taylor | **Contrainte : 0.0 à 13.5 kPa**



Mesure du coefficient de consolidation par la méthode Casagrande | **Contrainte : 0.0 à 13.5 kPa**



Qualitas

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275, Benjamin-Hudon
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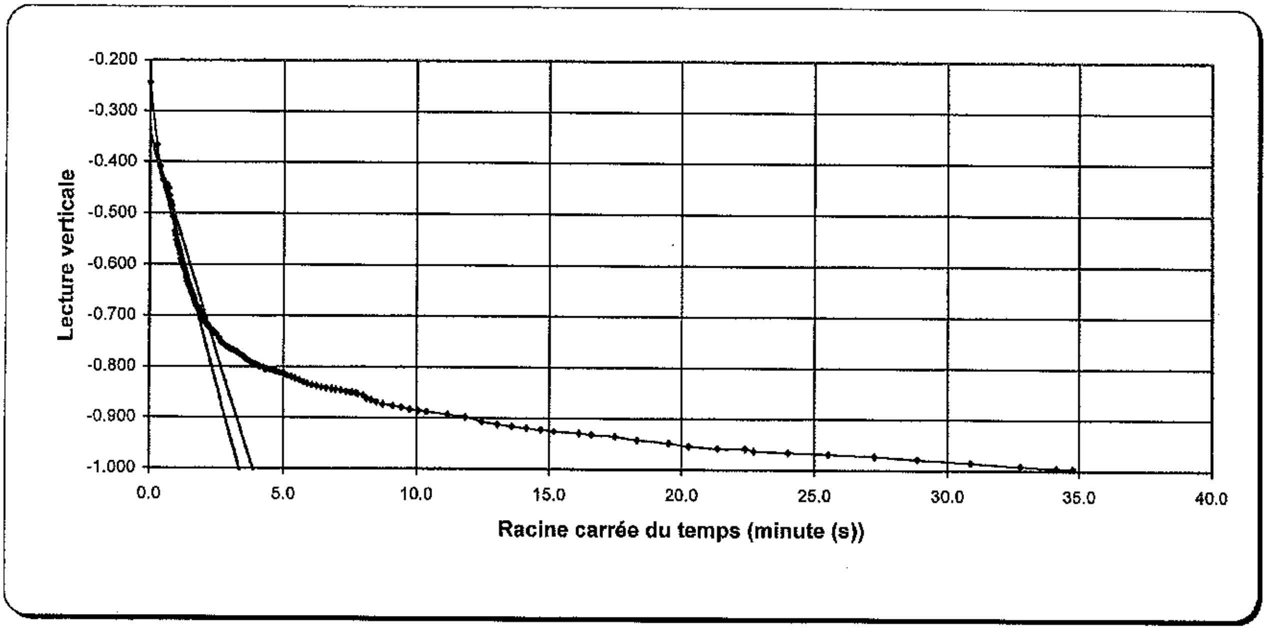
Télécopieur: 514-331-7632

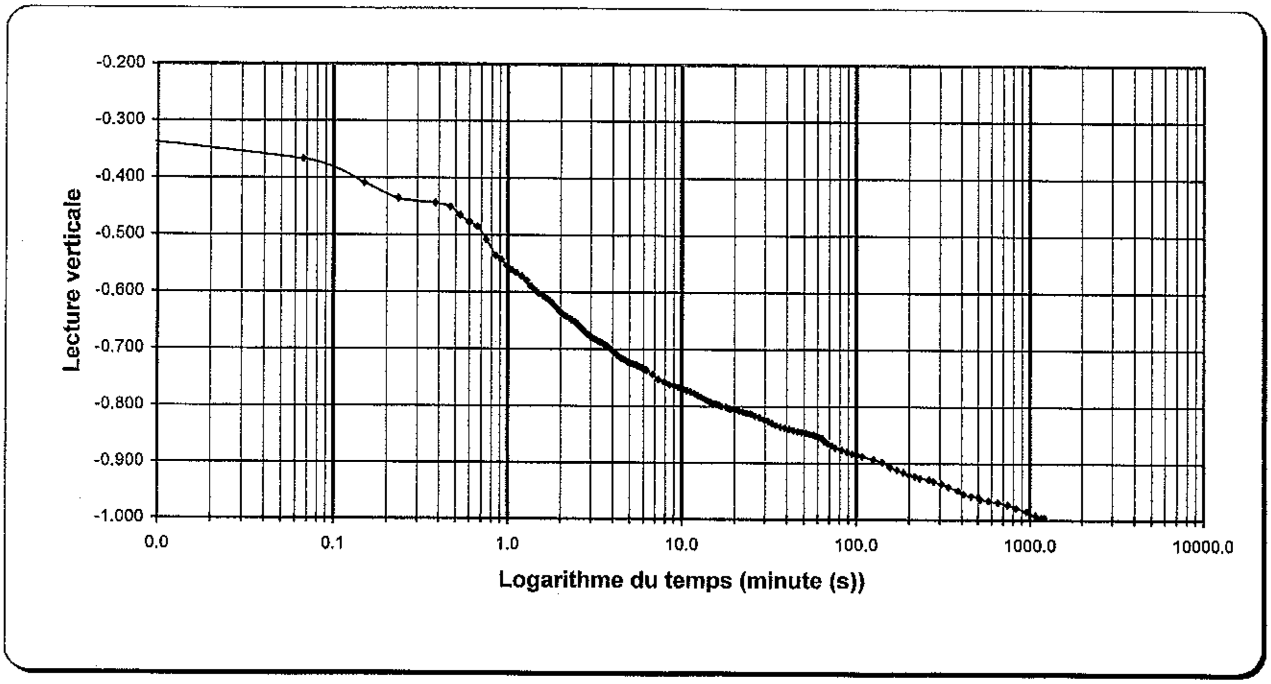
Essai de cisaillement direct -consolidation ASTM D 3080-04

Projet desc.:	Qualitas-Quéformat (n/d 14653-G)	**Sondage :**	BH-09-11	**Réalisé par :**	R.C.
Dossier no:	G09014-15	**Échantillon :**	ST-10	**Date:**	2009-11-26
		Profondeur:	7.80 à 7.90m	**Vérifié par :**	

Mesure du coefficient de consolidation par la méthode Taylor	**Contrainte : 13.5 à 44.5 kPa**



Mesure du coefficient de consolidation par la méthode Casagrande	**Contrainte : 13.5 à 44.5 kPa**



Qualitas

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275, Benjamin-Hudon
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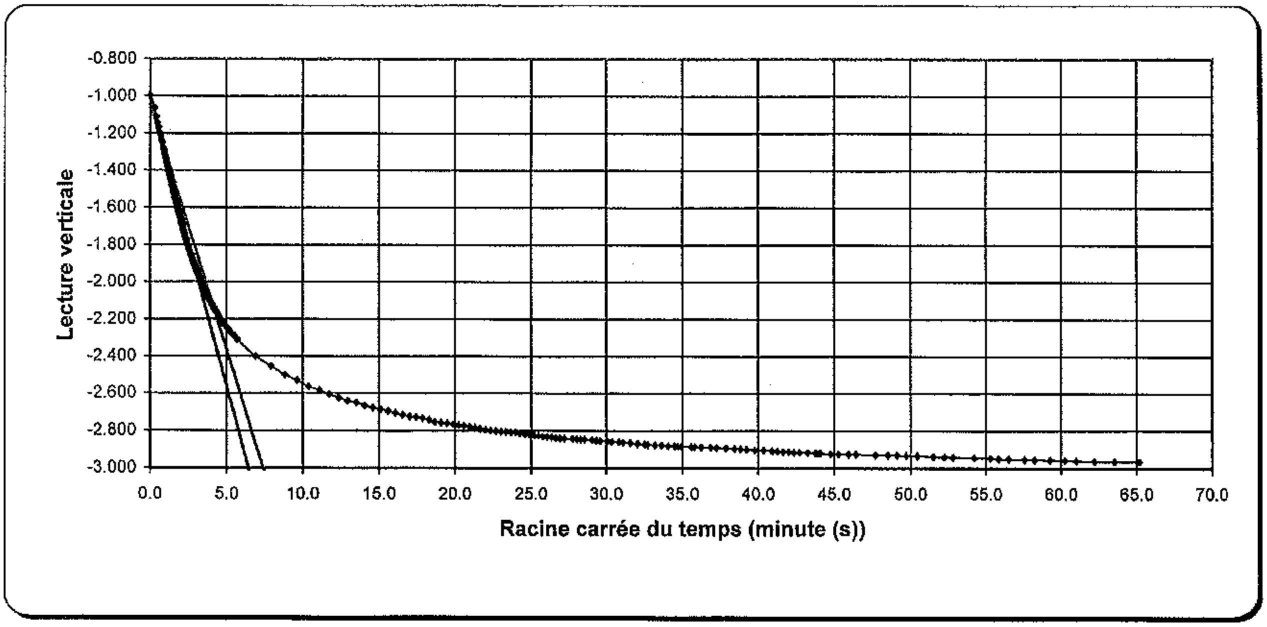
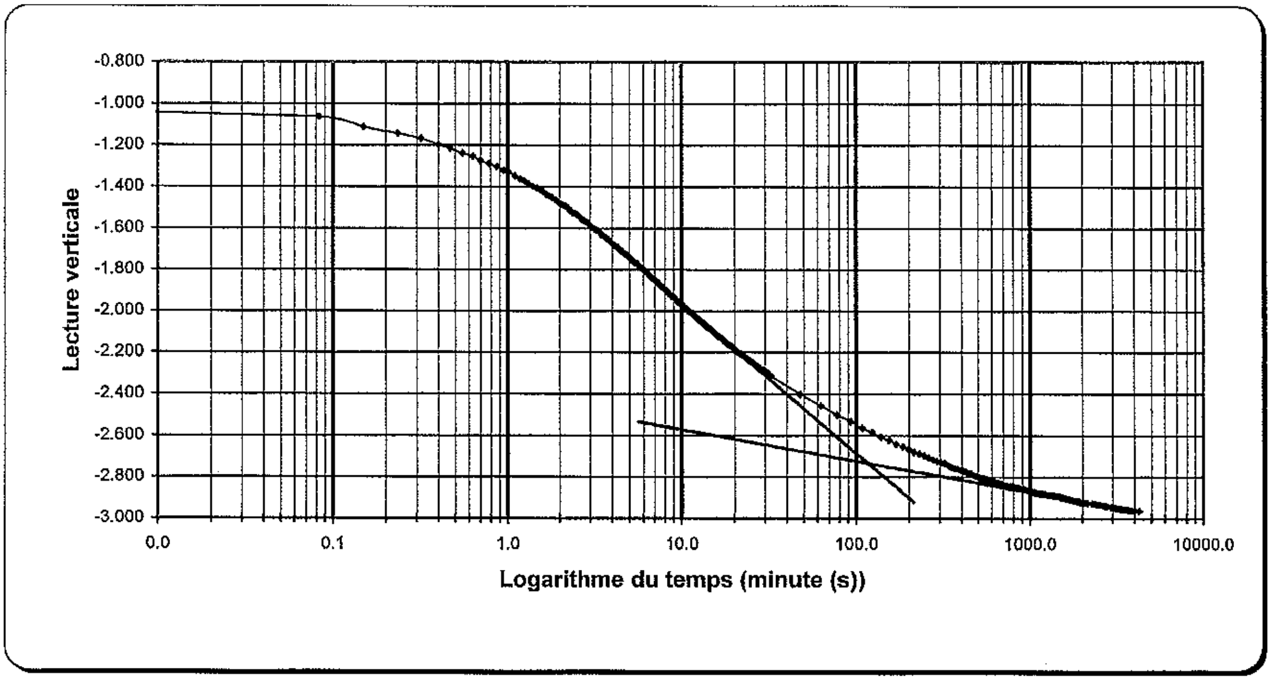
Essai de cisaillement direct -consolidation ASTM D 3080-04

Projet desc.:	Qualitas-Quéformat (n/d 14653-G)	**Sondage :**	BH-09-11	**Réalisé par :**	R.C.
Dossier no:	G09014-15	**Échantillon :**	ST-10	**Date:**	2009-11-26
		Profondeur:	7.80 à 7.90m	**Vérifié par :**	

Mesure du coefficient de consolidation par la méthode Taylor	**Contrainte : 44.5 à 99.5 kPa**



Mesure du coefficient de consolidation par la méthode Casagrande	**Contrainte : 44.5 à 99.5 kPa**



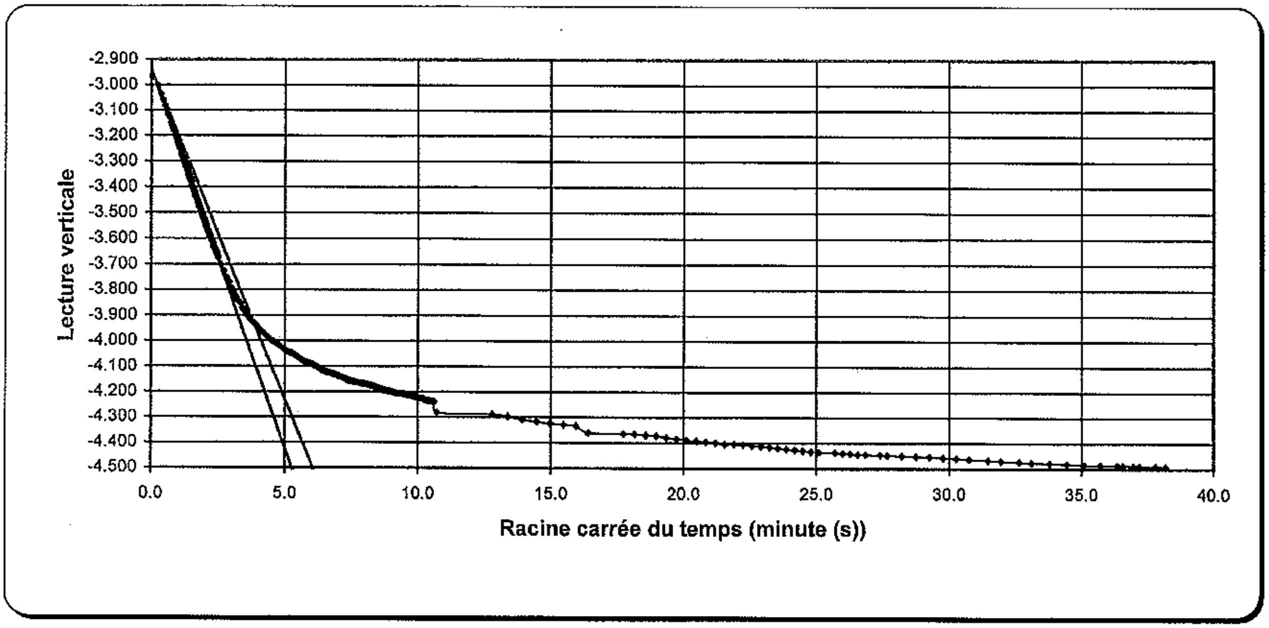
Qualitas

Groupe Qualitas inc.
275, Benjamin-Hudon
Saint-Laurent (Québec) H4N 1J1
Téléphone: 514-331-6910
Télécopieur: 514-331-7632

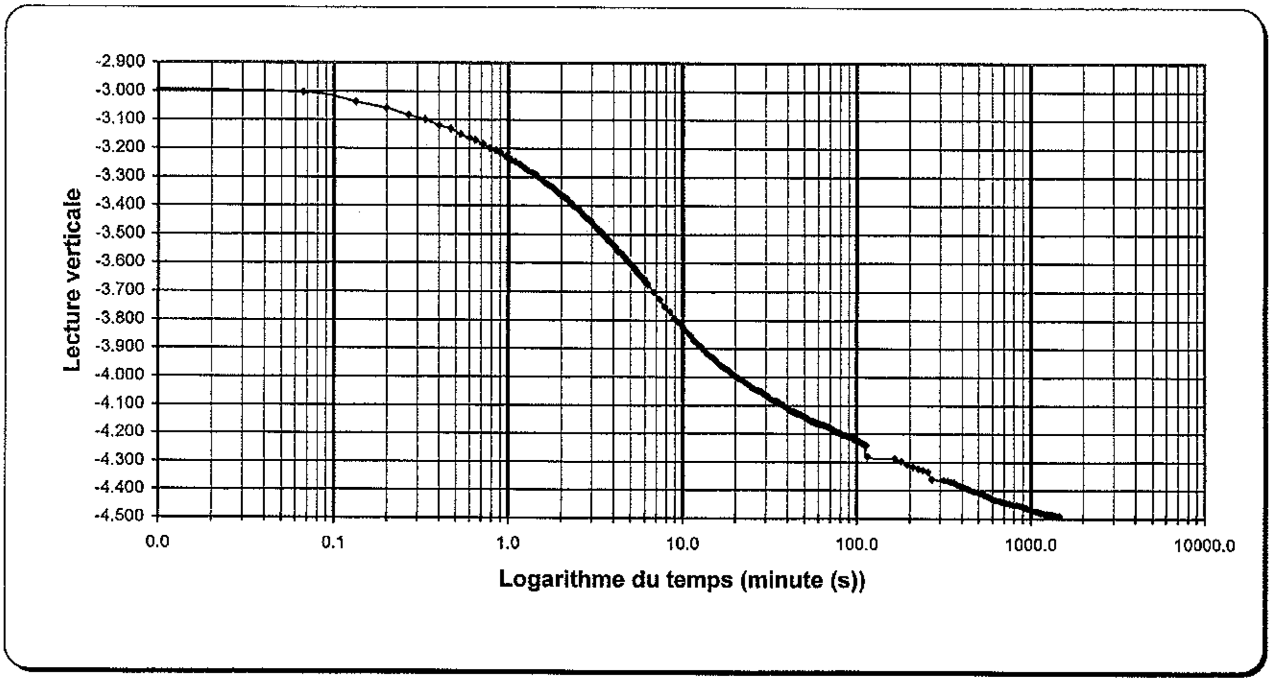
Essai de cisaillement direct -consolidation ASTM D 3080-04

Projet desc.:	Qualitas-Quéformat (n/d 14663-G)	**Sondage :**	BH-09-11	**Réalisé par :**	R.C.
Dossier no:	G09014-15	**Échantillon :**	ST-10	**Date:**	2009-11-26
		Profondeur:	7.80 à 7.90m	**Vérifié par :**	

Mesure du coefficient de consolidation par la méthode Taylor	**Contrainte : 99.5 à 195.8 kPa**



Mesure du coefficient de consolidation par la méthode Casagrande	**Contrainte : 99.5 à 195.8 kPa**



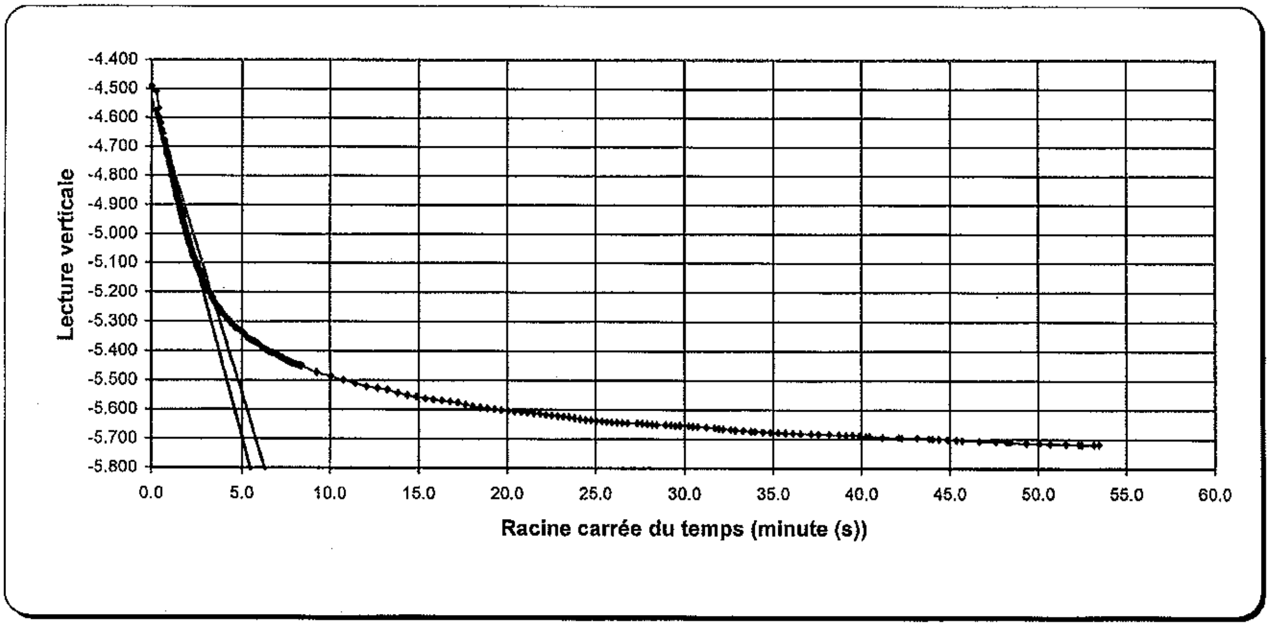
Qualitas

Groupe Qualitas inc.
275, Benjamin-Hudon
Saint-Laurent (Québec) H4N 1J1
Téléphone: 514-331-6910
Télécopieur: 514-331-7632

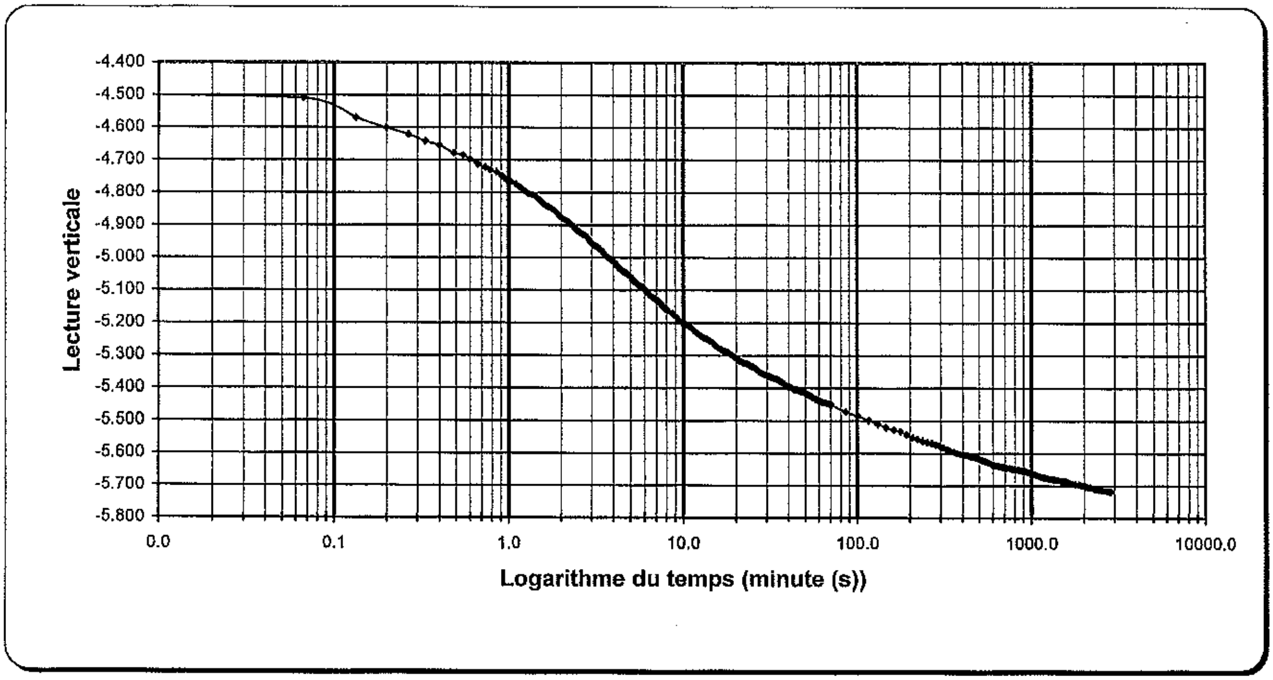
Essai de cisaillement direct -consolidation ASTM D 3080-04

Projet desc.:	Qualitas-Quéformat (n/d 14653-G)	**Sondage :**	BH-09-11	**Réalisé par :**	R.C.
Dossier no:	G09014-15	**Échantillon :**	ST-10	**Date:**	2009-11-26
		Profondeur:	7.80 à 7.90m	**Vérifié par :**	

Mesure du coefficient de consolidation par la méthode Taylor	**Contrainte : 195.8 à 350.6 kPa**



Mesure du coefficient de consolidation par la méthode Casagrande	**Contrainte : 195.8 à 350.6 kPa**



QUÉFORMAT LTÉE

COMPRESSION NON CONSOLIDÉE - ASTM D2166-06

DOSSIER : 15756-G
CLIENT : Labo S.M. inc.
PROJET : ALCOA / F099382-100

SONDAGE : BH-09-11
ECHANT. : ST-10
PROF. (m) : 8.00 - 8.10

FICHIER : Comp15756-09-11-10.xls

Compression non drainée

Longueur initiale, Hi (mm) :	101.46	Volume initial, Vi (cm³) :	208.60	Section initiale, Ai (cm²) :	20.56	Vit. déformation (mm/min) :	0.8
Longueur finale, Hf (mm) :	86.12	Volume final, Vf (cm³) :	208.60	Section finale, Af (cm²) :	24.22		

No.	Lectures ΔL (0,01mm)	Lectures Fa (N)	Déformation ΔH/Hi (%)	Section (cm²)	Résistance en compression, Uc (kPa)
1	1066	0	0.00%	20.56	0
2	1098	23	0.32%	20.62	11
3	1150	29	0.83%	20.73	14
4	1200	33	1.32%	20.83	16
5	1293	31	2.24%	21.03	15
6	1400	24	3.29%	21.26	11
7	1456	22	3.84%	21.38	10
8	1500	20	4.28%	21.48	9
9	1600	18	5.26%	21.70	8
10	1700	16	6.25%	21.93	7
11	1800	15	7.23%	22.16	7
12	1850	15	7.73%	22.28	7
13	1942	13	8.63%	22.50	6
14	2028	12	9.48%	22.71	5
15	2120	11	10.39%	22.94	5
16	2200	10	11.18%	23.15	4
17	2300	9	12.16%	23.41	4
18	2400	9	13.15%	23.67	4
19	2461	9	13.75%	23.84	4
20	2600	9	15.12%	24.22	4

Résultats

Rupture :

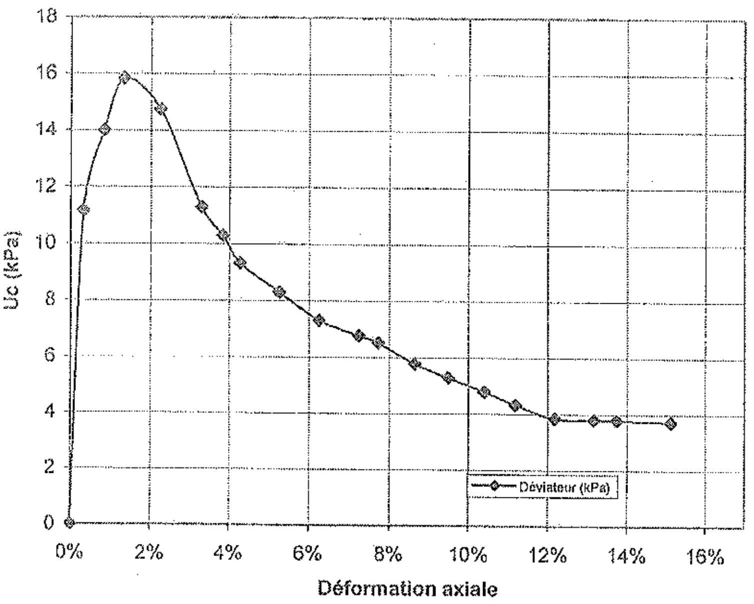
Uc (kPa) : 16 kPa
ΔH/Hi (%) : 1.32 %

Caractéristiques physiques :

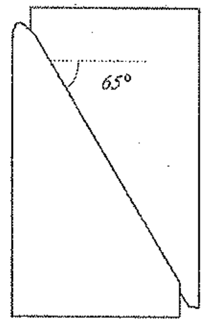
Teneur en eau initiale : 57.87 %
Masse volumique humide : 1716 kg/m³
Masse volumique sèche : 1087 kg/m³
Teneur en eau finale : 57.44 %

Remarques :

Rapport hauteur/diamètre
de l'échantillon au montage = 2.0



Croquis :



Réalisé par : A. Bustamante
date : 2009-12-02

Vérifié par : Hélène Bilodeau, ing.
date : 2009-12-03

SM LABO S.M. INC.

Rapport no. : ***09LL1819***

Rapport D'essai
CONSOLIDATION OEDOMETRIQUE
ASTM D2435-90

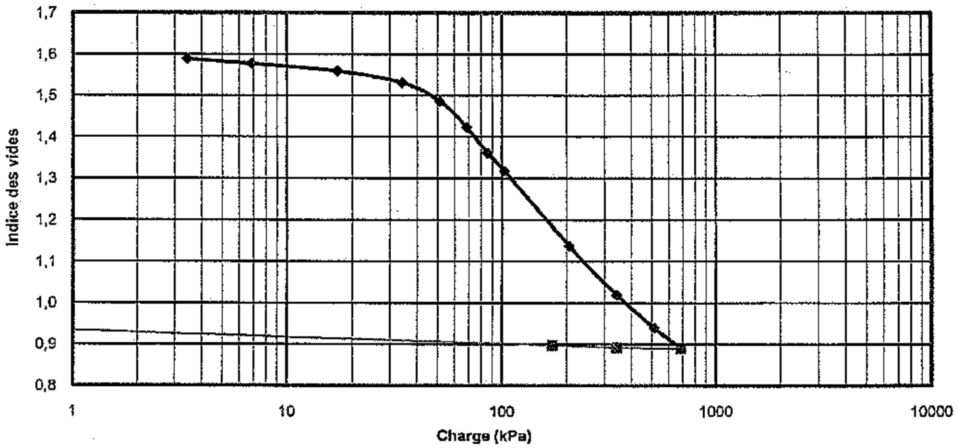
No Dossier :	**F99382100**	Sondage :	**BH-09-11**
Client :	**Alcoa**	Échantillon :	**ST-10**
Adresse :	100, rue Maritime	Prof. (m) :	7,90 **7,90@8,00**
Ville :	Baie-Comeau (Québec)		
Code postal :	G4Z 2L6		
Projet no :	Usine Alcoa de Baie-Comeau/Nouveau quai		
		Analysé par :	IG

Caractéristiques de l'anneau		
Numéro :		3
Masse :	(g)	109,08
Hauteur :	(mm)	25,48
Diamètre :	(mm)	63,48
Surface :	(cm^2)	31,65
Volume :	(cm^3)	80,64

Caractéristiques de l'appareil		
Numéro de l'appareil :		6
Calibration de l'extensomètre :	(div./mm)	500,00
Bras de levier :		11,03
Déformation = b * Pression ^ m		
Facteur de correction b :	(div)	10,00
Facteur de correction m :		0,50

Caractéristiques physiques		Initial	Final	
Numéro de la tare :		Anneau	Anneau	
Masse de la tare (anneau) :	(g)	109,08	109,08	
Masse du sol humide + tare :	(g)	243,19	224,79	
Masse du sol sec + tare :		194,45	194,45	
Masse du sol humide :	(g)	134,11	115,71	
Masse du sol sec :	(g)	85,37	85,37	
Teneur en eau du sol :	(%)	57,09	35,54	
Hauteur du sol humide :	(mm)	25,48	19,36	
Hauteur du sol sec :	(mm)	9,81	9,81	
Masse volumique humide :	(kg/m^3)	1 663	1 868	
Masse volumique sèche :	(kg/m^3)	1 059	1 393	
Indice des vides :		1,598	0,974	
Degré de saturation :	(%)	98,27	100,00	
Densité relative calculée :	Estimée	2,75	2,74	Calculée

Date (aaaa/mm/jj)	Heure (hh:mm)	Charge (kg)	Pression (kPa)	Lecture (0,002mm)	Correction de lecture	ΔH (mm)	Indice des vides	Hauteur (mm)	t50 (min)	Cv (m^2/s)
2009/11/23		0,00	0,00	0	0,0	0,00	1,598	25,48		
2009/11/24		0,10	3,42	50	4,4	0,09	1,588	25,39		
2009/11/25		0,20	6,84	108	8,8	0,20	1,577	25,28		
2009/11/26		0,50	17,09	211	19,0	0,38	1,559	25,10		
2009/11/27		1,00	34,18	360	33,0	0,65	1,531	24,83		
2009/11/28		1,50	51,27	589	39,5	1,10	1,486	24,38		
2009/11/29		2,00	68,35	903	46,0	1,71	1,423	23,77		
2009/11/30		2,50	85,44	1 211	51,0	2,32	1,361	23,16		
2009/12/01		3,00	102,53	1 430	56,0	2,75	1,318	22,73		
2009/12/02		6,00	205,06	2 334	76,5	4,52	1,137	20,97		
2009/12/03		10,00	341,77	2 933	94,8	5,68	1,019	19,80		
2009/12/04		15,00	512,65	3 342	114,1	6,46	0,940	19,02		
2009/12/05		20,00	683,53	3 596	127,5	6,94	0,890	18,54		
2009/12/06		15,00	512,65	3 585	114,1	6,94	0,890	18,54		
2009/12/07		10,00	341,77	3 554	94,8	6,92	0,892	18,56		
2009/12/08		5,00	170,88	3 503	71,3	6,86	0,898	18,62		
2009/12/09		0,00	0,00	3 062	0,0	6,12	0,973	19,36		



σ'p = 53 kPa

Cr = 0,0258

Cc = 0,5891

Remarques : ―

Préparé par : ______________________ Date :
Isabelle Gauthier, tech. Chef labo

Vérifié par : ______________________ Date :
Salomon O'Ngandée, ing., M.Sc.A.

Notes : Le résultat s'applique exclusivement à l'échantillon analysé. Ce rapport ne doit pas être reproduit, sinon en entier, sans l'autorisation écrite de Labo S.M. inc.

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2593

File Number	: **F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: ------
City	: Baie-Comeau (Québec)	Uses	: ------
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	: **09-2387**	Source	: 09-11A, SS-13, Depth.: 13,3 to 13,9 m.
Sample No.	: ------	Tests completed on	: 2009-10-27

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	% Gravel:	
C.U.	% Sand:	38
Unified Classification:	% Silt:	35
Fineness Module: 0,41	% Clay:	27

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements
Atterberg Limits (3pts)	BNQ2501-092		
Liquid Limit (%):		27	------
Plastic Limit (%):		17	------
Plasticity index (%):		10	------
Water Content (%):	LC21-201	32,14	------

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: 2009-10-30
Sylvie Daigle, Tech.

Verified by: 2009-10-30
Sonya Graveline, Ing.

QUÉFORMAT LTÉE

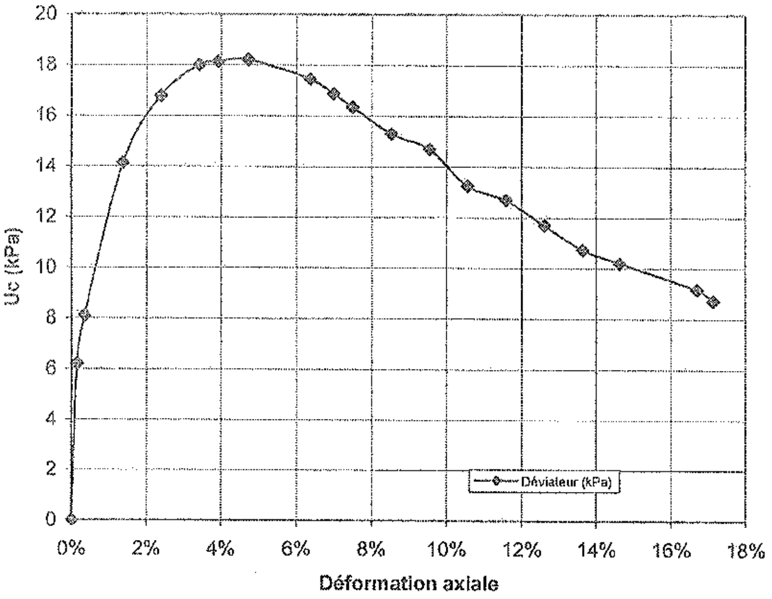
COMPRESSION NON CONSOLIDÉE - ASTM D2166-06

DOSSIER :	15756-G	SONDAGE :	BH-09-11
CLIENT :	Labo S.M. inc.	ECHANT. :	ST-11
PROJET :	ALCOA / F099382-100	PROF. (m) :	9.30 - 9.40
		FICHIER :	Comp15756-09-11-11.xls

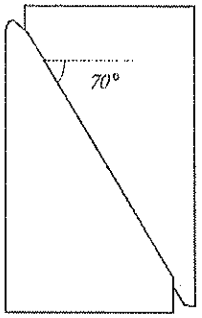
Compression non drainée

Longueur initiale, Hi (mm) :	97.87	Volume initial, Vi (cm³) :	204.84	Section initiale, Ai (cm²) :	20.93	Vit. déformation (mm/min) :	0.8
Longueur finale, Hf (mm) :	81.11	Volume final, Vf (cm³) :	204.84	Section finale, Af (cm²) :	25.25		

No.	Lectures ΔL (0,01mm)	Lectures Fa (N)	Déformation ΔH/Hi (%)	Section (cm²)	Résistance en compression, Uc (kPa)	Résultats
1	1666	0	0.00%	20.93	0	
2	1680	13	0.14%	20.96	6	**Rupture :**
3	1700	17	0.35%	21.00	8	
4	1800	30	1.37%	21.22	14	Uc (kPa) : 18 kPa
5	1900	36	2.39%	21.44	17	ΔH/Hi (%) : 4.72 %
6	2000	39	3.41%	21.67	18	
7	2050	40	3.92%	21.78	18	
8	2128	40	4.72%	21.97	18	**Caractéristiques physiques :**
9	2289	39	6.37%	22.35	17	
10	2350	38	6.99%	22.50	17	Teneur en eau initiale : 59.54 %
11	2400	37	7.50%	22.63	16	Masse volumique humide : 1669 kg/m³
12	2500	35	8.52%	22.88	15	Masse volumique sèche : 1046 kg/m³
13	2600	34	9.54%	23.14	15	Teneur en eau finale : 58.87 %
14	2700	31	10.57%	23.40	13	
15	2800	30	11.59%	23.67	13	
16	2900	28	12.61%	23.95	12	**Remarques :**
17	3000	26	13.63%	24.23	11	
18	3098	25	14.63%	24.52	10	Rapport hauteur/diamètre
19	3300	23	16.70%	25.12	9	de l'échantillon au montage = 1.9
20	3342	22	17.12%	25.25	9	



Croquis :



Réalisé par : A. Bustamante
date : 2009-12-02

Vérifié par : Hélène Bilodeau, ing.
date : 2009-12-03

QUÉFORMAT LTÉE

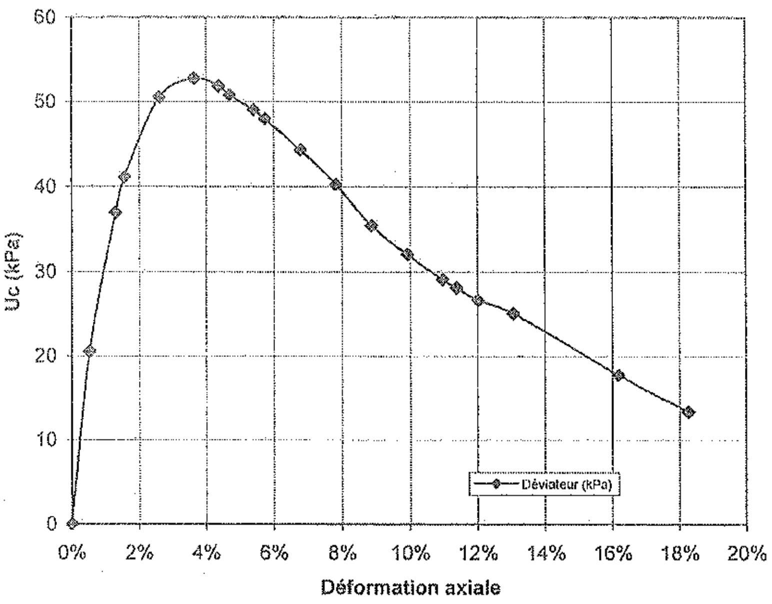
COMPRESSION NON CONSOLIDÉE - ASTM D2166-06

DOSSIER :	15756-G	SONDAGE :	BH-09-11
CLIENT :	Labo S.M. inc.	ECHANT. :	ST-12
PROJET :	ALCOA / F099382-100	PROF. (m) :	13.00 - 13.10
		FICHIER :	Comp15756-09-11-12.xls

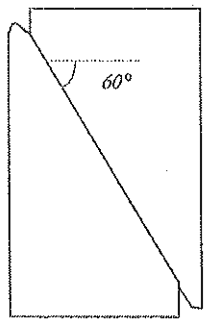
Compression non drainée

Longueur initiale, Hi (mm) :	95.73	Volume initial, Vi (cm³) :	199.40	Section initiale, Ai (cm²) :	20.83	Vit. déformation (mm/min) :	0.8
Longueur finale, Hf (mm) :	78.23	Volume final, Vf (cm³) :	199.40	Section finale, Af (cm²) :	25.49		

No.	Lectures ΔL (0,01mm)	Lectures Fa (N)	Déformation ΔH/Hi (%)	Section (cm²)	Résistance en compression, Uc (kPa)	Résultats
1	1550	0	0.00%	20.83	0	
2	1600	43	0.52%	20.94	21	**Rupture :**
3	1674	78	1.30%	21.10	37	
4	1700	87	1.57%	21.16	41	Uc (kPa) : 53 kPa
5	1800	108	2.61%	21.39	50	ΔH/Hi (%) : 3.66 %
6	1900	114	3.66%	21.62	53	
7	1970	113	4.39%	21.79	52	
8	2000	111	4.70%	21.86	51	**Caractéristiques physiques :**
9	2068	108	5.41%	22.02	49	
10	2100	106	5.75%	22.10	48	Teneur en eau initiale : 39.93 %
11	2200	99	6.79%	22.35	44	Masse volumique humide : 1827 kg/m³
12	2300	91	7.83%	22.60	40	Masse volumique sèche : 1306 kg/m³
13	2400	81	8.88%	22.86	35	Teneur en eau finale : 39.69 %
14	2500	74	9.92%	23.12	32	
15	2600	68	10.97%	23.40	29	
16	2640	66	11.39%	23.51	28	**Remarques :**
17	2700	63	12.01%	23.67	27	
18	2800	60	13.06%	23.96	25	Rapport hauteur/diamètre
19	3100	44	16.19%	24.85	18	de l'échantillon au montage = 1.9
20	3300	34	18.28%	25.49	13	



Croquis :



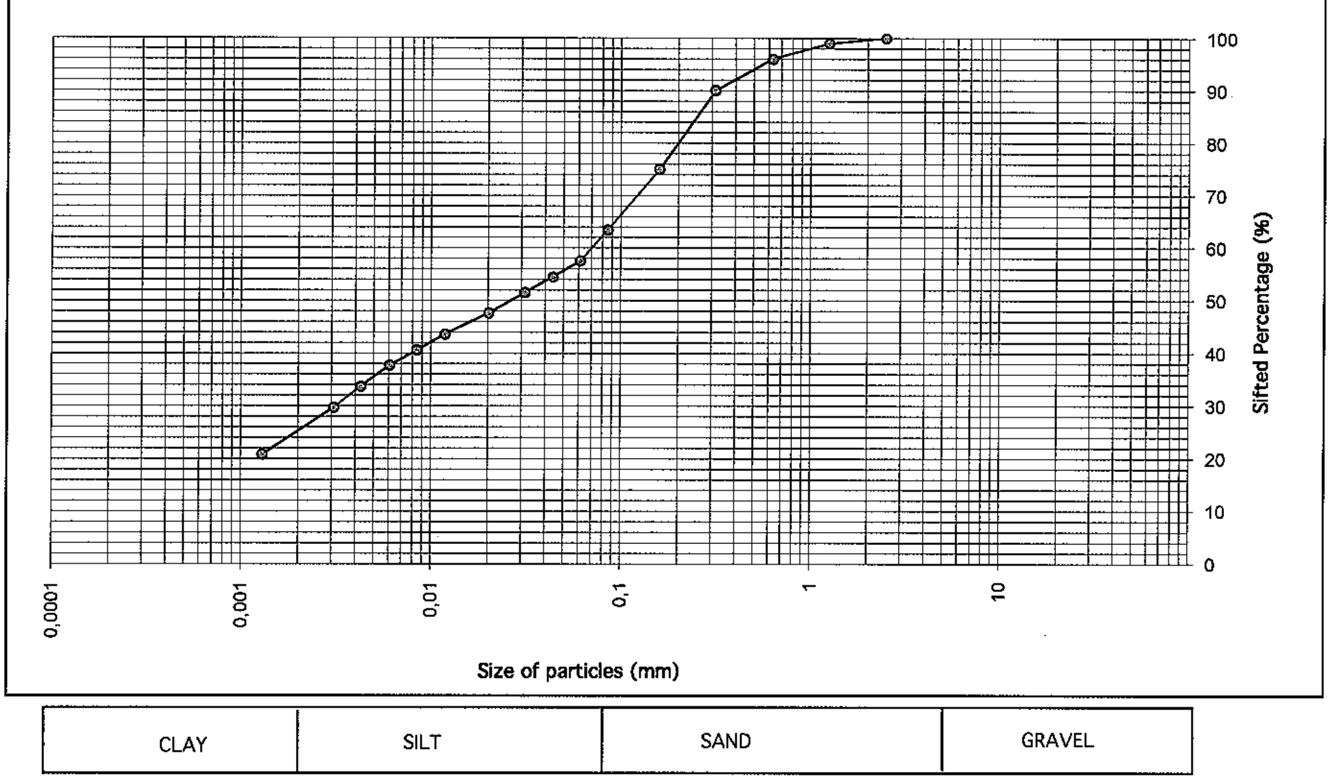
Réalisé par : A. Bustamante
date : 2009-12-02

Vérifié par : Hélène Bilodeau, ing.
date : 2009-12-03

SM
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
2,5	100
1,250	99
0,630	96
0,3150	90
0,1600	75
0,0853	63,4
0,0614	57,5
0,0440	54,5
0,0314	51,5
0,0202	47,6
0,0119	43,6
0,0085	40,6
0,0061	37,7
0,0043	33,7
0,0031	29,7
0,0013	20,8

Chart for particle size analysis



Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2387

Type of material: Clayey sand & silt.

Source: Material on site, 09-11A,SS-13, Depth: 13,3 to 13,9 m.

Approuved by : Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3189

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-3005**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-11, SS-14, Depth.: 14,5 to 15,0 m.
Tests completed on : 2009-12-01

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.
C.U.
Unified Classification:
Fineness Module: 0

% Gravel:	
% Sand:	27
% Silt:	52
% Clay:	21

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: Sylvie Daigle, Tech. 2009-12-08

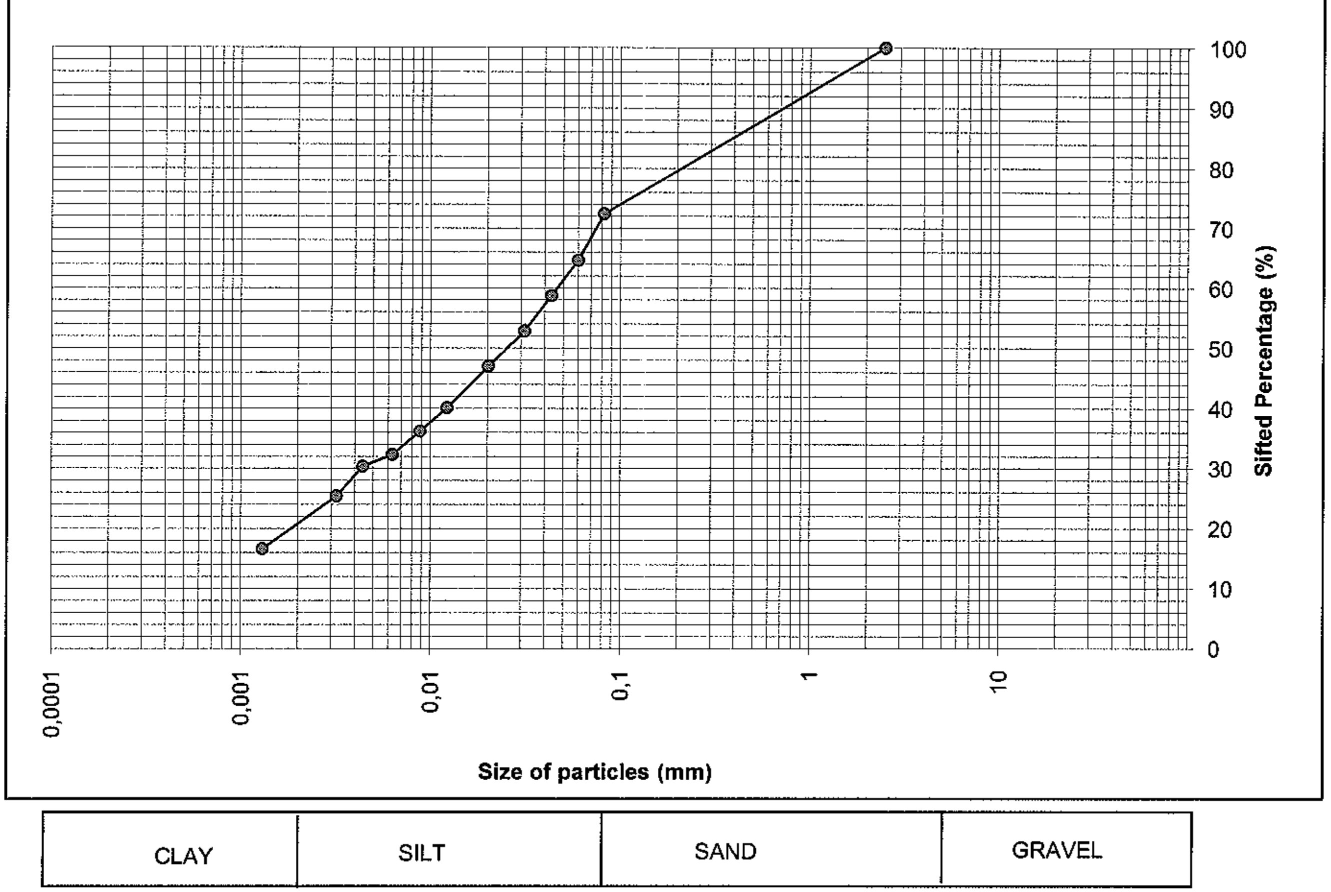
Verified by: Sonya Graveline, Ing. 2009-12-08

N.B. These results are exclusively for analysis sampled.

SM
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
2,5	100
0,082	72
0,060	65
0,0434	59
0,0313	53
0,0202	47,0
0,0122	40,1
0,0088	36,2
0,0063	32,3
0,0044	30,3
0,0032	25,4
0,0013	16,6

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-3005

Type of material: Sandy & clayey sand.

File #: **F099382200**

Source: Material on site, 09-11,SS-14, Depth: 14,5 to 15,0 m.

Customer: **Alcoa**

Approuved by : ______________ Date : __________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

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LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2579

File Number	: **F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: -----
City	: Baie-Comeau (Québec)	Uses	: -----
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	: **09-2388**	Source	: 09-11A, SS-18, Depth.: 17,5 to 18,1 m.
Sample No.	: -----	Tests completed on	: 2009-10-27

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	3,453	% Gravel:	11
C.U.	19,836	% Sand:	69
Unified Classification:		% Silt:	16
Fineness Module:	1,55	% Clay:	4,0

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: 2009-10-30
Sylvie Daigle, Tech.

Verified by: 2009-10-30
Sonya Graveline, Ing.

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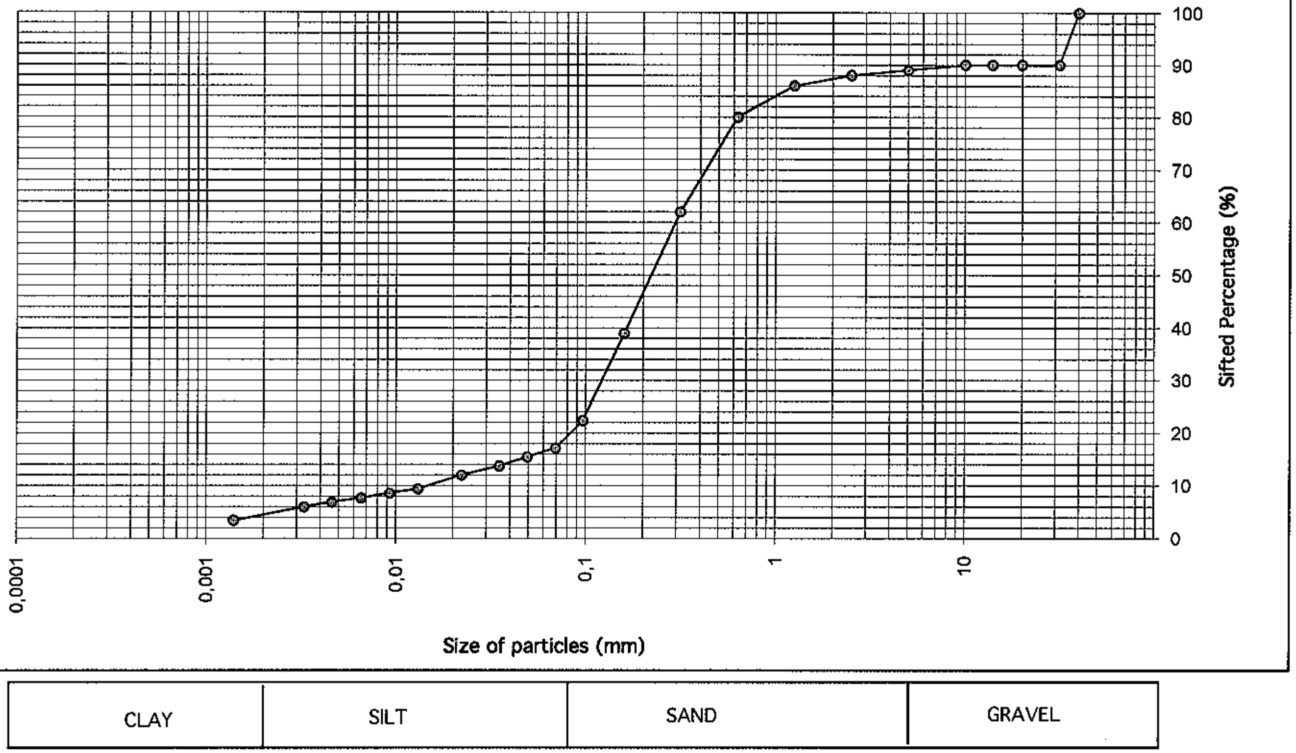
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
40	100
31,5	90
20,0	90
14,0	90
10,0	90
5,00	89
2,500	88
1,250	86
0,630	80
0,3150	62,0
0,1600	39,0
0,0965	22,3
0,0694	17,1000
0,0492	15,4
0,0351	13,7
0,0223	12,0
0,0131	9,4
0,0093	8,6
0,0066	7,7
0,0046	6,9
0,0033	6,0
0,0014	3,4

Chart for particle size analysis



Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2388

Type of material: Sand,some silt & gravel,traces clay.

Source: Material on site, 09-11A, SS-18, Depth: 17,5 to 18,1m.

Approuved by : ______ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3183

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-3004**
Sample No. : ------

Type of Mat : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-11, SS-21,SS-22 & SS-23, Depth.: 20,9 to 24,5 m
Tests completed on : 2009-12-07

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 4,884
C.U. 31,52
Unified Classification:
Fineness Module: 1,26

% Gravel: 2,0
% Sand: 76
% Silt: 15
% Clay: 7

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: 2009-12-10
Sylvie Daigle, Tech.

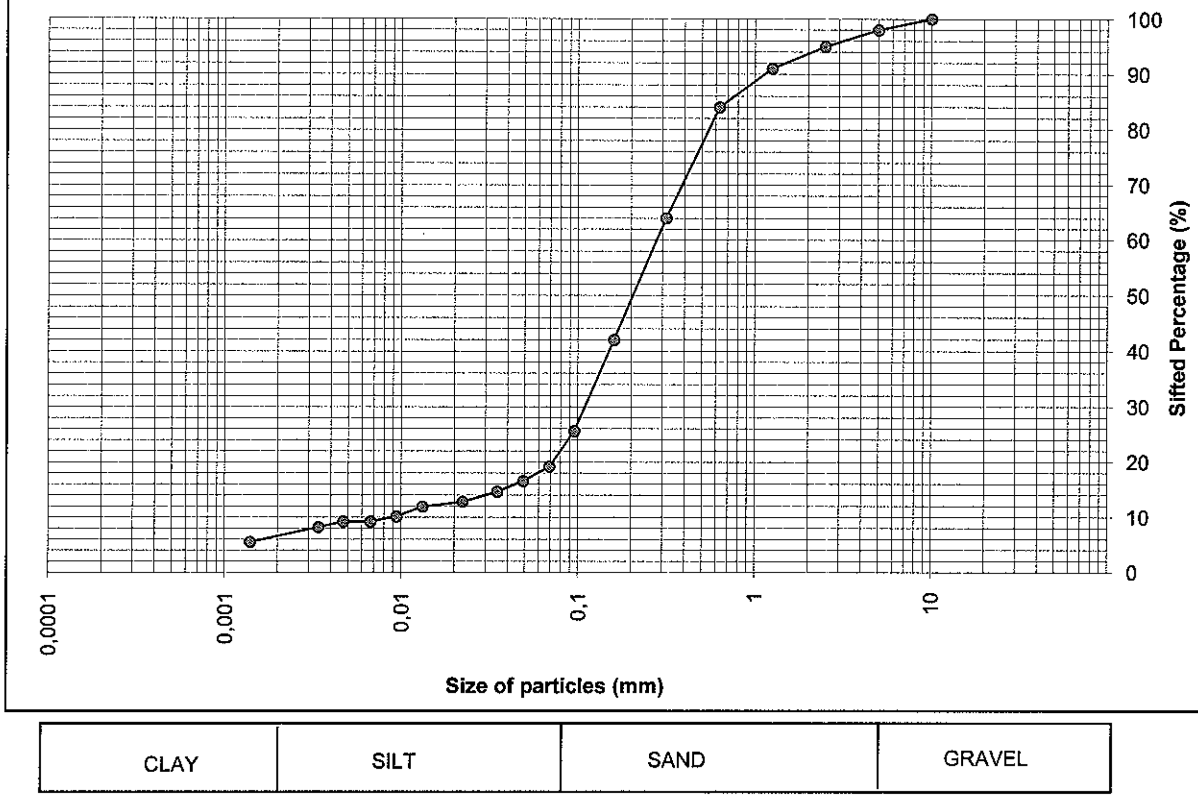
Verified by: 2009-12-10
Sonya Graveline, Ing.

SM*i*

LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
10,0	100
5,0	98
2,5	95
1,250	91
0,630	84
0,3150	64
0,1600	42
0,0956	25,6
0,0691	19,2
0,0492	16,5
0,0350	14,6
0,0223	12,8
0,0132	11,9
0,0094	10,1
0,0067	9,2
0,0047	9,2
0,0034	8,2
0,0014	5,5

Chart for particle size analysis



Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-3004

Type of material: Sand,some silt,traces clay & gravel.

Source: Material on site, 09-11,SS-22, SS-22 & SS-23, Depth: 20,9 to 24,5 m.

Approuved by :________________ Date : __________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2580

File Number	: **F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: -----
City	: Baie-Comeau (Québec)	Uses	: -----
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	: **09-2389**	Source	: 09-11A, SS-24, Depth.: 25,5 to 26,0 m.
Sample No.	: -----	Tests completed on	: 2009-10-27

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	7,183	% Gravel:	1,0
C.U.	42,821	% Sand:	65
Unified Classification:		% Silt:	27
Fineness Module: 0,72		% Clay:	7,0

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: 2009-10-30
Sylvie Daigle, Tech.

Verified by: 2009-10-30
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

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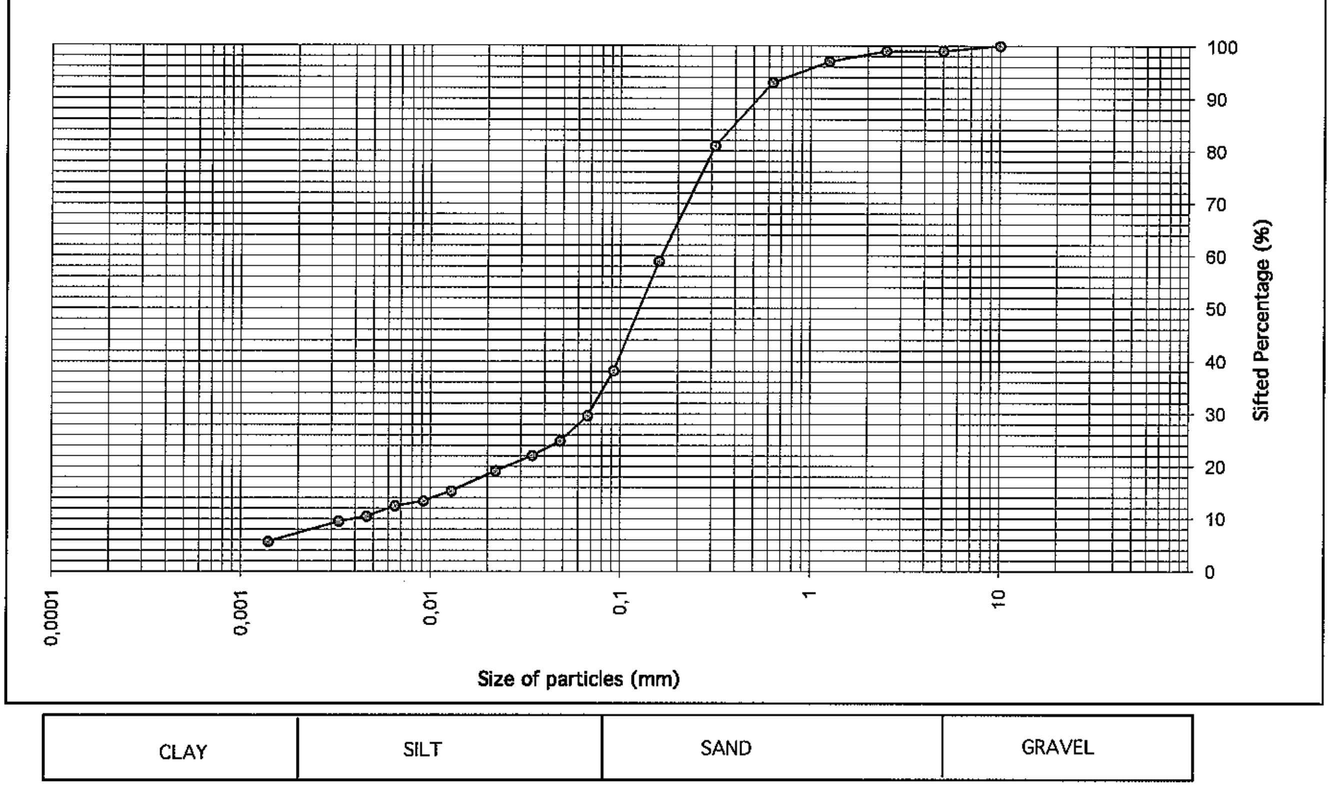
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
10,0	100
5,0	99
2,5	99
1,250	97
0,630	93
0,3150	81
0,1600	59
0,0924	38,2
0,0672	29,6
0,0483	24,8
0,0344	22,0
0,0220	19,1
0,0129	15,3
0,0092	13,4
0,0065	12,4
0,0046	10,5
0,0033	9,5
0,0014	5,7

Chart for particle size analysis



Project: New Baie-Comeau wharf

File #: F099382200

Customer: **Alcoa**

Laboratory No. : 09-2389

Type of material: Silty sand, traces clay & gravel.

Source: Material on site, 09-11A,SS-24, Depth: 25,5 to 26 m.

Approuved by : ________ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

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LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2567

File Number	**: F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: ------
City	: Baie-Comeau (Québec)	Uses	: ------
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	**: 09-2390**	Source	: 09-11A, SS-28, Depth: 31,5 to 31,8 m .
Sample No.	: ------	Tests completed on	: 2009-10-22

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 1,147
C.U. 4,545
Unified Classification:
Fineness Module: 1,47

% Gravel: 13
% Sand: 72
% Silt: 14
% Clay: 1,0

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : * =**Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: 2009-10-22
Sylvie Daigle, Tech.

Verified by: 2009-10-22
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

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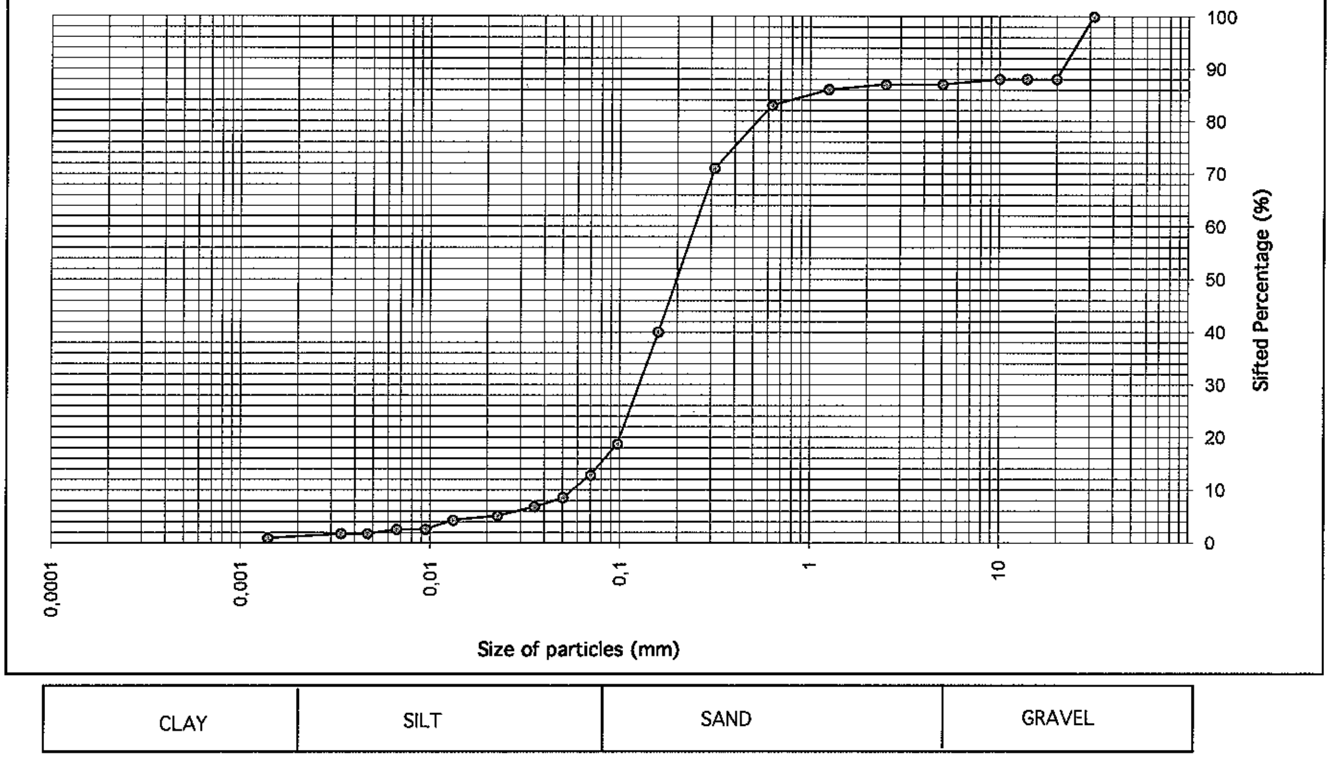
Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
31,5	100
20,0	88
14,0	88
10,0	88
5,0	87
2,5	87
1,250	86
0,630	83
0,3150	71
0,1600	40
0,0973	18,7
0,0702	12,8
0,0503	8,5
0,0357	6,8
0,0227	5,1
0,0133	4,3
0,0095	2,6
0,0067	2,6
0,0047	1,7
0,0034	1,7
0,0014	0,9

Chart for particle size analysis



Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2390

Type of material: Sand, some silt & gravel,traces clay.

Source: Material on site, 09-11A,SS-28, Depth: 31,5 to 31,8 m.

Approuved by : ______ Date : 30/10/2009.

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

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LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2564

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2391**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-11A, SS-39 Depth: 46,8 to 47,0 m.
Tests completed on : 2009-10-22

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	5,107	% Gravel:	
C.U.	25,315	% Sand:	63
Unified Classification:		% Silt:	30
Fineness Module:	0,50	% Clay:	7,0

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: 2009-10-22
Sylvie Daigle, Tech.

Verified by: 2009-10-22
Sonya Graveline, Ing.

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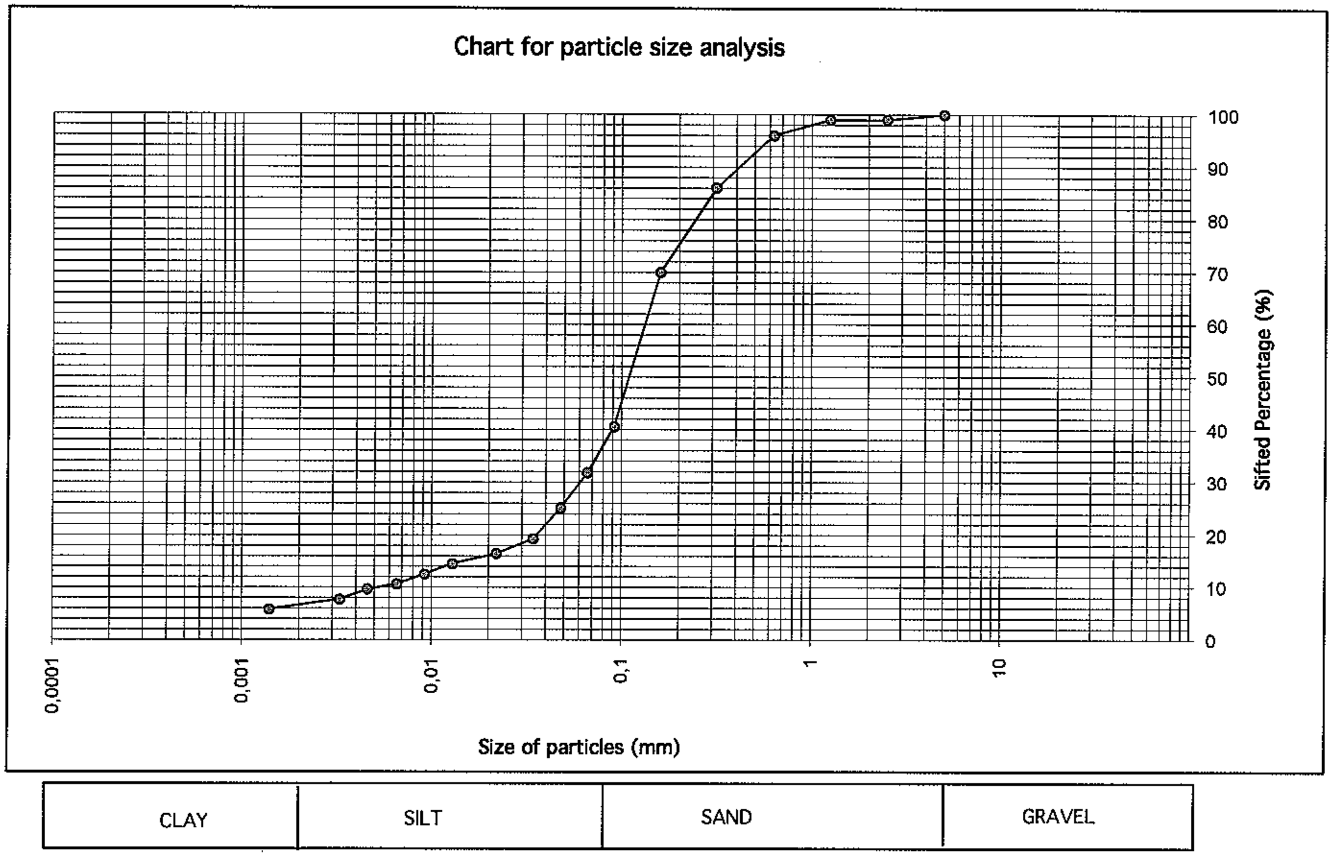
Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
5,0	100
2,5	99
1,250	99
0,630	96
0,3150	86
0,1600	70
0,0914	40,5
0,0663	31,8
0,0479	25,1
0,0345	19,3
0,0220	16,4
0,0129	14,5
0,0092	12,5
0,0066	10,6
0,0046	9,6
0,0033	7,7
0,0014	5,8



Project: New Baie-Comeau wharf

Laboratory No. : 09-2391

Type of material: Silty sand, traces clay.

File #: **F099382200**

Source: Material on site, 09-11A,SS-39, Depth: 46,8 to 47,0m.

Customer: **Alcoa**

Approuved by : ______ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-12
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 1 of 3
LOCATION OF BOREHOLE: X : 258851,05 Y : 5457072,32		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL**	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -12.22	**BORING DATE START:**	**END:**	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◧	Rock Core

Laboratory and in situ tests - Parameters

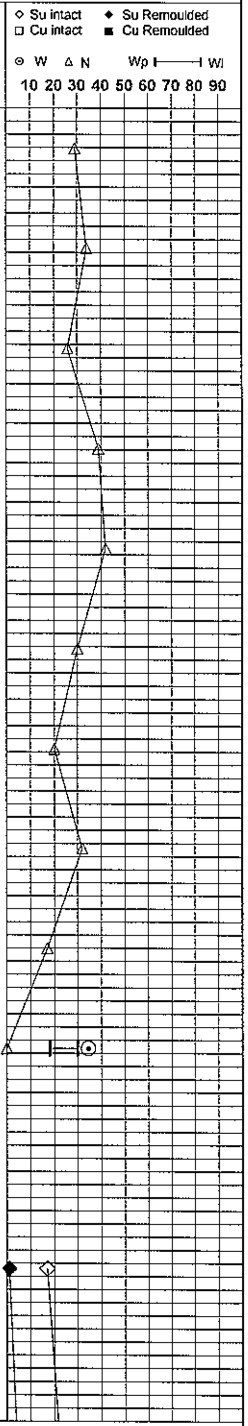
N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY				SAMPLES						LABO AND IN SITU TESTS	
Depth	Elev. Depth -12.22	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
	0.00	Gray fine sand with some silt and occasionnal sea shell fragments; medium dense		☒	SS-1	B	62	29	10-16-13-13		
1				☒	SS-2	B	42	34	15-17-17-19		
2				☒	SS-3	B	62	26	8-11-15-14		
				☒	SS-4	B	54	39	17-21-18-26		
3				☒	SS-5	B	58	42	14-21-21-21		Combined SS-4/5/6: GSA, DS; CU=1.9, Phi'=XXX, c'=XXX
4				☒	SS-6	B	58	30	11-13-17-18		
5				☒	SS-7	B	75	20	17-10-10-13		GSA, CU=3.6
				☒	SS-8	B	71	32	9-16-16-15		
6	-19.08			☒	SS-9	B	2	17	20-11-6-2		
7	6.86	Gray clay with some silt and thins layers of sand; very soft		☒	SS-10	B	50	0	0-0-0-0		SS-10: W=34.5%, Wp=18%, Wl=30%, Ip=12%
8				▨	ST-11		96				ST-11: GSA, CUT CU=XXX, W=XXX, Wp=XXX, Wl=XXX, Ip=XXX, D=2.74, UC=15kPa
9											
				▨	ST-12		92				



Notes:

Approved by :
Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-12
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 2 of 3
LOCATION OF BOREHOLE: X : 258851,05 Y : 5457072,32		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL**	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -12.22	**BORING DATE START:**	**END:**	

Type of Sampler

SS: Split Spoon
DC: Diamond Core
WS: Wash Sample
HT: Hydraulic Trust
HW: Hammer Weight
SP: Shelby and Piston
AS: Auger Sampler
ST: Thin Walled Shelby Tube

☒ Remoulded
▨ Intact
■ Lost
◧ Rock Core

Laboratory and In situ tests - Parameters

N: SPT N-Value
Nd: DCPT Nd-Value
Su: Field Vane
GSA: Grain size analysis
CU: Uniformity coefficient
W: Water Content
Wp: Plastic limit
Wl: Liquid limit

Ip: Plasticity index:
D: Specific density
Cu: Swedish cone
C: Consolidation
PP: Preconsolidation pressure
Cc: Compression index
Ccr: Recompression index
UC: Unconfined compression

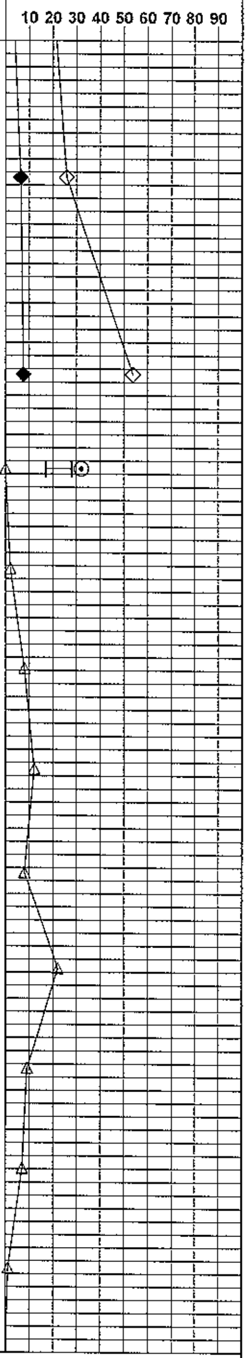
DS: Direct shear
Phi': Angle of internal friction
c': Cohesion
CUT: Consolidation undrained triaxial

Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY				SAMPLES						LABO AND IN SITU TESTS	
Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
11											ST-12: GSA, C CU=XXX, W=XXX, Wp=XXX, Wl=XXX, Ip=XXX,PP=84, Cc=0.579, cr=0.037, UC=21kPa
12											
	-25.02 12.80	Gray silty clay with trace sand; very soft									
13					SS-13	B	33	0	0-0-0-0		SS-13: W=32.2%, Wp=17%, Wl=28%, Ip=11%
	-25.89 13.67	Gray silty sand with trace gravel; very loose									
14					SS-14	B	92	2	4-2-0-1		
15					SS-15	B	92	8	8-3-5-12		
	-27.38 15.16	Gray silty sand, trace to some clay and occasionnal layers of sandy silt; very loose to loose									
					SS-16	B	87	12	8-7-5-6		
16					SS-17	B	100	8	3-4-4-6		
17					SS-18	B	83	22	2-9-13-8		
18					SS-19	B	92	9	4-6-3-8		
					SS-20	B	100	7	4-2-5-3		
19					SS-21	B	71	1	0-1-0-1		GSA, CU=99.5



Notes:

Approved by :
Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4
SITE: Alcoa - Baie-Comeau smelter (Quebec)
LOCATION OF BOREHOLE: X : 258851,05 Y : 5457072,32
CASING: HW
EQUIPEMENT USED: D-50
SAMPLER: Indicated
CORE BARREL
SURFACE ELEVATION (m): -12,22
BORING DATE START: END:

BOREHOLE: 09-12
PAGE: 3 of 3
FILE NO: F099382300
TECHNICIAN: Simon Marois, tech.

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒ Remoulded
▨ Intact
■ Lost
◧ Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value
Nd:	DCPT Nd-Value
Su:	Field Vane
GSA:	Grain size analysis
CU:	Uniformity coefficient
W:	Water Content
Wp:	Plastic limit
Wl:	Liquid limit
Ip:	Plasticity index:
D:	Specific density
Cu:	Swedish cone
C:	Consolidation
PP:	Preconsolidation pressure
Cc:	Compression index
Ccr:	Recompression index
UC:	Unconfined compression
DS:	Direct shear
Phi':	Angle of internal friction
c':	Cohesion
CUT:	Consolidation undrained triaxial

Water level

Date: Time: Elev.(m):

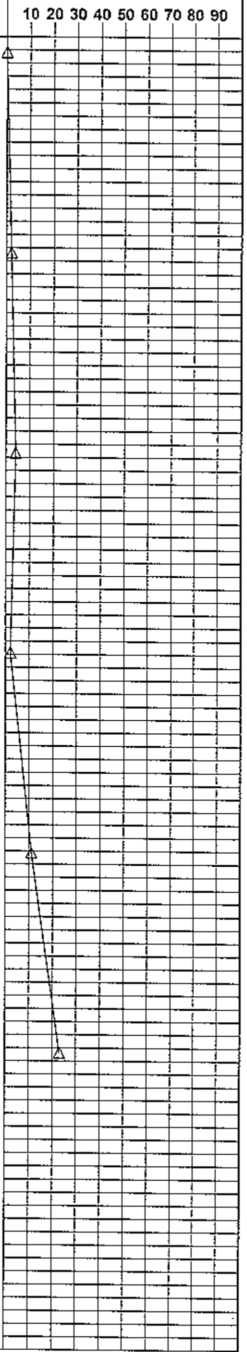
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
				☒	SS-22	B	50	0	0-0-0-0		
21											
				☒	SS-23	B	100	2	0-1-1-2		GSA, CU=78.3
22											
23											
				☒	SS-24	B	92	4	6-3-1-6		
24											
				☒	SS-25	B	100	2	4-0-2-10		
25											
26	-38.12 25.90	Becoming medium dense									
				☒	SS-26	B	54	11	4-6-5-4		
27											
				☒	SS-27	B	92	23	3-12-11-11		
28	-40.26 28.04	End of borehole									
29											



Notes:

Approved by :
Sonya Graveline, ing.

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3181

File Number	**: F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: ------
City	: Baie-Comeau (Québec)	Uses	: ------
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	**: 09-3002**	Source	: 09-12, SS-4, SS-5 & SS-6, Depth.: 2,3 to 4,4 m.
Sample No.	: ------	Tests completed on	: 2009-12-07

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	1,09	% Gravel:	
C.U.	1,932	% Sand:	84
Unified Classification:		% Silt:	14
Fineness Module: 0,36		% Clay:	2

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: 2009-12-10
Sylvie Daigle, Tech.

Verified by: 2009-12-10
Sonya Graveline, Ing.

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LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
5,0	100
2,5	99
1,250	98
0,630	96
0,3150	92
0,1600	79
0,0964	23,4
0,0710	9,7
0,0507	5,8
0,0361	3,9
0,0228	3,9
0,0135	3,9
0,0096	3,9
0,0068	3,9
0,0048	2,9
0,0034	2,9
0,0014	1,9

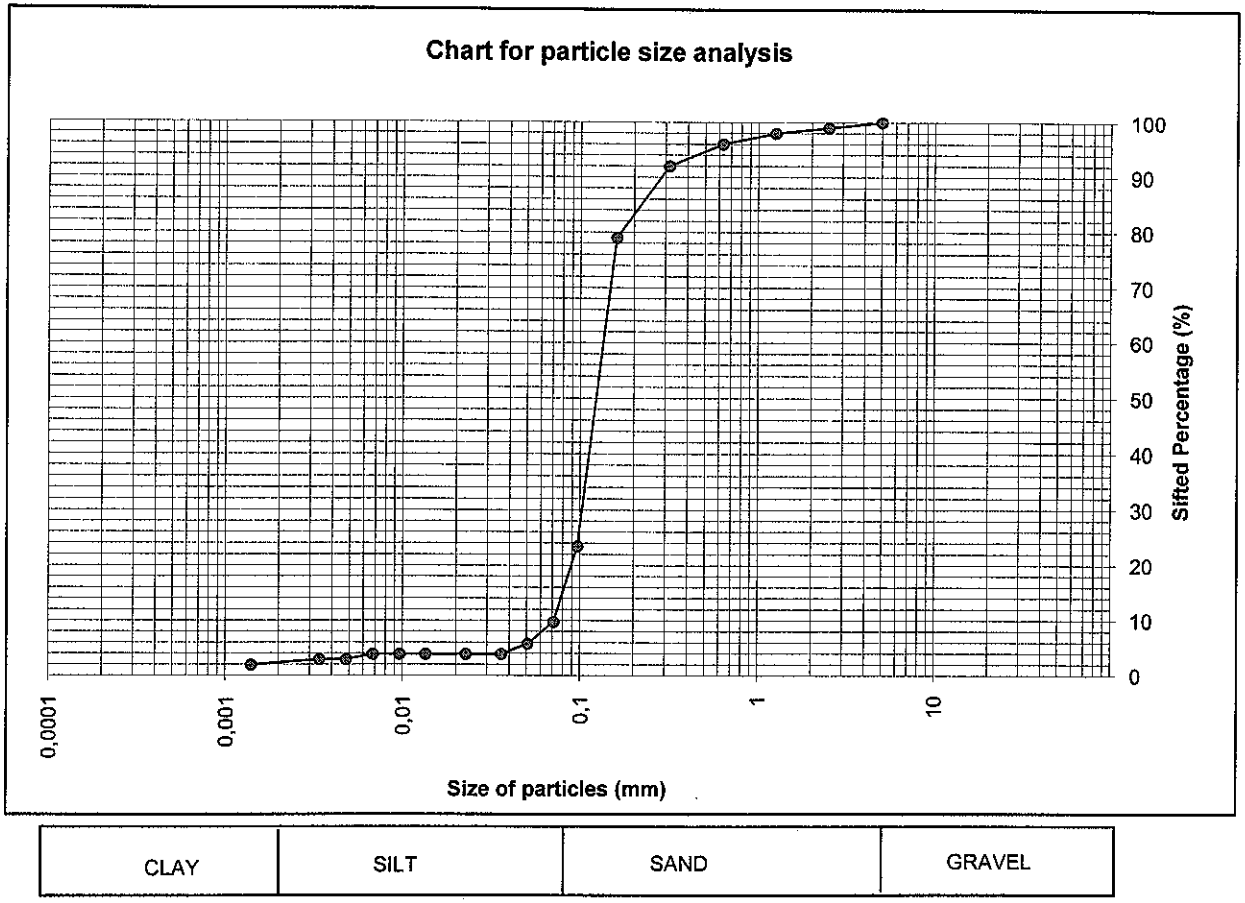
Chart for particle size analysis

Project: New Baie-Comeau wharf

Laboratory No. : 09-3002

Type of material: Sand,some silt,traces clay.

File #: **F099382200**

Source: Material on site, 09-12,SS-4, SS-5 & SS-6, Depth: 2,3 to 4,4 m.

Customer: **Alcoa**

Approuved by :__________ Date : __________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2242

File Number	**: F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: ------
City	: Baie-Comeau (Québec)	Uses	: ------
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	**: 09-2104**	Source	: 09-12, SS-7, Depth.: 4,6 to 5,2 m.
Sample No.	: ------	Tests completed on	: 2009-09-30

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	0,956	% Gravel:	1
C.U.	3,634	% Sand:	87
Unified Classification:		% Silt:	10
Fineness Module: 1,09		% Clay:	2

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: 2009-09-30
Sylvie Daigle, Tech.

Verified by: 2009-09-30
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

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FLS-051b (00-05) rév. 1

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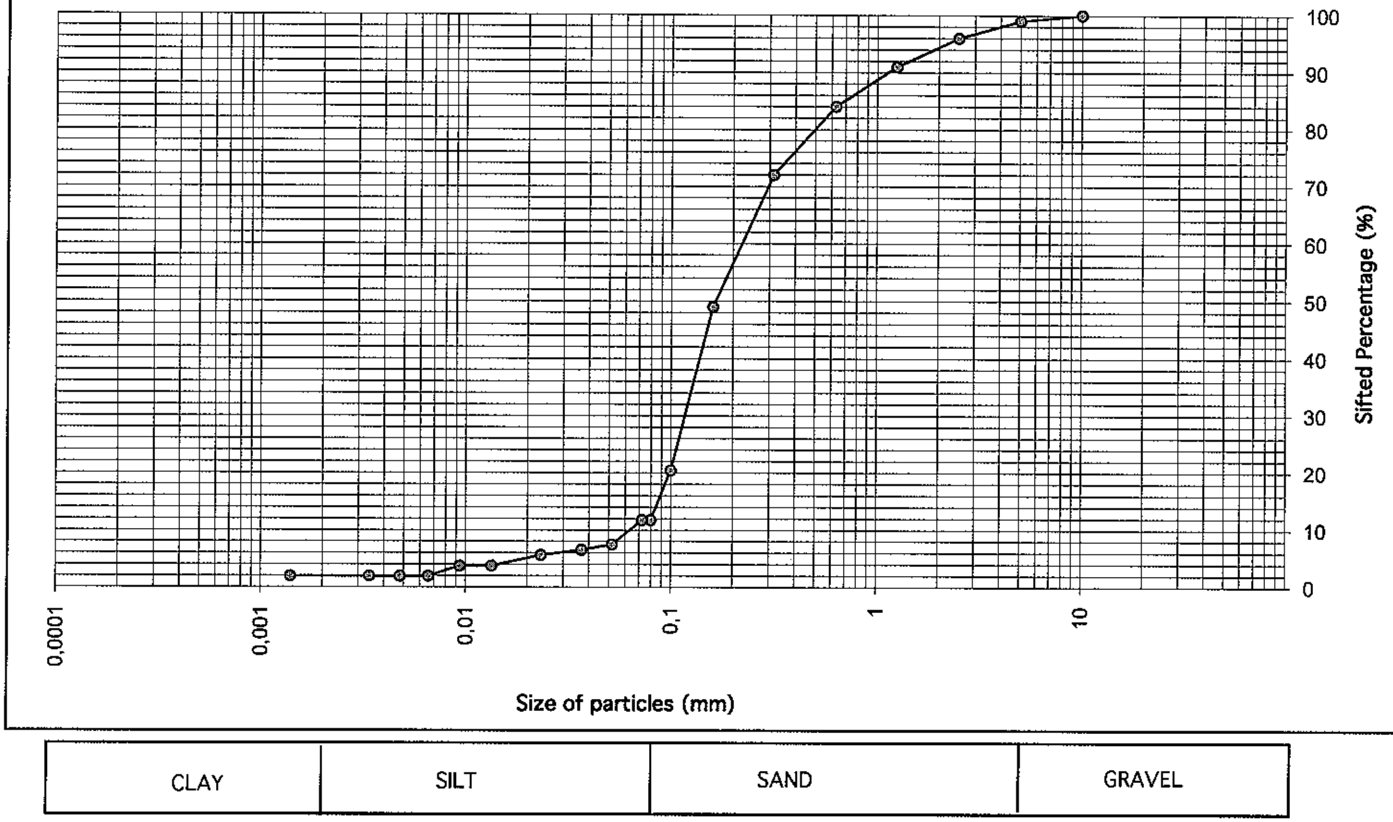
LABO S.M. INC.

Sediments Analysis NQ 2501-025

Size (mm)	% Sifted (%)
10,0	100
5,00	99
2,500	96
1,250	91
0,630	84
0,3150	72,0
0,1600	49,0
0,0999	20,4
0,0800	11,7
0,0726	11,7
0,0518	7,4
0,0368	6,5
0,0233	5,6
0,0134	3,7
0,0094	3,7
0,0066	1,9
0,0048	1,9
0,0034	1,9
0,0014	1,9

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2104

Type of material: Sand, some silt, traces clay & gravel.

File #: **F099382200**

Source: Material on site, 09-12,SS-7, Depth: 4,6 to 5,2m.

Customer: **Alcoa**

Approuved by : __________ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2226

File Number	**: F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: ------
City	: Baie-Comeau (Québec)	Uses	:
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	**: 09-2091**	Location	: 09-12, SS-10, Depth.: 6,8 to 7,5 m.
Sample No.	: ------	Tests completed on	: 2009-09-30

Particle Size Analysis
LC 21 040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements
Atterberg Limits (3pts)	BNQ2501-092		
Liquid Limit (%):		30	------
Plastic Limit (%):		18	------
Plasticity index (%):		12	------
Water Content (%):	LC21-201	34,45	------

Legend : *** =Results not in conformity**

Remarks:

Prepared by: ____________ 2009-09-30
Sylvie Daigle, Tech.

Verified by: ____________ 2009-09-30
Sonya Graveline, Ing.

QUÉFORMAT LTÉE

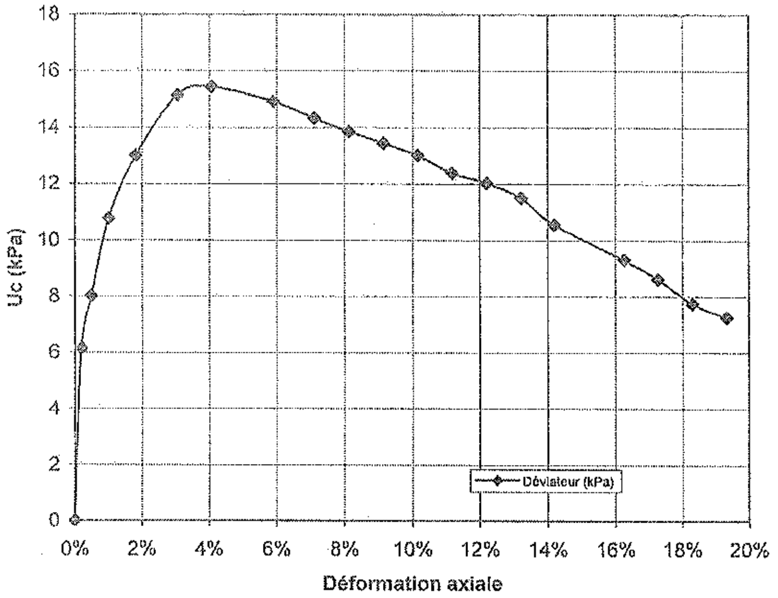
COMPRESSION NON CONSOLIDÉE - ASTM D2166-06

DOSSIER :	15756-G	SONDAGE :	BH-09-12
CLIENT :	Labo S.M. inc.	ECHANT. :	ST-11
PROJET :	ALCOA / F099382-100	PROF. (m) :	8.10 - 8.20
		FICHIER :	Comp15756-09-12-11.xls

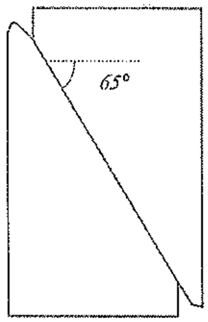
Compression non drainée

Longueur initiale, Hi (mm) :	98.30	Volume initial, Vi (cm³) :	207.90	Section initiale, Ai (cm²) :	21.15	Vit. déformation (mm/min) :	0.8
Longueur finale, Hf (mm) :	79.31	Volume final, Vf (cm³) :	207.90	Section finale, Af (cm²) :	26.21		

No.	Lectures ΔL (0,01mm)	Lectures Fa (N)	Déformation ΔH/Hi (%)	Section (cm²)	Résistance en compression, Uc (kPa)	Résultats
1	1501	0	0.00%	21.15	0	
2	1520	13	0.19%	21.19	6	**Rupture :**
3	1550	17	0.50%	21.26	8	
4	1600	23	1.01%	21.36	11	Uc (kPa) : 15 kPa
5	1680	28	1.82%	21.54	13	ΔH/Hi (%) : 4.06 %
6	1800	33	3.04%	21.81	15	
7	1900	34	4.06%	22.04	15	
8	2081	34	5.90%	22.48	15	**Caractéristiques physiques :**
9	2200	33	7.11%	22.77	14	
10	2300	32	8.13%	23.02	14	Teneur en eau initiale : 58.65 %
11	2400	31	9.15%	23.28	13	Masse volumique humide : 1668 kg/m³
12	2500	31	10.16%	23.54	13	Masse volumique sèche : 1051 kg/m³
13	2600	30	11.18%	23.81	12	Teneur en eau finale : 58.14 %
14	2700	29	12.20%	24.09	12	
15	2800	28	13.21%	24.37	11	
16	2896	26	14.19%	24.65	11	**Remarques :**
17	3100	24	16.27%	25.26	9	
18	3200	22	17.28%	25.57	9	Rapport hauteur/diamètre
19	3300	20	18.30%	25.89	8	de l'échantillon au montage = 1.9
20	3400	19	19.32%	26.21	7	



Croquis :



Réalisé par : A. Bustamante
date : 2009-12-02

Vérifié par : Hélène Bilodeau, ing.
date : 2009-12-03

QUÉFORMAT LTÉE

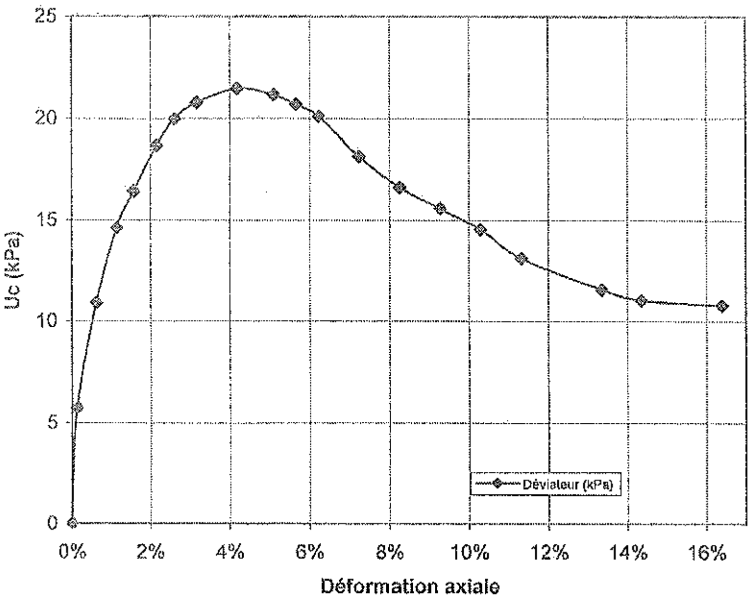
COMPRESSION NON CONSOLIDÉE - ASTM D2166-06

DOSSIER :	15756-G	SONDAGE :	BH-09-12
CLIENT :	Labo S.M. inc.	ECHANT. :	ST-12
PROJET :	ALCOA / F099382-100	PROF. (m) :	9.70 - 9.80
		FICHIER :	Comp15756-09-12-12.xls

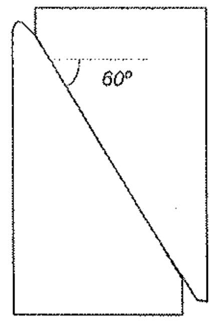
Compression non drainée

Longueur initiale, Hi (mm) :	98.30	Volume initial, Vi (cm³) :	206.23	Section initiale, Ai (cm²) :	20.98	Vit. déformation (mm/min) :	0.8
Longueur finale, Hf (mm) :	82.18	Volume final, Vf (cm³) :	206.23	Section finale, Af (cm²) :	25.09		

No.	Lectures ΔL	Fa	Déformation ΔH/Hi	Section	Résistance en compression, Uc	Résultats
	(0,01mm)	(N)	(%)	(cm²)	(kPa)	
1	1488	0	0.00%	20.98	0	
2	1500	12	0.12%	21.01	6	**Rupture :**
3	1550	23	0.63%	21.11	11	
4	1600	31	1.14%	21.22	15	Uc (kPa) : 21 kPa
5	1643	35	1.58%	21.32	16	ΔH/Hi (%) : 4.19 %
6	1700	40	2.16%	21.44	19	
7	1745	43	2.61%	21.54	20	
8	1800	45	3.17%	21.67	21	**Caractéristiques physiques :**
9	1900	47	4.19%	21.90	21	
10	1990	47	5.11%	22.11	21	Teneur en eau initiale : 50.07 %
11	2044	46	5.66%	22.24	21	Masse volumique humide : 1727 kg/m³
12	2100	45	6.23%	22.37	20	Masse volumique sèche : 1151 kg/m³
13	2200	41	7.24%	22.62	18	Teneur en eau finale : 49.84 %
14	2300	38	8.26%	22.87	17	
15	2400	36	9.28%	23.13	16	
16	2500	34	10.30%	23.39	15	**Remarques :**
17	2600	31	11.31%	23.66	13	
18	2800	28	13.35%	24.21	12	Rapport hauteur/diamètre
19	2900	27	14.36%	24.50	11	de l'échantillon au montage = 1.9
20	3100	27	16.40%	25.09	11	



Croquis :



Réalisé par : A. Bustamante
date : 2009-12-02

Vérifié par : Hélène Bilodeau, ing.
date : 2009-12-03

SM LABO S.M. INC.

Rapport no. : *09LL1820*

Rapport D'essai
CONSOLIDATION OEDOMETRIQUE
ASTM D2435-90

No Dossier :	**F99382100**	Sondage :	**BH-09-12**	
Client :	**Alcoa**	Échantillon :	**ST-12**	
Adresse :	100, rue Maritime	Prof. (m) :	9,60	**9,60@9,70**
Ville :	Baie-Comeau (Québec)			
Code postal :	G4Z 2L6			
Projet no :	Usine Alcoa de Baie-Comeau/Nouveau quai			

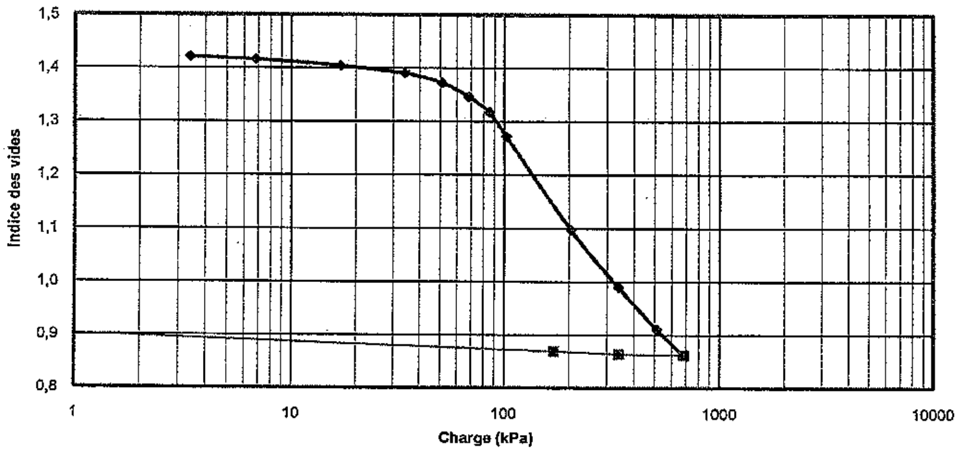
Analysé par : IG

Caractéristiques de l'anneau		
Numéro :		4
Masse :	(g)	107,15
Hauteur :	(mm)	25,40
Diamètre :	(mm)	63,44
Surface :	(cm^2)	31,61
Volume :	(cm^3)	80,29

Caractéristiques de l'appareil		
Numéro de l'appareil :		4
Calibration de l'extensomètre :	(div./mm)	500,00
Bras de levier :		10,97
Déformation = b * Pression ^ m		
Facteur de correction b :	(div)	10,00
Facteur de correction m :		0,50

Caractéristiques physiques		Initial	Final	
Numéro de la tare :		Anneau	Anneau	
Masse de la tare (anneau) :	(g)	107,15	107,15	
Masse du sol humide + tare :	(g)	242,15	229,21	
Masse du sol sec + tare :		198,23	198,23	
Masse du sol humide :	(g)	135,00	122,06	
Masse du sol sec :	(g)	91,08	91,08	
Teneur en eau du sol :	(%)	48,22	34,01	
Hauteur du sol humide :	(mm)	25,40	20,30	
Hauteur du sol sec :	(mm)	10,48	10,48	
Masse volumique humide :	(kg/m^3)	1 681	1 902	
Masse volumique sèche :	(kg/m^3)	1 134	1 419	
Indice des vides :		1,424	0,937	
Degré de saturation :	(%)	93,11	100,00	
Densité relative calculée :	Estimée	2,75	2,76	Calculée

Date (aaaa/mm/jj)	Heure (hh:mm)	Charge (kg)	Pression (kPa)	Lecture (0,002mm)	Correction de lecture	ΔH (mm)	Indice des vides	Hauteur (mm)	t50 (min)	Cv (m²/s)
2009/11/23		0,00	0,00	0	0,0	0,00	1,424	25,40		
2009/11/24		0,10	3,40	23	4,4	0,04	1,421	25,36		
2009/11/25		0,20	6,81	54	8,8	0,09	1,416	25,31		
2009/11/26		0,50	17,02	123	19,0	0,21	1,404	25,19		
2009/11/27		1,00	34,03	213	33,0	0,36	1,390	25,04		
2009/11/28		1,50	51,05	311	39,0	0,54	1,372	24,86		
2009/11/29		2,00	68,07	456	45,0	0,82	1,346	24,58		
2009/11/30		2,50	85,08	612	50,3	1,12	1,317	24,28		
2009/12/01		3,00	102,10	850	55,5	1,59	1,272	23,81		
2009/12/02		6,00	204,20	1 789	77,0	3,42	1,097	21,98		
2009/12/03		10,00	340,34	2 372	95,8	4,55	0,990	20,85		
2009/12/04		15,00	510,51	2 805	115,1	5,38	0,911	20,02		
2009/12/05		20,00	680,67	3 073	129,5	5,89	0,862	19,51		
2009/12/06		15,00	510,51	3 161	115,1	6,09	0,843	19,31		
2009/12/07		10,00	340,34	3 031	95,8	5,87	0,864	19,53		
2009/12/08		5,00	170,17	2 982	71,5	5,82	0,869	19,58		
2009/12/09		0,00	0,00	2 548	0,0	5,10	0,938	20,30		



$\sigma'_p = 84$ kPa

$C_{cr} = 0{,}0372$

$C_c = 0{,}5785$

Remarques : ----

Préparé par : Isabelle Gauthier, tech. Chef labo   Date :

Vérifié par : Salomon O'Ngandée, ing., M.Sc.A.   Date :

Notes : Le résultat s'applique exclusivement à l'échantillon analysé. Ce rapport ne doit pas être reproduit, sinon en entier, sans l'autorisation écrite de Labo S.M. Inc.

FLG-0204 02/10 rev. 0

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2222

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2092**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses :
Sampled by : Simon Marois,Tech.
:
:
Location : 09-12, SS-13, Depth.:12,9 to 13,6 m.
Tests completed on : 2009-09-30

Particle Size Analysis
LC 21 040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements
Atterberg Limits (3pts)	BNQ2501-092		
Liquid Limit (%):		28	------
Plastic Limit (%):		17	------
Plasticity index (%):		11	------
Water Content (%):	LC21-201	32,2	------

Legend : *** =Results not in conformity**

Remarks:

Prepared by: 2009-09-30
Sylvie Daigle, Tech. .

Verified by: 2009-09-30
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2257

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2103**
Sample No. : ------

Type of Material : -----
Caliber : -----
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-12, SS-21, Depth.: 19 to 19,7m.
Tests completed on : 2009-09-30

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	6,638	% Gravel:	1
C.U.	99,5	% Sand:	63
Unified Classification:		% Silt:	26
Fineness Module: 0,78		% Clay:	10

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: 2009-09-30
Sylvie Daigle, Tech.

Verified by: 2009-09-30
Sonya Graveline, Ing.

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
10,0	100
5,00	99
2,500	99
1,250	97
0,630	93
0,3150	81,0
0,1600	53,0
0,0937	36,7
0,0665	34,7
0,0479	28,9
0,0343	25,1
0,0218	24,1
0,0128	20,3
0,0090	17,4
0,0064	14,5
0,0046	13,5
0,0033	12,5
0,0014	8,7

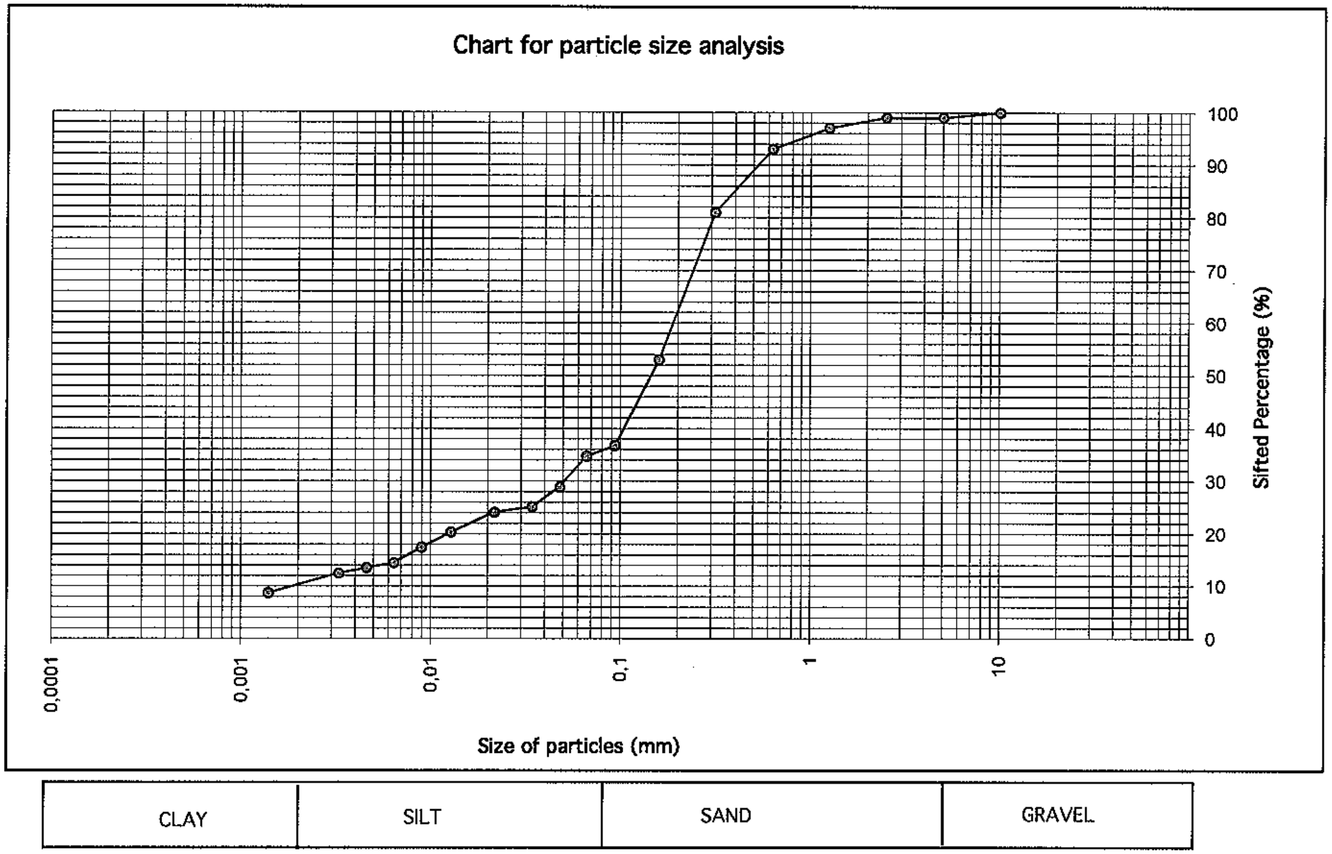


Chart for particle size analysis

Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2103

Type of material: Silty sand, some clay, traces gravel.

Source: Material on site, 09-12,SS-21, Depth: 19 to 19,7 m.

Approuved by : Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMI
LABO S.M. INC

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2255

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2102**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-12, SS-23, Depth.:21,3 to 22 m.
Tests completed on : 2009-09-30

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 3,313
C.U. 78,25
Unified Classification:
Fineness Module: 0,67

% Gravel: 0
% Sand: 56
% Silt: 33
% Clay: 11

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

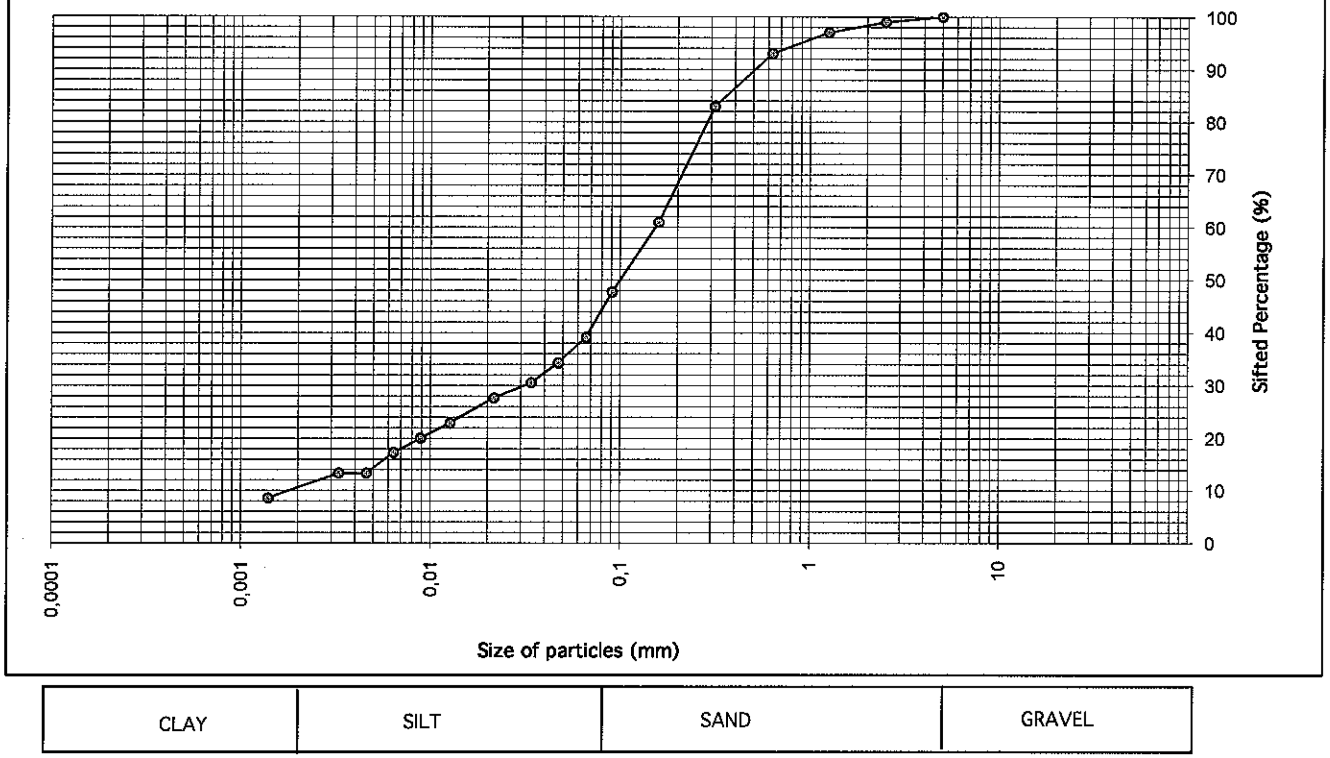
Prepared by: 2009-09-30
Sylvie Daigle, Tech.

Verified by: 2009-09-30
Sonya Graveline, Ing.

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
5,00	100
2,500	99
1,250	97
0,630	93
0,3150	83,0
0,1600	61,0
0,0908	47,7
0,0662	39,1
0,0474	34,3
0,0340	30,5
0,0217	27,7
0,0127	22,9
0,0089	20,0
0,0064	17,2
0,0046	13,3
0,0033	13,3
0,0014	8,6

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2102

Type of material: Silty sand, some clay.

File #: **F099382200**

Source: Material on site, 09-12,SS-23, Depth: 21,3 to 22 m.

Customer: **Alcoa**

Approuved by :

Date : 2009/10/30

'FLS-079 (06-2007) rév. 1

SM Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-13
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 1 of 3
LOCATION OF BOREHOLE: X : 258886,83 Y : 5457092,27		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL**NQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -16.83	**BORING DATE** **START:** 2009-11-05 10:30:00	**END:** 2009-11-06 21:30:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◧	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

Water level

Date:	Time:	Elev.(m):

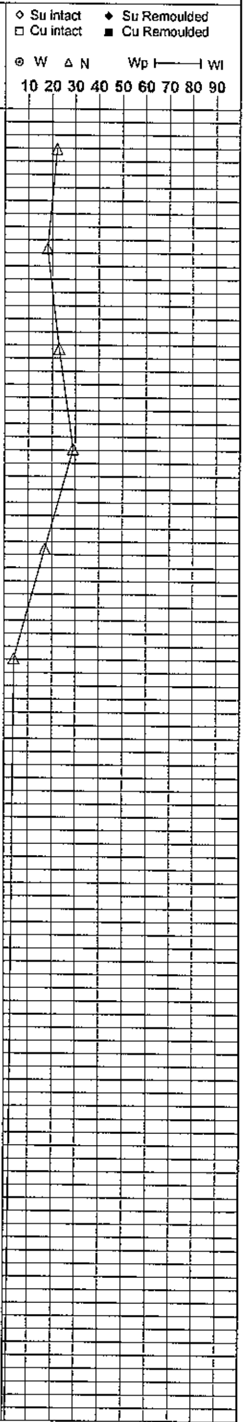
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth -16.83	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
	0.00	Gray sand with some silt, trace gravel and occasionally sea shell; medium dense		☒	SS-1	B	67	22	6-9-13-8		
1				☒	SS-2	B	75	18	9-8-10-10		
2				☒	SS-3	B	58	23	10-10-13-11		Combined SS-3/4/5: GSA, DS; CU=3.5, Phi'=XXX, c'=XXX
				☒	SS-4	B	54	29	12-14-15-15		
3											
				☒	SS-5	B	42	17	12-9-8-8		
4				■	SS-6	B	0	4	11-4-0-0		
	-21.10 4.27	Gray clay with some silt									
5											
				▨	ST-7		42				
6											
				▨	ST-8		87				
7											
				▨	ST-9		92				ST-9: GSA, C, CUT CU=XXX, W=XXX, Wp=XXX, Wl=XXX, Ip=XXX, D=XXX, UC=XXX, PP=XXX, Ccr=XXX
8											
				▨	ST-10		96				ST-10: GSA, C, DS CU=XXX, W=XXX, Wp=XXX, Wl=XXX, Ip=XXX, UC=XXX, PP=XXX, Ccr=XXX, Phi'=XXX, c'=XXX
9											
				▨	ST-11		92				



Notes:

Approved by :
Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-13
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 2 of 3
LOCATION OF BOREHOLE: X : 258886,83 Y : 5457092,27		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL**NQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -16,83	**BORING DATE START:** 2009-11-05 10:30:00	**END:** 2009-11-06 21:30:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

- ☒ Remoulded
- ▨ Intact
- ■ Lost
- ◫ Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value
Nd:	DCPT Nd-Value
Su:	Field Vane
GSA:	Grain size analysis
CU:	Uniformity coefficient
W:	Water Content
Wp:	Plastic limit
Wl:	Liquid limit
Ip:	Plasticity index:
D:	Specific density
Cu:	Swedish cone
C:	Consolidation
PP:	Preconsolidation pressure
Cc:	Compression index
Ccr:	Recompression index
UC:	Unconfined compression
DS:	Direct shear
Phi':	Angle of internal friction
c':	Cohesion
CUT:	Consolidation undrained triaxial

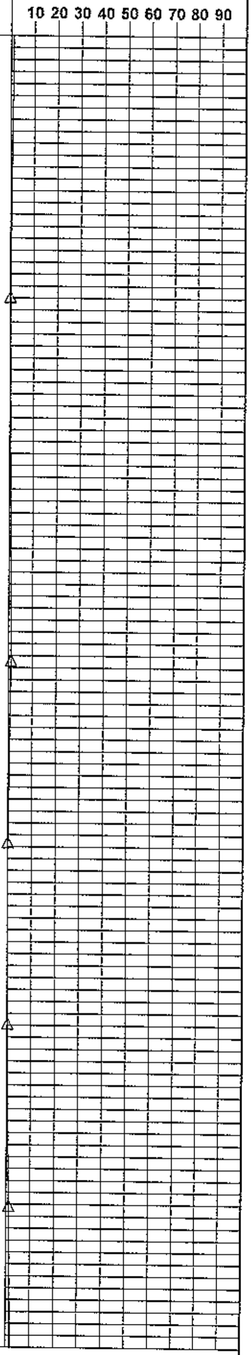
Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY / SAMPLES / LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
	10.14	Gray silt with some clay, trace sand and occasionally sea shell; very loose		▨	ST-12		92				ST-12: GSA, C, DS CU=XXX, W=XXX, Wp=XXX, Wl=XXX, Ip=XXX, PP=XXX, Ccr=XXX, Phi'=XXX, c'=XXX
11											
12				☒	SS-13	B	100	0	0-0-0-0		
13											
	-30.24 13.41	Gravel up to 50 mmØ		■	SS-14	B	0		50 /refusal		
14				■	DC-15	NQ	5				
15	-31.77 14.94	Gray silty sand with trace clay; very loose		☒	SS-16	B	100	1	1-0-1-0		
16											
17				☒	SS-17	B	87	0	0-0-0-0		Combined SS-17/18: GSA, DS; CU=59.1, Phi'=XXX, c'=XXX
18				☒	SS-18	B	100	0	1-0-0-0		
19											
20				☒	SS-19	B	100	1	1-0-1-0		



Notes:

Approved by :
Sonya Graveline, ing.

BORING LOG

PROJECT: New wharf #4	**BOREHOLE:** 09-13
SITE: Alcoa - Baie-Comeau smelter (Quebec)	**PAGE:** 3 of 3
LOCATION OF BOREHOLE: X : 258886,83 Y : 5457092,27 — **CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50 — **SAMPLER:** Indicated — **CORE BARREL**NQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -16.83 — **BORING DATE START:** 2009-11-05 10:30:00 **END:** 2009-11-06 21:30:00	

Type of Sampler

SS: Split Spoon
DC: Diamond Core
WS: Wash Sample
HT: Hydraulic Trust
HW: Hammer Weight
SP: Shelby and Piston
AS: Auger Sampler
ST: Thin Walled Shelby Tube

☒ Remoulded
▨ Intact
■ Lost
◧ Rock Core

Laboratory and In situ tests - Parameters

N: SPT N-Value
Nd: DCPT Nd-Value
Su: Field Vane
GSA: Grain size analysis
CU: Uniformity coefficient
W: Water Content
Wp: Plastic limit
Wl: Liquid limit

Ip: Plasticity index:
D: Specific density
Cu: Swedish cone
C: Consolidation
PP: Preconsolidation pressure
Cc: Compression index
Ccr: Recompression index
UC: Unconfined compression

DS: Direct shear
Phi': Angle of internal friction
c': Cohesion
CUT: Consolidation undrained triaxial

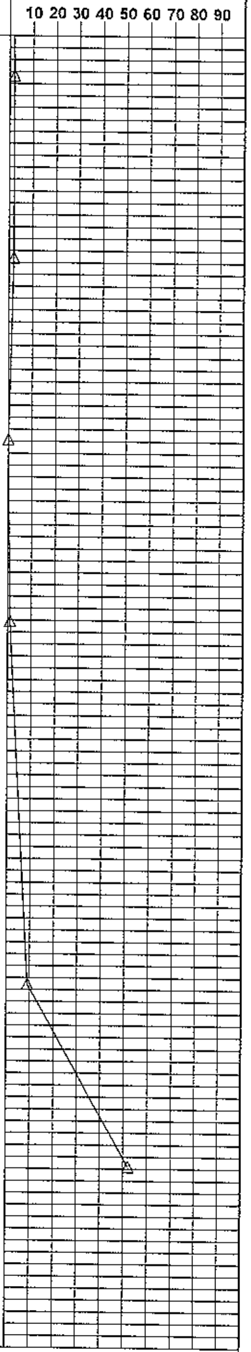
Water level

Date: Time: Elev.(m):

Installation:

STRATIGRAPHY — SAMPLES — LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
				☒	SS-20	B	100	2	4-1-1-0		
22											
23				☒	SS-21	B	100	2	3-2-0-3		
24											
				☒	SS-22	B	100	0	1-0-0-0		GSA, CU=86.1
25											
26				☒	SS-23	B	100	1	0-0-1-0		GSA, DS, CU=34.4, Phi'=XXX, c'=XXX
27											
	-44.21 27.38	Boulder 355mmØ		☒	SS-24	B	100		50 /refusal		GSA, CU=34.3
				■	DC-25	NQ	100				
	-44.57 27.74	Gray silty sand, some clay, stratified with thin layers of sand; loose									
28											
29				☒	SS-26	B	79	9	4-6-3-0		GSA, CU=nd (>>)
	-46.55 29.72	Gray sand and silt, trace clay; very dense									
30											
				☒	SS-27	B	83	52	4-23-29-37		GSA, CU=29
31	-47.61 30.79	End of borehole									



Notes:

Approved by :
Sonya Graveline, ing.

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3076

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2935**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-13, SS-3 ,SS-4 & SS-5, Depth.: 1,5 t
Tests completed on : 2009-11-30

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 0,771
C.U. 3,539
Unified Classification:
Fineness Module: 1,43

% Gravel: 7,0
% Sand: 80
% Silt: 12
% Clay: 1

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : * **=Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: Sylvie Daigle, Tech. 2009-12-04

Verified by: Sonya Graveline, Ing. 2009-12-04

SMi

LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
14,0	100
10,0	97
5,0	93
2,5	89
1,250	83
0,630	76
0,3150	66
0,1600	50
0,0973	18,7
0,0709	9,4
0,0506	6,0
0,0359	5,1
0,0228	4,3
0,0134	3,4
0,0095	2,6
0,0068	2,6
0,0048	1,7
0,0034	1,7
0,0014	0,9

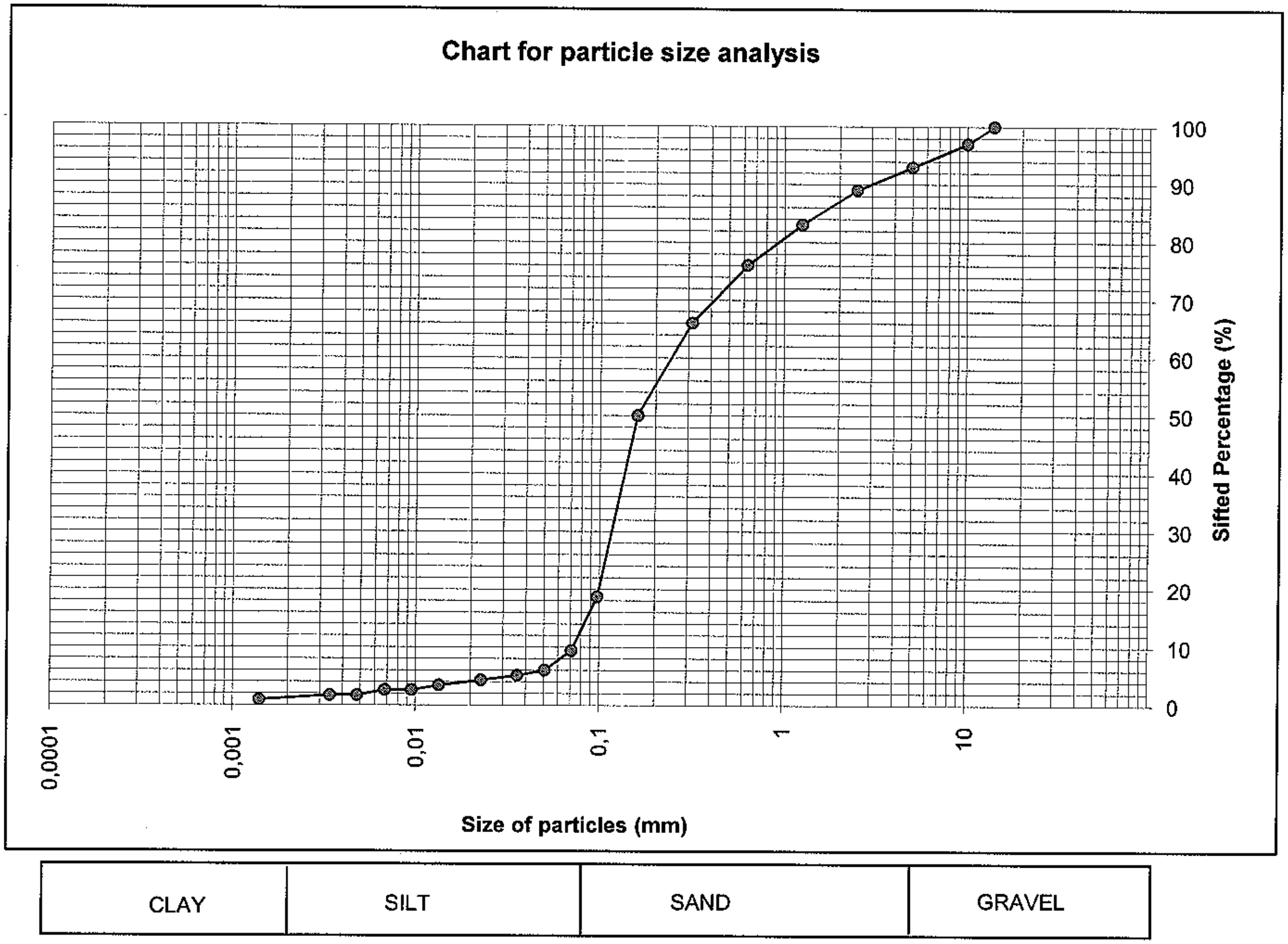


Chart for particle size analysis

Project: New Baie-Comeau wharf

Laboratory No. : 09-2935

Type of material: Sand,some silt traces gravel & clay

File #: **F099382200**

Source: Material on site, 09-13,SS-3,SS-4 & SS-5 Depth: 1,5 to 3,7 m.

Customer: **Alcoa**

Approuved by : ________ Date : 8/12/09

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3071

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2936**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-13, SS-17 & SS-18, Depth.: 16,5 to 1
Tests completed on : 2009-11-30

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 3,828
C.U. 59,136
Unified Classification:
Fineness Module: 0,49

% Gravel:
% Sand: 57
% Silt: 33
% Clay: 10

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: 2009-12-04
Sylvie Daigle, Tech.

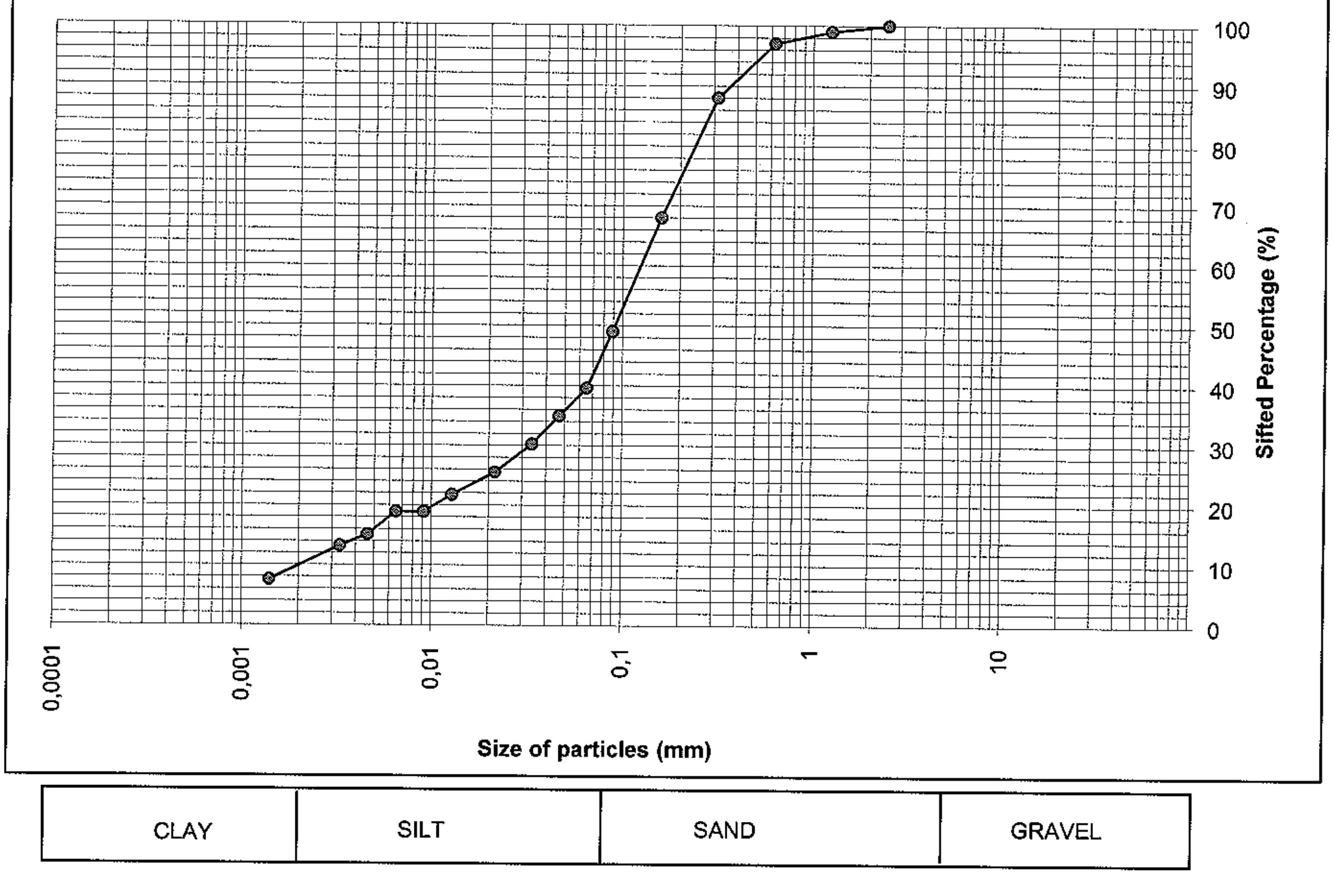
Verified by: 2009-12-04
Sonya Graveline, Ing.

FLS-051b (00-05) rév. 1

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
2,5	100
1,250	99
0,630	97
0,3150	88
0,1600	68
0,0889	49,0
0,0652	39,6
0,0467	34,9
0,0336	30,2
0,0215	25,5
0,0128	21,7
0,0091	18,9
0,0065	18,9
0,0046	15,1
0,0033	13,2
0,0014	7,5

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2936

Type of material: Silty sand,someclay

File #: **F099382200**

Source: Material on site, 09-13,SS-17 & SS-18 Depth: 16,5 to 18,6 m.

Customer: **Alcoa**

Approuved by : ____________ Date : ________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3101

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2937**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-13, SS-22 Depth: 24,0 to 24,7 m.
Tests completed on : 2009-12-01

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 7,326
C.U. 86,12
Unified Classification:
Fineness Module: 0,66

% Gravel: 1
% Sand: 59
% Silt: 29
% Clay: 11

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: 2009-12-07
Sylvie Daigle, Tech.

Verified by: 2009-12-07
Sonya Graveline, Ing.

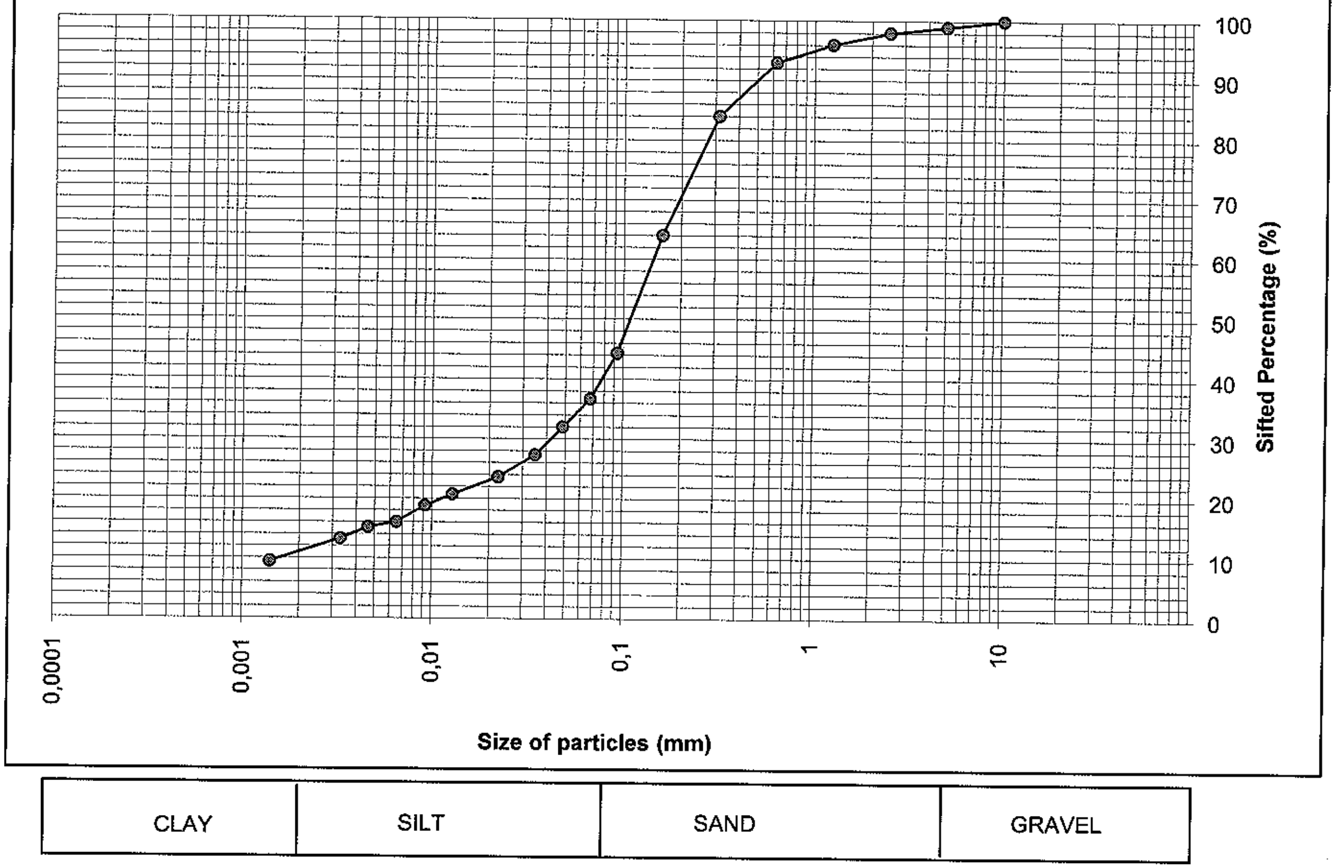
N.B. These results are exclusively for analysis sampled.

SM
LABO S.M. INC.

Sediments Analysis
NQ 2501-025

Size (mm)	% Sifted (%)
10,0	100
5,0	99
2,5	98
1,250	96
0,630	93
0,3150	84
0,1600	64
0,0932	44,3
0,0676	36,7
0,0485	32,0
0,0348	27,3
0,0223	23,6
0,0128	20,7
0,0092	18,8
0,0065	16,0
0,0046	15,1
0,0033	13,2
0,0014	9,4

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2937

Type of material: Silty sand,some clay,traces gravel

File #: **F099382200**

Source: Material on site, 09-13,SS-22, Depth: 24,0 to 24,7 m.

Customer: **Alcoa**

Approuved by : ________________ Date : __________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3184

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-3003**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-13, SS-23, Depth.: 25,6 to 26,2 m.
Tests completed on : 2009-12-01

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 5,350
C.U. 34,43
Unified Classification:
Fineness Module: 0,62

% Gravel: 1,0
% Sand: 61
% Silt: 31
% Clay: 7

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: ____________ 2009-12-08
Sylvie Daigle, Tech.

Verified by: ____________ 2009-12-08
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

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FLS-051b (00-05) rév. 1

Page 1 de 1

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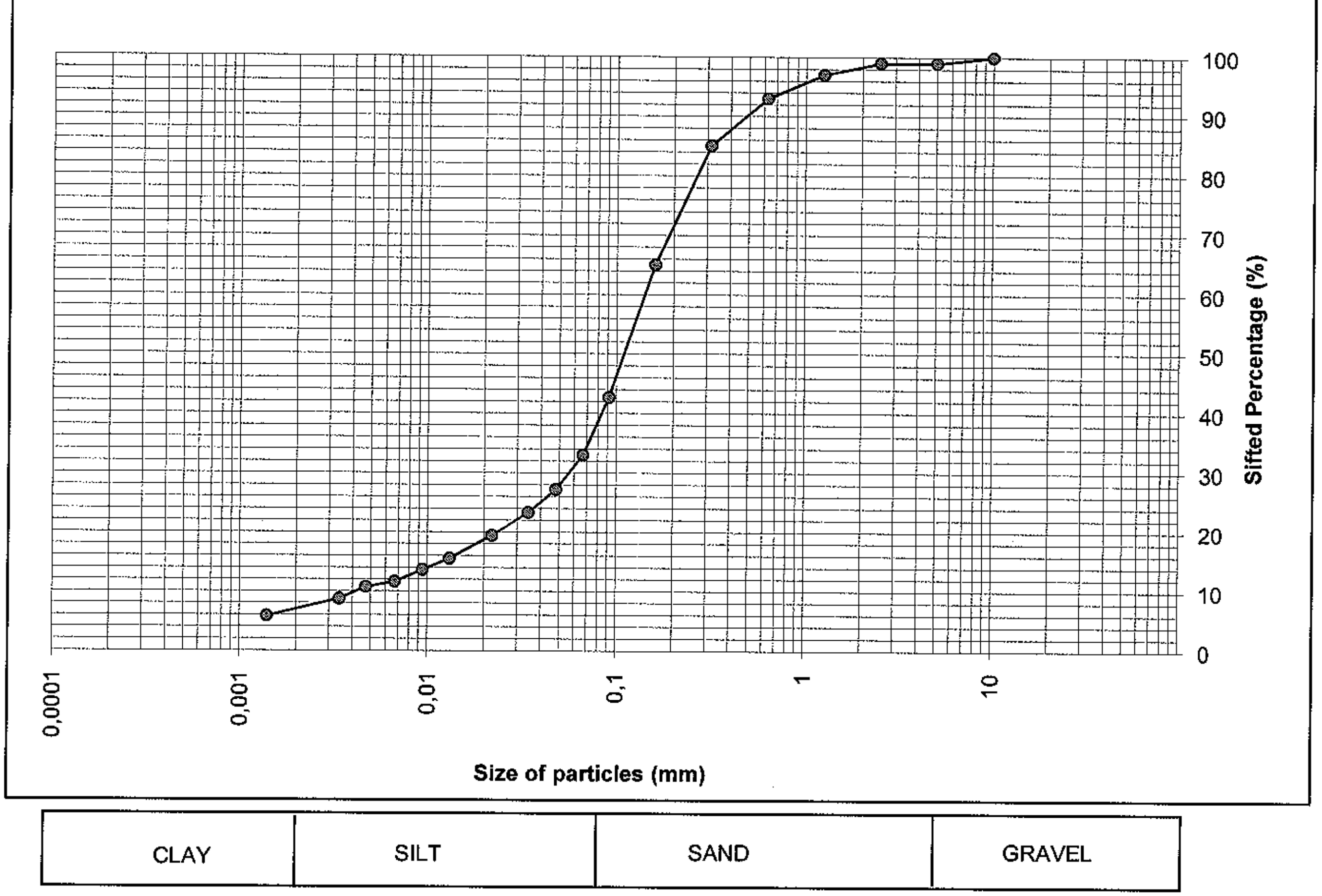
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
10,0	100
5,0	99
2,5	99
1,250	97
0,630	93
0,3150	85
0,1600	65
0,0914	42,7
0,0667	33,0
0,0480	27,2
0,0343	23,3
0,0220	19,4
0,0131	15,5
0,0094	13,6
0,0067	11,6
0,0047	10,7
0,0034	8,7
0,0014	5,8

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-3003

Type of material: Silty sand,traces clay & gravel.

File #: **F099382200**

Source: Material on site, 09-13, SS-23, Depth: 25,6 to 26,2 m.

Customer: **Alcoa**

Approuved by :_______________ Date : _________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3102

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2938**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-13, SS-24, Depth.: 27,1 to 27,4 m.
Tests completed on : 2009-12-01

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	7,178	% Gravel:	
C.U.	34,31	% Sand:	76
Unified Classification:		% Silt:	19
Fineness Module: 0,99		% Clay:	5

Legend : *** =Results not in conformity**

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Remarks: **See following chart for sediments analysis.**

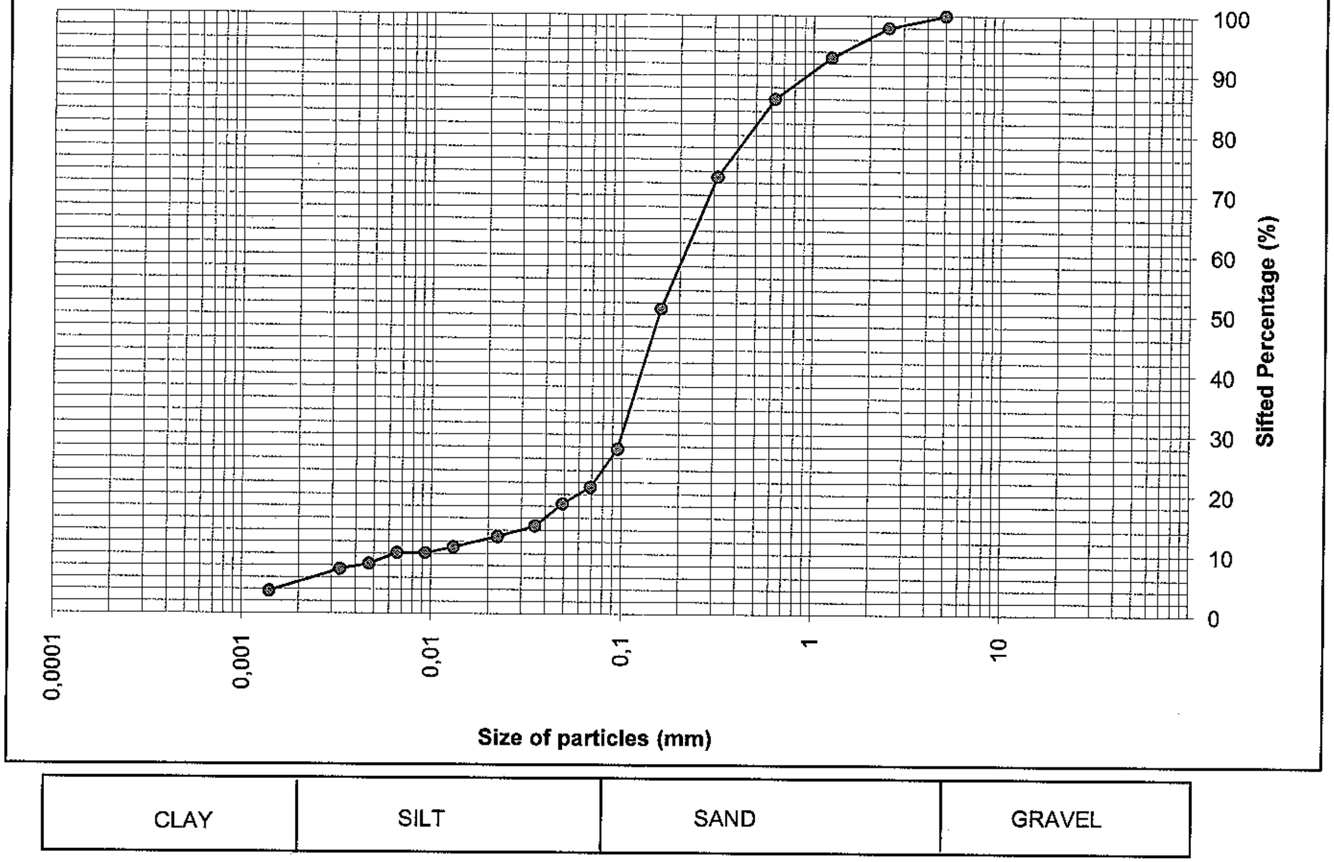
Prepared by: ____________ 2009-12-04
Sylvie Daigle, Tech.

Verified by: ____________ 2009-12-04
Sonya Graveline, Ing.

SM
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
5,0	100
2,5	98
1,250	93
0,630	86
0,3150	73
0,1600	51
0,0954	27,6
0,0689	21,2
0,0492	18,4
0,0352	14,7
0,0224	12,9
0,0131	11,1
0,0093	10,1
0,0066	10,1
0,0047	8,3
0,0033	7,4
0,0014	3,7

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2938

Type of material: Sand,some silt,traces clay.

File #: **F099382200**

Source: Material on site, 09-13,SS-24, Depth: 27,1 to 27,4 m.

Customer: **Alcoa**

Approuved by : ________________ Date : __________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3178

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2998**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-13 SS-26, Depth.: 28,6to 29,3 m.
Tests completed on : 2009-12-07

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.
C.U.
Unified Classification:
Fineness Module: 0,45

% Gravel:	
% Sand:	55
% Silt:	32
% Clay:	13

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

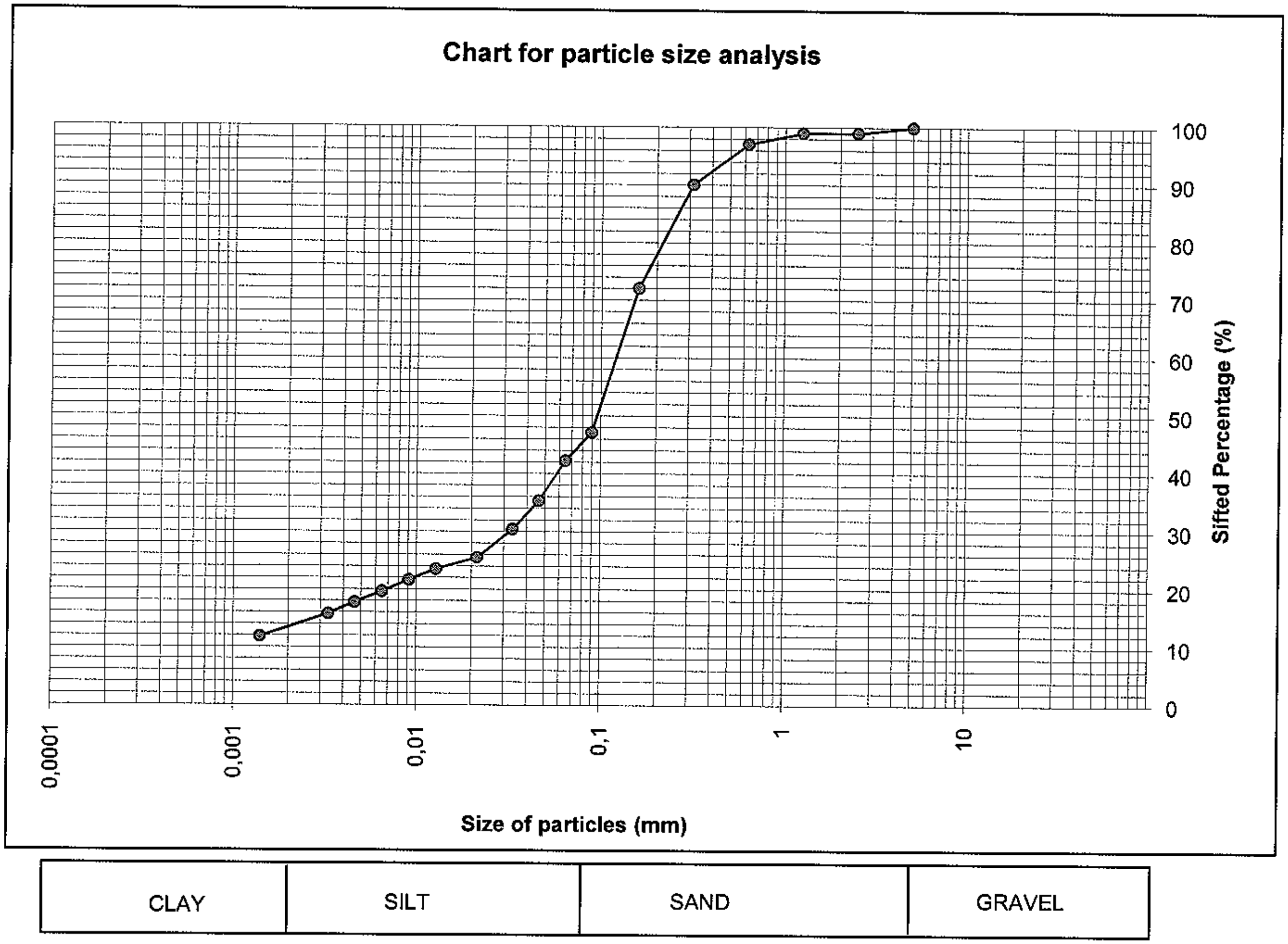
Remarks: **See following chart for sediments analysis.**

Prepared by: 2009-12-10
Sylvie Daigle, Tech.

Verified by: 2009-12-10
Sonya Graveline, Ing.

SM
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
5,0	100
2,5	99
1,250	99
0,630	97
0,3150	90
0,1600	72
0,0896	47,1
0,0644	42,2
0,0464	35,3
0,0334	30,4
0,0214	25,5
0,0128	23,5
0,0091	21,6
0,0065	19,6
0,0046	17,7
0,0033	15,7
0,0014	11,8



Project: New Baie-Comeau wharf

Laboratory No. : 09-2998

Type of material: Silty sand,some clay

File #: **F099382200**

Source: Material on site, 09-13,SS-26, Depth: 28,6 to 29,3 m.

Customer: **Alcoa**

Approuved by :________________ Date : __________

SOIL MATERIALS ANALYSIS REPORT

SM
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3103

File Number : F099382200
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : 09-2934
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-13, SS-27, Depth.: 30,2 to 30,8 m.
Tests completed on : 2009-11-30

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 3,334
C.U. 28,95
Unified Classification:
Fineness Module: 0,40

% Gravel:
% Sand: 53
% Silt: 39
% Clay: 8

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

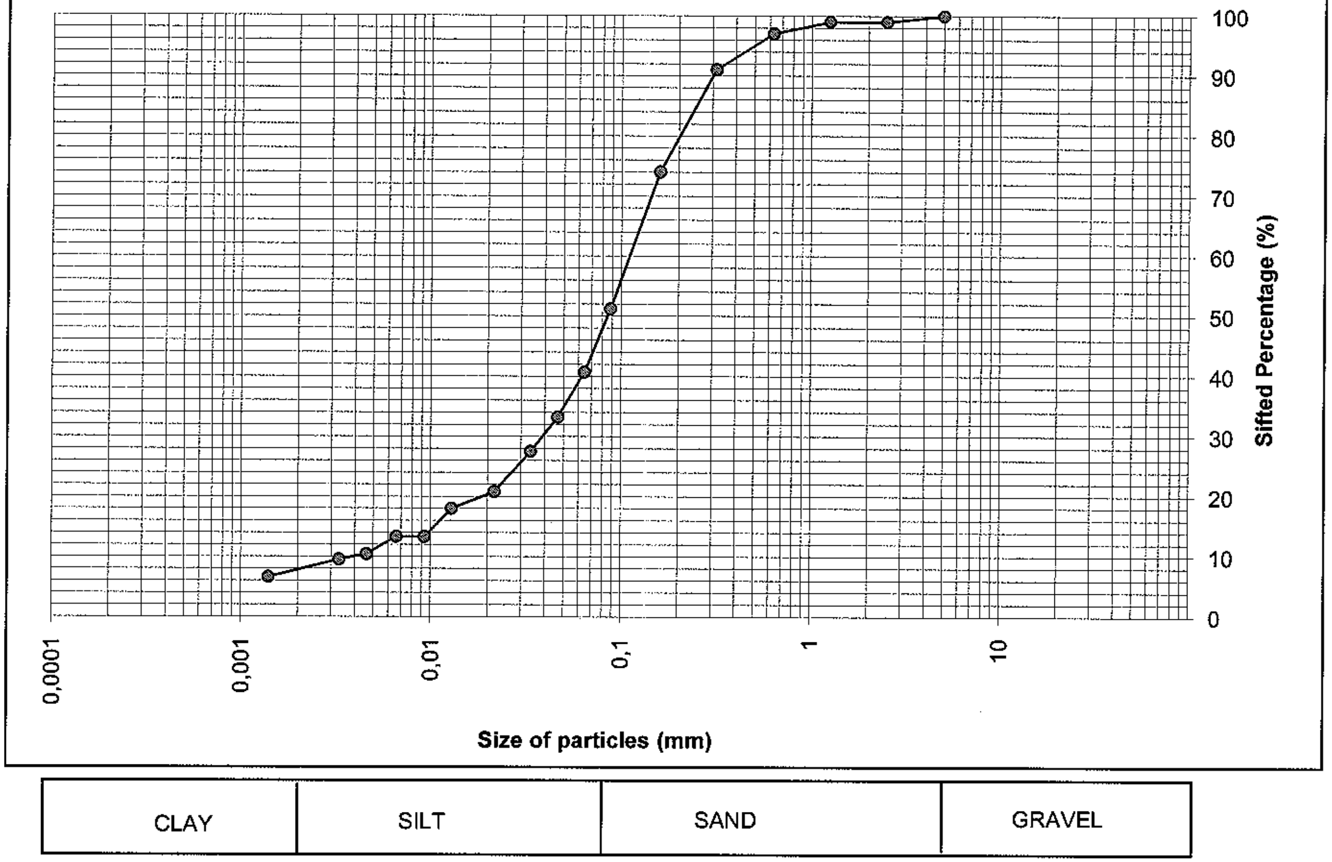
Prepared by: ______________ 2009-12-04
Sylvie Daigle, Tech.

Verified by: ______________ 2009-12-04
Sonya Graveline, Ing.

SM
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
5,0	100
2,5	99
1,250	99
0,630	97
0,3150	91
0,1600	74
0,0880	51,2
0,0645	40,7
0,0467	33,2
0,0336	27,5
0,0217	20,8
0,0129	18,0
0,0093	13,3
0,0066	13,3
0,0046	10,4
0,0033	9,5
0,0014	6,6

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2934

Type of material: Sand & silt, traces clay

File #: **F099382200**

Source: Material on site, 09-13,SS-27 Depth: 30,2 to 30,8m.

Customer: **Alcoa**

Approuved by :__________ Date : ________

'FLS-079 (06-2007) rév. 1

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4	**BOREHOLE:** 09-14
SITE: Alcoa - Baie-Comeau smelter (Quebec)	**PAGE:** 1 of 3
LOCATION OF BOREHOLE: X : 258937,48 Y : 5457065,24 / **CASING:** HW/NW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50 / **SAMPLER:** Indicated / **CORE BARREL**HQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -20.43 / **BORING DATE START:** 2009-11-01 11:00:00 **END:** 2009-11-02 12:00:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

⊠	Remoulded
▨	Intact
■	Lost
◧	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

Water level

Date:	Time:	Elev.(m):

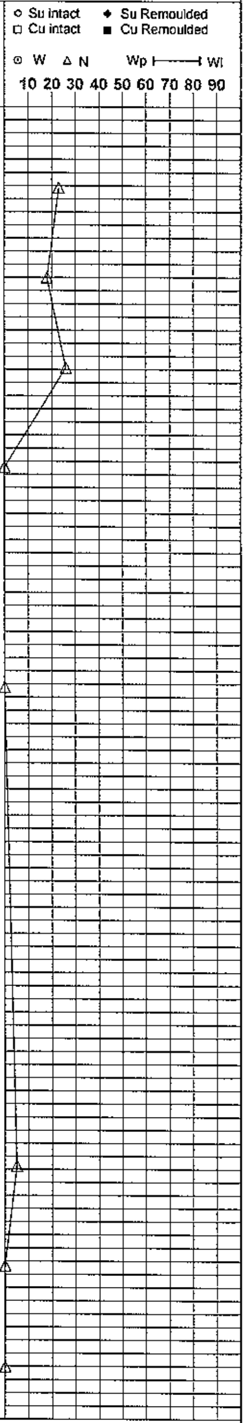
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth -20.43	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
	0.00	Gray sand, some silt and occasionnally sea shell; medium dense									
				⊠	SS-01	B	67	23	8-9-14-15		Combined SS-1/2: GSA, DS GSA, Cu=2.3, Phi'=XXX, c'=6
1											
				⊠	SS-02	B	100	18	7-8-10		
2				⊠	SS-03	B	54	26	6-9-17-18		
	-22.87 2.44	Gray clayey silt, some sand									
				⊠	SS-04	B	100	0	0-0-0-0		
3											
				▨	ST-05		1				
4											
				⊠	SS-06	B	100	0	0-0-0-0		
5											
6				▨	ST-07		95				GSA, C, CUT CU=XXX, W=XXX, Wp=XXX, Wl=XXX, Ip=XXX, PP=XXX, Ccr=XXX, UC=XXX
7				▨	ST-08		95				
8				⊠	SS-09	B	100	5	1-4-1-2		
9				⊠	SS-10	B	62	0	0-0-0-0		
				⊠	SS-11	B	41	0	1-0-0-0		



Notes:

Approved by :
Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4		**BOREHOLE:** 09-14	
SITE: Alcoa - Baie-Comeau smelter (Quebec)		**PAGE:** 2 of 3	
LOCATION OF BOREHOLE: X : 258937,48 Y : 5457065,24	**CASING:** HW/NW	**FILE NO:** F099382300	
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL** HQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -20.43	**BORING DATE START:** 2009-11-01 11:00:00	**END:** 2009-11-02 12:00:00	

Type of Sampler

SS:	Split Spoon	⊠	Remoulded
DC:	Diamond Core	▨	Intact
WS:	Wash Sample	■	Lost
HT:	Hydraulic Trust	◧	Rock Core
HW:	Hammer Weight		
SP:	Shelby and Piston		
AS:	Auger Sampler		
ST:	Thin Walled Shelby Tube		

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

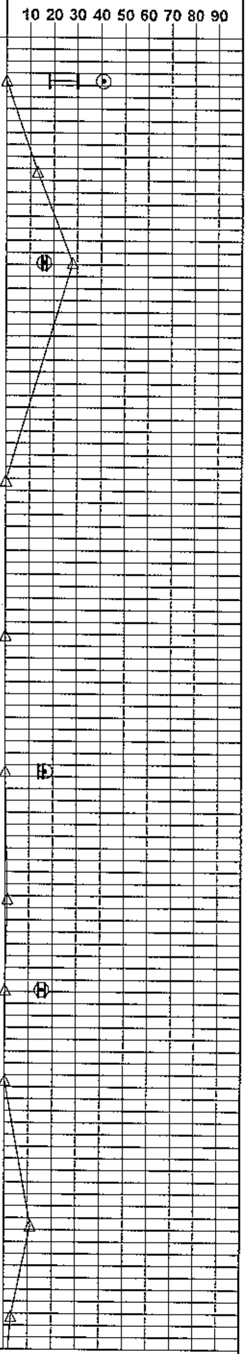
Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY | SAMPLES | LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
				⊠	SS-12	B	84	0	0-0-0-0		GSA, CU=nd,W=40.8%, Wp=18%, Wl=30%, Ip=12%
11	-31.45 11.02	Gray silty sand, trace clay; very loose		⊠	SS-13	B	100	13	8-5-8-23		
12				⊠	SS-14	B	92	28	12-27-1-12		Combined SS-14/15: GSA, DS CU=32, W=15.9%, Wp=15%, Wl=17%, Ip=2%, Phi'=XXX, c'=XXX
13											
				⊠	SS-15	B	87	0	0-0-0-0		
14											
15				■	SS-16	B	0	0	0-0-0-0		The split spoon (0,6m lenght) sank on 1,68m in one shot; sample has been lost
	-35.75 15.32	Gray silty sand to silt and sand, some to trace clay and gravel; very loose									
16				⊠	SS-17	B	100	0	1-0-0-0		Combined SS-17/18: GSA, DS CU=91.9, W=16.8%, Wp=14%, Wl=16%, Ip=2%, Phi'=XXX, c'=XXX
17				⊠	SS-18	B	100	1	1-0-1-0		
18				⊠	SS-19	B	84	0	0-0-0-0		Combined SS-19/20: GSA, DS CU=62.3, W=15.5%, Wp=14%, Wl=17%, Ip=3%, Phi'=XXX, c'=XXX
19				⊠	SS-20	B	87	0	0-0-0-0		
20				⊠	SS-21	B	84	11	5-5-6-4		
				⊠	SS-22	B	38	3	0-0-3-2		



Notes:

Approved by :

Sonya Graveline, ing.

SM Labo S.M. inc

BORING LOG

PROJECT: New wharf #4

SITE: Alcoa - Baie-Comeau smelter (Quebec)

LOCATION OF BOREHOLE: X : 258937,48 Y : 5457065,24

CASING: HW/NW

EQUIPEMENT USED: D-50

SAMPLER: Indicated

CORE BARREL HQ

SURFACE ELEVATION (m): -20.43

BORING DATE START: 2009-11-01 11:00:00 **END:** 2009-11-02 12:00:00

BOREHOLE: 09-14

PAGE: 3 of 3

FILE NO: F099382300

TECHNICIAN: Simon Marois, tech.

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◧	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value
Nd:	DCPT Nd-Value
Su:	Field Vane
GSA:	Grain size analysis
CU:	Uniformity coefficient
W:	Water Content
Wp:	Plastic limit
Wl:	Liquid limit
Ip:	Plasticity index:
D:	Specific density
Cu:	Swedish cone
C:	Consolidation
PP:	Preconsolidation pressure
Cc:	Compression index
Ccr:	Recompression index
UC:	Unconfined compression
DS:	Direct shear
Phi':	Angle of internal friction
c':	Cohesion
CUT:	Consolidation undrained triaxial

Water level

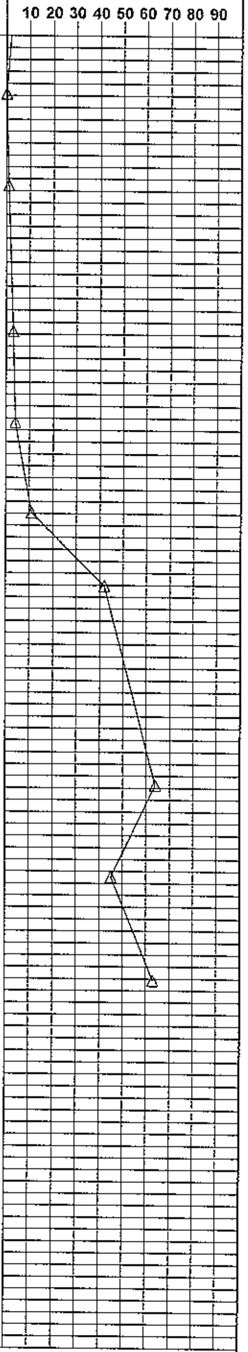
Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS



Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
				☒	SS-23	B	87	0	0-0-0-0		
22											
				☒	SS-24	B	100	1	3-0-1-0		
23											
				☒	SS-25	B	100	3	0-3-0-0		Combined SS-25/26: GSA, DS CU=nd(>>), W=19.4%, Wp=15%, Wl=18%, Ip=3%, Phi'=XXX, c'=XXX
24											
				☒	SS-26	B	84	4	0-0-4-7		
	-45.12 24.69	Gray silty fine sand, traces gravel; medium to very dense.									
25				☒	SS-27	B	87	11	11-4-7-11		
				☒	SS-28	B	70	42	12-21-21-22		
26											
27											
				☒	SS-29	B	46	64	28-31-33-30		
28				☒	SS-30	B	92	45	8-14-31-33		
	-49.39 28.96	Gray coarse sand with gravel and cobbles									
29				☒	SS-31	B	100	63	32-27-36-50 /Refusal		
				☒	SS-32	B	100		50 /Refusal		
30				◧	DC-33	HQ	95				
	-50.76 30.33	End of borehole									
31											

Notes:

Approved by :

Sonya Graveline, ing.

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3066

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2927**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-14, SS-1 & SS-2, Depth.: 0,3 to 1,5
Tests completed on : 2009-11-30

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	1,076	% Gravel:	
C.U.	2,343	% Sand:	87
Unified Classification:		% Silt:	12
Fineness Module: 0,75		% Clay:	1

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: ______________ 2009-12-04
Sylvie Daigle, Tech.

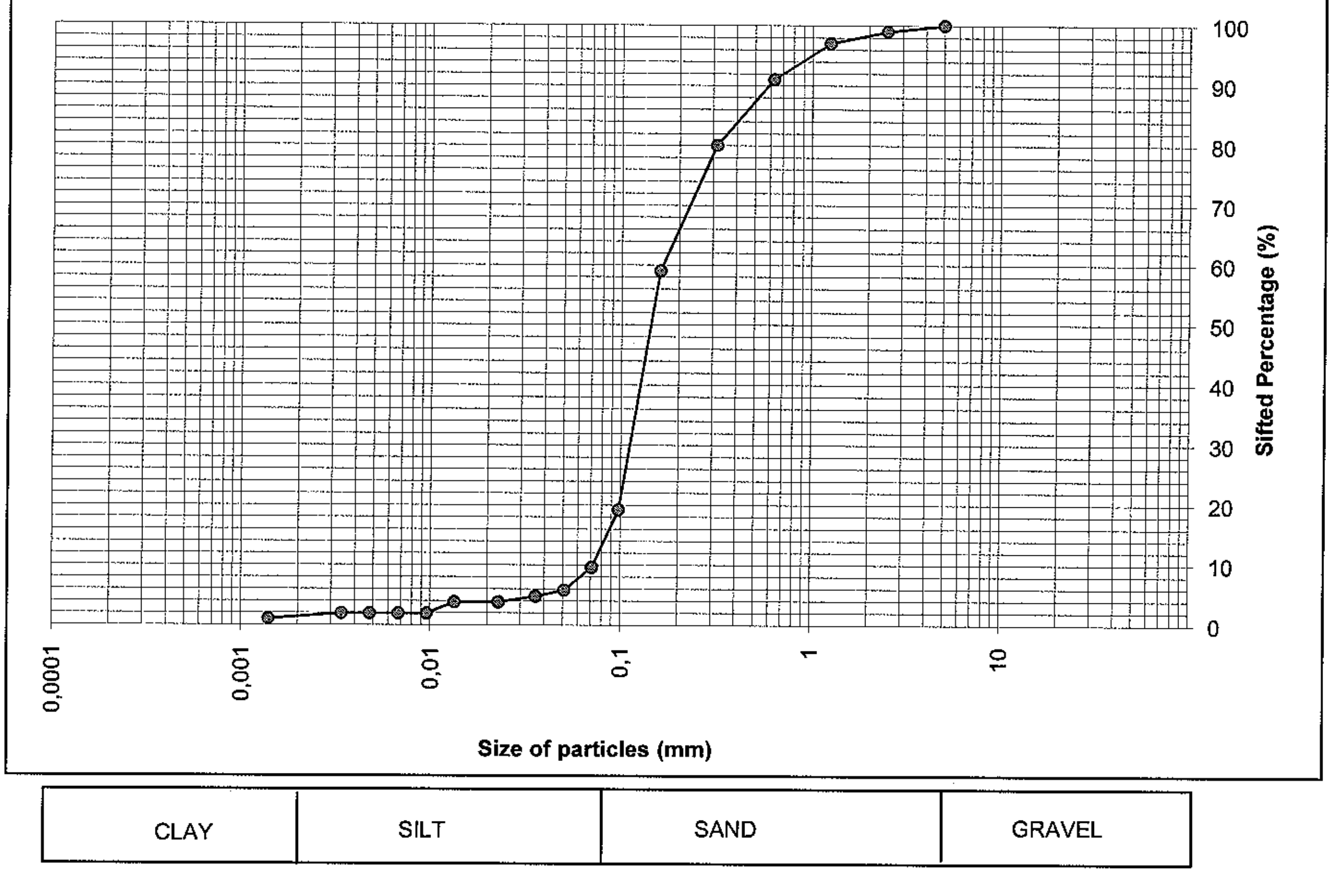
Verified by: ______________ 2009-12-04
Sonya Graveline, Ing.

SM
LABO S.M. INC.

Sediments Analysis
NQ 2501-025

Size (mm)	% Sifted (%)
5,0	100
2,5	99
1,250	97
0,630	91
0,3150	80
0,1600	59
0,0980	19,2
0,0712	9,6
0,0508	5,8
0,0360	4,8
0,0229	3,8
0,0134	3,8
0,0096	1,9
0,0068	1,9
0,0048	1,9
0,0034	1,9
0,0014	1,0

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2927

Type of material: Sand,some silt,traces clay

File #: **F099382200**

Source: Material on site, 09-14,SS-1 & SS-2, Depth: 0,3 to 1,5 m.

Customer: **Alcoa**

Approuved by : ____________ Date : ________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3087

File Number : F099382200
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : 09-2929
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-14, SS-12, 10,1 - 10,7 m
Tests completed on : 2009-12-03

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.
C.U.
Unified Classification:
Fineness Module: 0,22

% Gravel:	
% Sand:	19
% Silt:	54
% Clay:	27

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements
Atterberg Limits (3pts)	BNQ2501-092		
Liquid Limit (%):		30	------
Plastic Limit (%):		18	------
Plasticity index (%):		12	------
Water Content (%):	LC21-201	40,81	------

Legend : * =**Results not in conformity**

Remarks: **See following chart for sediments analysis.**

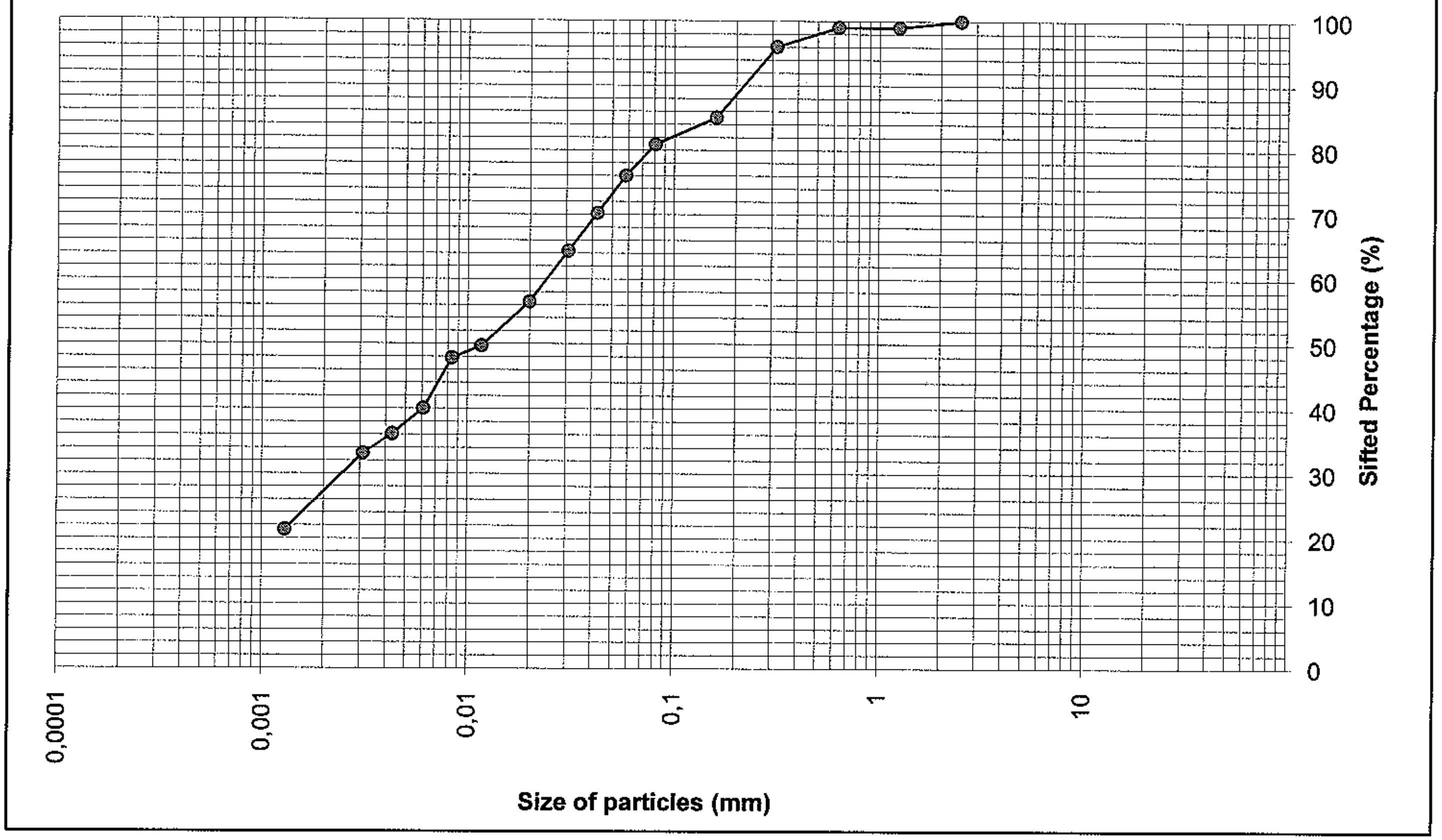
Prepared by: ______________________ 2009-12-07
Sylvie Daigle, Tech.

Verified by: ______________________ 2009-12-07
Sonya Graveline, Ing.

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
2,5	100
1,250	99
0,630	99
0,3150	96
0,1600	85
0,0809	80,9
0,0584	76,0
0,0423	70,2
0,0306	64,3
0,0199	56,5
0,0117	49,7
0,0084	47,8
0,0061	40,0
0,0043	36,1
0,0031	33,1
0,0013	21,4

Chart for particle size analysis



CLAY	SILT	SAND	GRAVEL

Project: New Baie-Comeau wharf

Laboratory No. : 09-2929

Type of material: Clayey silt,some sand.

File #: **F099382200**

Source: Material on site, 09-14,SS-12,

Customer: **Alcoa**

Approuved by :__________ Date : __________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3104

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2928**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-14, SS-14 & SS-15, 11,6 - 14,0 m
Tests completed on : 2009-12-01

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 6,115
C.U. 31,96
Unified Classification:
Fineness Module: 0,60

% Gravel: 1,0
% Sand: 63
% Silt: 30
% Clay: 6

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements
Atterberg Limits (3pts)	BNQ2501-092		
Liquid Limit (%):		17	------
Plastic Limit (%):		15	------
Plasticity index (%):		2	------
Water Content (%):	LC21-201	15,91	------

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: ______________________ 2009-12-04
Sylvie Daigle, Tech.

Verified by: ______________________ 2009-12-04
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

FLS-051b (00-05) rév. 1

SMi
LABO S.M. INC.

Sediments Analysis
NQ 2501-025

Size (mm)	% Sifted (%)
10,0	100
5,0	99
2,5	99
1,250	98
0,630	96
0,3150	87
0,1600	61
0,0919	41,1
0,0672	29,4
0,0484	23,5
0,0346	20,6
0,0220	17,6
0,0130	15,7
0,0093	11,8
0,0066	11,8
0,0047	9,8
0,0033	7,8
0,0014	4,9

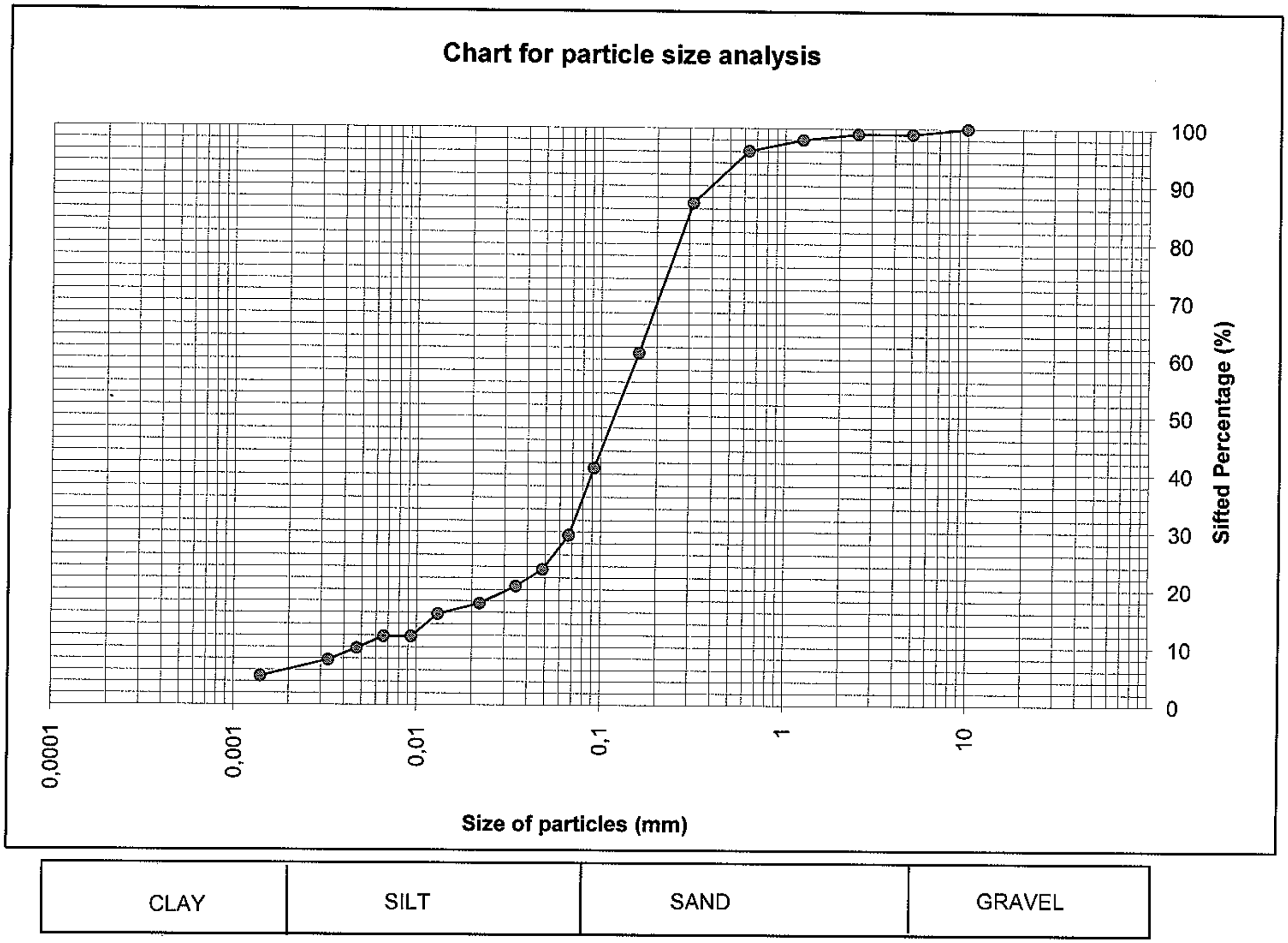


Chart for particle size analysis

Project: New Baie-Comeau wharf

Laboratory No. : 09-2928

Type of material: Silty sand,traces clay & gravel

File #: **F099382200**

Source: Material on site, 09-14,SS-14 & SS-15

Customer: **Alcoa**

Approuved by :________________ Date : __________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3186

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2985**
Sample No. : ------

Type of Materia : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-14, SS-17 & SS-18, Depth:15,8 to 20,6 m.
Tests completed on : 2009-12-07

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	7,543	% Gravel:	
C.U.	91,93	% Sand:	59
Unified Classification:		% Silt:	30
Fineness Module: 0,50		% Clay:	11

Legend : *** =Results not in conformity**

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements
Atterberg Limits (3pts)	BNQ2501-092		
Liquid Limit (%):		16	------
Plastic Limit (%):		14	------
Plasticity index (%):		2	------
Water Content (%):	LC21-201	16,8	------

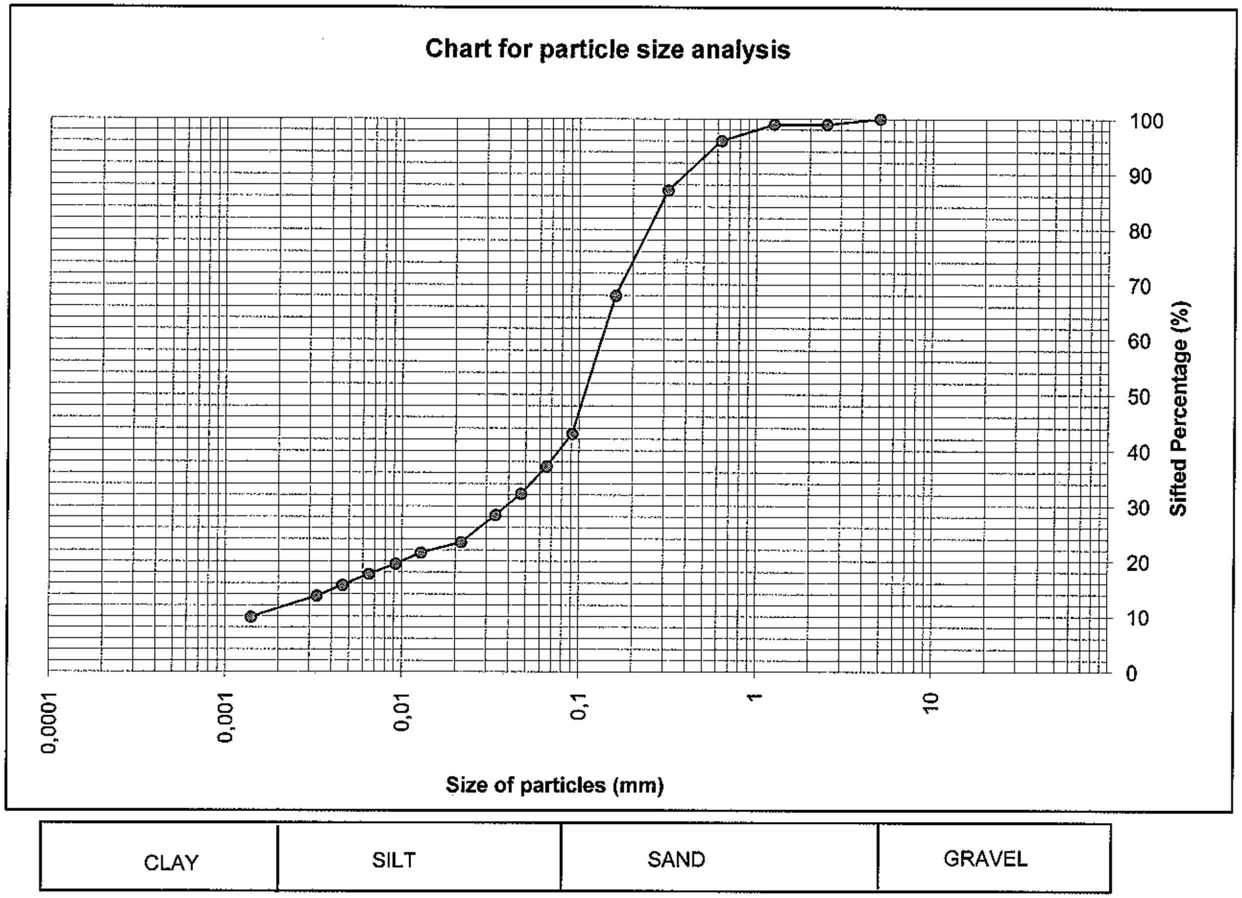
Remarks: **See following chart for sediments analysis.**

Prepared by: ____________ 2009-12-10
Sylvie Daigle, Tech.

Verified by: ____________ 2009-12-10
Sonya Graveline, Ing.

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
5,0	100
2,5	99
1,250	99
0,630	96
0,3150	87
0,1600	68
0,0911	43,0
0,0657	37,1
0,0471	32,2
0,0337	28,3
0,0216	23,4
0,0128	21,5
0,0092	19,5
0,0065	17,6
0,0046	15,6
0,0033	13,7
0,0014	9,8



Project: New Baie-Comeau wharf
Laboratory No. : 09-2985
Type of material: Silty sand,some clay.

File #: **F099382200**
Source: Material on site, 09-14,SS-17, & SS-18, Depth: 15,8 to 20,6 m.

Customer: **Alcoa**
Approuved by :__________ Date : __________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3157

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2986**
Sample No. : -----

Type of Materia : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-14, SS-19 & SS-20, Depth:17,7 to 19,7 m.
Tests completed on : 2009-12-04

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	4,056	% Gravel:	6
C.U.	62,31	% Sand:	56
Unified Classification:		% Silt:	29
Fineness Module:	1,12	% Clay:	9

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements
Atterberg Limits (3pts)	BNQ2501-092		
Liquid Limit (%):		17	------
Plastic Limit (%):		14	------
Plasticity index (%):		3	------
Water Content (%):	LC21-201	15,45	------

Legend : * **=Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: ____________ 2009-12-08
Sylvie Daigle, Tech.

Verified by: ____________ 2009-12-08
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

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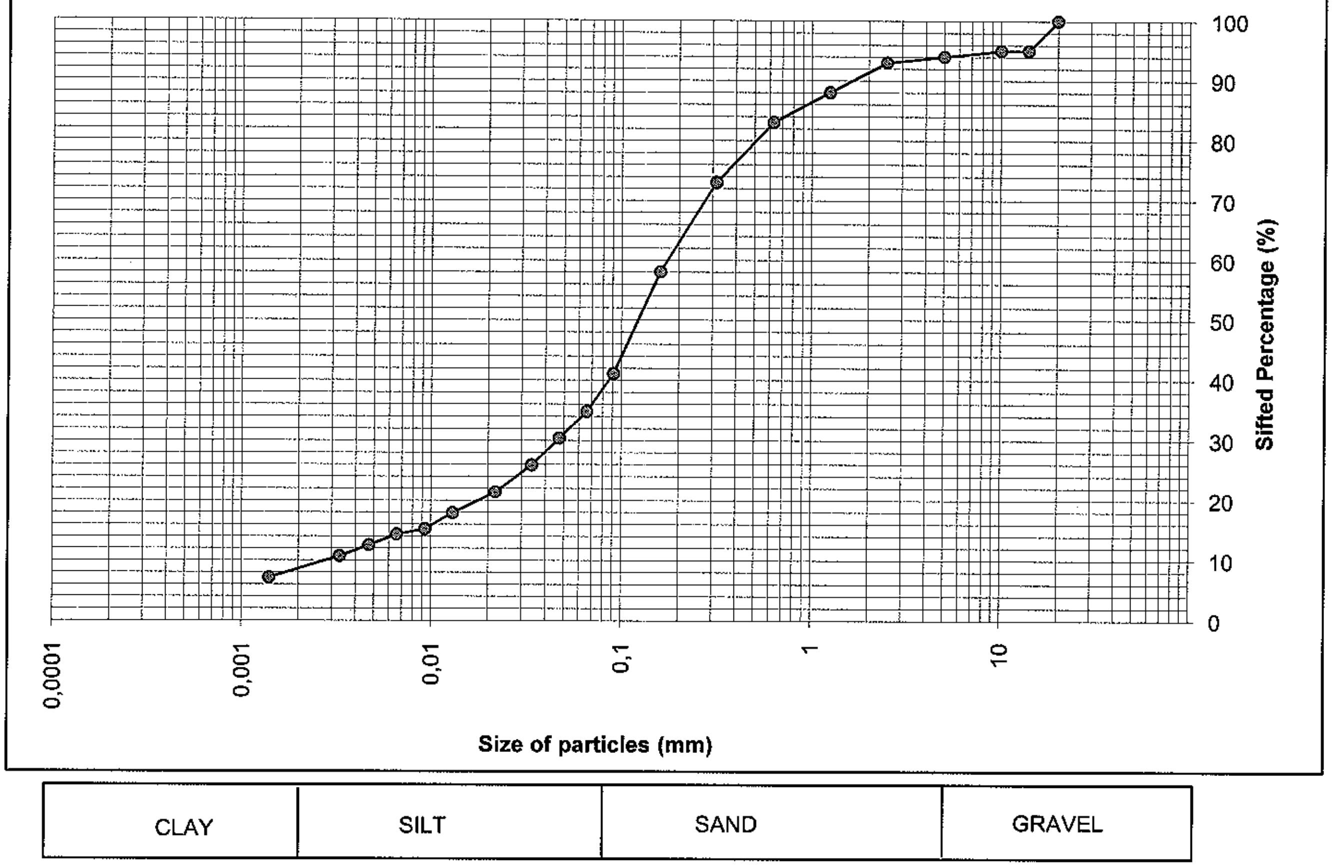
FLS-051b (00-05) rév. 1

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
20,0	100
14,0	95
10,0	95
5,0	94
2,5	93
1,250	88
0,630	83
0,3150	73
0,1600	58
0,0910	41,1
0,0659	34,8
0,0473	30,4
0,0339	25,9
0,0218	21,4
0,0130	17,9
0,0093	15,2
0,0066	14,3
0,0047	12,5
0,0033	10,7
0,0014	7,1

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2986

Type of material: Silty sand,traces clay & gravel.

File #: **F099382200**

Source: Material on site, 09-14 SS-19 & SS-20, Depth: 17,7 to 19,7 m.

Customer: **Alcoa**

Approuved by : ______________ Date : __________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3185

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2987**
Sample No. : ------

Type of Materia : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-14, SS-25 & SS-26, Depth:21,3 to 24,5 m.
Tests completed on : 2009-12-07

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.
C.U.
Unified Classification:
Fineness Module: 0,37

% Gravel:	
% Sand:	50
% Silt:	38
% Clay:	12

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements
Atterberg Limits (3pts)	BNQ2501-092		
Liquid Limit (%):		18	------
Plastic Limit (%):		15	------
Plasticity index (%):		3	------
Water Content (%):	LC21-201	19,37	------

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: 2009-12-10
Sylvie Daigle, Tech.

Verified by: 2009-12-10
Sonya Graveline, Ing.

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
5,0	100
2,5	99
1,250	99
0,630	97
0,3150	90
0,1600	78
0,0873	53,0
0,0637	44,5
0,0460	37,9
0,0330	33,1
0,0213	27,5
0,0127	24,6
0,0091	21,8
0,0065	18,9
0,0046	17,0
0,0033	15,2
0,0014	10,4

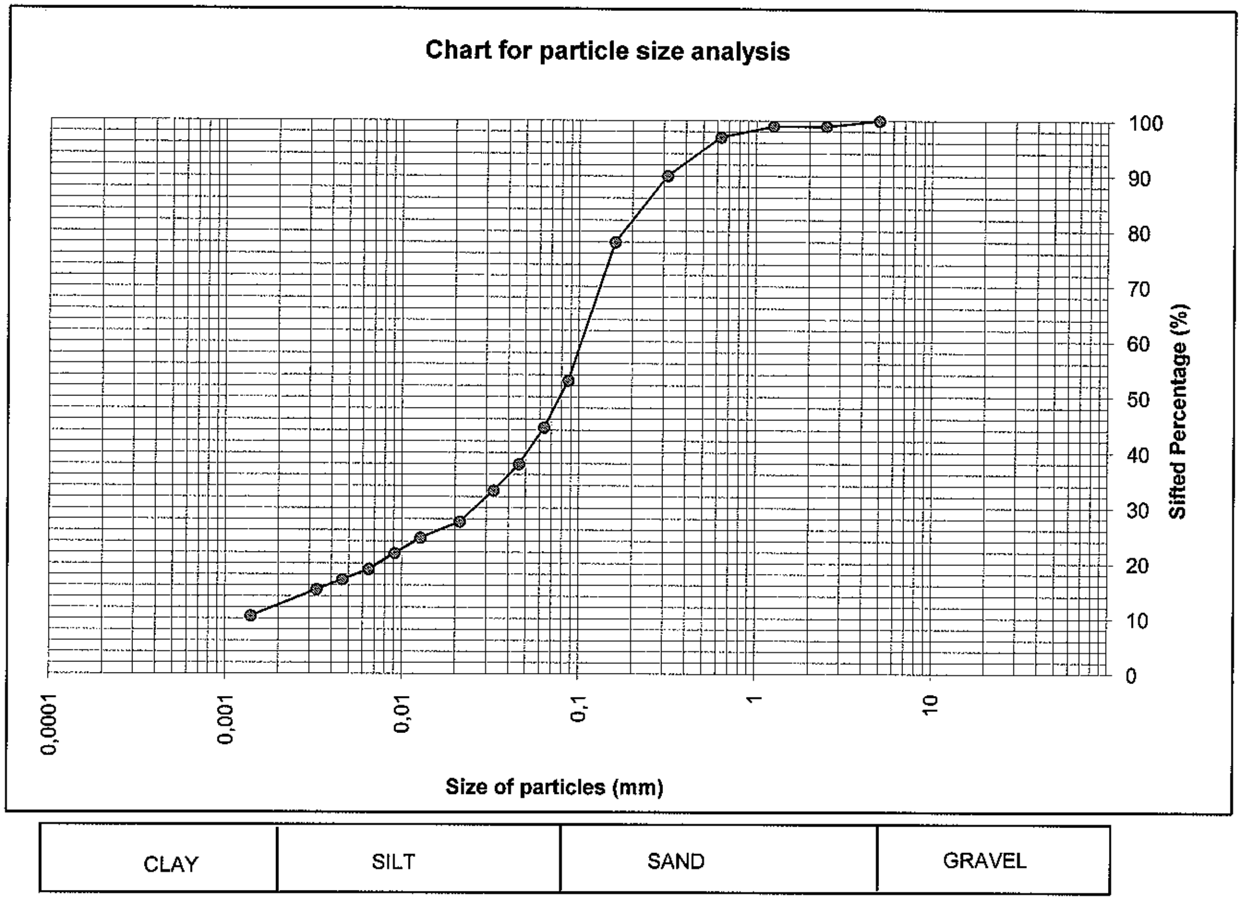


Chart for particle size analysis

Project: New Baie-Comeau wharf

Laboratory No. : 09-2987

Type of material: Sand & silt,some clay.

File #: **F099382200**

Source: Material on site, 09-14,SS-25, & SS-26, Depth: 21,3 to 24,5 m.

Customer: **Alcoa**

Approuved by :________________ Date : __________

SM Labo S.M. inc

BORING LOG

PROJECT: New wharf #4	**BOREHOLE:** 09-15
SITE: Alcoa - Baie-Comeau smelter (Quebec)	**PAGE:** 1 of 3
LOCATION OF BOREHOLE: X : 258913,79 Y : 5457107,63 · **CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50 · **SAMPLER:** Indicated · **CORE BARREL**NX/HQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -20.60 · **BORING DATE START:** 2009-10-29 11:00:00 **END:** 2009-10-30 20:00:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

⊠	Remoulded
▨	Intact
■	Lost
◫	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value
Nd:	DCPT Nd-Value
Su:	Field Vane
GSA:	Grain size analysis
CU:	Uniformity coefficient
W:	Water Content
Wp:	Plastic limit
Wl:	Liquid limit
Ip:	Plasticity index:
D:	Specific density
Cu:	Swedish cone
C:	Consolidation
PP:	Preconsolidation pressure
Cc:	Compression index
Ccr:	Recompression index
UC:	Unconfined compression
DS:	Direct shear
Phi':	Angle of internal friction
c':	Cohesion
CUT:	Consolidation undrained triaxial

Water level

Date:	Time:	Elev.(m):

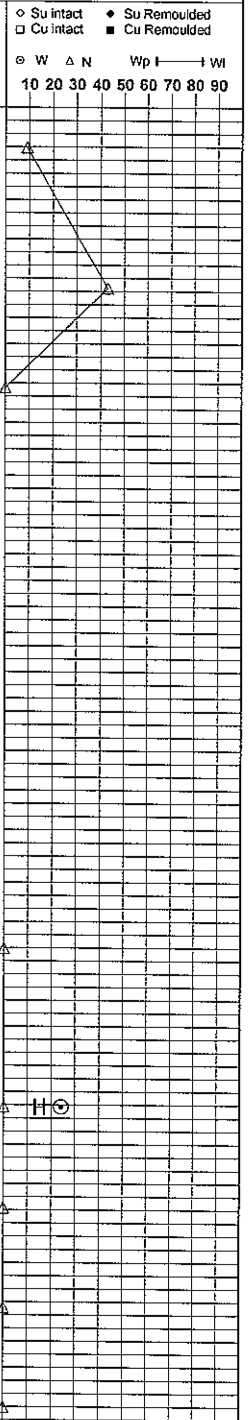
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth -20.60	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
	0.00	Gray sand, some silt; loose to medium dense		⊠	SS-01	B	92	9	9-4-5-12		
1											
				⊠	SS-02	B	46	43	14-21-22-27		
	-22.40 1.80	Gray clayey silt, traces sand;									
2				⊠	SS-03	B	100	0	0-0-0-0		
3											
				▨	ST-04		95				GSA, C Cu=XXX, W=XXX, Wp=XXX, Wl=XXX, Ip=XXX, PP=XXX, Ccr=XXX, UC=XXX
4											
5				▨	ST-05		92				Failure of field vane test at 4,3 m and 5,8 m depth due to the floating boring mode
6	-26.70 6.10	Gray silty sand, to sand and silt, trace clay; very loose									
				⊠	SS-06	B	100	0	1-0-0-0		
7											
				⊠	SS-07	B	100	0	0-0-0-0		Combined SS-7/8: GSA, DS CU=60.4, W=24.2%, Wp=13%, Wl=17%, Ip=4%, Phi'=XXX, c'=XXX
8											
				⊠	SS-08	B	95	0	0-0-0-0		
9				⊠	SS-09	B	95	0	0-0-0-0		
				⊠	SS-10	B	100	0	0-0-0-0		



Notes:

Approved by :
Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-15
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 2 of 3
LOCATION OF BOREHOLE: X : 258913,79 Y : 5457107,63		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL**NX/HQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -20.60	**BORING DATE** **START:** 2009-10-29 11:00:00	**END:** 2009-10-30 20:00:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◧	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

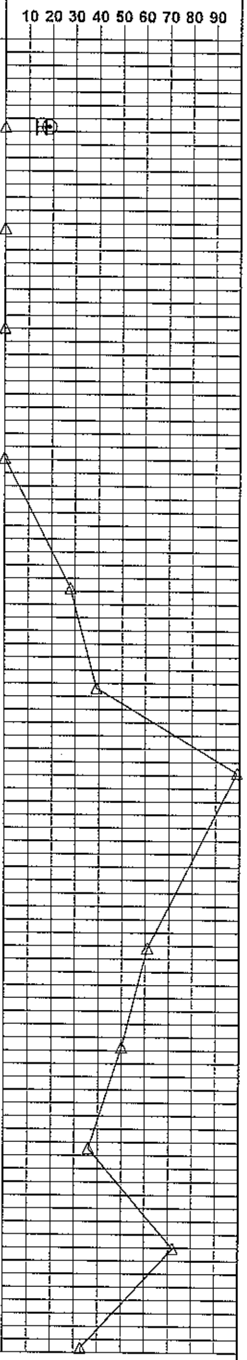
Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY | SAMPLES | LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
11				☒	SS-11	B	100	0	0-0-0-0		Combined SS-11/12: GSA, DS CU=53.3, W=18.5%, Wp=13%, Wl=17%, Ip=4%, Phi'=XXX, c'=XXX ***Anormally water pressure from borehole at 11.2 m depth; the water came out of the caising during 2 minutes before stabilizing
				☒	SS-12	B	100	0	0-0-0-0		
12				☒	SS-13	B	100	0	0-0-0-1		
13				☒	SS-14	B	56	0	1-0-0-0		SS-14: The split spoon sank on 1,1 m
14	-34.47 13.87	Gray sand and gravel with trace silt and clay; medium dense to very dense		☒	SS-15	B	84	28	13-9-19-21		SS-15: GSA, CU=22.3
15				☒	SS-16	B	54	39	17-12-27-21		
				☒	SS-17	B	66	99	33-49-50 /Refusal		SS-17: GSA, CU=36.6
16	-36.45 15.85	Gravel and cobbles up to 120mmØ, some to trace sand and silt		◧	DC-18	HQ	6				0,8 m sanding up at 16 m depth
				☒	SS-19	B	50		50 /Refusal		
17	-37.21 16.61	Gray sand, trace silt and gravel; dense to very dense		☒	SS-20	B	51	61	56-32-29-39		
18				■	SS-21	B	0	50	2-14-36-42		
				☒	SS-22	N	4	36	13-17-19-38		
19				☒	SS-23	N	62	72	10-30-42-53		
				☒	SS-24	B	41	33	10-14-19-19		



Notes:

Approved by :
Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-15
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 3 of 3
LOCATION OF BOREHOLE: X : 258913,79 Y : 5457107,63		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL**NX/HQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -20.60	**BORING DATE START:** 2009-10-29 11:00:00	**END:** 2009-10-30 20:00:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◨	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value
Nd:	DCPT Nd-Value
Su:	Field Vane
GSA:	Grain size analysis
CU:	Uniformity coefficient
W:	Water Content
Wp:	Plastic limit
Wl:	Liquid limit
Ip:	Plasticity index:
D:	Specific density
Cu:	Swedish cone
C:	Consolidation
PP:	Preconsolidation pressure
Cc:	Compression index
Ccr:	Recompression index
UC:	Unconfined compression
DS:	Direct shear
Phi':	Angle of internal friction
c':	Cohesion
CUT:	Consolidation undrained triaxial

Water level

Date:	Time:	Elev.(m):

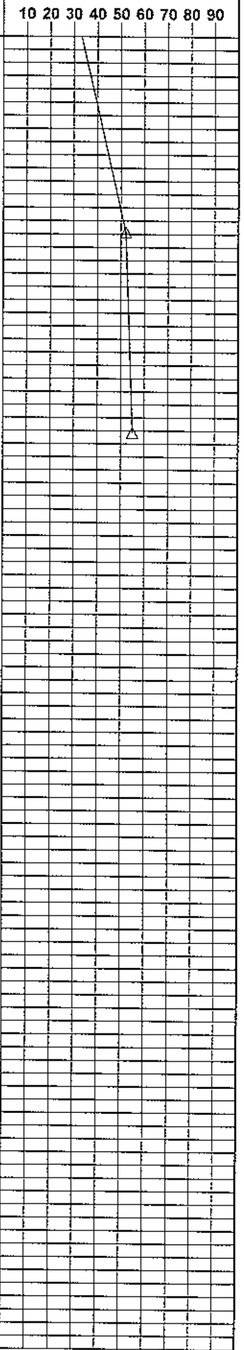
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
				☒							Combined SS-23/24/25: GSA, DS CU=3.6, Phi'=XXX, c'=XXX
21											
				☒	SS-25	B	62	52	6-17-35-32		
22											
	-43.03 22.43	Gravel up to 60 mmØ		■	DC-26	NX	100				
	-43.31 22.71	Brown sand, some silt, traces gravel; dense									
23				☒	SS-27	B	75	55	9-15-40-50		
	-43.92 23.32	End of borehole									
24											
25											
26											
27											
28											
29											



Notes:

Approved by :
Sonya Graveline, ing.

SOIL MATERIALS ANALYSIS REPORT

SMI
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3149

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2941**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-15, SS-7 & SS-8, Depth:7,3 to 8,7 m.
Tests completed on : 2009-12-03

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	3,967	% Gravel:	
C.U.	60,38	% Sand:	55
Unified Classification:		% Silt:	35
Fineness Module: 0,44		% Clay:	10

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements
Atterberg Limits (3pts)	BNQ2501-092		
Liquid Limit (%):		17	------
Plastic Limit (%):		13	------
Plasticity index (%):		4	------
Water Content (%):	LC21-201	24,25	------

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

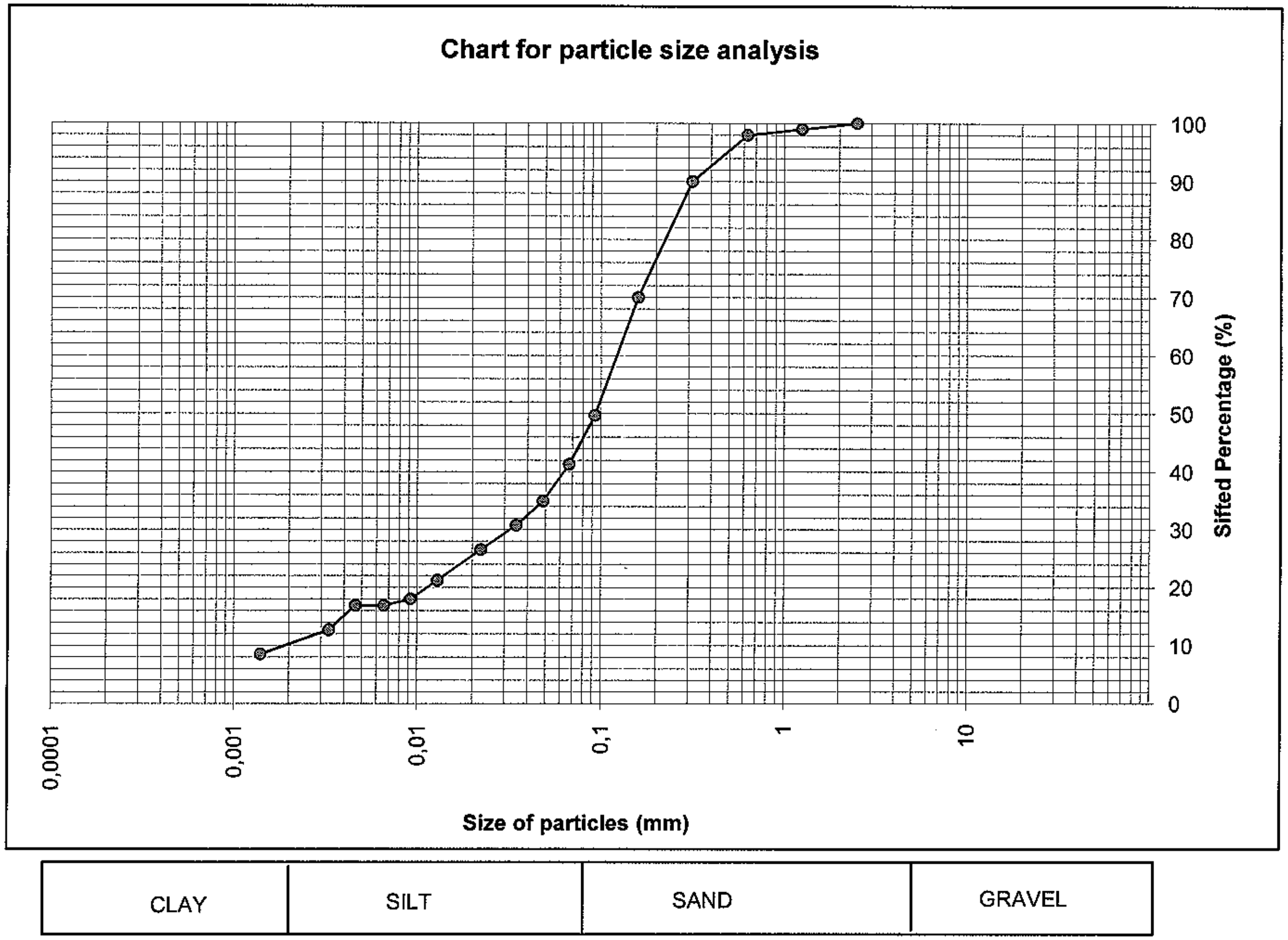
Prepared by: ____________________ 2009-12-07
Sylvie Daigle, Tech.

Verified by: ____________________ 2009-12-07
Sonya Graveline, Ing.

SM*i*

LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
2,5	100
1,250	99
0,630	98
0,3150	90
0,1600	70
0,0927	49,7
0,0672	41,3
0,0484	34,9
0,0346	30,7
0,0222	26,5
0,0129	21,2
0,0092	18,0
0,0066	16,9
0,0046	16,9
0,0033	12,7
0,0014	8,5



Project: New Baie-Comeau wharf

Laboratory No. : 09-2941

Type of material: Silty sand,some clay.

File #: **F099382200**

Source: Material on site, 09-15,SS-7 & SS-8, Depth: 7,3 to 8,7m.

Customer: **Alcoa**

Approuved by :________________ Date : __________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3150

File Number	: **F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: ------
City	: Baie-Comeau (Québec)	Uses	: ------
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	: **09-2942**	Source	: 09-15, SS-11 & SS-12, Depth:10,4 to 11
Sample No.	: ------	Tests completed on	: 2009-12-03

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	2,665	% Gravel:	
C.U.	53,26	% Sand:	53
Unified Classification:		% Silt:	38
Fineness Module: 0,49		% Clay:	9

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements
Atterberg Limits (3pts)	BNQ2501-092		
Liquid Limit (%):		17	------
Plastic Limit (%):		13	------
Plasticity index (%):		4	------
Water Content (%):	LC21-201	18,53	------

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: ______________ 2009-12-07
Sylvie Daigle, Tech.

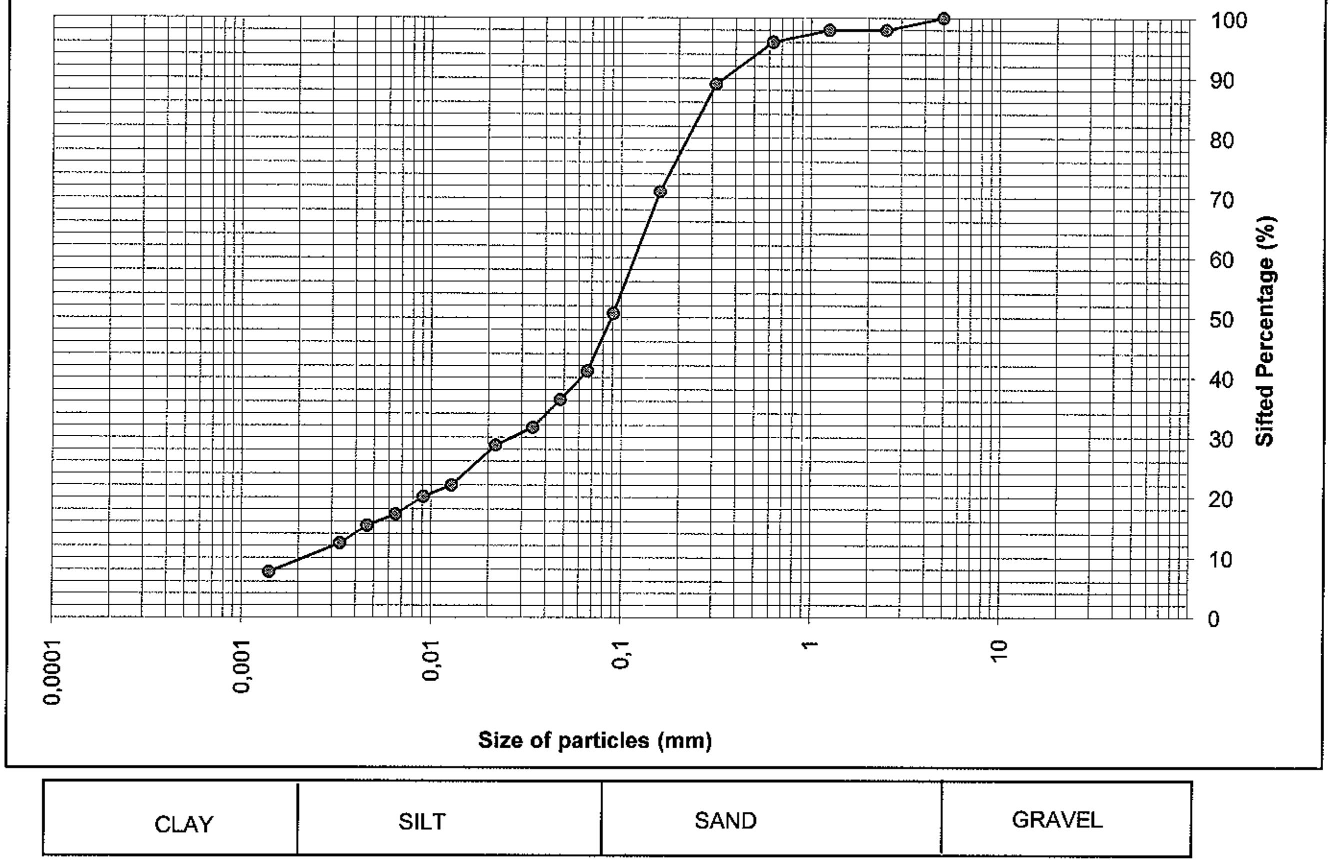
Verified by: ______________ 2009-12-07
Sonya Graveline, Ing.

SMi
LABO S.M. INC.

Sediments Analysis
NQ 2501-025

Size (mm)	% Sifted (%)
5,0	100
2,5	98
1,250	98
0,630	96
0,3150	89
0,1600	71
0,0908	50,7
0,0664	41,1
0,0477	36,3
0,0342	31,6
0,0218	28,7
0,0128	22,0
0,0091	20,1
0,0065	17,2
0,0046	15,3
0,0033	12,4
0,0014	7,6

Chart for particle size analysis



Project: New Baie-Comeau wharf
Laboratory No. : 09-2942
Type of material: Sand & silt,traces clay.

File #: **F099382200**
Source: Material on site, 09-15,SS-11 & SS-12, Depth: 10,4 to 11,7 m.

Customer: **Alcoa**
Approuved by :
Date :

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3065

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2943**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-15, SS-15, Depth.: 13,9 to 14,5 m.
Tests completed on : 2009-12-01

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	0,587	% Gravel:	4,0
C.U.	22,33	% Sand:	71
Unified Classification:		% Silt:	24
Fineness Module:	1,86	% Clay:	1

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: 2009-12-04
Sylvie Daigle, Tech.

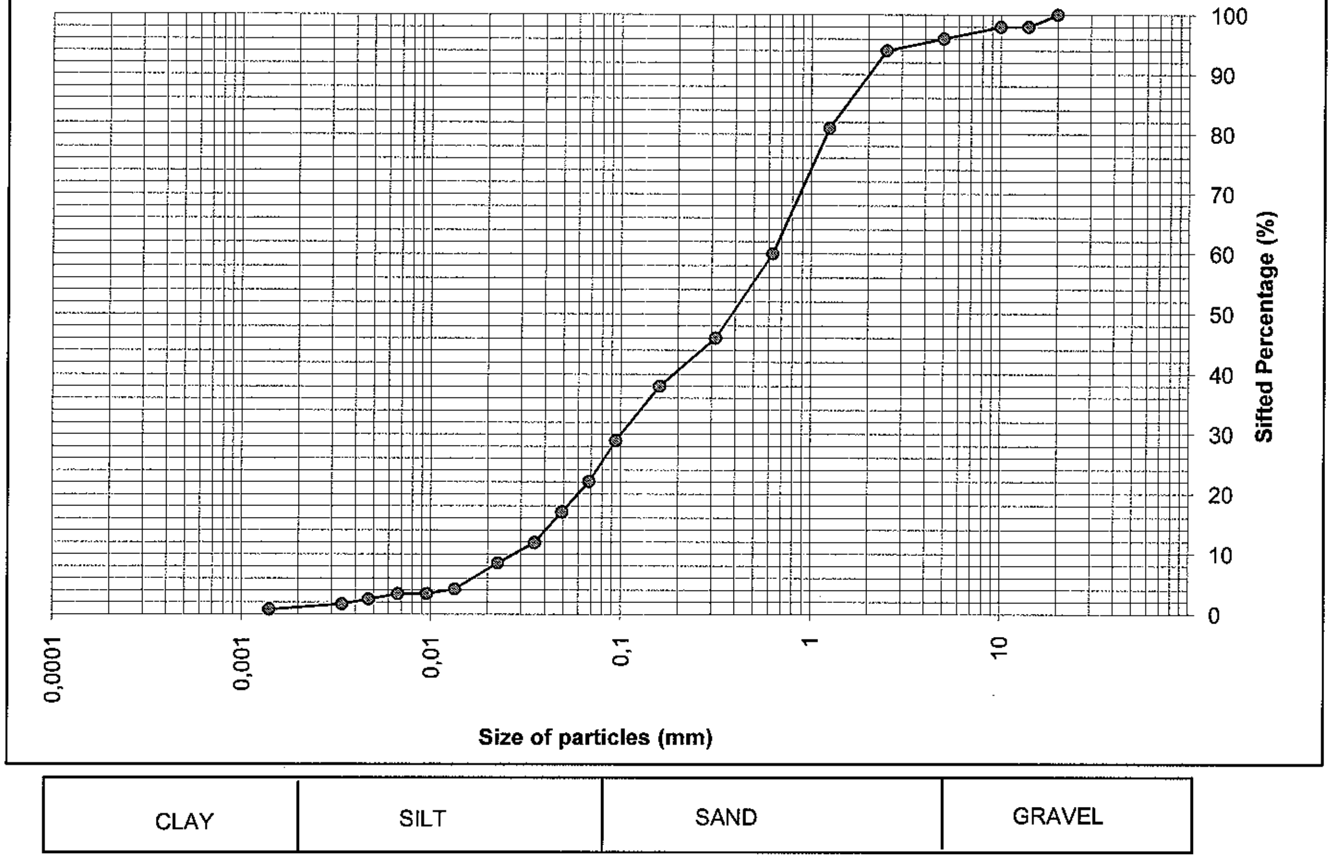
Verified by: 2009-12-04
Sonya Graveline, Ing.

SM

LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
20,0	100
14,0	98
10,0	98
5,0	96
2,5	94
1,250	81
0,630	60
0,3150	46
0,1600	38
0,0942	28,9
0,0683	22,1
0,0492	17,0
0,0353	11,9
0,0226	8,5
0,0134	4,2
0,0095	3,4
0,0067	3,4
0,0047	2,5
0,0034	1,7
0,0014	0,8

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2943

Type of material: Silty sand,traces gravel & clay.

File #: **F099382200**

Source: Material on site, 09-15,SS-15, Depth: 13,9 to 14,5 m.

Customer: **Alcoa**

Approuved by : ____________ Date : ________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3180

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2984**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-15 SS-17, Depth.: 15,4 to 15,8 m.
Tests completed on : 2009-12-07

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	0,728	% Gravel:	44
C.U.	36,61	% Sand:	51
Unified Classification:		% Silt:	3
Fineness Module: 4,15		% Clay:	2

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

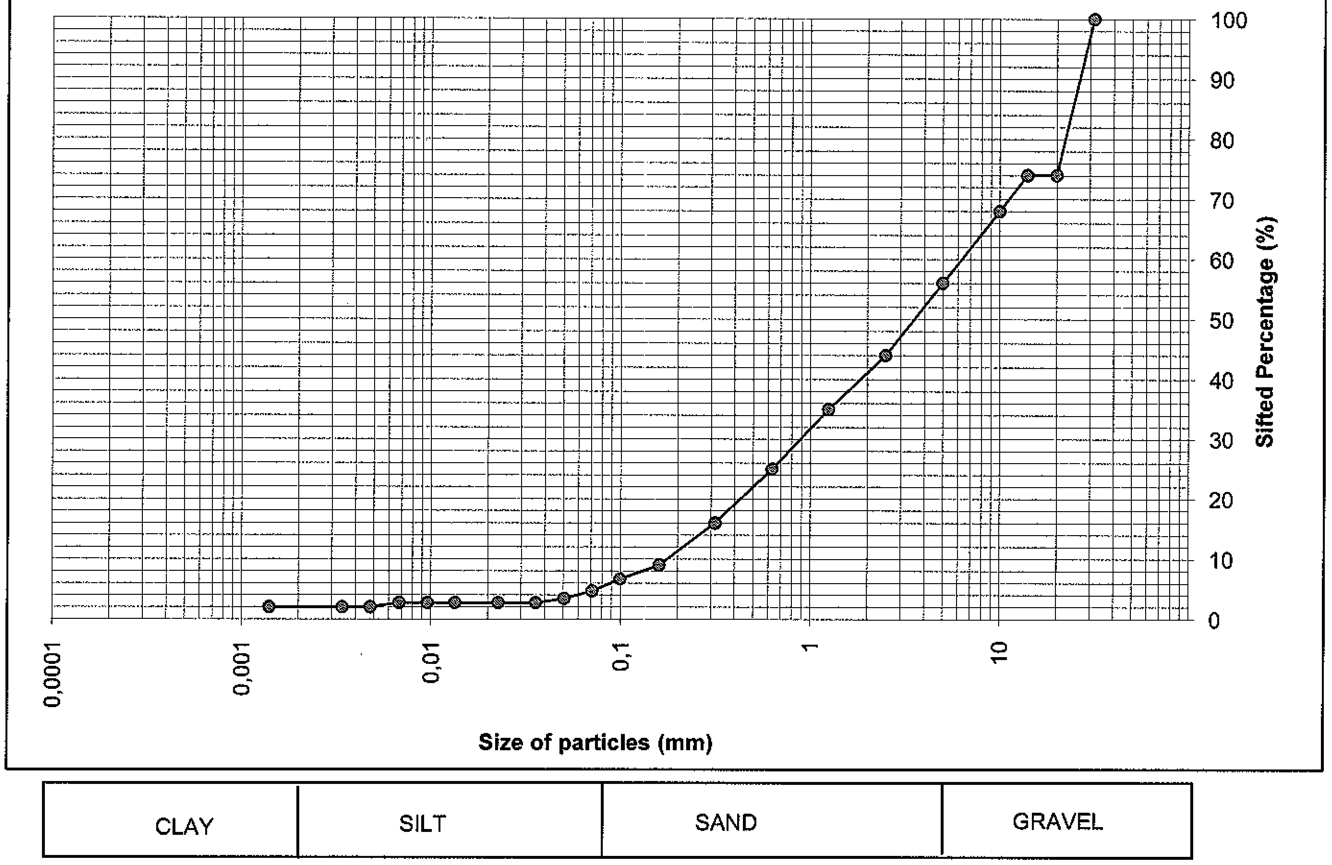
Prepared by: 2009-12-10
Sylvie Daigle, Tech.

Verified by: 2009-12-10
Sonya Graveline, Ing.

SM*i*
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
31,5	100
20,0	74
14,0	74
10,0	68
5,0	56
2,5	44
1,250	35
0,630	25
0,3150	16
0,1600	9
0,0998	6,7
0,0710	4,7
0,0505	3,4
0,0358	2,7
0,0227	2,7
0,0134	2,7
0,0096	2,7
0,0068	2,7
0,0048	2,0
0,0034	2,0
0,0014	2,0

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2984

Type of material: Sand & gravel,traces silt & clay.

File #: **F099382200**

Source: Material on site, 09-15,SS-17, Depth: 15,4 to 15,8 m.

Customer: **Alcoa**

Approuved by :________________ Date : _________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3073

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2939**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-15, SS-23/24/25, Depth.: 19 to 22 m.
Tests completed on : 2009-11-30

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	1,003	% Gravel:	2
C.U.	3,651	% Sand:	93
Unified Classification:		% Silt:	4
Fineness Module: 1,71		% Clay:	1

Legend : * **=Results not in conformity**

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Remarks: **See following chart for sediments analysis.**

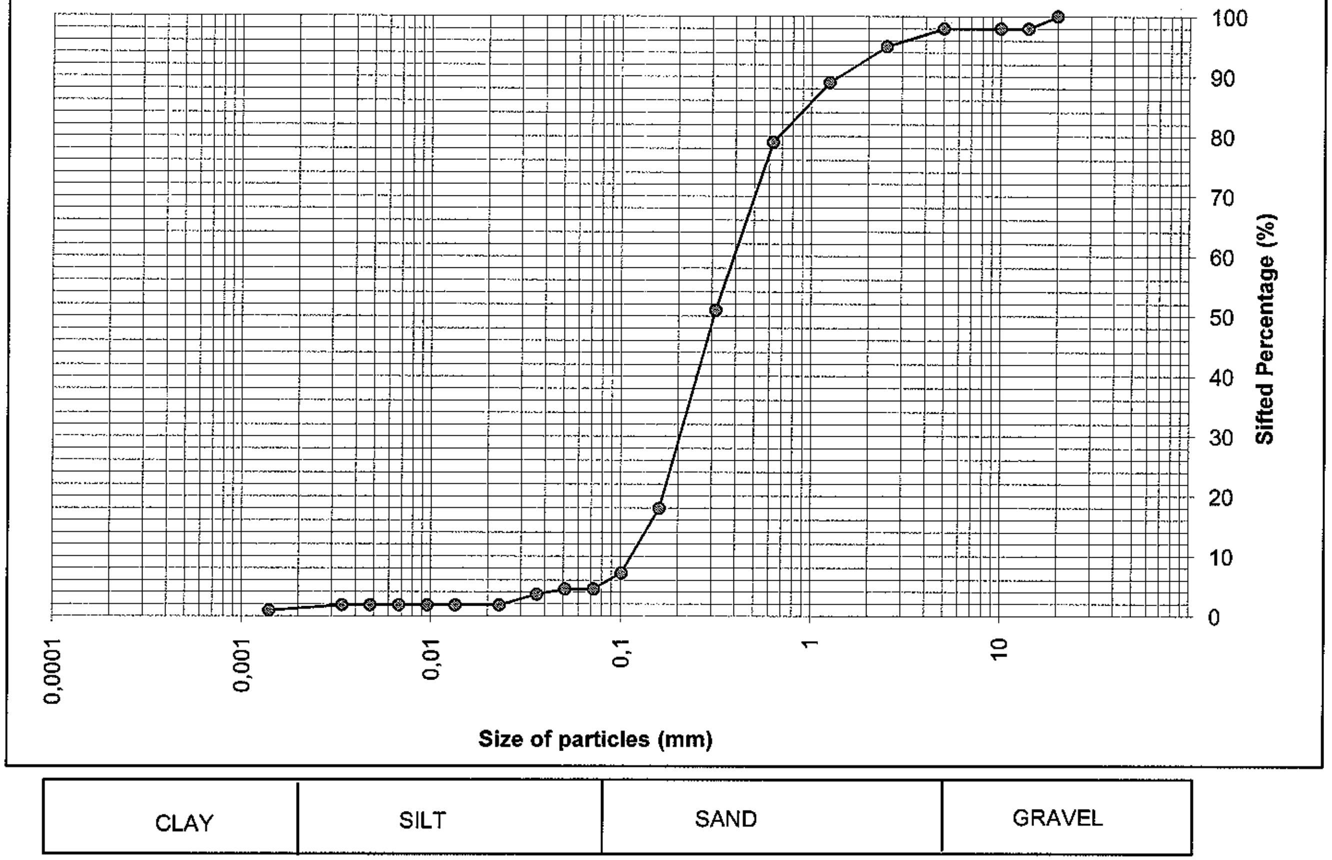
Prepared by: 2009-12-04
Sylvie Daigle, Tech.

Verified by: 2009-12-04
Sonya Graveline, Ing.

SM*i*
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
20,0	100
14,0	98
10,0	98
5,0	98
2,5	95
1,250	89
0,630	79
0,3150	51
0,1600	18
0,1013	7,2
0,0723	4,5
0,0511	4,5
0,0363	3,6
0,0230	1,8
0,0135	1,8
0,0096	1,8
0,0068	1,8
0,0048	1,8
0,0034	1,8
0,0014	0,9

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2939

Type of material: Sand,traces silt , gravel & clay

64/25

File #: **F099382200**

Source: Material on site, 09-15,SS-23, Depth: 19 to 22 m.

Customer: **Alcoa**

Approuved by : ____________ Date : ________

'FLS-079 (06-2007) rév. 1

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-16
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 1 of 3
LOCATION OF BOREHOLE: X : 258945,60 Y : 5457094,73		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL** HQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -24.12	**BORING DATE START:** 2009-11-10 06:30:00	**END:** 2009-11-11 13:30:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒ Remoulded
▨ Intact
■ Lost
◫ Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

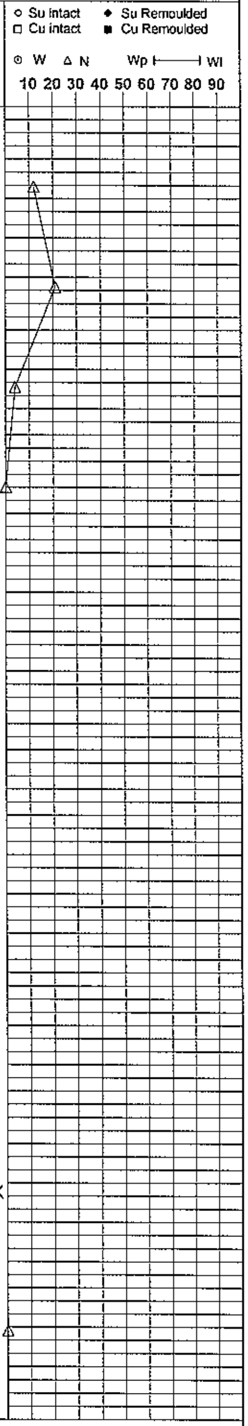
Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY — SAMPLES — LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
	-24.12 0.00	Gray sand with some silt and occasionally sea shell; medium dense									
				☒	SS-1	B	83	12	6-6-6-7		Combined SS-1/2: GSA, DS CU=2.1, Phi'=XXX, c'=XXX
1											
				☒	SS-2	B	62	21	19-12-9-8		
2				☒	SS-3	B	62	4	4-4-0-1		
3				☒	SS-4	B	17	0	1-0-0-0		
	-27.17 3.05	Gray clay with trace silt; stratified with thin layers of silt with some sand									
4				▨	ST-5		92				
5				▨	ST-6		96				ST-6: GSA, C, CUT CU=XXX, W=XX%, Wp=XX%, Wl=XX%, Ip=XX%, D=XXX, PP=XXX, Ccr=XXX, UC=XXX
6				▨	ST-7		92				ST-7: GSA, C, DS CU=XXX, W=XX%, Wp=XX%, Wl=XX%, Ip=XX%, PP=XXX, Ccr=XXX, UC=XXX, Phi'=XXX, c'=XXX
	-30.75 6.63	Gray silt and sand with some clay; stratified with layers of sand; very soft									
7				▨	ST-8		92				ST-8: GSA, C, CUT CU=XXX, W=XX%, Wp=XX%, Wl=XX%, Ip=XX%, PP=XXX, Ccr=XXX, Phi=XXX, c=XXX
8				▨	ST-9		96				
9											
				☒	SS-10	B	100	0	0-0-0-0		



Notes:

Approved by :
Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			BOREHOLE: 09-16
SITE: Alcoa - Baie-Comeau smelter (Quebec)			PAGE: 2 of 3
LOCATION OF BOREHOLE: X : 258945,60 Y : 5457094,73		CASING: HW	FILE NO: F099382300
EQUIPEMENT USED: D-50	SAMPLER: Indicated	CORE BARRELHQ	TECHNICIAN: Simon Marois, tech.
SURFACE ELEVATION (m): -24.12	BORING DATE START: 2009-11-10 06:30:00	END: 2009-11-11 13:30:00	

Type of Sampler

SS: Split Spoon
DC: Diamond Core
WS: Wash Sample
HT: Hydraulic Trust
HW: Hammer Weight
SP: Shelby and Piston
AS: Auger Sampler
ST: Thin Walled Shelby Tube

☒ Remoulded
▨ Intact
■ Lost
◧ Rock Core

Laboratory and in situ tests - Parameters

N: SPT N-Value
Nd: DCPT Nd-Value
Su: Field Vane
GSA: Grain size analysis
CU: Uniformity coefficient
W: Water Content
Wp: Plastic limit
Wl: Liquid limit
Ip: Plasticity index:
D: Specific density
Cu: Swedish cone
C: Consolidation
PP: Preconsolidation pressure
Cc: Compression index
Ccr: Recompression index
UC: Unconfined compression
DS: Direct shear
Phi': Angle of internal friction
c': Cohesion
CUT: Consolidation undrained triaxial

Water level

Date:	Time:	Elev.(m):

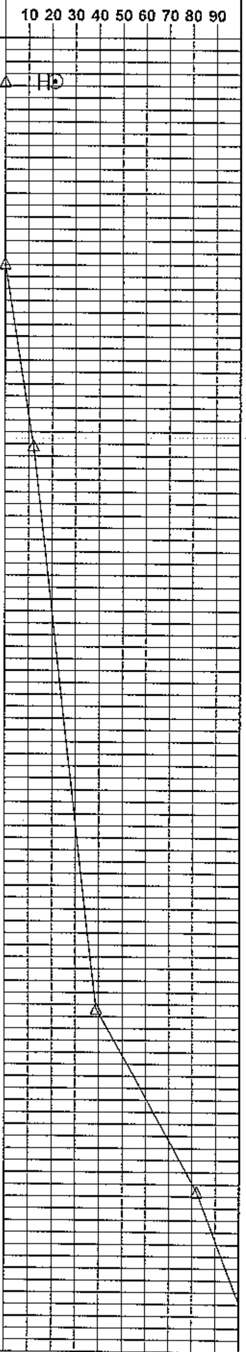
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
				☒	SS-11	B	100	0	0-0-0-0		Combined SS-11/12: GSA, DS CU=nd(>>), W=21.1%, Wp=14%, Wl=18%, Ip=4%, D=XXX, Phi=XXX, c=XXX
11											
12				☒	SS-12	B	100	0	0-0-0-0		
	-36.77 12.65	Gray sand with some silt, trace clay; medium dense									
13											
	-37.53 13.41	Gray silty fine sand; medium dense		☒	SS-13	B	83	12	11-5-7-8		GSA, CU=14.8
14	-38.29 14.17	Gray sand with some gravel and trace silt and clay; very dense. Gravel and cobbles up to 200mmØ									
					SS-14	B	0		25 /refusal		
15				☒	SS-15	B	20		63-50 /refusal		
16					DC-16	HQ	30				3,0m sanding up at 17 m depth 4,6 m sanding up at 17,8 m depth
17											
18				☒	SS-17	B	8	39	4-12-27-32		
19											
				☒	SS-18	B	8	82	27-42-40-47		
20					DC-19	HQ	69				



Notes:

Approved by :
Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4
BOREHOLE: 09-16
SITE: Alcoa - Baie-Comeau smelter (Quebec)
PAGE: 3 of 3
LOCATION OF BOREHOLE: X : 258945,60 Y : 5457094,73
CASING: HW
FILE NO: F099382300
EQUIPEMENT USED: D-50
SAMPLER: Indicated
CORE BARRELHQ
TECHNICIAN: Simon Marois, tech.
SURFACE ELEVATION (m): -24.12
BORING DATE **START:** 2009-11-10 06:30:00 **END:** 2009-11-11 13:30:00

Type of Sampler

SS: Split Spoon
DC: Diamond Core
WS: Wash Sample
HT: Hydraulic Trust
HW: Hammer Weight
SP: Shelby and Piston
AS: Auger Sampler
ST: Thin Walled Shelby Tube

☒ Remoulded
▨ Intact
■ Lost
◨ Rock Core

Laboratory and In situ tests - Parameters

N: SPT N-Value
Nd: DCPT Nd-Value
Su: Field Vane
GSA: Grain size analysis
CU: Uniformity coefficient
W: Water Content
Wp: Plastic limit
Wl: Liquid limit

Ip: Plasticity index:
D: Specific density
Cu: Swedish cone
C: Consolidation
PP: Preconsolidation pressure
Cc: Compression index
Ccr: Recompression index
UC: Unconfined compression

DS: Direct shear
Phi': Angle of internal friction
c': Cohesion
CUT: Consolidation undrained triaxial

Water level

Date: Time: Elev.(m):

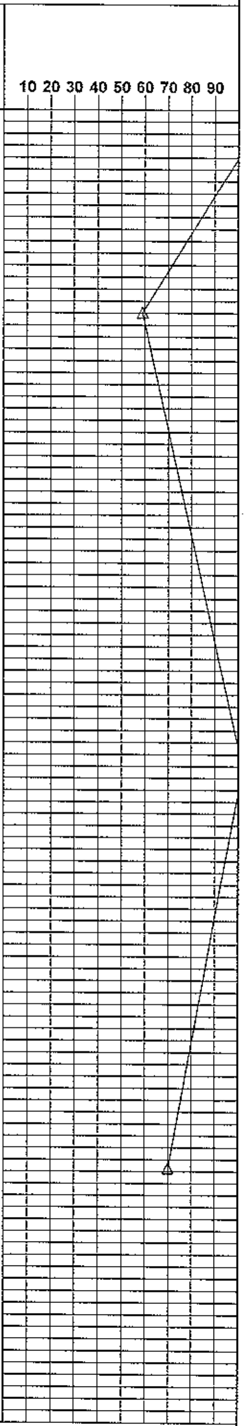
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
				☒	SS-20	B	94	110	25-50-60 /refusal		GSA, CU=10.5
				◨	DC-21	HQ	78				
22											
				☒	SS-22	B	48	59	8-32-27-60 /refusal		
23											
24				■	SS-23	N	0		60 /refusal		
25				■	SS-24	B	0		50 /refusal		
26											
				■	SS-25	B	0	102	27-53-49-38		
27											
28				☒	SS-26	N	60		61-50 /refusal		
29											
30	-54.29 30.18	End of borehole		☒	SS-27	B	46	70	26-28-42-61		
31											



Notes:

Approved by :
Sonya Graveline, ing.

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3072

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2947**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-16, SS-1 & SS-2, Depth.: 0,30 to 1,7
Tests completed on : 2009-11-30

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	1,052	% Gravel:	
C.U.	2,115	% Sand:	86
Unified Classification:		% Silt:	13
Fineness Module: 0,63		% Clay:	1

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: ____________ 2009-12-04
Sylvie Daigle, Tech.

Verified by: ____________ 2009-12-04
Sonya Graveline, Ing.

SMI
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
5,0	100
2,5	99
1,250	97
0,630	93
0,3150	84
0,1600	64
0,0970	22,3
0,0714	9,3
0,0506	7,4
0,0361	4,6
0,0229	3,7
0,0134	3,7
0,0096	1,9
0,0068	1,9
0,0048	1,9
0,0034	1,9
0,0014	0,9

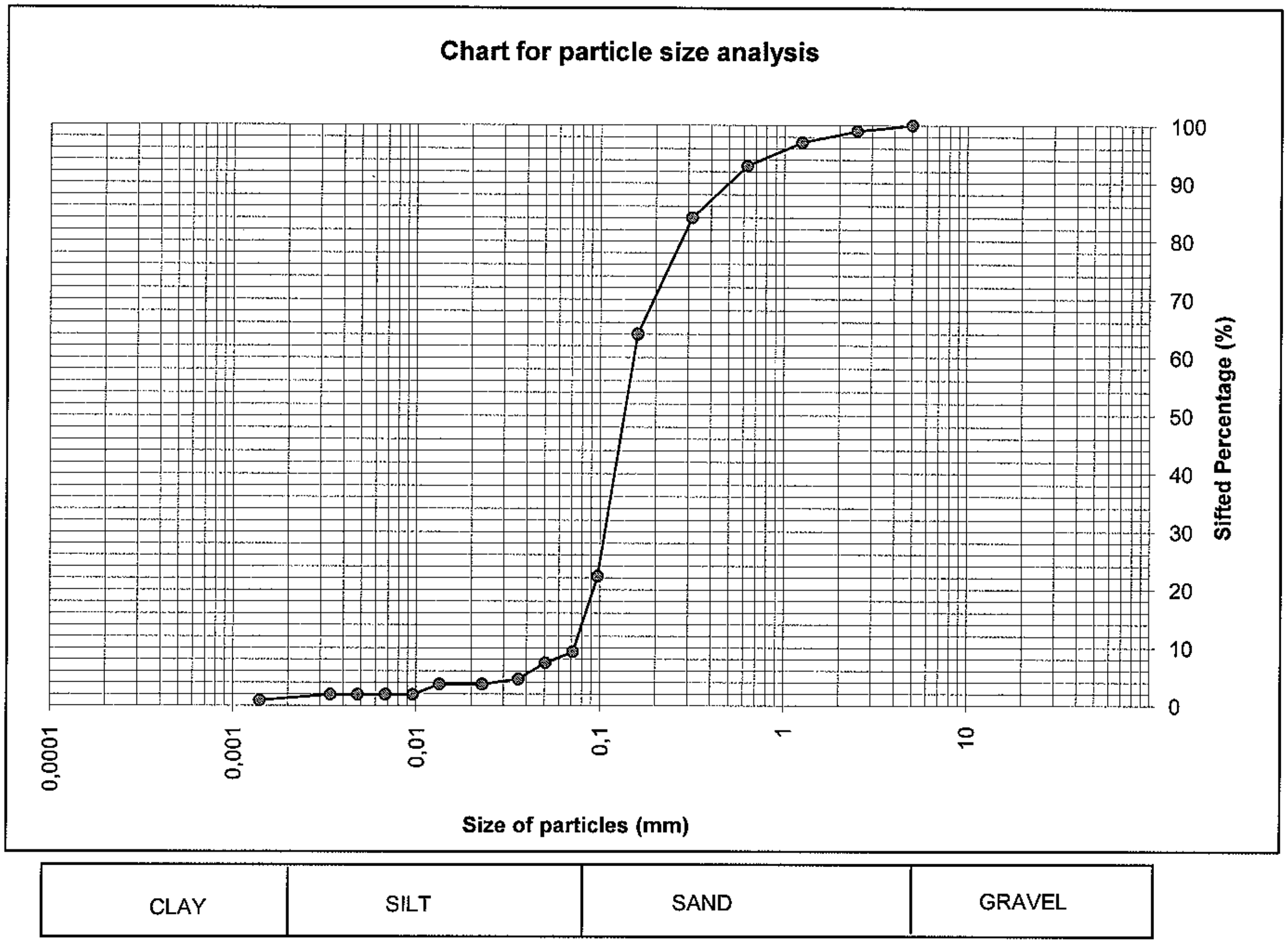


Chart for particle size analysis

Project: New Baie-Comeau wharf

Laboratory No. : 09-2947

Type of material: Sand,some silt,traces clay

File #: **F099382200**

Source: Material on site, 09-16,SS-1 & SS-2, Depth: 0,30 to 1,7 m.

Customer: **Alcoa**

Approuved by : ____________ Date : __________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3156

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2948**
Sample No. : ------

Type of Materia : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-16, SS-11 & SS-12, Depth:10,0 to 12,2 m.
Tests completed on : 2009-12-04

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.
C.U.
Unified Classification:
Fineness Module: 0,43

% Gravel:	1
% Sand:	41
% Silt:	45
% Clay:	13

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements
Atterberg Limits (3pts)	BNQ2501-092		
Liquid Limit (%):		18	------
Plastic Limit (%):		14	------
Plasticity index (%):		4	------
Water Content (%):	LC21-201	21,08	------

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: ______________ 2009-12-08
Sylvie Daigle, Tech.

Verified by: ______________ 2009-12-08
Sonya Graveline, Ing.

LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
14,0	100
10,0	99
5,0	99
2,5	99
1,250	98
0,630	96
0,3150	90
0,1600	75
0,0856	61,6
0,0630	50,0
0,0454	44,3
0,0325	41,4
0,0210	33,7
0,0126	28,9
0,0091	25,0
0,0065	22,1
0,0046	20,2
0,0033	17,3
0,0014	11,5

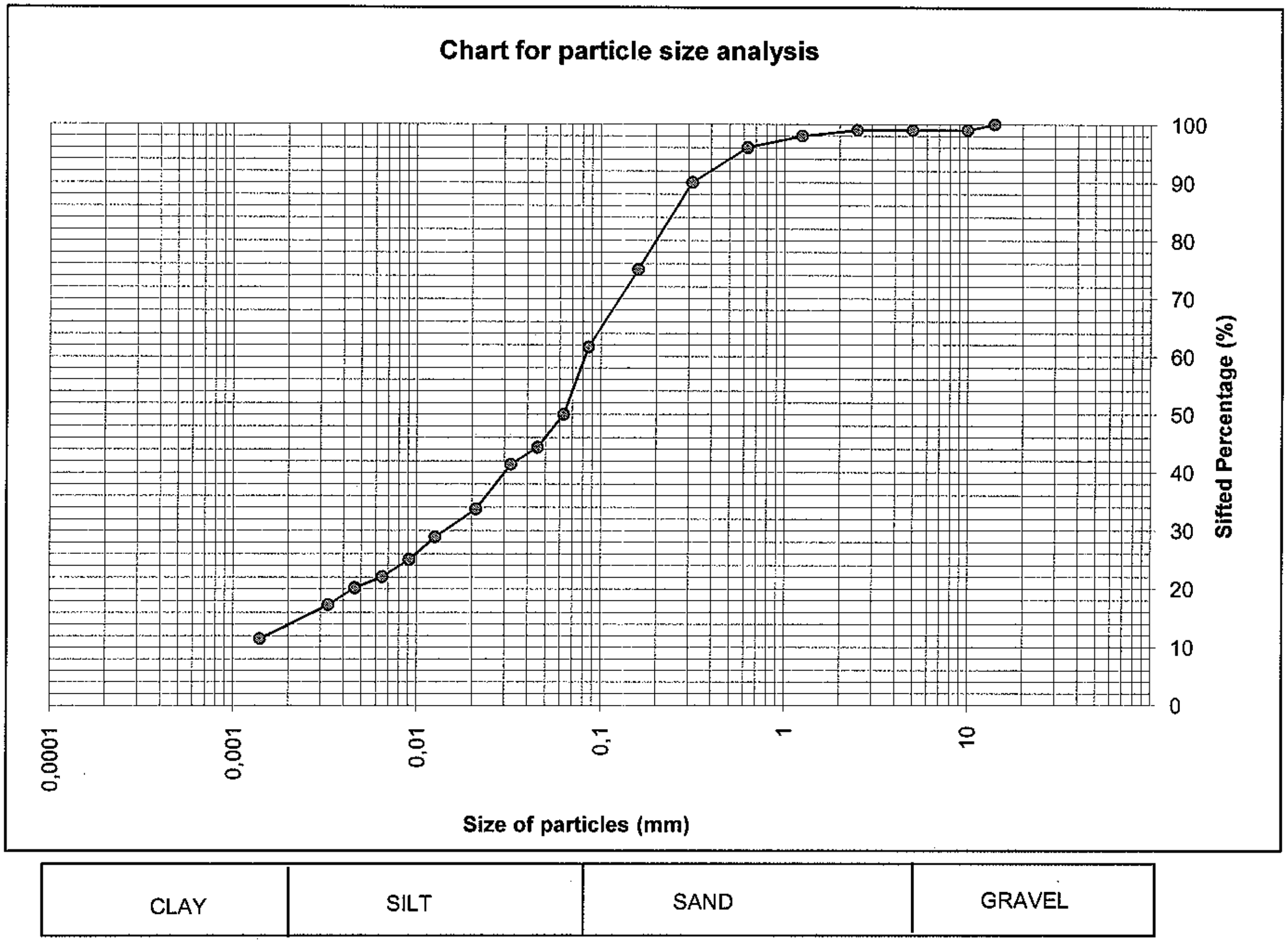


Chart for particle size analysis

Project: New Baie-Comeau wharf

Laboratory No. : 09-2948

Type of material: Silt & sand,some clay,traces gravel.

File #: **F099382200**

Source: Material on site, 09-16,SS-11 & SS-12, Depth: 10,0 to 12,2 m.

Customer: **Alcoa**

Approuved by :__________ Date : __________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3098

File Number	**: F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: ------
City	: Baie-Comeau (Québec)	Uses	: ------
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	**: 09-2949**	Source	: 09-16, SS-13 (A) Depth: 13,1 to 13,4 m.
Sample No.	: ------	Tests completed on	: 2009-12-01

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 3,262 — % Gravel: 1
C.U. 14,83 — % Sand: 79
Unified Classification: — % Silt: 15
Fineness Module: 1,21 — % Clay: 4

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

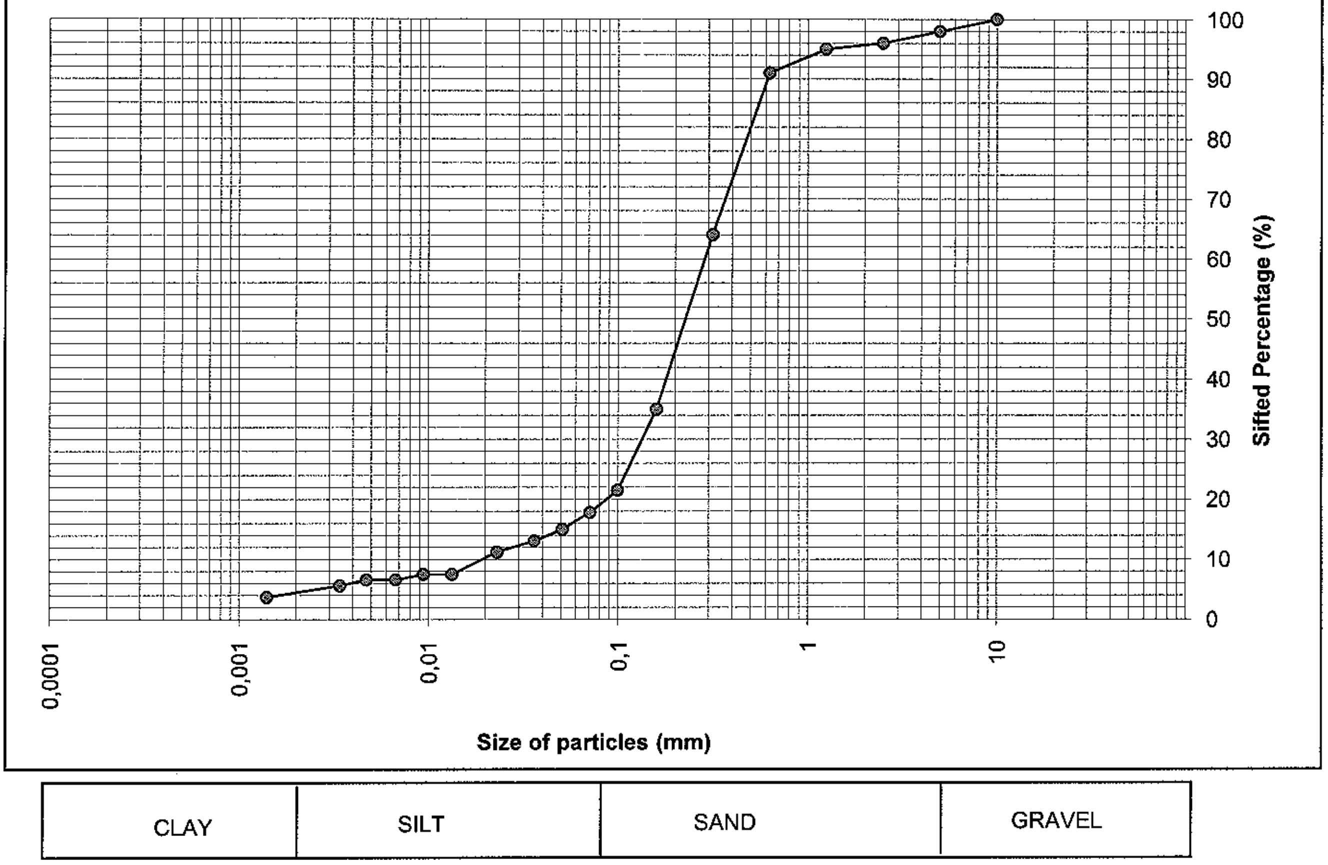
Prepared by: 2009-12-07
Sylvie Daigle, Tech.

Verified by: 2009-12-07
Sonya Graveline, Ing.

SM*i*
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
10,0	100
5,0	98
2,5	96
1,250	95
0,630	91
0,3150	64
0,1600	35
0,0997	21,5
0,0714	17,8
0,0509	15,0
0,0362	13,1
0,0230	11,2
0,0133	7,5
0,0094	7,5
0,0067	6,6
0,0047	6,6
0,0034	5,6
0,0014	3,7

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2949

Type of material: Sand,some silt,traces clay & gravel.

File #: **F099382200**

Source: Material on site, 09-16,SS-13 (A), Depth: 13,1 to 13,4 m.

Customer: **Alcoa**

Approuved by :________________ Date : __________

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3091

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2950**
Sample No. : ------

Type of Material : -----
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-16, SS-20, Depth.: 20,8 to 21,3 m.
Tests completed on : 2009-12-01

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	1,632	% Gravel:	18,0
C.U.	10,52	% Sand:	73
Unified Classification:		% Silt:	7
Fineness Module: 2,91		% Clay:	2

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : * **=Results not in conformity**

Remarks: **See following chart for sediments analysis.**

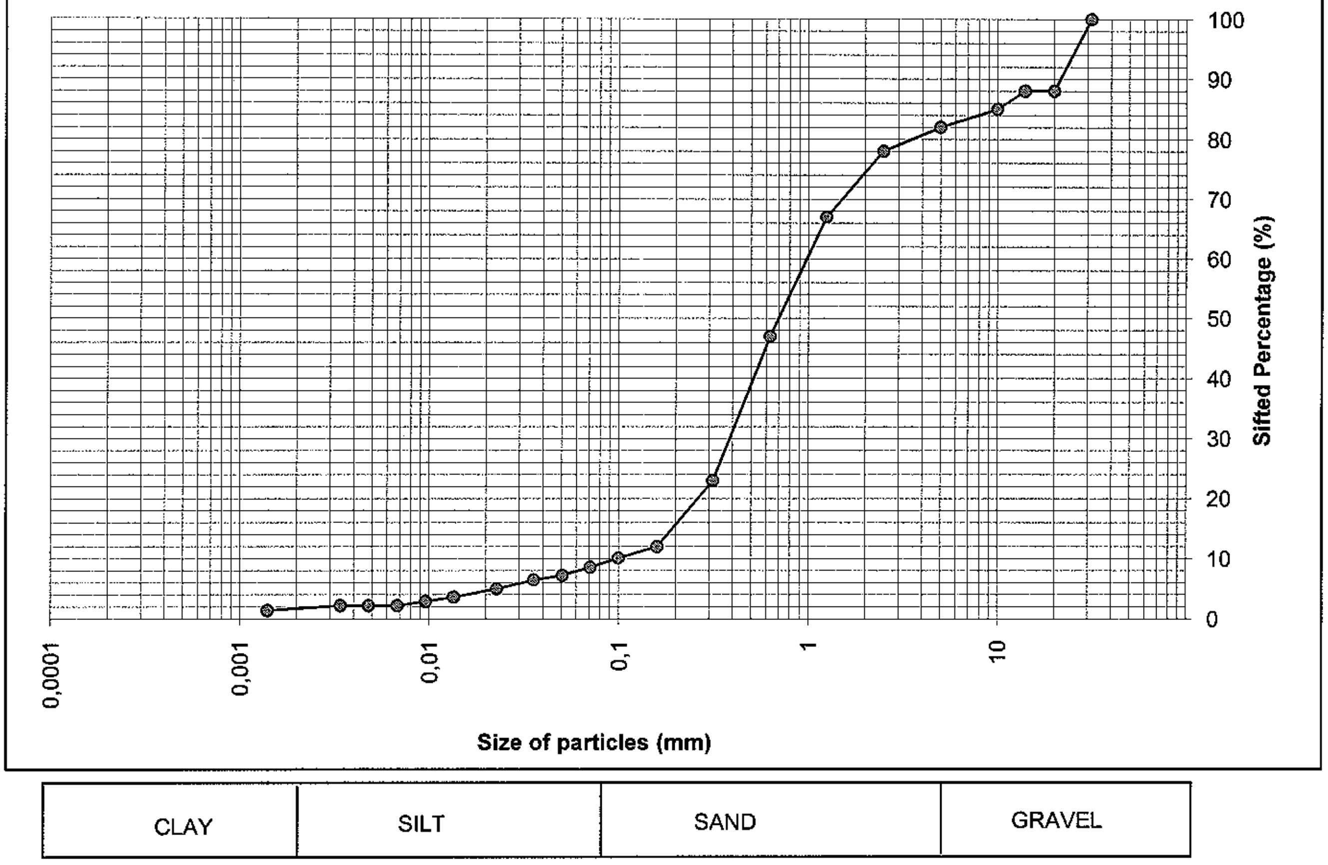
Prepared by: 2009-12-08
Sylvie Daigle, Tech.

Verified by: 2009-12-08
Sonya Graveline, Ing.

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
31,5	100
20,0	88
14,0	88
10,0	85
5,0	82
2,5	78
1,250	67
0,630	47
0,3150	23
0,1600	12
0,1001	10,1
0,0710	8,6
0,0506	7,2
0,0358	6,5
0,0228	5,0
0,0135	3,6
0,0096	2,9
0,0068	2,2
0,0048	2,2
0,0034	2,2
0,0014	1,4

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2950

Type of material: Sand,some gravel,traces silt & clay.

File #: **F099382200**

Source: Material on site, 09-16, SS-20, Depth: 20,8 to 21,3 m.

Customer: **Alcoa**

Approuved by :________________ Date : __________

'FLS-079 (06-2007) rév. 1

SM Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-17
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 1 of 3
LOCATION OF BOREHOLE: X : 258907,80 Y : 5457049,47		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL**	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -17.27	**BORING DATE START:** 2009-11-02 13:30:00	**END:** 2009-11-04 15:00:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◧	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value
Nd:	DCPT Nd-Value
Su:	Field Vane
GSA:	Grain size analysis
CU:	Uniformity coefficient
W:	Water Content
Wp:	Plastic limit
Wl:	Liquid limit
Ip:	Plasticity index:
D:	Specific density
Cu:	Swedish cone
C:	Consolidation
PP:	Preconsolidation pressure
Cc:	Compression index
Ccr:	Recompression index
UC:	Unconfined compression
DS:	Direct shear
Phi':	Angle of internal friction
c':	Cohesion
CUT:	Consolidation undrained triaxial

Water level

Date:	Time:	Elev.(m):

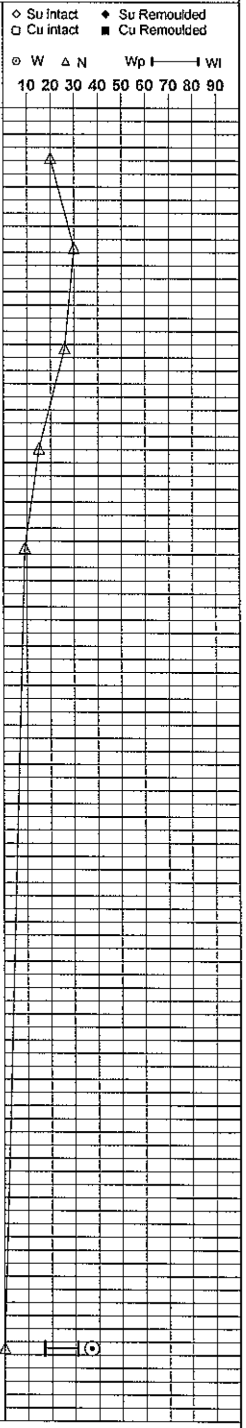
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth -17.27	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
	0.00	Gray sand with some silt and trace gravel, occasionally sea shell; medium dense		☒	SS-1	B	29	20	7-8-12-10		
1				☒	SS-2	B	71	30	13-15-15-17		
2				☒	SS-3	B	75	26	13-12-14-14		GSA, CU=3.3
				☒	SS-4	B	54	15	12-8-7-6		
3											
	-20.62 3.35	Gray clay with trace silt		☒	SS-5	B	4	9	9-9-0-0		
4											
				▨	ST-6		83				
5											
				▨	ST-7		92				GSA, C, DS CU=XXX, W=XX%, Wp=XX%, Wl=XX%, Ip=XX%, PP=XXX, Cc=XXX, Ccr=XXX, UC=XXX, Phi'=XXX, c'=XXX
6											
				▨	ST-8		96				
7											
				▨	ST-9		96				
8											
	-25.50 8.23	Gray to brown clayey sandy silt									
				▨	ST-10		75				
9											
				☒	SS-11	B	100	0	0-0-0-0		Combined SS-11/12: GSA, DS CU=nd, W=36.9%, Wp=17%, Wl=31%,



Notes:	Approved by : Sonya Graveline, ing.

SM Labo S.M. inc

BORING LOG

PROJECT: New wharf #4	**BOREHOLE:** 09-17
SITE: Alcoa - Baie-Comeau smelter (Quebec)	**PAGE:** 2 of 3
LOCATION OF BOREHOLE: X : 258907,80 Y : 5457049,47 / **CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50 / **SAMPLER:** Indicated / **CORE BARREL**	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -17.27 / **BORING DATE START:** 2009-11-02 13:30:00 **END:** 2009-11-04 15:00:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◧	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value
Nd:	DCPT Nd-Value
Su:	Field Vane
GSA:	Grain size analysis
CU:	Uniformity coefficient
W:	Water Content
Wp:	Plastic limit
Wl:	Liquid limit
Ip:	Plasticity index:
D:	Specific density
Cu:	Swedish cone
C:	Consolidation
PP:	Preconsolidation pressure
Cc:	Compression index
Ccr:	Recompression index
UC:	Unconfined compression
DS:	Direct shear
Phi':	Angle of internal friction
c':	Cohesion
CUT:	Consolidation undrained triaxial

Water level

Date:	Time:	Elev.(m):

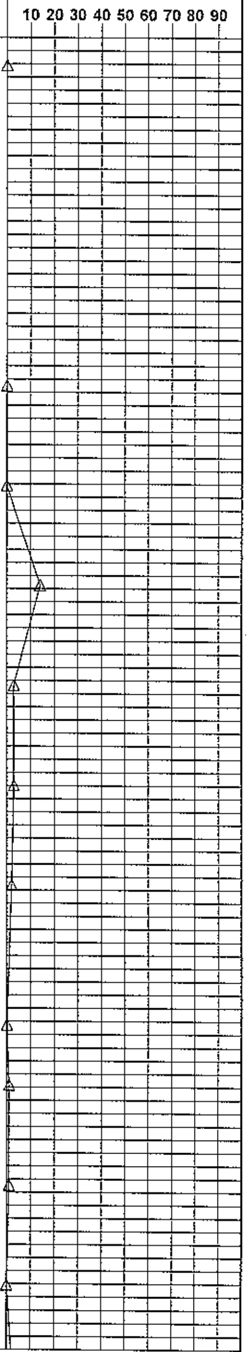
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
			☒	SS-12	B	100	0	0-0-0-0		Ip=14%, Phi'=XXX, c'=XXX
11										
12										
			☒	SS-13	B	62	0	0-0-0-0		
13										
			☒	SS-14	B	100	0	0-0-0-1		
14	-31.06 13.79	Gray silty sand with trace clay, stratified with layers of sand; very loose	☒	SS-15	B	33	14	3-8-6-1		
15			☒	SS-16	B	100	3	1-2-1-3		Combined SS-16/18: GSA, DS CU=53.3, Phi'=XXX, c'=XXX
16			☒	SS-17	B	33	3	1-2-1-1		
			☒	SS-18	B	83	2	1-1-1-1		
17										
			■	SS-19	B	0	0	0-0-0-0		
18			☒	SS-20	B	83	1	0-0-1-0		
19			☒	SS-21	B	42	1	0-1-0-3		
			☒	SS-22	B	75	0	1-0-0-8		



Notes:

Approved by :
Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4
BOREHOLE: 09-17
SITE: Alcoa - Baie-Comeau smelter (Quebec)
PAGE: 3 of 3
LOCATION OF BOREHOLE: X : 258907,80 Y : 5457049,47
CASING: HW
FILE NO: F099382300
EQUIPEMENT USED: D-50
SAMPLER: Indicated
CORE BARREL
TECHNICIAN: Simon Marois, tech.
SURFACE ELEVATION (m): -17.27
BORING DATE START: 2009-11-02 13:30:00 **END:** 2009-11-04 15:00:00

Type of Sampler

SS: Split Spoon
DC: Diamond Core
WS: Wash Sample
HT: Hydraulic Trust
HW: Hammer Weight
SP: Shelby and Piston
AS: Auger Sampler
ST: Thin Walled Shelby Tube

☒ Remoulded
▨ Intact
■ Lost
◫ Rock Core

Laboratory and in situ tests - Parameters

N: SPT N-Value
Nd: DCPT Nd-Value
Su: Field Vane
GSA: Grain size analysis
CU: Uniformity coefficient
W: Water Content
Wp: Plastic limit
Wl: Liquid limit
Ip: Plasticity index:
D: Specific density
Cu: Swedish cone
C: Consolidation
PP: Preconsolidation pressure
Cc: Compression index
Ccr: Recompression index
UC: Unconfined compression
DS: Direct shear
Phi': Angle of internal friction
c': Cohesion
CUT: Consolidation undrained triaxial

Water level

Date: Time: Elev.(m):

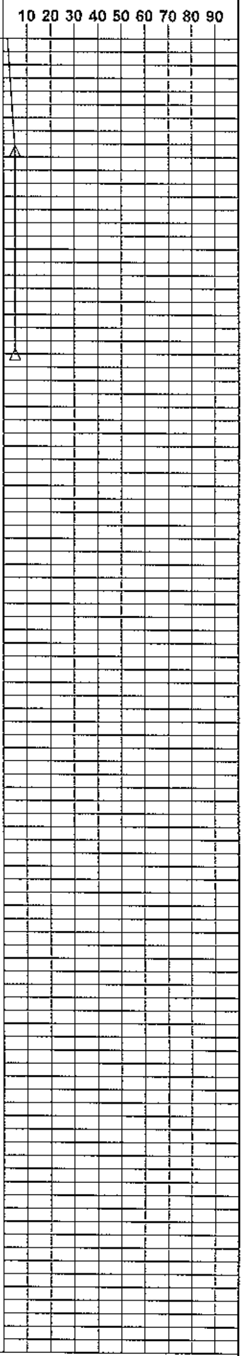
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
	-37.56 20.29										
	-37.82 20.55	Gray coarse gravel		■	DC-23	NX	100				
21		Gray silty sand with trace gravel, stratified with thin layers of sand; loose		☒	SS-24	B	54	5	7-3-2-1		
22				☒	SS-25	B	75	5	3-2-3-9		
	-39.98 22.70	End of borehole									
23											
24											
25											
26											
27											
28											
29											



Notes:

Approved by :
Sonya Graveline, ing.

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3090

File Number	**: F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: ------
City	: Baie-Comeau (Québec)	Uses	: ------
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	**: 09-2953**	Source	: 09-17, SS-3 Depth: 1,5 to 2,1 m.
Sample No.	: ------	Tests completed on	: 2009-12-01

Particle Size Analysis
LC 21-040

Sieve (mm)	% Sifted (%)	Specifications (Min. - Max.)

C.C.	1,092	% Gravel:	5
C.U.	3,299	% Sand:	80
Unified Classification:		% Silt:	15
Fineness Module: 0,50		% Clay:	

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

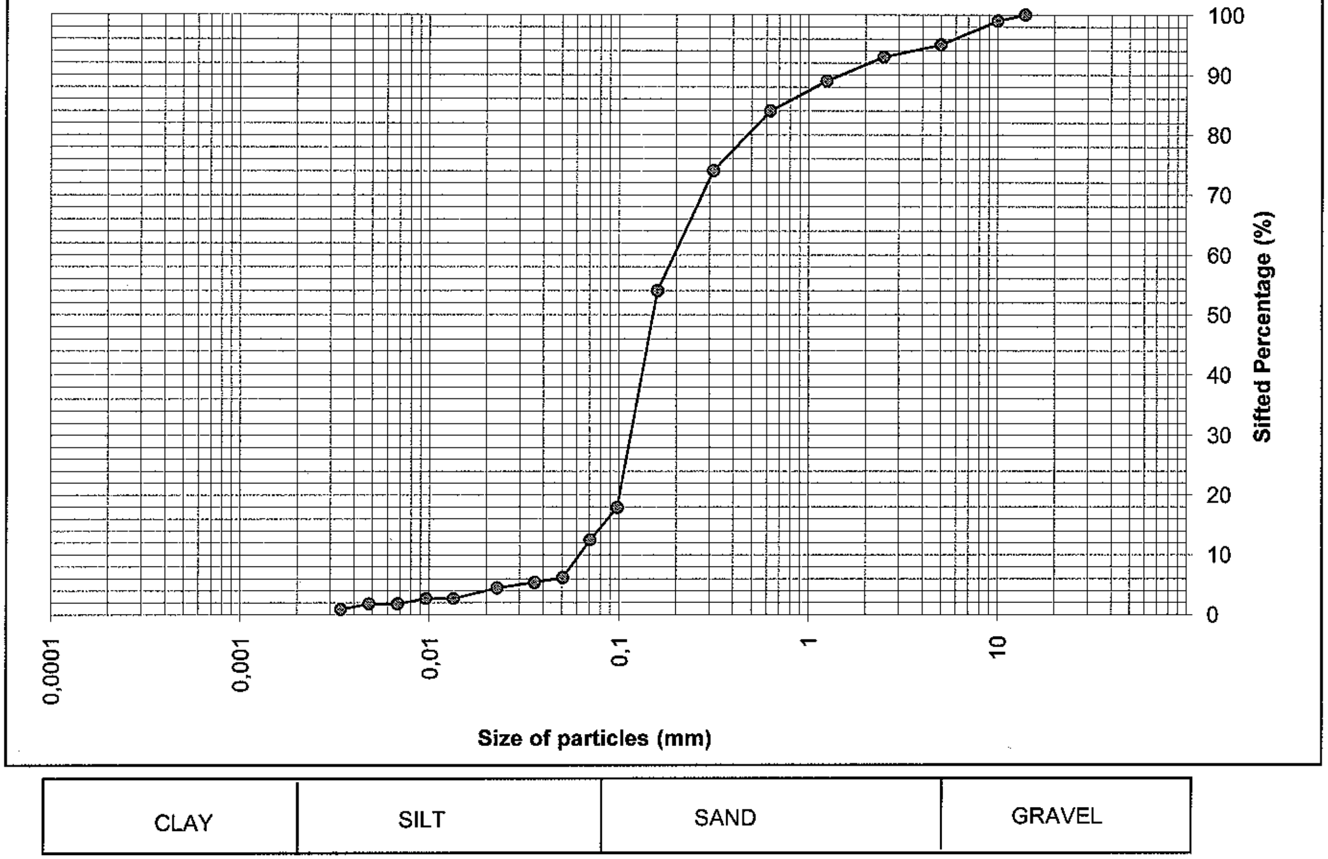
Prepared by: 2009-12-07
Sylvie Daigle, Tech.

Verified by: 2009-12-07
Sonya Graveline, Ing.

LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
14,0	100
10,0	99
5,0	95
2,5	93
1,250	89
0,630	84
0,3150	74
0,1600	54
0,0980	17,9
0,0705	12,5
0,0506	6,2
0,0359	5,4
0,0228	4,5
0,0134	2,7
0,0096	2,7
0,0068	1,8
0,0048	1,8
0,0034	0,9

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2953

Type of material: Sand,some silt,traces gravel

File #: **F099382200**

Source: Material on site, 09-17,SS-3, Depth: 1,5 to 2,1 m.

Customer: **Alcoa**

Approuved by : ____________ Date : ________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3146

File Number	: **F099382200**		
Customer	: Alcoa	Type of Material	: -----
Address	: 100, route Maritime	Caliber	: ------
City	: Baie-Comeau (Québec)	Uses	: ------
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	: **09-2951**	Source	: 09-17, SS-11 & SS-12, Depth:9,1 to ~~9,7~~ 10,5
Sample No.	: -----	Tests completed on	: 2009-12-03

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.		% Gravel:	
C.U.		% Sand:	34
Unified Classification:		% Silt:	38
Fineness Module: 0,54		% Clay:	28

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements
Atterberg Limits (3pts)	BNQ2501-092		
Liquid Limit (%):		31	------
Plastic Limit (%):		17	------
Plasticity index (%):		14	------
Water Content (%):	LC21-201	36,91	------

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: 2009-12-07
Sylvie Daigle, Tech.

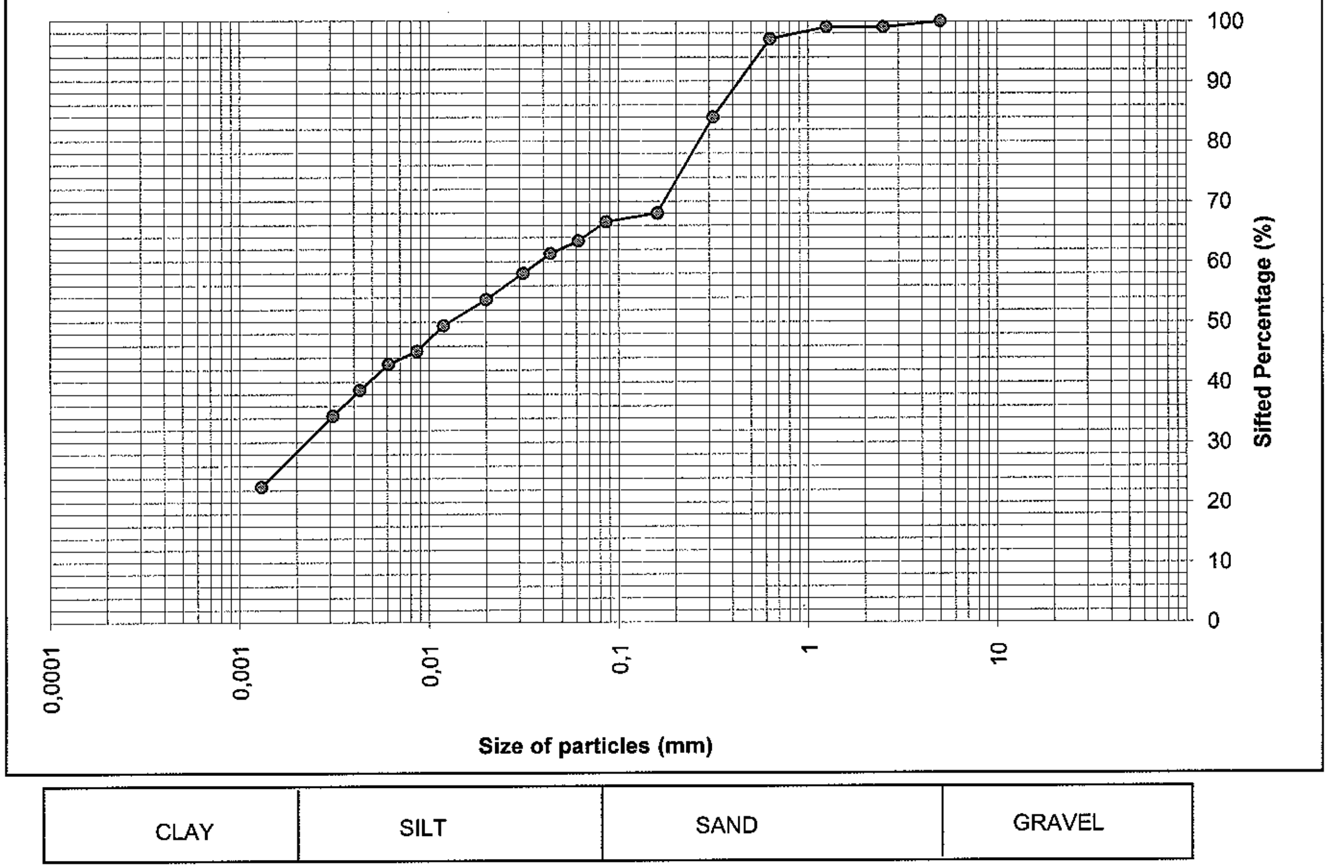
Verified by: 2009-12-07
Sonya Graveline, Ing.

SM

LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
5,0	100
2,5	99
1,250	99
0,630	97
0,3150	84
0,1600	68
0,0858	66,6
0,0613	63,4
0,0437	61,3
0,0313	58,0
0,0200	53,7
0,0119	49,4
0,0086	45,1
0,0061	43,0
0,0043	38,7
0,0031	34,4
0,0013	22,6

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2951

Type of material: Sandy & clayey silt.

File #: **F099382200**

Source: Material on site, 09-17,SS-11 & SS-12, Depth: 9,1 to 9,7 m.

Customer: **Alcoa**

Approuved by :________________ Date : __________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3086

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2952**
Sample No. : -----

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-17, SS-16 & SS-18, Depth.: 14,6 to 16,8 m.
Tests completed on : 2009-12-01

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	8,001	% Gravel:	2
C.U.	53,33	% Sand:	63
Unified Classification:		% Silt:	26
Fineness Module: 0,71		% Clay:	9

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

Prepared by: 2009-12-08
Sylvie Daigle, Tech.

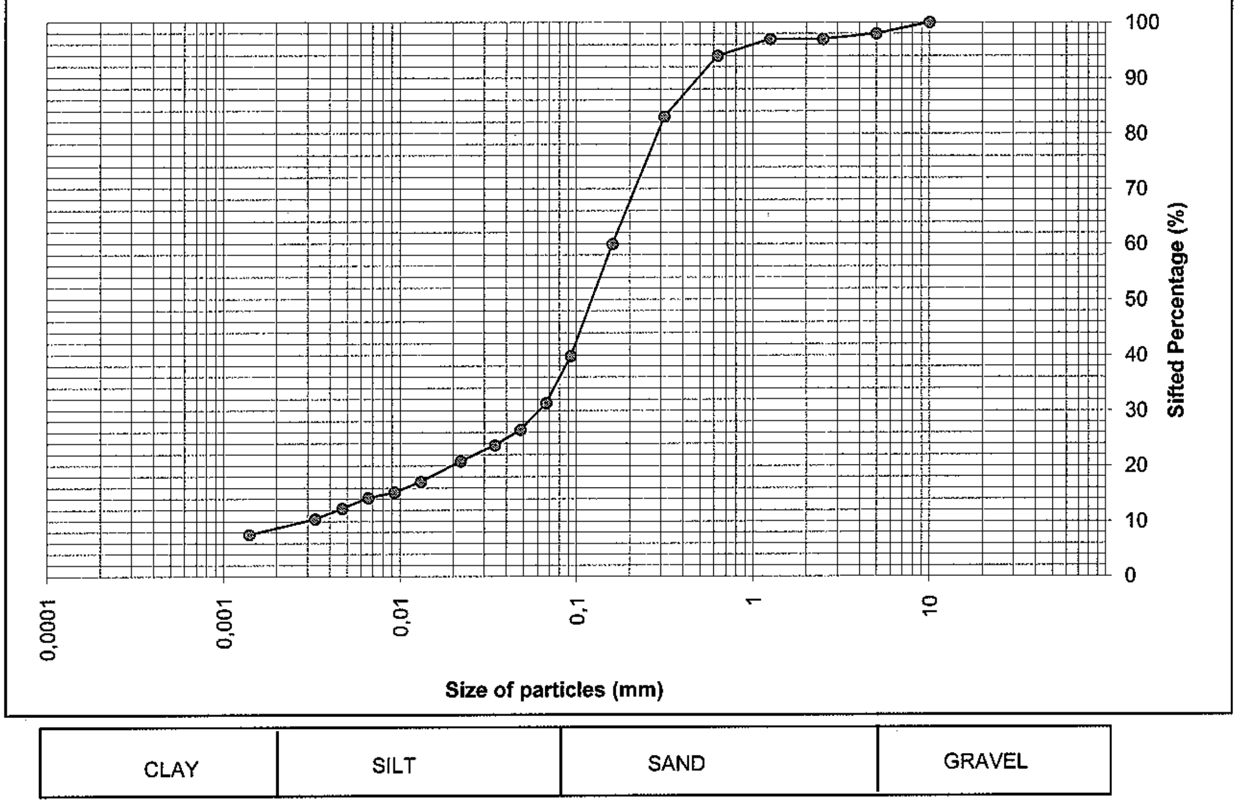
Verified by: 2009-12-08
Sonya Graveline, Ing.

SM*i*

LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
10,0	100
5,0	98
2,5	97
1,250	97
0,630	94
0,3150	83
0,1600	60
0,0926	39,8
0,0672	31,3
0,0482	26,5
0,0344	23,7
0,0220	20,8
0,0131	17,1
0,0093	15,2
0,0066	14,2
0,0047	12,3
0,0033	10,4
0,0014	7,6

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2952

Type of material: Silty sand,traces clay & gravel.

File #: **F099382200**

Source: Material on site, 09-17, SS-16 & SS-18, Depth: 14,6 to 16,8 m.

Customer: **Alcoa**

Approuved by : __________ Date : __________

'FLS-079 (06-2007) rév. 1

SM Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-CDF-01
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 1 of 2
LOCATION OF BOREHOLE: X : 258442,77 Y : 5456931,43		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL-**	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -10.50	**BORING DATE START:** 2009-09-23 18:00:00	**END:** 2009-09-24 07:30:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◧	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value
Nd:	DCPT Nd-Value
Su:	Field Vane
GSA:	Grain size analysis
CU:	Uniformity coefficient
W:	Water Content
Wp:	Plastic limit
Wl:	Liquid limit
Ip:	Plasticity index:
D:	Specific density
Cu:	Swedish cone
C:	Consolidation
PP:	Preconsolidation pressure
Cc:	Compression index
Ccr:	Recompression index
UC:	Unconfined compression
DS:	Direct shear
Phi':	Angle of internal friction
c':	Cohesion
CUT:	Consolidation undrained triaxial

Water level

Date:	Time:	Elev.(m):

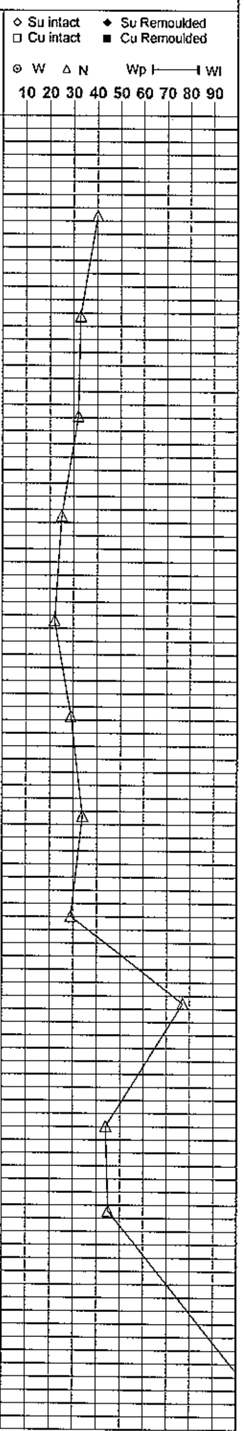
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
	-10.50 0.00	Black and gray sand, trace silt; dense							
			SS-1	B	46	40	15-20-20-16		
1									
	-11.78 1.28	Gray medium to coarse sand with trace silt; medium dense.							
			SS-2	B	58	33	12-15-18-23		
2									
			SS-3	B	67	32	0-16-16-26		GSA, CU=3.6
3									
			SS-4	B	25	25	13-12-13-12		
			SS-5	B	4	22	10-11-11-12		
4									
			SS-6	N	38	29	11-10-19-13		
5									
			SS-7	B	0	34	14-18-16-14		
6									
			SS-8	N	50	29	10-12-17-21		
	-16.98 6.48	Gray gravelly sand with trace silt; very dense Gravel and cobbles up to 100mm Ø							
			SS-9	N	37	77	57-27-50 /refusal		Refusal on coarse gravel
7									
			DC-10	NX	44				
			SS-11	N	56	44	70-26-18		
8	-18.50 8.00	Gray silty sand trace gravel and clay; very dense							
			SS-12	B	91	45	13-7-38-50 /refusal		GSA, CU=58.0
9			SS-13	B			50 /refusal		Many refusals on coarse gravel and/or very dense soil
			SS-14	B	0		100 /refusal		



Notes:

Approved by :
Sonya Graveline, ing.

SM Labo S.M. inc

BORING LOG

PROJECT: New wharf #4
SITE: Alcoa - Baie-Comeau smelter (Quebec)
LOCATION OF BOREHOLE: X : 258442,77 Y : 5456931,43
CASING: HW
EQUIPEMENT USED: D-50
SAMPLER: Indicated
CORE BARREL-
SURFACE ELEVATION (m): -10.50
BORING DATE START: 2009-09-23 18:00:00 **END:** 2009-09-24 07:30:00

BOREHOLE: 09-CDF-01
PAGE: 2 of 2
FILE NO: F099382300
TECHNICIAN: Simon Marois, tech.

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◨	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value
Nd:	DCPT Nd-Value
Su:	Field Vane
GSA:	Grain size analysis
CU:	Uniformity coefficient
W:	Water Content
Wp:	Plastic limit
Wl:	Liquid limit
Ip:	Plasticity index:
D:	Specific density
Cu:	Swedish cone
C:	Consolidation
PP:	Preconsolidation pressure
Cc:	Compression index
Ccr:	Recompression index
UC:	Unconfined compression
DS:	Direct shear
Phi':	Angle of internal friction
c':	Cohesion
CUT:	Consolidation undrained triaxial

Water level

Date:	Time:	Elev.(m):

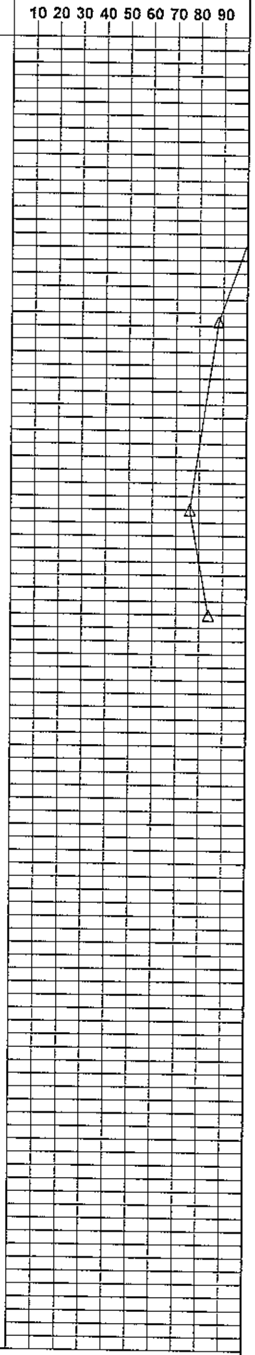
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
				☒	SS-15	B	67	145	62-95-50 /refusal		
11											
				☒	SS-16	B	40	105	36-55-50 /refusal		
12											
				☒	SS-17	B	50	88	30-35-53-50 /refusal		
				☒	SS-18	B	75		55-50 /refusal		
13											
				☒	SS-19	B	40	76	26-26-50 /refusal		
14	-24.67 14.17	Deposit more gravelly Gravel and cobbles up to 100mm Ø									
				☒	SS-20	B	22	84	33-41-43 /refusal		
15	-25.74 15.24	End of borehole									
16											
17											
18											
19											



Notes:

Approved by :
Sonya Graveline, ing.

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2492

File Number	**: F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: ------
City	: Baie-Comeau (Québec)	Uses	: ------
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	**: 09-2306**	Source	: 09-CDF-01, SS-3, Depth.: 2,0 to 2,6 m.
Sample No.	: ------	Tests completed on	: 2009-10-18

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 1,041
C.U. 3,599
Unified Classification:
Fineness Module: 1,32

% Gravel: 1
% Sand: 92
% Silt: 7
% Clay:

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

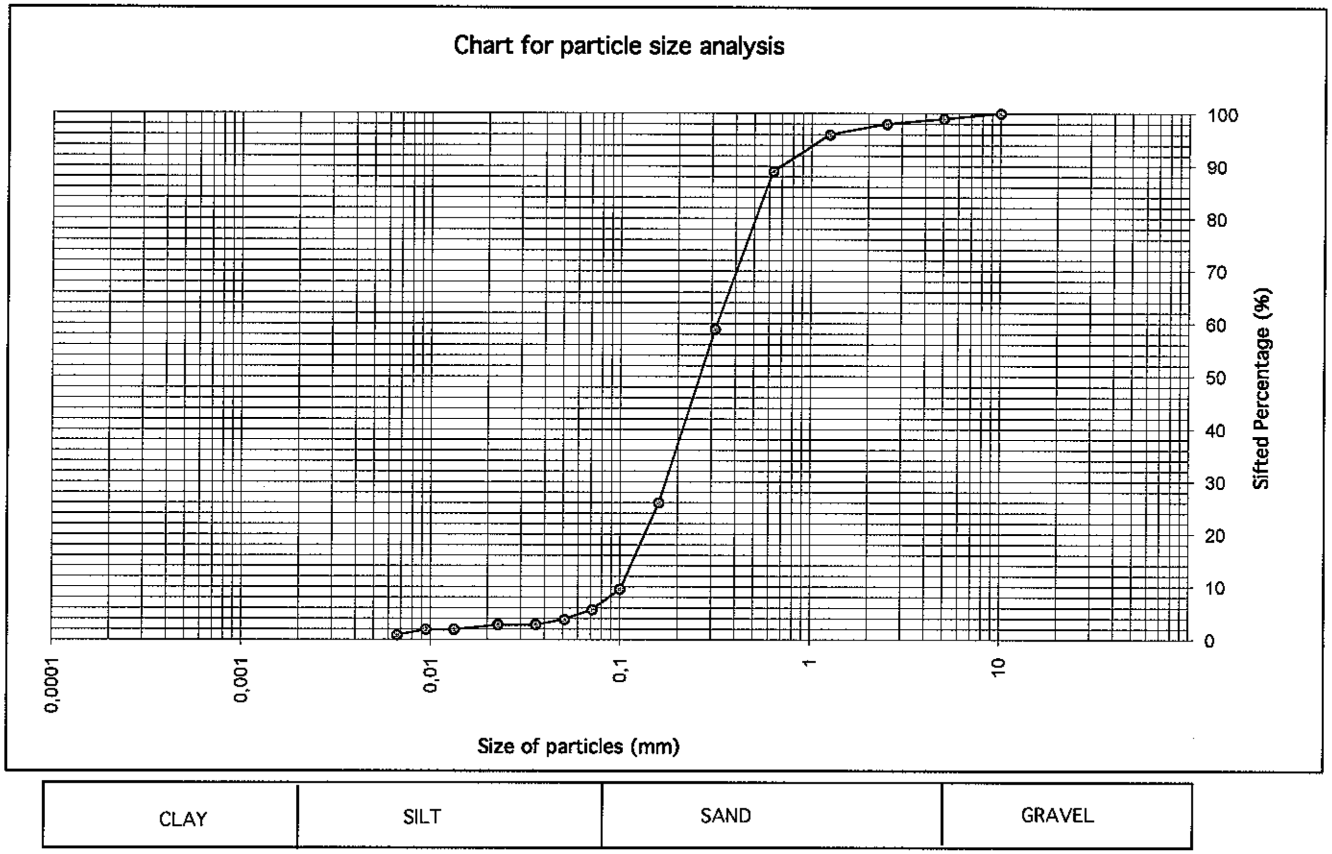
Remarks: See following chart for sediments analysis.

Prepared by: Sylvie Daigle, Tech. 2009-10-21

Verified by: Sonya Graveline, Ing. 2009-10-21

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
10,0	100
5,00	99
2,500	98
1,250	96
0,630	89
0,3150	59,0
0,1600	26,0
0,1003	9,5
0,0716	5,7
0,0510	3,8
0,0361	2,8
0,0228	2,8
0,0134	1,9
0,0095	1,9
0,0067	0,9



Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2306

Type of material: Sand,traces silt & gravel.

Source: Material on site, 09-CDF-01,SS-3, Depth: 2,0 to 2,6 m.

Approuved by : ______ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2497

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2307**
Sample No. : ------

Type of Material : -----
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-CDF-01, SS-12, Depth.: 8,0 to 8,6 m.
Tests completed on : 2009-10-19

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	2,894	% Gravel:	8
C.U.	57,969	% Sand:	62
Unified Classification:		% Silt:	26
Fineness Module:	1,61	% Clay:	4

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: 2009-10-21
Sylvie Daigle, Tech.

Verified by: 2009-10-21
Sonya Graveline, Ing.

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
20,0	100
14,0	97
10,0	96
5,00	92
2,500	88
1,250	83
0,630	74
0,3150	57,0
0,1600	45,0
0,0927	31,9
0,0668	26,9
0,0481	21,8
0,0342	19,3
0,0219	15,9
0,0130	13,4
0,0092	12,6
0,0065	10,1
0,0046	8,4
0,0033	6,7
0,0014	2,5

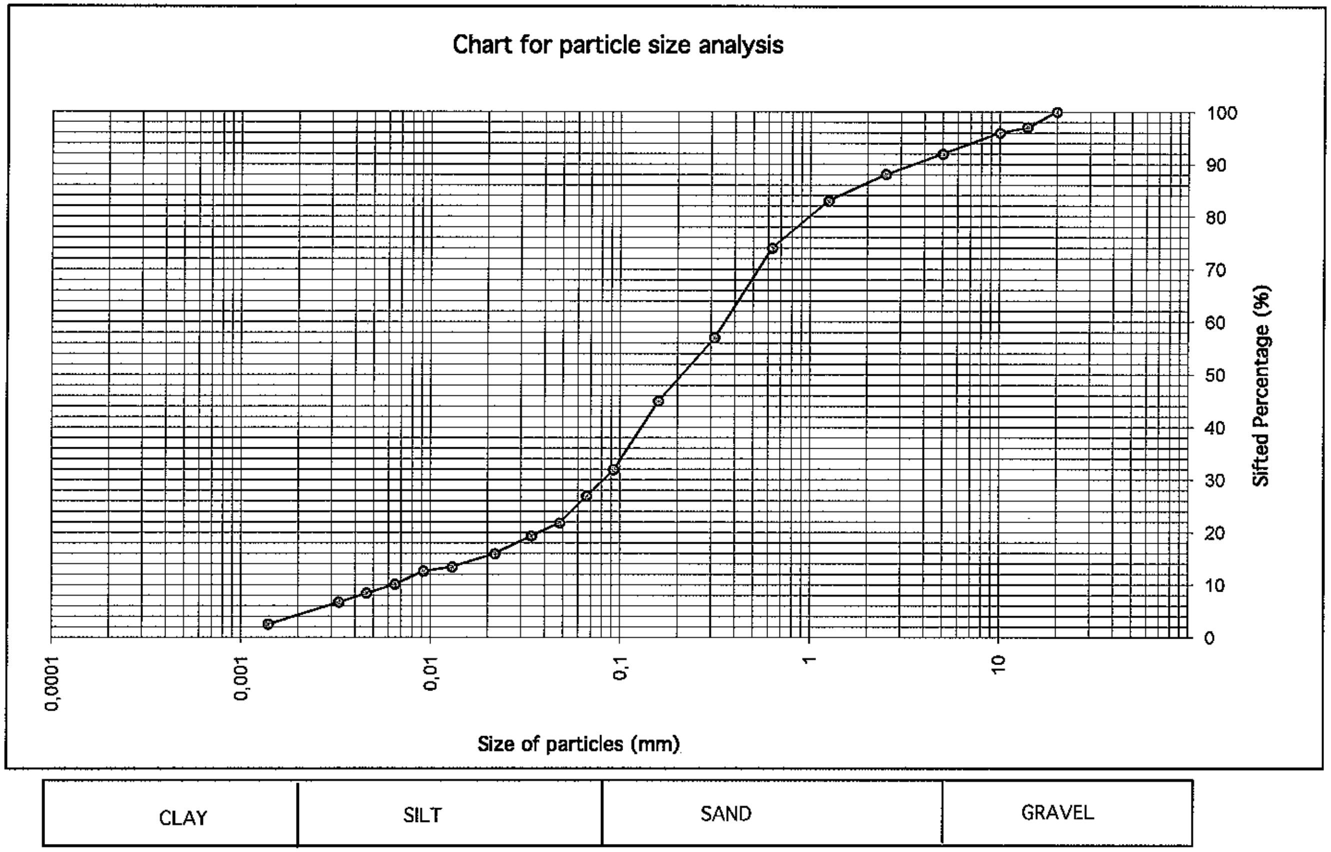


Chart for particle size analysis

Project: New Baie-Comeau wharf

Laboratory No. : 09-2307

Type of material: Silty sand, traces gravel & clay.

File #: **F099382200**

Source: Material on site, 09-CDF-01, SS-12, Depth: 8,0 to 8,6 m.

Customer: **Alcoa**

Approuved by : ________ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-CDF-03
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 1 of 3
LOCATION OF BOREHOLE: X : 258498,80 Y : 5456935,56		**CASING:** HW/NW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL**NQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -11.19	**BORING DATE START:** 2009-11-12 07:00:00	**END:** 2009-11-13 14:00:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

⊠	Remoulded
▨	Intact
■	Lost
◫	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value
Nd:	DCPT Nd-Value
Su:	Field Vane
GSA:	Grain size analysis
CU:	Uniformity coefficient
W:	Water Content
Wp:	Plastic limit
Wl:	Liquid limit
Ip:	Plasticity index:
D:	Specific density
Cu:	Swedish cone
C:	Consolidation
PP:	Preconsolidation pressure
Cc:	Compression index
Ccr:	Recompression index
UC:	Unconfined compression
DS:	Direct shear
Phi':	Angle of internal friction
c':	Cohesion
CUT:	Consolidation undrained triaxial

Water level

Date:	Time:	Elev.(m):

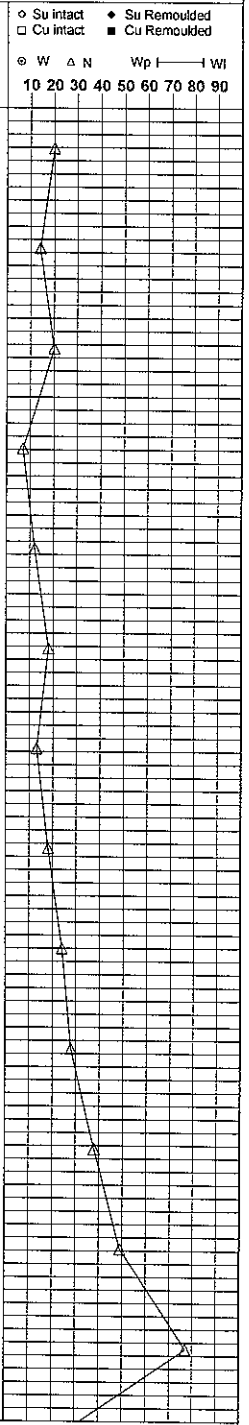
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Elev. Depth -11.19	Soils and Rock Description	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
0.00	Gray and black sand with some silt and trace gravel; dense to very dense. Presence of black vitrified material (coal or other)	⊠	SS-1	B	83	20	15-9-11-9		GSA, CU=5.7
		⊠	SS-2	B	79	14	5-4-10-8		
-12.56 1.37	Gray medium to coarse sand with some silt; medium dense to dense	⊠	SS-3	B	46	20	9-10-10-9		GSA, CU=2.4
		⊠	SS-4	B	54	7	2-3-4-5		
		■	SS-5	B	0	12	3-7-5-6		
		⊠	SS-6	B	46	18	6-10-8-11		
		⊠	SS-7	B	50	13	5-7-6-7		
		■	SS-8	B	0	18	6-10-8-10		
		⊠	SS-9	N	42	24	19-12-12-9		
		⊠	SS-10	B	67	28	11-11-17-20		
		⊠	SS-11	B	46	38	12-19-19-23		
-19.57 8.38	Gray sandy gravel, some cobbles; medium dense to very dense. Gravel and cobbles up to 100mmØ	⊠	SS-12	B	25	49	14-30-19-14		GSA, CU=21
		■	SS-13	N	0	77	50-46-31-47		



Notes:

Approved by :
Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4	**BOREHOLE:** 09-CDF-03
SITE: Alcoa - Baie-Comeau smelter (Quebec)	**PAGE:** 2 of 3
LOCATION OF BOREHOLE: X : 258498,80 Y : 5456935,56 **CASING:** HW/NW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50 **SAMPLER:** Indicated **CORE BARREL**NQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -11.19 **BORING DATE START:** 2009-11-12 07:00:00 **END:** 2009-11-13 14:00:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◫	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value
Nd:	DCPT Nd-Value
Su:	Field Vane
GSA:	Grain size analysis
CU:	Uniformity coefficient
W:	Water Content
Wp:	Plastic limit
Wl:	Liquid limit
Ip:	Plasticity index:
D:	Specific density
Cu:	Swedish cone
C:	Consolidation
PP:	Preconsolidation pressure
Cc:	Compression index
Ccr:	Recompression Index
UC:	Unconfined compression
DS:	Direct shear
Phi':	Angle of internal friction
c':	Cohesion
CUT:	Consolidation undrained triaxial

Water level

Date:	Time:	Elev.(m):

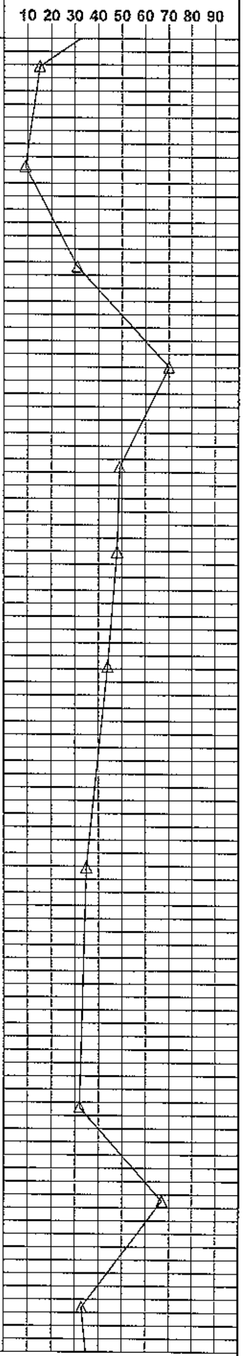
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
					SS-14	B	79	15	3-5-10-19		GSA, CU=3.9
	-21.71 10.52	Gray medium to coarse sand with trace silt; dense to very dense									
11					SS-15	B	50	9	4-4-5-8		
					SS-16	B	54	31	10-13-18-23		
12											
					SS-17	B	50	70	12-26-44-39		
13											
					SS-18	B	67	49	15-22-27-25		
14	-25.11 13.92	Coarse sand, some gravel and cobble less than 150mmØ			SS-19	B	67	48	11-20-28 /refusal		
					DC-20	NQ	58				
	-25.67 14.48	Brown (first sample) to gray coarse sand, trace silt and gravel; occasionally some gravel; very dense			SS-21	B	79	44	6-18-26-23		
15											
					SS-22	B	50		29-50 /refusal		
16											
					SS-23	B	17	35	54-19-16-14		
17					SS-24	N	0		70 /refusal		
		240mm thick granit cobble at 17m depth			DC-25	NQ	67				
		240mm thick granit cobble at 17,5m depth			DC-26	NQ	42				
18					SS-27	B	0	32	24-13-19-14		
19					SS-28	N	35	67	19-27-40-60 /refusal		
					SS-29	B	21	33	42-19-14-20		



Notes:

Approved by :

Sonya Graveline, ing.

SM Labo S.M. inc

BORING LOG

PROJECT: New wharf #4	BOREHOLE: 09-CDF-03
SITE: Alcoa - Baie-Comeau smelter (Quebec)	PAGE: 3 of 3
LOCATION OF BOREHOLE: X : 258498,80 Y : 5456935,56 — CASING: HW/NW	FILE NO: F099382300
EQUIPEMENT USED: D-50 — SAMPLER: Indicated — CORE BARREL NQ	TECHNICIAN: Simon Marois, tech.
SURFACE ELEVATION (m): -11.19 — BORING DATE START: 2009-11-12 07:00:00 END: 2009-11-13 14:00:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◨	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

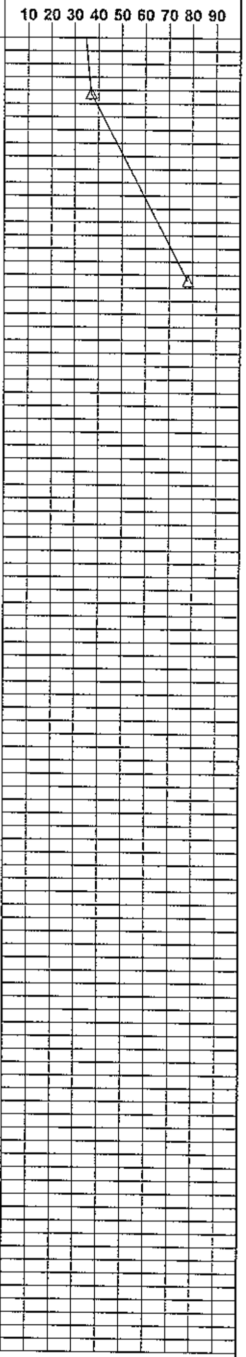
Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY — SAMPLES — LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
				☒	SS-30	N	54	37	24-18-19-26		
21		450mm thick granit boulder at 20,9m depth		■	DC-31	NX	50				
				■	DC-32	NX	58				
				☒	SS-33	B	19	78	18-28-50 /refusal		
22	-33.24 22.07	Rock or boulder		■	DC-34	NX	100				The borehole has been interrupted to realize the borehole 09-07B
	-33.46 22.27	End of borehole; refusal on rock or boulder									
23											
24											
25											
26											
27											
28											
29											



Notes:

Approved by :
Sonya Graveline, ing.

SOIL MATERIALS ANALYSIS REPORT

SM
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3096

File Number : F099382200
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : 09-2944
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-CDF-03, SS-1, 0,0 - 0,6 m
Tests completed on : 2009-12-01

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.
C.U. 5,7
Unified Classification:
Fineness Module: 1,94

% Gravel: 7,6
% Sand: 81,5
% Silt: 10,8
% Clay:

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: **See following chart for particle size analysis.**

Black vitrified material (coal or other.)
Sand,some silt,traces gravel.

Prepared by: ______________________ 2009-12-08
Sylvie Daigle, Tech.

Verified by: ______________________ 2009-12-08
Sonya Graveline, Ing.

SM*i*
LABO S.M. INC.

ANNEXE A

Particle size analysis LC 21-040	
Size (mm)	% sifted (%)
112	100
80	100
56,0	100
40	100
31,5	100
20	100
14,0	100
10,0	98
5,00	92
2,500	82
1,250	74
0,630	66
0,3150	55,0
0,1600	36,0
0,0800	10,8

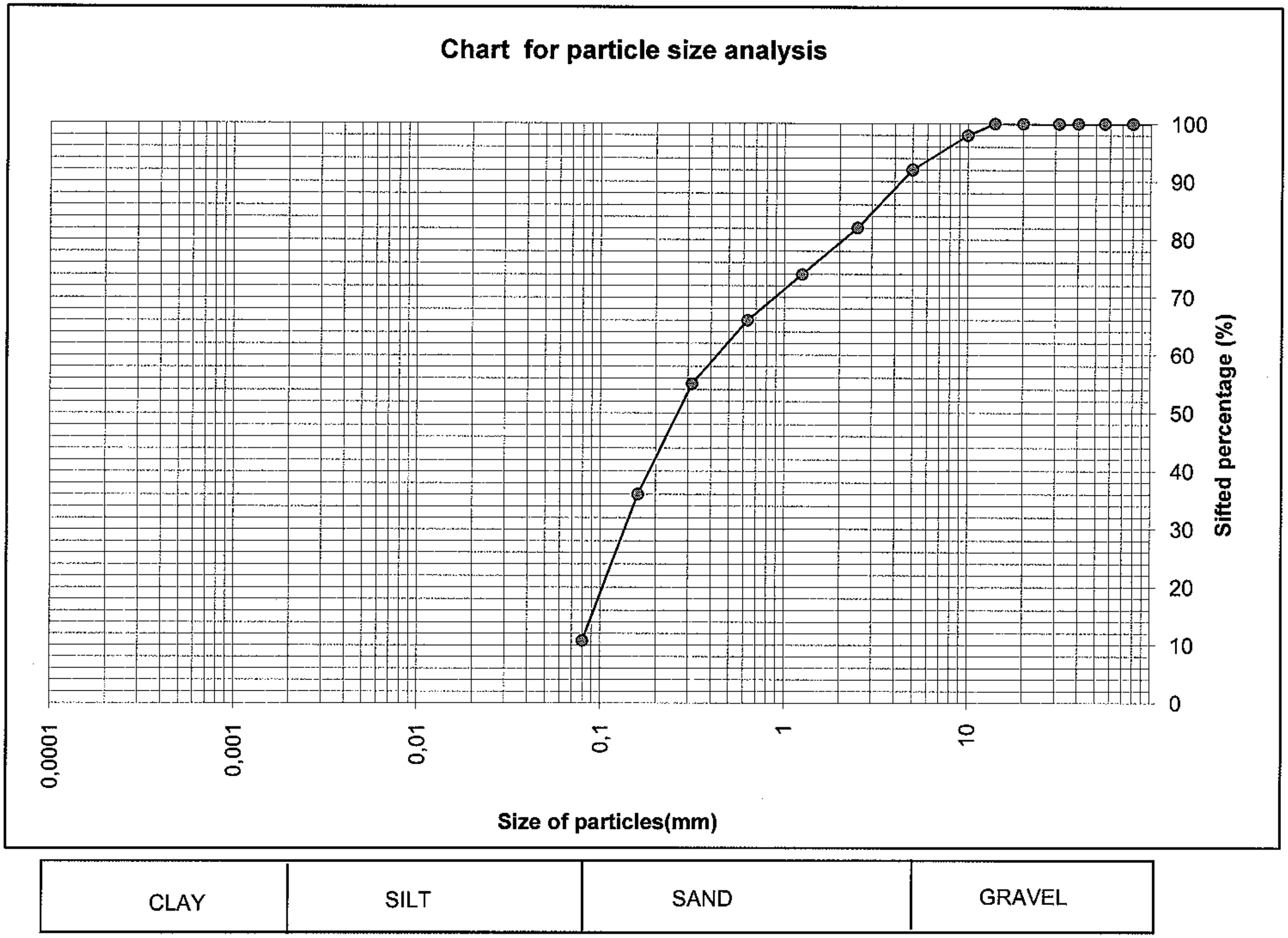


Chart for particle size analysis

Project:

File #: New Baie-Comeau Wharf

Laboratory No.: 09-2944

Type of material: Sand,some silt,traces gravel.

Customer: **F099382200**

Alcoa

Source: 09-CDF-03, SS-1

Approuved by:________________ Date : __________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3092

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2945**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-CDF-03, SS-3 Depth: 1,5 to 2,1 m.
Tests completed on : 2009-12-01

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 1,099
C.U. 2,448
Unified Classification:
Fineness Module: 0,50

% Gravel:
% Sand: 87
% Silt: 13
% Clay:

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: 2009-12-07
Sylvie Daigle, Tech.

Verified by: 2009-12-07
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

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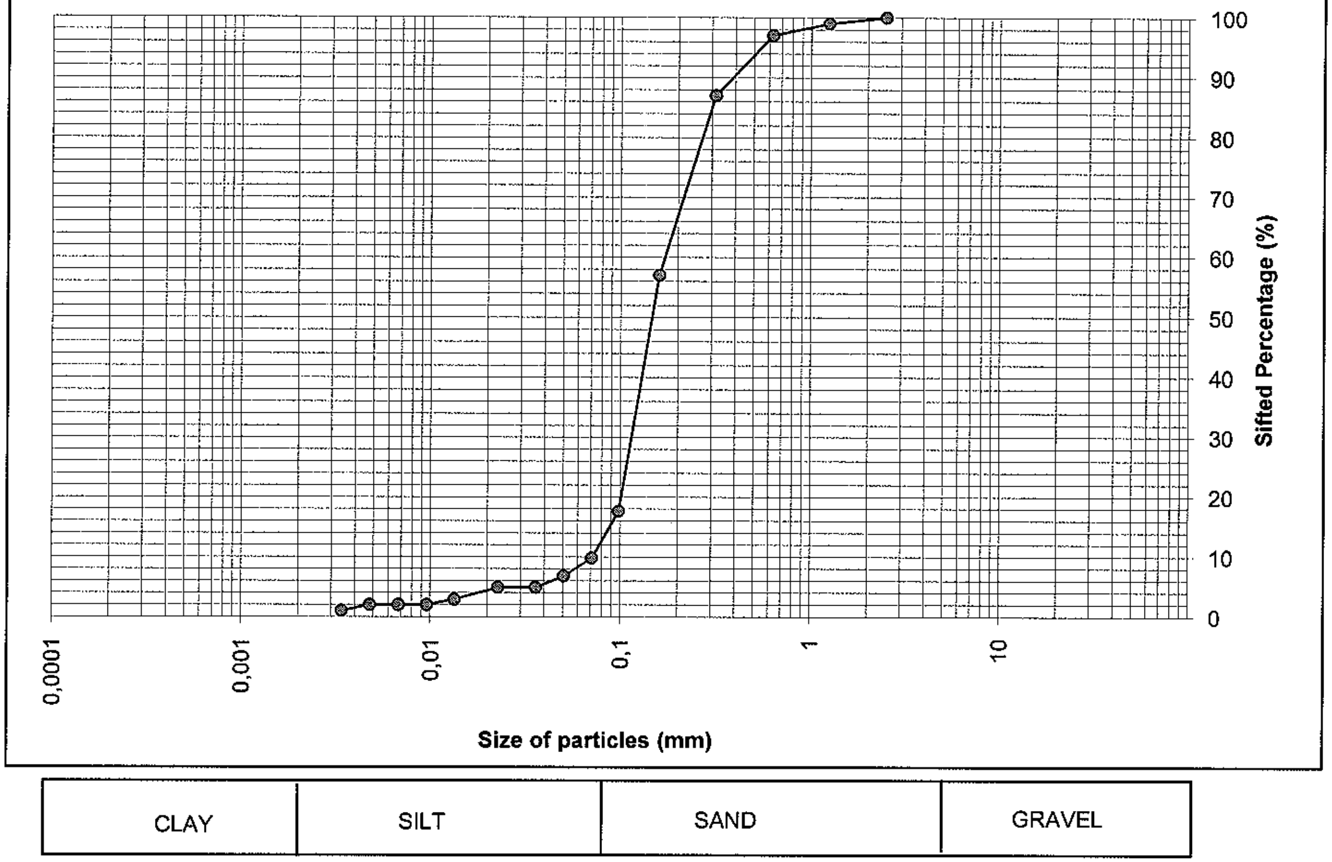
FLS-051b (00-05) rév. 1

SM*i*
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
2,5	100
1,250	99
0,630	97
0,3150	87
0,1600	57
0,0982	17,6
0,0710	9,8
0,0506	6,8
0,0360	4,9
0,0228	4,9
0,0134	2,9
0,0096	2,0
0,0068	2,0
0,0048	2,0
0,0034	1,0

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2945

Type of material: Sand, some silt.

File #: **F099382200**

Source: Material on site, 09-CDF-03,SS-3, Depth: 1,5 to 2,1 m.

Customer: **Alcoa**

Approuved by : ____________ Date : ________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMI
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3179

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2983**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-CDF-03, SS-12, Depth.: 8,4 to 9,0 m.
Tests completed on : 2009-12-07

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	1,471	% Gravel:	65,0
C.U.	21	% Sand:	34
Unified Classification:		% Silt:	1
Fineness Module: 5,03		% Clay:	

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

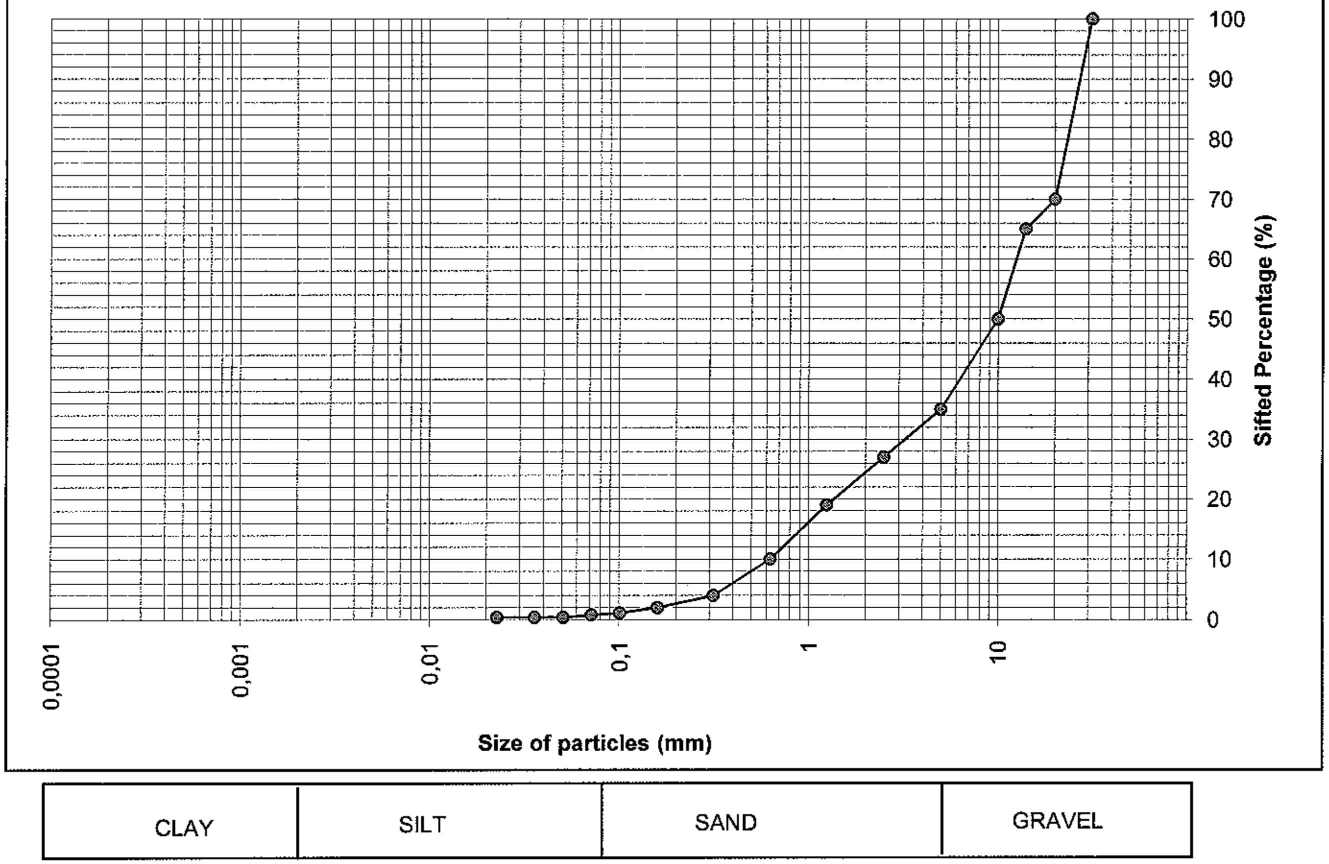
Prepared by: 2009-12-10
Sylvie Daigle, Tech.

Verified by: 2009-12-10
Sonya Graveline, Ing.

SM
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
31,5	100
20,0	70
14,0	65
10,0	50
5,0	35
2,5	27
1,250	19
0,630	10
0,3150	4
0,1600	2
0,1010	1,1
0,0716	0,8
0,0508	0,4
0,0359	0,4
0,0227	0,4

Chart for particle size analysis



Project: New Baie-Comeau wharf
Laboratory No. : 09-2983
Type of material: Sandy gravel,traces silt.
File #: **F099382200**
Source: Material on site, 09-CDF-03,SS-12, Depth: 8,4 to 9,0 m.
Customer: **Alcoa**
Approuved by : ________________ Date : __________

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS3100

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2946**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-CDF-03, SS-14, Depth.: 9,9 to 10,5 n
Tests completed on : 2009-12-01

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 1,464
C.U. 3,85
Unified Classification:
Fineness Module: 1,21

% Gravel:
% Sand: 90
% Silt: 8
% Clay: 2

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: **See following chart for sediments analysis.**

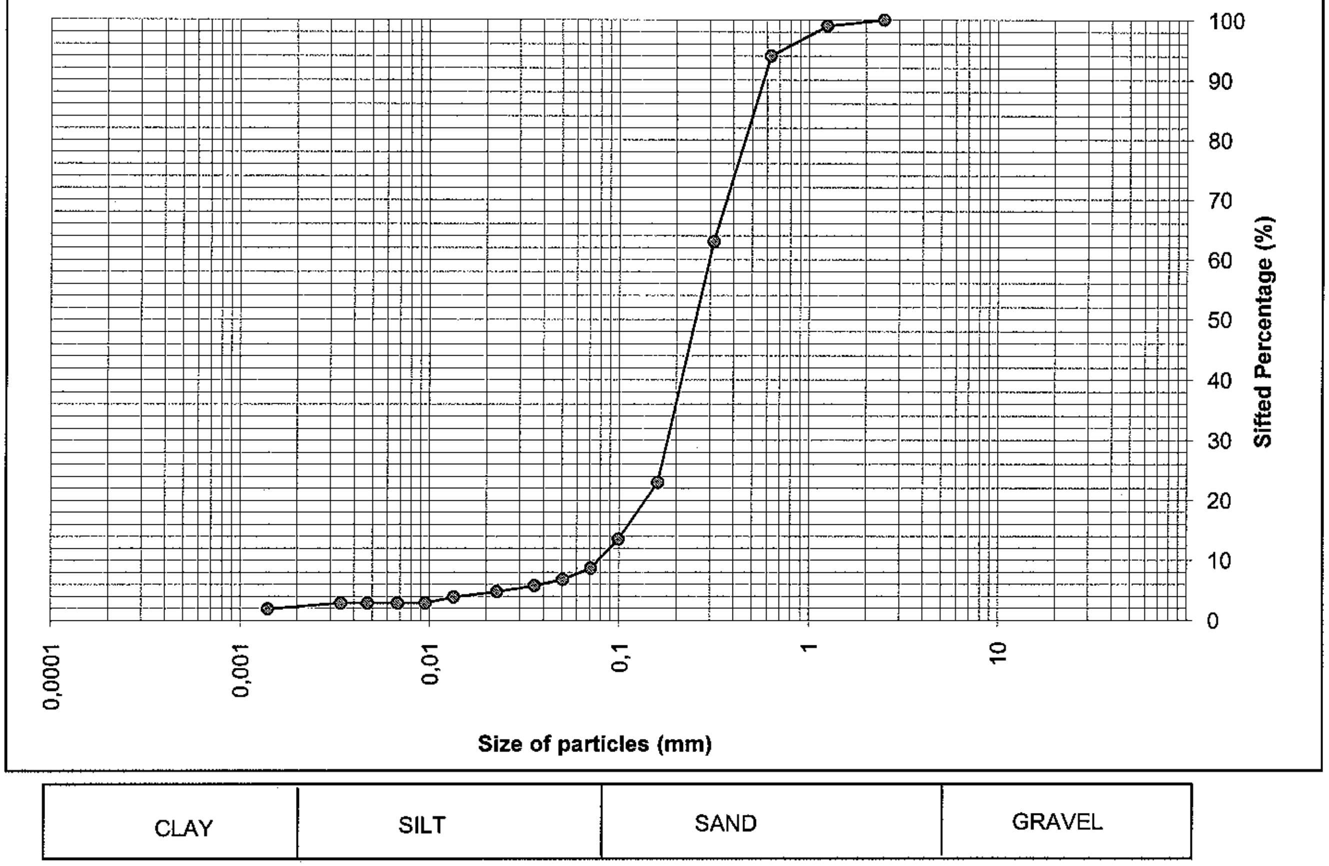
Prepared by: 2009-12-04
Sylvie Daigle, Tech.

Verified by: 2009-12-04
Sonya Graveline, Ing.

SMI
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
2,5	100
1,250	99
0,630	94
0,3150	63
0,1600	23
0,0994	13,5
0,0711	8,7
0,0505	6,8
0,0358	5,8
0,0227	4,8
0,0134	3,9
0,0095	2,9
0,0068	2,9
0,0047	2,9
0,0034	2,9
0,0014	1,9

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2946

Type of material: Sand,traces silt & clay.

File #: **F099382200**

Source: Material on site, 09-CDF-03,SS-14, Depth: 9,9 to 10,5 m.

Customer: **Alcoa**

Approuved by : ______ Date : 8/12/2009.

'FLS-079 (06-2007) rév. 1

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-CDF-04
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 1 of 3
LOCATION OF BOREHOLE: X : 258544,39 Y : 5456915,01		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL**HQ / NQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -9.71	**BORING DATE** **START:** 2009-09-29 17:00:00	**END:** 2009-10-01 10:00:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

⊠	Remoulded
▨	Intact
■	Lost
◫	Rock Core

Laboratory and In situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

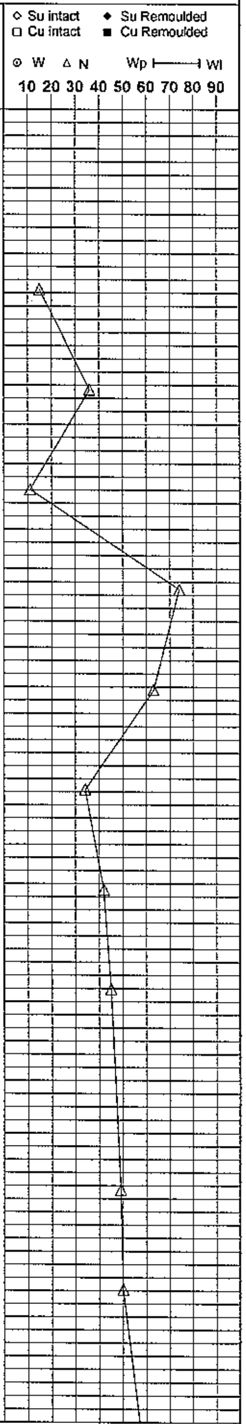
Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY / SAMPLES / LABO AND IN SITU TESTS

Elev. Depth	Soils and Rock Description	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
-9.71 0.00	Black sand with some silt; medium dense.	SS-1	B	25	15	4-5-10-7		
-11.59 1.88	Soils becoming gray	SS-2	B	54	36	5-15-21-15		GSA, CU=4.2
-12.22 2.52	Gray gravelly sand; dense.	SS-3	B	0	11	2-3-8-14		
		SS-4	B	12	74	15-53-21-16		
		SS-5	N	8	63	23-28-35-26		
-14.51 4.80	Gray sand with trace silt and gravel; dense.	SS-6	B	42	34	9-13-21-24		GSA, CU=3.5
		SS-7	B	8	42	15-18-24-24		
		SS-8	N	25	45	9-20-25-22		
-16.79 7.09	Gray sandy gravel with trace silt; dense.	SS-9	B	0		50 /refusal		Many refusals on coarse gravel
		SS-10	B	8	49	26-27-22-21		
		SS-11	B	8	50	21-28-22-17		
		SS-12	B	45		48-50 /refusal		GSA, CU=104



Notes:

Approved by :
Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-CDF-04
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 2 of 3
LOCATION OF BOREHOLE: X : 258544,39 Y : 5456915,01		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL** HQ / NQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -9.71	**BORING DATE** **START:** 2009-09-29 17:00:00	**END:** 2009-10-01 10:00:00	

Type of Sampler

SS: Split Spoon
DC: Diamond Core
WS: Wash Sample
HT: Hydraulic Trust
HW: Hammer Weight
SP: Shelby and Piston
AS: Auger Sampler
ST: Thin Walled Shelby Tube

☒ Remoulded
▨ Intact
■ Lost
◫ Rock Core

Laboratory and in situ tests - Parameters

N: SPT N-Value
Nd: DCPT Nd-Value
Su: Field Vane
GSA: Grain size analysis
CU: Uniformity coefficient
W: Water Content
Wp: Plastic limit
Wl: Liquid limit

Ip: Plasticity index:
D: Specific density
Cu: Swedish cone
C: Consolidation
PP: Preconsolidation pressure
Cc: Compression index
Ccr: Recompression index
UC: Unconfined compression

DS: Direct shear
Phi': Angle of internal friction
c': Cohesion
CUT: Consolidation undrained triaxial

Water level

Date: Time: Elev.(m):

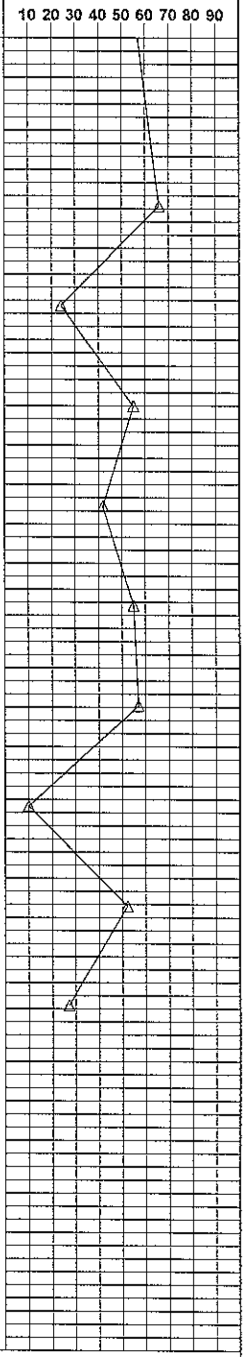
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
				☒	SS-13	N	34		59 /refusal		
	-20.37 10.67	Gray fine to coarse sand, trace silt; dense.									
11											
				☒	SS-14	N	21	66	21-32-34-40		
12				☒	SS-15	B	42	24	0-8-16-23		
				☒	SS-16	B	83	55	11-25-30-30		
13											
				☒	SS-17	B	62	42	14-16-26-30		
14											
				☒	SS-18	B	83	55	0-27-28-25		
15				☒	SS-19	B	25	57	26-30-27-23		
16				☒	SS-20	B	29	10	7-4-6-7		8 cm sanding up at 15,4 m depth 80 cm sanding up at 15,5 m depth
				☒	SS-21	B	25	52	42-32-20-11		
17				■	SS-22	B	0	27	14-16-11-22		
	-27.38 17.68	Rock: Gray granitic rock, excellent quality	+	◫							
18			+	◫	DC-23	HQ	98				
19			+	◫							
			+	◫	DC-24	NQ	100	98			



Notes:

Approved by :
Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4	**BOREHOLE:** 09-CDF-04
SITE: Alcoa - Baie-Comeau smelter (Quebec)	**PAGE:** 3 of 3
LOCATION OF BOREHOLE: X : 258544,39 Y : 5456915,01 — **CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50 — **SAMPLER:** Indicated — **CORE BARREL** HQ / NQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -9.71 — **BORING DATE START:** 2009-09-29 17:00:00 **END:** 2009-10-01 10:00:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒ Remoulded
▨ Intact
■ Lost
◨ Rock Core

Laboratory and In situ tests - Parameters

N:	SPT N-Value
Nd:	DCPT Nd-Value
Su:	Field Vane
GSA:	Grain size analysis
CU:	Uniformity coefficient
W:	Water Content
Wp:	Plastic limit
Wl:	Liquid limit
Ip:	Plasticity index
D:	Specific density
Cu:	Swedish cone
C:	Consolidation
PP:	Preconsolidation pressure
Cc:	Compression index
Ccr:	Recompression index
UC:	Unconfined compression
DS:	Direct shear
Phi':	Angle of internal friction
c':	Cohesion
CUT:	Consolidation undrained triaxial

Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY — SAMPLES — LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks	10 20 30 40 50 60 70 80 90
			+									
			+		DC-25	NQ	100	100				
21			+									
			+									
22			+		DC-26	NQ	100	100				
			+									
23			+		DC-27	NQ	100	100				
			+									
24	-33.61 23.90	End of borehole										
25												
26												
27												
28												
29												

Notes:

Approved by :
Sonya Graveline, ing.

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2544

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2339**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-CDF-04, SS-2, Depth.: 1,8 to 2,4 m.
Tests completed on : 2009-10-20

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 0,985
C.U. 4,233
Unified Classification:
Fineness Module: 1,07

% Gravel: 1
% Sand: 84
% Silt: 14
% Clay: 1

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

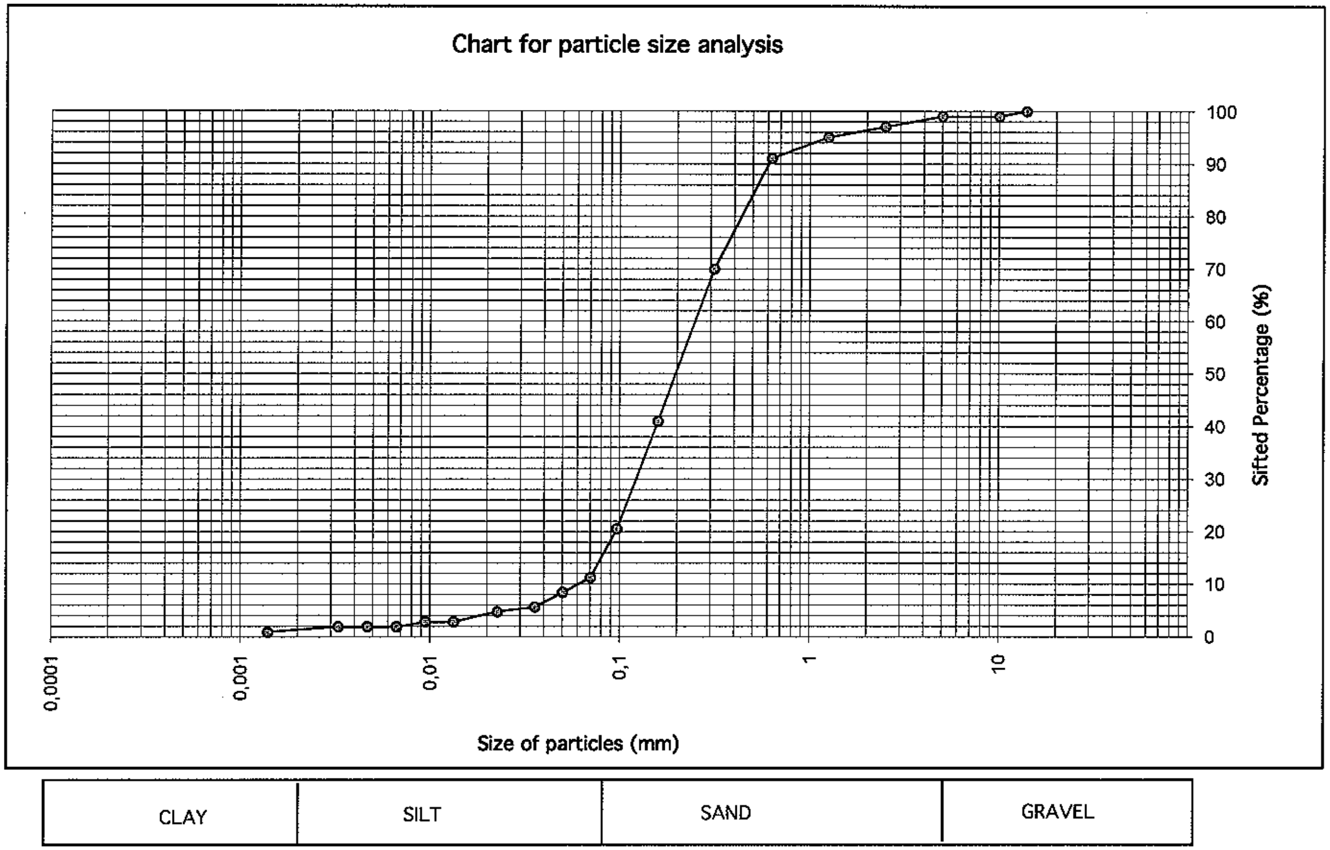
Prepared by: ______________ 2009-10-21
Sylvie Daigle, Tech.

Verified by: ______________ 2009-10-21
Sonya Graveline, Ing.

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
14,0	100
10,0	99
5,0	99
2,5	97
1,250	95
0,630	91
0,3150	70
0,1600	41
0,0971	20,5
0,0705	11,2
0,0503	8,4
0,0358	5,6
0,0227	4,7
0,0134	2,8
0,0095	2,8
0,0067	1,9
0,0047	1,9
0,0033	1,9
0,0014	0,9

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2339

Type of material: Sand,some silt, traces gravel & clay.

File #: **F099382200**

Source: Material on site, 09-CDF-04,SS-2, Depth: 1,8 to 2,4 m.

Customer: **Alcoa**

Approuved by : Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2543

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2341**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-CDF-04, SS-6, Depth.: 4,9 to 5,5 m.
Tests completed on : 2009-10-20

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 1,016
C.U. 3,518
Unified Classification:
Fineness Module: 2,53

% Gravel: 10
% Sand: 87
% Silt: 3
% Clay:

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: 2009-10-21
Sylvie Daigle, Tech.

Verified by: 2009-10-21
Sonya Graveline, Ing.

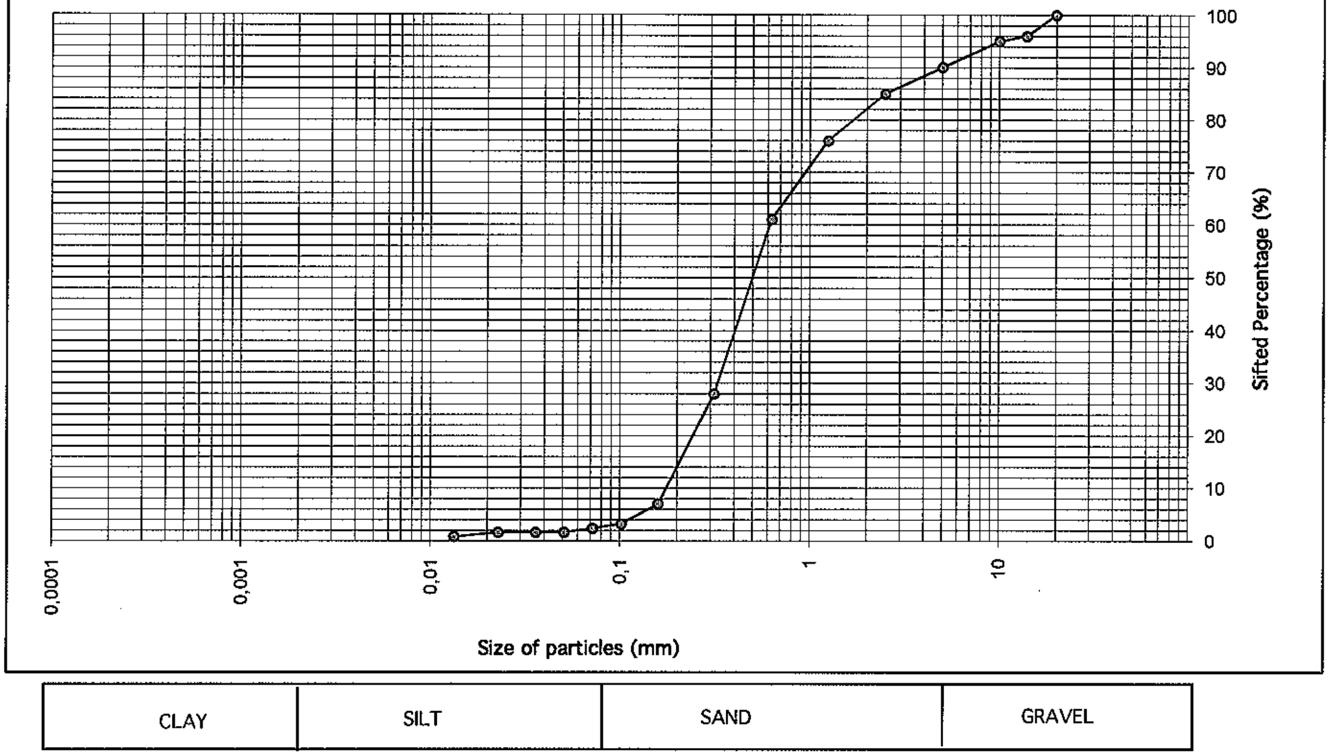
N.B. These results are exclusively for analysis sampled.

This report must not be copied, in part or in full, without written authorization from Labo S.M. inc.

SM*i*
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
20,0	100
14,0	96
10,0	95
5,0	90
2,5	85
1,250	76
0,630	61
0,3150	28
0,1600	7
0,1019	3,2
0,0722	2,4
0,0511	1,6
0,0361	1,6
0,0229	1,6
0,0134	0,8

Chart for particle size analysis



Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2341

Type of material: Sand, some gravel,traces silt.

Source: Material on site, 09-CDF-04,SS-6, Depth: 4,9 to 5,5 m.

Approuved by :__________ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2542

File Number	**: F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: ------
City	: Baie-Comeau (Québec)	Uses	: ------
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	**: 09-2342**	Source	: 09-CDF-04, SS-12, Depth.: 9,4 to 9,7 m.
Sample No.	: ------	Tests completed on	: 2009-10-20

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 0,343
C.U. 104
Unified Classification:
Fineness Module: 4,51

% Gravel: 61,7
% Sand: 36,3
% Silt: 2
% Clay:

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for particle size analysis.

Prepared by: 2009-10-21
Sylvie Daigle, Tech.

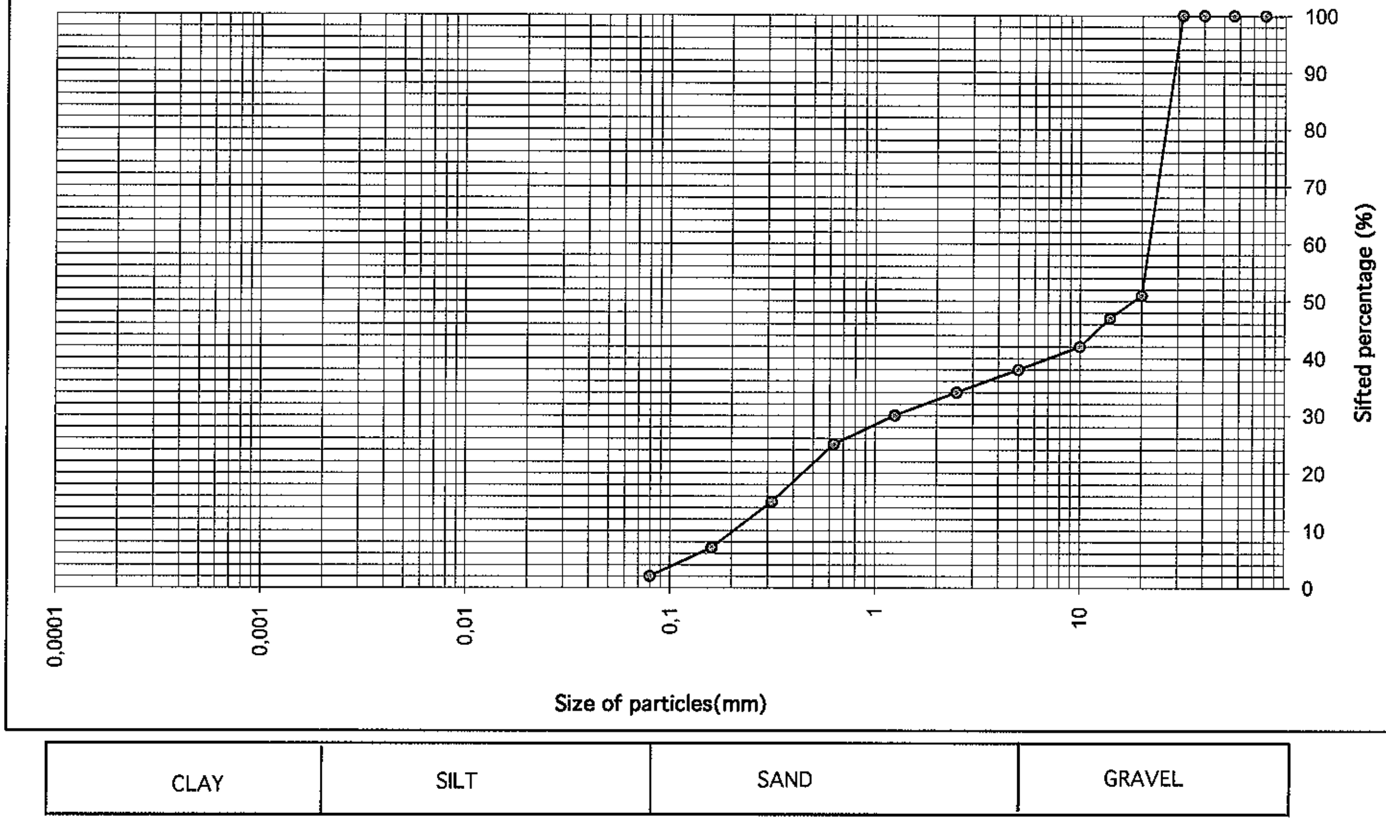
Verified by: 2009-10-21
Sonya Graveline, Ing.

SMi
LABO S.M. INC.

ANNEXE A

Particle size analysis LC 21-040	
Size (mm)	% sifted (%)
112	100
80	100
56,0	100
40	100
31,5	100
20	51
14,0	47
10,0	42
5,00	38
2,500	34
1,250	30
0,630	25
0,3150	15,0
0,1600	7,0
0,0800	2,0

Chart for particle size analysis



Project: New Baie-Comeau Wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No.: 09-2342

Type of material: Gravel & sand, traces silt.

Source: 09-CDF-04, SS-12
Depth: 9,4 to 9,7 m.

Approuved by: ______________ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-CDF-05
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 1 of 4
LOCATION OF BOREHOLE: X : 258544,79 Y : 5456940,99		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL** NQ/NX	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -10.48	**BORING DATE** **START:** 2009-09-21 18:00:00	**END:** 2009-09-23 05:00:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◨	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression Index		
Wl:	Liquid limit	UC:	Unconfined compression		

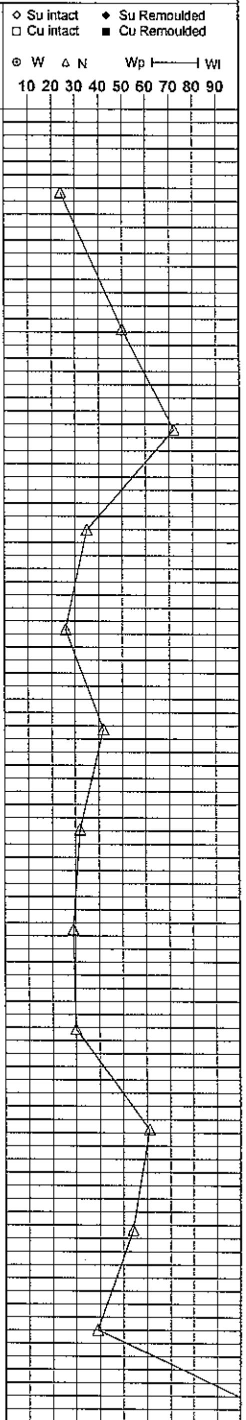
Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY / SAMPLES / LABO AND IN SITU TESTS

Depth	Elev. Depth -10.48	Soils and Rock Description	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
	0.00	Gray fine to coarse sand with trace to some silt, trace gravel; dense.								
			☒	SS-1	B	62	24	7-11-13-15		
1										
			☒	SS-2	B	46	50	20-24-26-25		
2										
			■	SS-3	B	0	72	49-36-36-32		
3										
			☒	SS-4	B	62	35	10-17-18-19		GSA, CU=3.8
4			☒	SS-5	B	17	26	12-13-13-19		
			■	SS-6	B	0	42	12-17-25-24		
5										
			☒	SS-7	B	25	32	10-15-17-24		
6			☒	SS-8	B	33	29	12-13-16-16		
7			☒	SS-9	B	46	30	10-14-16-24		
			☒	SS-10	B	62	61	16-25-36-43		
8										
			☒	SS-11	B	25	54	-26-28-25		Blow for the first 150mm SPT hasn't been obtained because the split spoon sank into soil
9										
			☒	SS-12	B	50	39	9-21-18-21		
			☒	SS-13	N	30	129	44-56-73-50		



Notes:

Approved by :

Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-CDF-05
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 2 of 4
LOCATION OF BOREHOLE: X : 258544,79 Y : 5456940,99		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL** NQ/NX	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -10.48	**BORING DATE START:** 2009-09-21 18:00:00	**END:** 2009-09-23 05:00:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◧	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

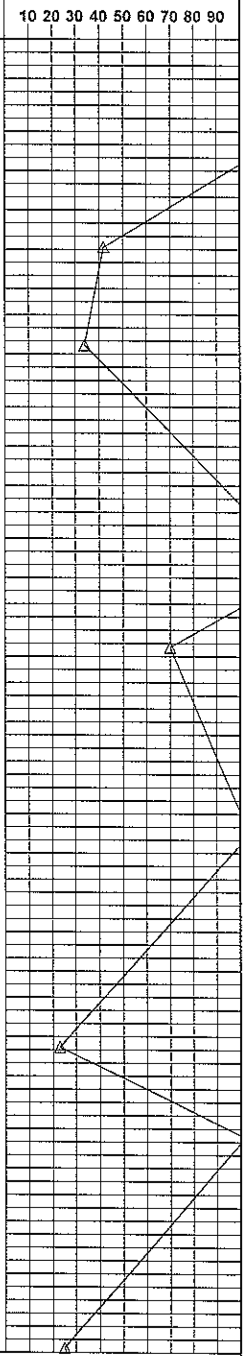
Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY | SAMPLES | LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
				☒					/refusal		
				■	SS-14	N	0	119	32-54-65		
11											
				☒	SS-15	B	17	42	3-14-28-31		Sanding up at 11,3 m depth
12											
				☒	SS-16	B	57	34	8-10-24-50 /refusal		GSA, CU=3.9
13				☒	SS-17	B	54		65-50 /refusal		Many refusals on coarse gravel
14				☒	SS-18	B	56	128	38-68-60		
				☒	SS-19	B	50	70	10-29-41-55		
15											
				☒	SS-20	B	100		53-50 /refusal		
16				☒	SS-21	B	100	104	33-54-50 /refusal		GSA, CU=6.8
				■	SS-22	N	0		100 /refusal		
17											
				☒	SS-23	B	54	23	16-10-13-16		
18											
				☒	SS-24	B	61	102	23-50-52		
19				☒	SS-25	B	73		32-50 /refusal		
				☒	SS-26	B	50	25	11-13-12-15		



Notes:

Approved by :

Sonya Graveline, ing.

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-CDF-05
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 3 of 4
LOCATION OF BOREHOLE: X : 258544,79 Y : 5456940,99		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL**NQ/NX	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -10.48	**BORING DATE** **START:** 2009-09-21 18:00:00	**END:** 2009-09-23 05:00:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◧	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value
Nd:	DCPT Nd-Value
Su:	Field Vane
GSA:	Grain size analysis
CU:	Uniformity coefficient
W:	Water Content
Wp:	Plastic limit
Wl:	Liquid limit
Ip:	Plasticity index:
D:	Specific density
Cu:	Swedish cone
C:	Consolidation
PP:	Preconsolidation pressure
Cc:	Compression index
Ccr:	Recompression index
UC:	Unconfined compression
DS:	Direct shear
Phi':	Angle of internal friction
c':	Cohesion
CUT:	Consolidation undrained triaxial

Water level

Date:	Time:	Elev.(m):

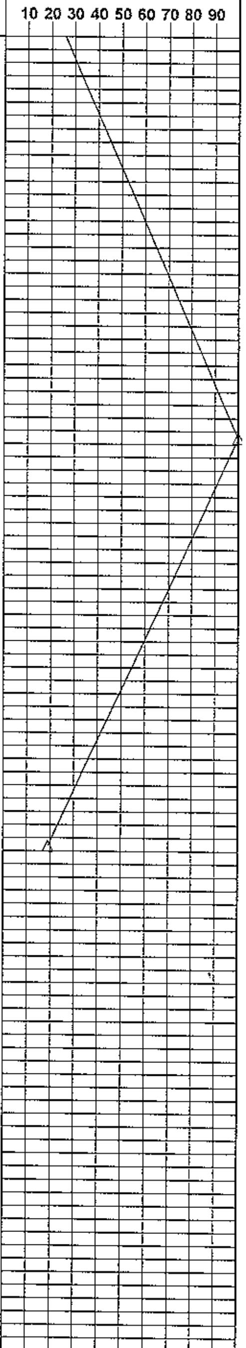
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
21											
					WS-27						
22											
23					SS-28	B	80	100	22-50-50 /refusal		Sanding up at 22,5 m depth
24											
					SS-29	B	100		50 /refsual		
25											
26					SS-30	B	60	19	7-9-10-50 /refusal		
27											
	-37.91 27.43	Rock: Gray granitic rock; excellent quality	+		SS-31 DC-32	B NX	91		/refusal		
28			+								
			+		DC-33	NQ	100	100			
29			+								
			+		DC-34	NQ	100	100			



Notes:

Approved by :
Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-CDF-05
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 4 of 4
LOCATION OF BOREHOLE: X : 258544,79 Y : 5456940,99		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL** NQ/NX	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -10.48	**BORING DATE** **START:** 2009-09-21 18:00:00	**END:** 2009-09-23 05:00:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◧	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. / Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks	10 20 30 40 50 60 70 80 90
			+	◧								
31			+	◧								
			+	◧	DC-35	NQ	100	100				
			+	◧								
32			+	◧								
			+	◧	DC-36	NQ		100				
33			+	◧								
	-44.01 33.53	End of borehole										
34												
35												
36												
37												
38												
39												

Notes:

Approved by :

Sonya Graveline, ing.

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2325

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2145**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-CDF-05, SS-4, Depth.: 2,9 to 3,5 m.
Tests completed on : 2009-10-02

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 1,114
C.U. 3,776
Unified Classification:
Fineness Module: 1,54

% Gravel: 1,6
% Sand: 91,6
% Silt: 6,8
% Clay:

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: ____________ 2009-10-07
Sylvie Daigle, Tech.

Verified by: ____________ 2009-10-07
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

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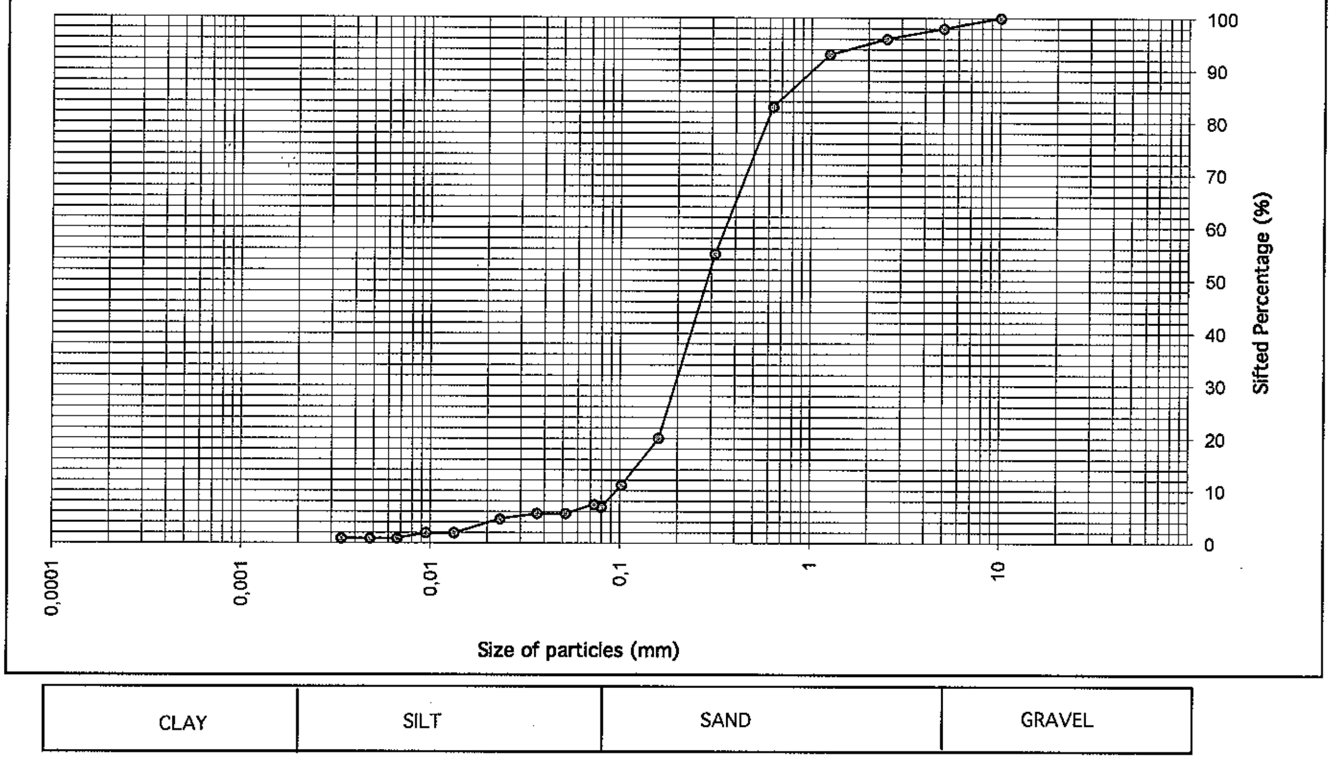
FLS-051b (00-05) rév. 1

SMi
LABO S.M. INC.

Sediments Analysis NO 2501-025	
Size (mm)	% Sifted (%)
10	100
5	98
2,5	96
1,250	93
0,630	83
0,3150	55
0,1600	20
0,1022	11,1
0,0800	6,8
0,0729	7,4
0,0519	5,6
0,0367	5,6
0,0233	4,6
0,0134	1,9
0,0095	1,9
0,0067	0,9
0,0048	0,9
0,0034	0,9

Chart for particle size analysis



Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2145

Type of material: Sand, traces silt & gravel.

Source: Material on site, 09-CDF-05,SS-4, Depth: 2,9 to 3,5 m.

Approuved by : ____________ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2327

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2146**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-CDF-05, SS-16, Depth.: 12 to 12,6 m.
Tests completed on : 2009-10-02

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 1,17
C.U. 3,938
Unified Classification:
Fineness Module: 1,54

% Gravel: 3,2
% Sand: 88,6
% Silt: 8,2
% Clay:

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: Sylvie Daigle, Tech. 2009-10-07

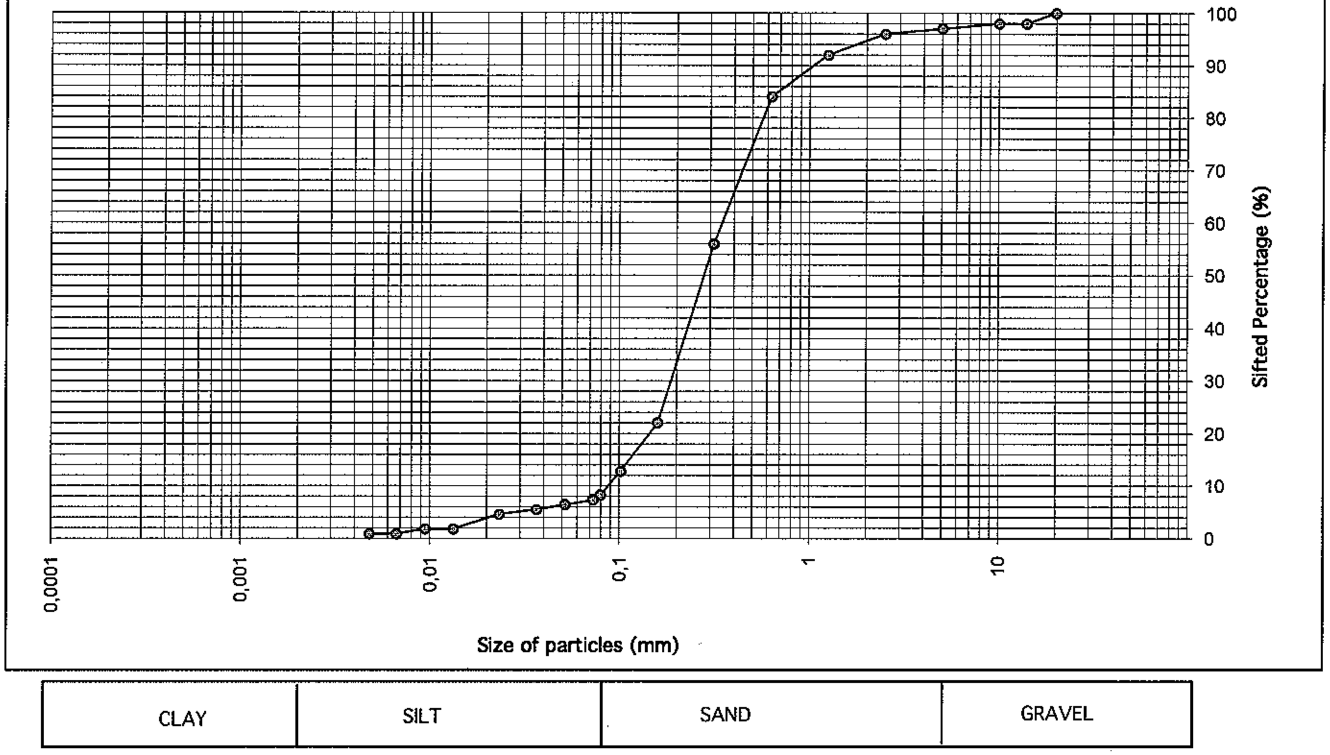
Verified by: Sonya Graveline, Ing. 2009-10-07

SM*i*

LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
20	100
14	98
10	98
5	97
2,5	96
1,250	92
0,630	84
0,3150	56
0,1600	22
0,1020	12,8
0,0800	8,2
0,0731	7,3
0,0518	6,4
0,0368	5,5
0,0233	4,6
0,0134	1,8
0,0095	1,8
0,0067	0,9
0,0048	0,9

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2146

Type of material: Sand, traces silt & gravel.

File #: **F099382200**

Source: Material on site, 09-CDF-05,SS-16, Depth: 12 to 12,6 m.

Customer: **Alcoa**

Approuved by :__________ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM
LABO S.M. INC

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2328

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2147**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-CDF-05, SS-21, Depth.: 15,8 to 16,3 m.
Tests completed on : 2009-10-02

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	1,624	% Gravel:	0
C.U.	6,765	% Sand:	79
Unified Classification:		% Silt:	19
Fineness Module:	0,86	% Clay:	2

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

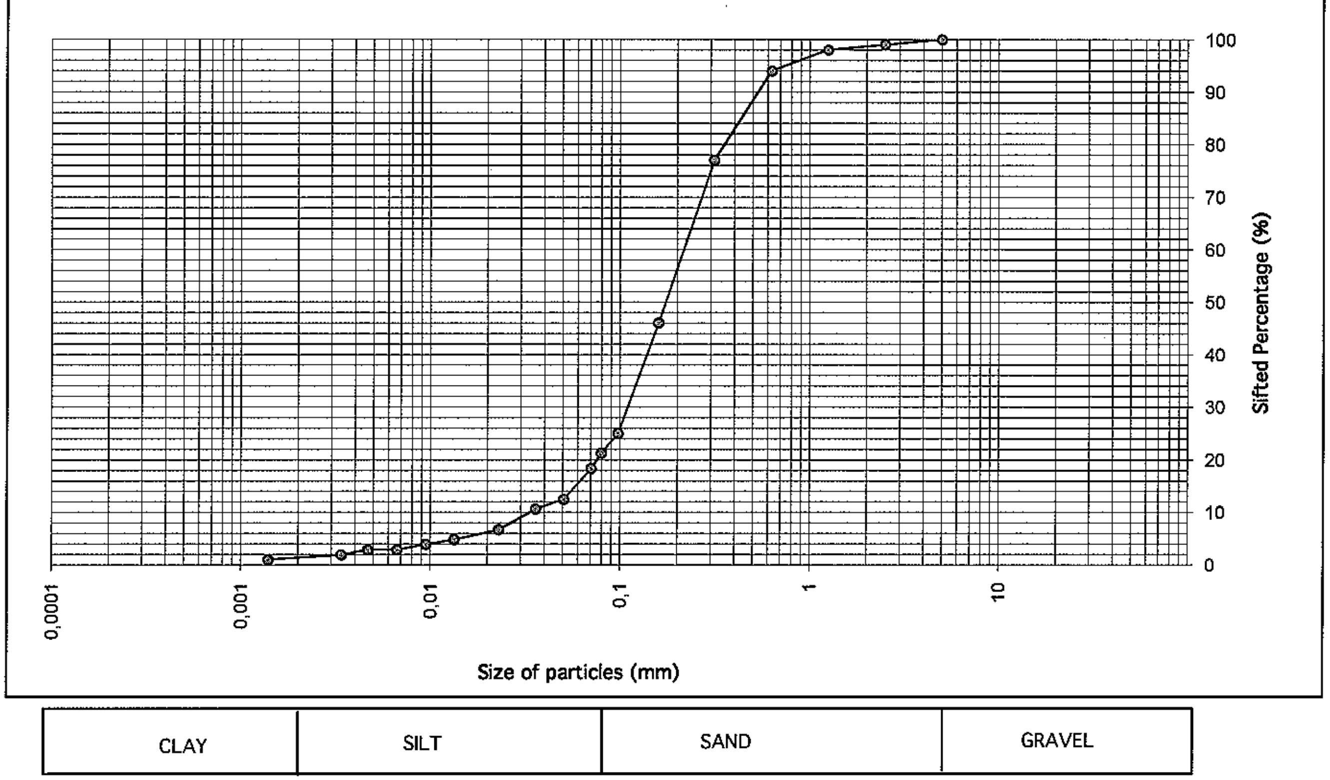
Prepared by: 2009-10-07
Sylvie Daigle, Tech.

Verified by: 2009-10-07
Sonya Graveline, Ing.

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
5	100
2,5	99
1,250	98
0,630	94
0,3150	77
0,1600	46
0,0979	25,0
0,0800	21,3
0,0706	18,3
0,0507	12,5
0,0360	10,6
0,0230	6,7
0,0134	4,8
0,0095	3,9
0,0067	2,9
0,0047	2,9
0,0034	1,9
0,0014	1,0

Chart for particle size analysis



Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2147

Type of material: Sand, some silt, traces clay.

Source: Material on site, 09-CDF-05,SS-21, Depth: 15,8 to 16,3 m.

Approuved by : ______ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-CDF-06
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 1 of 3
LOCATION OF BOREHOLE: X : 258540,44 Y : 5456958,88		**CASING:** NW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL**	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -12.33	**BORING DATE START:** 2009-10-05 17:00:00 **END:** 2009-10-06 14:00:00		

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◧	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

Water level

Date:	Time:	Elev.(m):

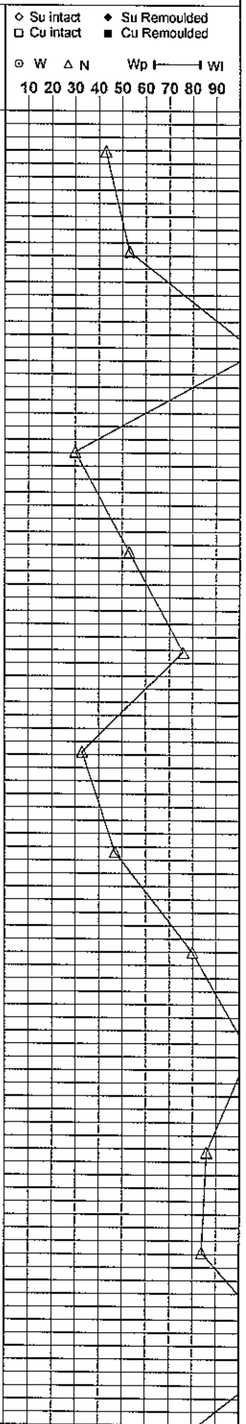
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth -12.33	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
	0.00	Gray medium sand with trace gravel and silt; very dense:		☒	SS-1	B	54	43	17-21-22-25		GSA, CU=4,4
1				☒	SS-2	B	46	53	18-37-16-15		
2				☒	SS-3	B	71	107	53-53-54-46		
3				☒	SS-4	B	54	30	15-16-14-14		
				☒	SS-5	B	17	53	31-27-26-24		
4				☒	SS-6	B	42	76	12-22-54-23		
5				☒	SS-7	B	54	33	11-16-17-23		
6				☒	SS-8	B	67	47	20-22-25-26		
				■	SS-9	B	0	80	20-40-40-31		
7				☒	SS-10	N	71	104	26-32-72-56		GSA, CU=4.8
8				☒	SS-11	B	71	86	26-37-49-69		
9				☒	SS-12	B	67	84	25-36-48-60		
				☒	SS-13	B	58	122	26-57-65-69		GSA, CU=3.1



Notes:

Approved by :
Sonya Graveline, ing.

SM Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-CDF-06
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 2 of 3
LOCATION OF BOREHOLE: X : 258540,44 Y : 5456958,88		**CASING:** NW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL**	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -12.33	**BORING DATE START:** 2009-10-05 17:00:00	**END:** 2009-10-06 14:00:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒	Remoulded
▨	Intact
■	Lost
◨	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

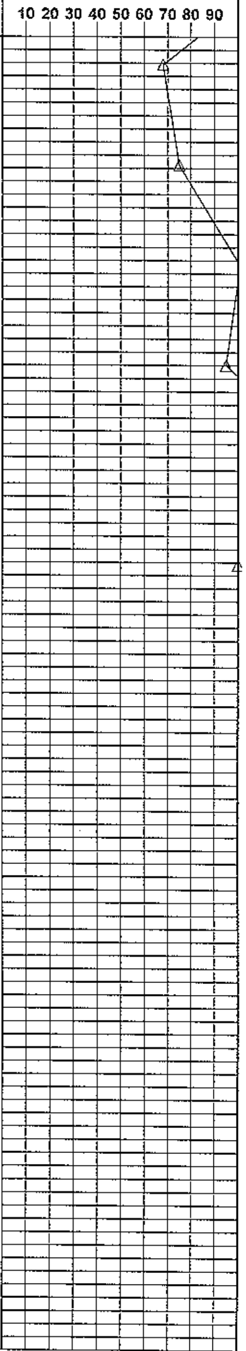
Water level

Date: Time: Elev.(m):

Installation:

STRATIGRAPHY | SAMPLES | LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
					SS-14	B	58	68	21-32-36-49		
11					SS-15	B	58	75	19-26-49-43		
12					SS-16	B	42	101	56-52-49-38		
					SS-17	B	71	95	23-36-59-54		
13					SS-18	N	75	141	53-63-78-76		
14					SS-19	B	67	100	27-47-53-58		90 cm sanding up at 13,8 m depth
	-26.71 14.38	Gravel and cobbles up to 200mmØ			DC-20	NX	0				
15					SS-21	B	0		50 /refusal		
16					SS-22	B	0		100 /refusal		
17	-29.32 16.99	Gray sand with trace silt and gravel; very dense. Gravel up to 70mmØ			SS-23	B	14	123	22-52-71-76		Many refusals on coarse gravel
18					SS-24	B	54		37-50 /refusal		
					SS-25	B	33		50 /refusal		
19					SS-26	B	0		50 /refusal		



Notes:

Approved by :
Sonya Graveline, ing.

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-CDF-06
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 3 of 3
LOCATION OF BOREHOLE: X : 258540,44 Y : 5456958,88		**CASING:** NW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL**	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -12.33	**BORING DATE START:** 2009-10-05 17:00:00	**END:** 2009-10-06 14:00:00	

Type of Sampler

SS: Split Spoon
DC: Diamond Core
WS: Wash Sample
HT: Hydraulic Trust
HW: Hammer Weight
SP: Shelby and Piston
AS: Auger Sampler
ST: Thin Walled Shelby Tube

☒ Remoulded
▨ Intact
■ Lost
◨ Rock Core

Laboratory and in situ tests - Parameters

N: SPT N-Value
Nd: DCPT Nd-Value
Su: Field Vane
GSA: Grain size analysis
CU: Uniformity coefficient
W: Water Content
Wp: Plastic limit
Wl: Liquid limit
Ip: Plasticity index:
D: Specific density
Cu: Swedish cone
C: Consolidation
PP: Preconsolidation pressure
Cc: Compression index
Ccr: Recompression index
UC: Unconfined compression
DS: Direct shear
Phi': Angle of internal friction
c': Cohesion
CUT: Consolidation undrained triaxial

Water level

Date: Time: Elev.(m):

Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks	10 20 30 40 50 60 70 80 90
				■	SS-27	B	0		50 /refusal			
21												
22												
				☒	SS-28	B	100		70 /refusal		GSA, CU=2.8	
23												
				☒	SS-29	B	50		79 /refusal			
24												
25	-37.48 25.15	End of borehole		☒	SS-30	B	50		76 /refusal			
26												
27												
28												
29												

Notes:

Approved by :
Sonya Graveline, ing.

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2545

File Number	**: F099382200**			
Customer	: Alcoa		Type of Material	: ------
Address	: 100, route Maritime		Caliber	: ------
City	: Baie-Comeau (Québec)		Uses	: ------
Postal Code	:		Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf			:
Site	:			:
Laboratory No.	**: 09-2343**		Source	: 09-CDF-06, SS-1, Depth.: 0 to 0,6 m.
Sample No.	: ------		Tests completed on	: 2009-10-21

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	0,907	% Gravel:	9
C.U.	4,441	% Sand:	85
Unified Classification:		% Silt:	6
Fineness Module: 2,00		% Clay:	

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

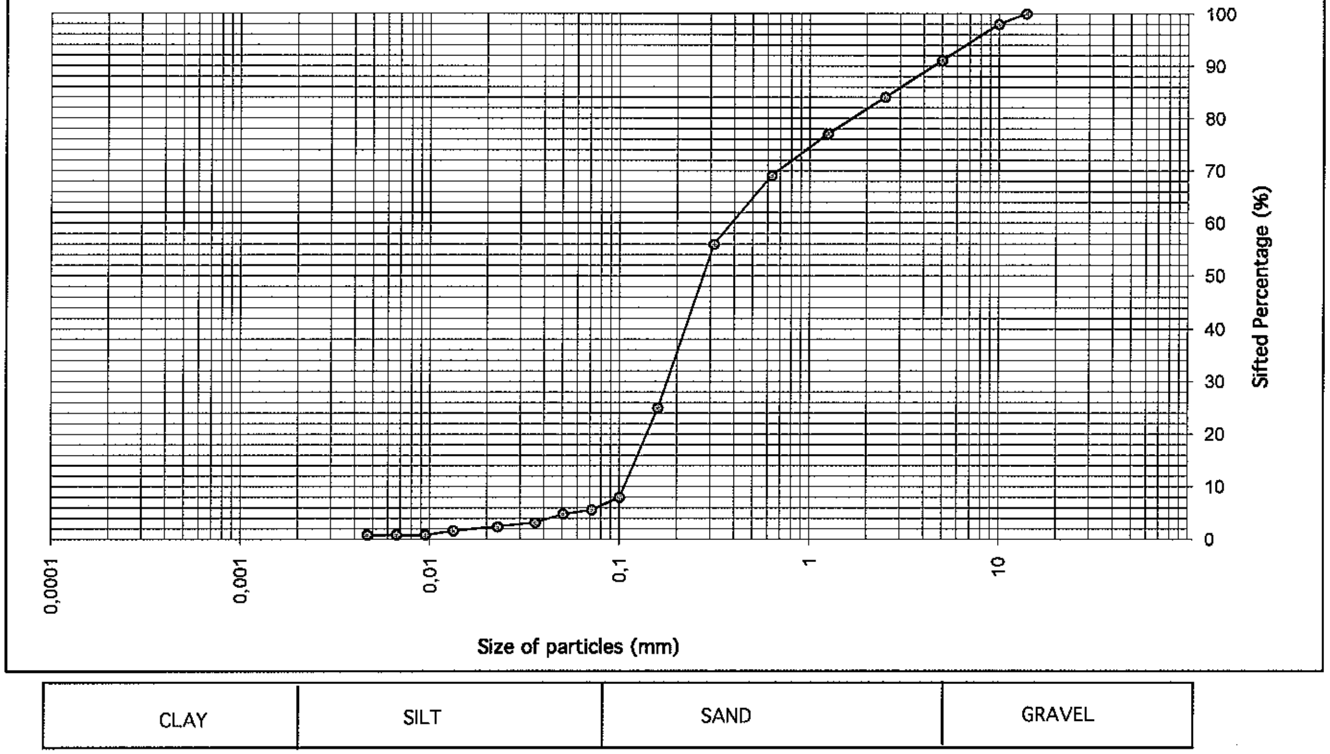
Prepared by: ______________ 2009-10-21
Sylvie Daigle, Tech.

Verified by: ______________ 2009-10-21
Sonya Graveline, Ing.

SMi
LABO S.M. INC.

Sediments Analysis NO 2501-025	
Size (mm)	% Sifted (%)
14,0	100
10,0	98
5,0	91
2,5	84
1,250	77
0,630	69
0,3150	56
0,1600	25
0,1005	8,0
0,0715	5,6
0,0507	4,8
0,0361	3,2
0,0229	2,4
0,0134	1,6
0,0095	0,8
0,0067	0,8
0,0047	0,8

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2343

Type of material: Sand,traces gravel & silt.

File #: **F099382200**

Source: Material on site, 09-CDF-06,SS-1, Depth: 0 to 0,6 m.

Customer: **Alcoa**

Approuved by : ________ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM*i*
LABO S.M. INC

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2546

File Number	**: F099382200**		
Customer	: Alcoa	Type of Material	: -----
Address	: 100, route Maritime	Caliber	: ------
City	: Baie-Comeau (Québec)	Uses	: ------
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	**: 09-2344**	Source	: 09-CDF-06, SS-10, Depth.: 6,8 to 7,5 m.
Sample No.	: ------	Tests completed on	: 2009-10-21

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	0,997	% Gravel:	8
C.U.	4,779	% Sand:	84
Unified Classification:		% Silt:	8
Fineness Module:	1,75	% Clay:	

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: 2009-10-21
Sylvie Daigle, Tech.

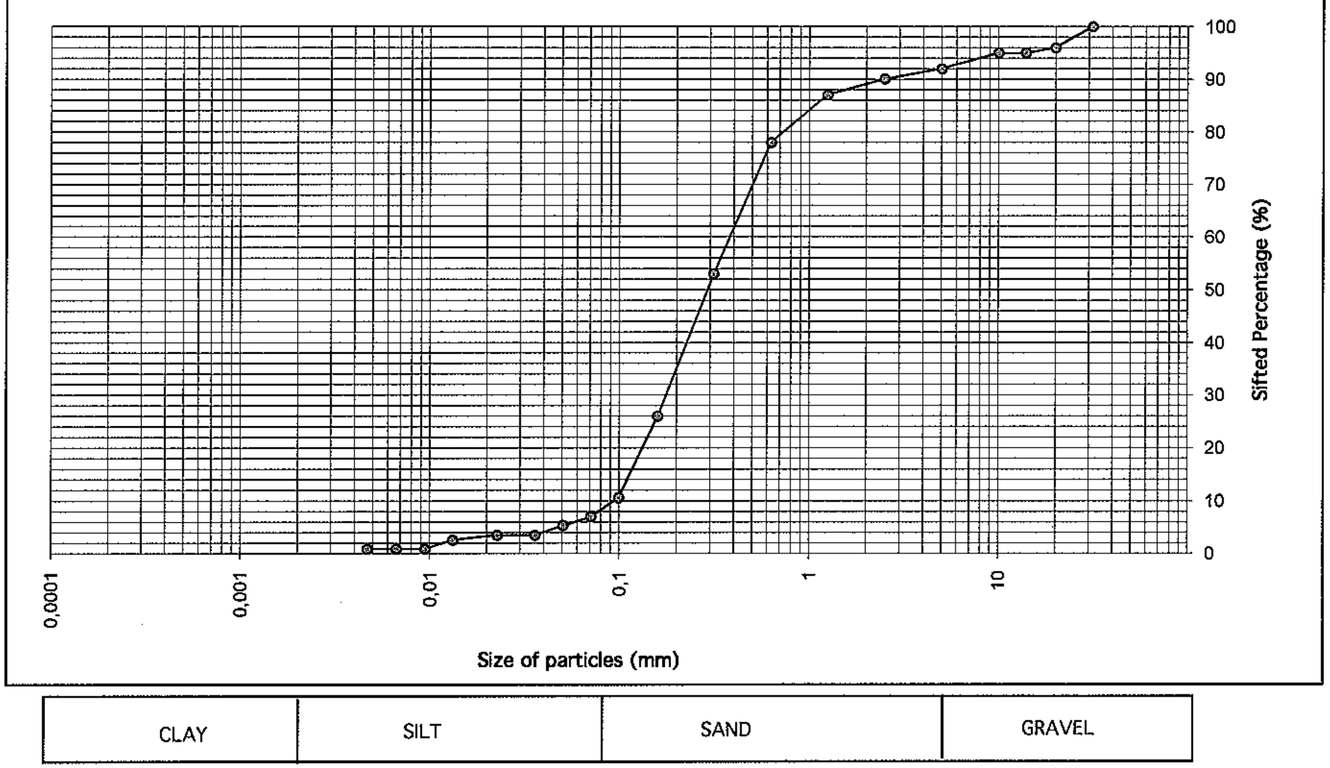
Verified by: 2009-10-21
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
31,5	100
20,0	96
14,0	95
10,0	95
5,0	92
2,5	90
1,250	87
0,630	78
0,3150	53
0,1600	26
0,0997	10,6
0,0712	7,0
0,0507	5,3
0,0361	3,5
0,0228	3,5
0,0133	2,6
0,0095	0,9
0,0067	0,9
0,0047	0,9

Chart for particle size analysis



Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2344

Type of material: Sand,traces silt & gravel.

Source: Material on site, 09-CDF-06,SS-10, Depth: 6,8 to 7,5 m.

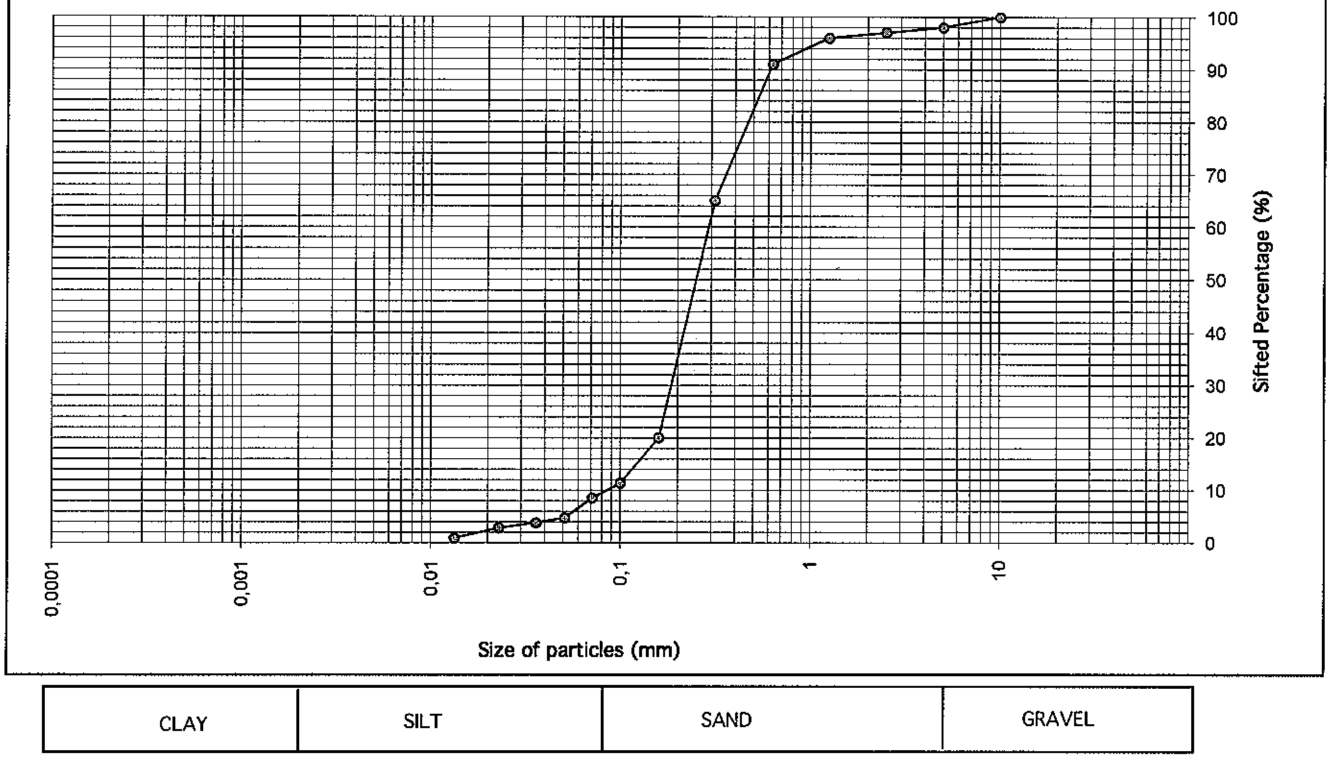
Approuved by : ______ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
10,0	100
5,0	98
2,5	97
1,250	96
0,630	91
0,3150	65
0,1600	20
0,1000	11,3
0,0713	8,5
0,0510	4,7
0,0361	3,8
0,0229	2,8
0,0134	0,9

Chart for particle size analysis



Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2346

Type of material: Sand, some silt, traces gravel.

Source: Material on site, 09-CDF-06,SS-13, Depth: 9,1 to 9,7m.

Approuved by :________ Date : 30/10/2009.

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2550

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2347**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-CDF-06, SS-28, Depth.: 22,2 to 22,3m.
Tests completed on : 2009-10-21

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 1,262
C.U. 2,796
Unified Classification:
Fineness Module: 1,19

% Gravel: 3
% Sand: 89
% Silt: 8
% Clay:

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: 2009-10-21
Sylvie Daigle, Tech.

Verified by: 2009-10-21
Sonya Graveline, Ing.

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2554

File Number	**: F099382200**		
Customer	: Alcoa	Type of Material	: ------
Address	: 100, route Maritime	Caliber	: -----
City	: Baie-Comeau (Québec)	Uses	: -----
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	**: 09-2346**	Source	: 09-CDF-06, SS-13, Depth.: 9,1 to 9,7 m.
Sample No.	: -----	Tests completed on	: 2009-10-21

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 1,236
C.U. 3,078
Unified Classification:
Fineness Module: 1,33

% Gravel: 2
% Sand: 88
% Silt: 10
% Clay:

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: 2009-10-21
Sylvie Daigle, Tech.

Verified by: 2009-10-21
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

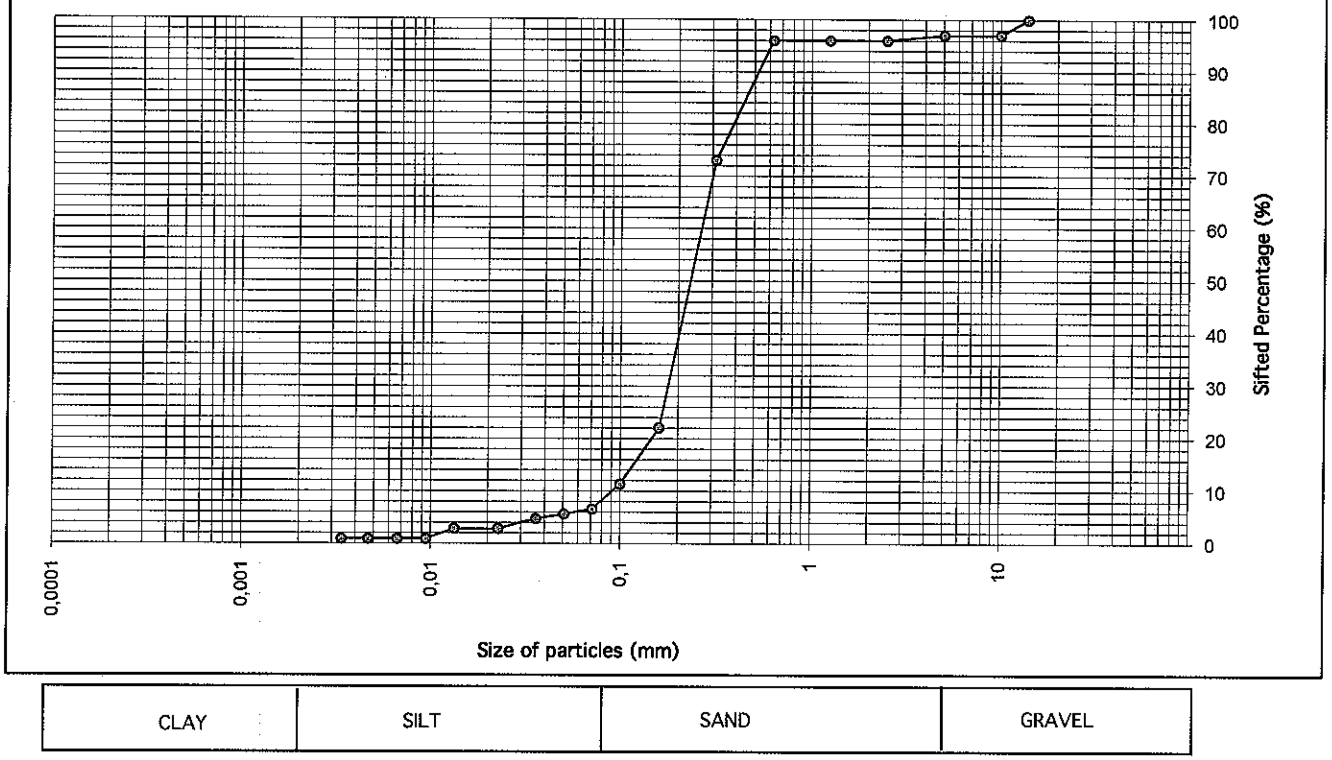
This report must not be copied, in part or in full, without written authorization from Labo S.M. inc.

FLS-051b (00-05) rév. 1

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
14,0	100
10,0	97
5,0	97
2,5	96
1,250	96
0,630	96
0,3150	73
0,1600	22
0,0997	11,3
0,0714	6,6
0,0507	5,6
0,0359	4,7
0,0228	2,8
0,0134	2,8
0,0095	0,9
0,0067	0,9
0,0047	0,9
0,0034	0,9

Chart for particle size analysis



Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2347

Type of material: Sand, traces silt & gravel.

Source: Material on site, 09-CDF-06,SS-28, Depth: 22,2 to 22,3 m.

Approuved by :__________ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4	**BOREHOLE:** 09-CDF-07
SITE: Alcoa - Baie-Comeau smelter (Quebec)	**PAGE:** 1 of 3
LOCATION OF BOREHOLE: X : 258588,44 Y : 5456965,79 — **CASING:** HW / NW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50 — **SAMPLER:** Indicated — **CORE BARREL** NQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -10.94 — **BORING DATE START:** 2009-09-19 09:30:00 **END:** 2009-09-20 02:00:00	

Type of Sampler

SS: Split Spoon
DC: Diamond Core
WS: Wash Sample
HT: Hydraulic Trust
HW: Hammer Weight
SP: Shelby and Piston
AS: Auger Sampler
ST: Thin Walled Shelby Tube

☒ Remoulded
▨ Intact
■ Lost
◧ Rock Core

Laboratory and in situ tests - Parameters

N: SPT N-Value
Nd: DCPT Nd-Value
Su: Field Vane
GSA: Grain size analysis
CU: Uniformity coefficient
W: Water Content
Wp: Plastic limit
Wl: Liquid limit
Ip: Plasticity index:
D: Specific density
Cu: Swedish cone
C: Consolidation
PP: Preconsolidation pressure
Cc: Compression index
Ccr: Recompression index
UC: Unconfined compression
DS: Direct shear
Phi': Angle of internal friction
c': Cohesion
CUT: Consolidation undrained triaxial

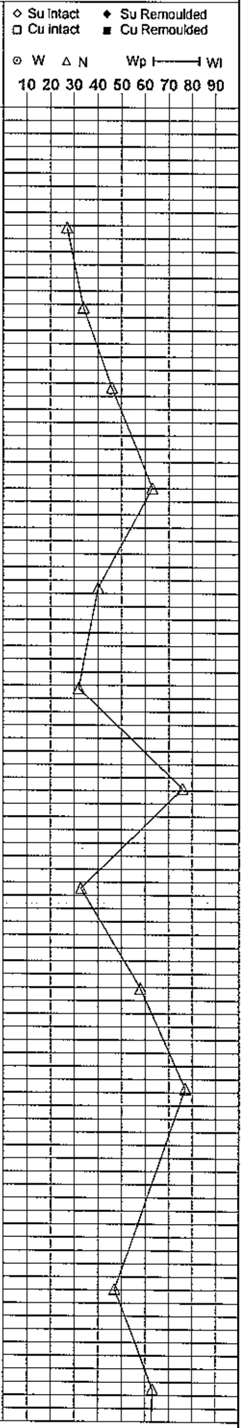
Water level

Date: Time: Elev.(m):

Installation:

STRATIGRAPHY / SAMPLES / LABO AND IN SITU TESTS

Depth	Elev. Depth -10.94	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
	0.00	Gray sand with trace gravel and silt; dense to very dense.									
1				☒	SS-1	B	92	27	8-10-17-18		GSA, CU=6.3
				☒	SS-2	B	38	34	12-16-18-21		
2											
				☒	SS-3	B	33	46	6-13-33-14		
3				☒	SS-4	B	62	63	16-34-29-25		
				☒	SS-5	B	42	40	34-23-17-15		
4											
				☒	SS-6	B	54	32	16-15-17-19		
5											
				☒	SS-7	B	42	76	16-40-36-31		
6				☒	SS-8	B	62	33	12-15-18-21		GSA, CU=3.8
				☒	SS-9	B	33	58	11-31-27-24		
7											
				☒	SS-10	B	42	77	20-27-50-24		
8				☒	SS-11	B	20		50 /refusal		Refusal on coarse gravel
9				☒	SS-12	B	50	47	18-23-24-28		
				☒	SS-13	B	67	63	15-30-33-34		



Notes:

Approved by :
Sonya Graveline, ing.

BORING LOG

PROJECT: New wharf #4			BOREHOLE: 09-CDF-07
SITE: Alcoa - Baie-Comeau smelter (Quebec)			PAGE: 2 of 3
LOCATION OF BOREHOLE: X : 258588,44 Y : 5456965,79		CASING: HW / NW	FILE NO: F099382300
EQUIPEMENT USED: D-50	SAMPLER: Indicated	CORE BARRELNQ	TECHNICIAN: Simon Marois, tech.
SURFACE ELEVATION (m): -10.94	BORING DATE START: 2009-09-19 09:30:00 END: 2009-09-20 02:00:00		

Type of Sampler

SS: Split Spoon
DC: Diamond Core
WS: Wash Sample
HT: Hydraulic Trust
HW: Hammer Weight
SP: Shelby and Piston
AS: Auger Sampler
ST: Thin Walled Shelby Tube

☒ Remoulded
▨ Intact
■ Lost
◨ Rock Core

Laboratory and in situ tests - Parameters

N: SPT N-Value
Nd: DCPT Nd-Value
Su: Field Vane
GSA: Grain size analysis
CU: Uniformity coefficient
W: Water Content
Wp: Plastic limit
Wl: Liquid limit
Ip: Plasticity index:
D: Specific density
Cu: Swedish cone
C: Consolidation
PP: Preconsolidation pressure
Cc: Compression index
Ccr: Recompression index
UC: Unconfined compression
DS: Direct shear
Phi': Angle of internal friction
c': Cohesion
CUT: Consolidation undrained triaxial

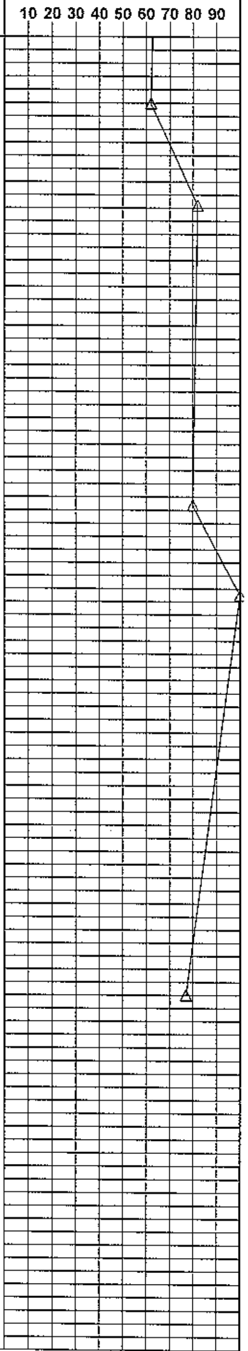
Water level

Date: Time: Elev.(m):

Installation:

STRATIGRAPHY / SAMPLES / LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
				☒	SS-14	B	57	62	10-27-35-50 /refusal		
11				☒	SS-15	B	67	82	30-37-45-51		
				■	SS-16	B	0		58 /refusal		Many refusals on coarse gravel up to bedrock
12											
				☒	SS-17	N	100		69-70 /refusal		
13											
				☒	SS-18	B	79	80	27-37-43-53		
14				☒	SS-19	B	72	100	24-45-55 /refusal		
				☒	SS-20	B	20		50 /refusal		
15											
				☒	SS-21	N	83		50-76 /refusal		
16				■	SS-22	N	0		/refusal		
				■	DC-23	NW					
17	-28.01 17.07	Gray silty sand; very dense.		☒	SS-24	B	78	77	20-22-55 /refusal		GSA, CU=4.0
18				■	SS-25	B	0		50 /refusal		
	-29.59 18.65	Rock: Gray granitic rock; excellent quality	+	■	SS-26	B	0		50 /refusal		
19			+	◨	DC-27	NX	96	40			
			+	◨	DC-28	NX	100	83			



Notes:

Approved by :
Sonya Graveline, ing.

SM Labo S.M. inc

BORING LOG

PROJECT: New wharf #4		**BOREHOLE:** 09-CDF-07
SITE: Alcoa - Baie-Comeau smelter (Quebec)		**PAGE:** 3 of 3
LOCATION OF BOREHOLE: X : 258588,44 Y : 5456965,79	**CASING:** HW / NW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50 / **SAMPLER:** Indicated	**CORE BARREL** NQ	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -10.94	**BORING DATE START:** 2009-09-19 09:30:00	**END:** 2009-09-20 02:00:00

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

☒ Remoulded
▨ Intact
■ Lost
◨ Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value
Nd:	DCPT Nd-Value
Su:	Field Vane
GSA:	Grain size analysis
CU:	Uniformity coefficient
W:	Water Content
Wp:	Plastic limit
Wl:	Liquid limit
Ip:	Plasticity index:
D:	Specific density
Cu:	Swedish cone
C:	Consolidation
PP:	Preconsolidation pressure
Cc:	Compression index
Ccr:	Recompression index
UC:	Unconfined compression
DS:	Direct shear
Phi':	Angle of internal friction
c':	Cohesion
CUT:	Consolidation undrained triaxial

Water level

Date:	Time:	Elev.(m):

Installation:

STRATIGRAPHY				SAMPLES						LABO AND IN SITU TESTS		
Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks	10 20 30 40 50 60 70 80 90
			+	◨	DC-29	NQ	100	100				
21			+	◨	DC-30	NQ	100	100				
22			+									
23			+	◨	DC-31	NQ	100	100				
24			+	◨	DC-32	NQ	97	95				
25	-35.93 24.99	End of borehole										
26												
27												
28												
29												

Notes:

Approved by :
Sonya Graveline, ing.

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2300

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2142**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-CDF-07, SS-1, Depth.: 0,6 to 1,2 m.
Tests completed on : 2009-10-02

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 1,326
C.U. 6,313
Unified Classification:
Fineness Module: 2,31

% Gravel: 10
% Sand: 81,6
% Silt: 8,3
% Clay:

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

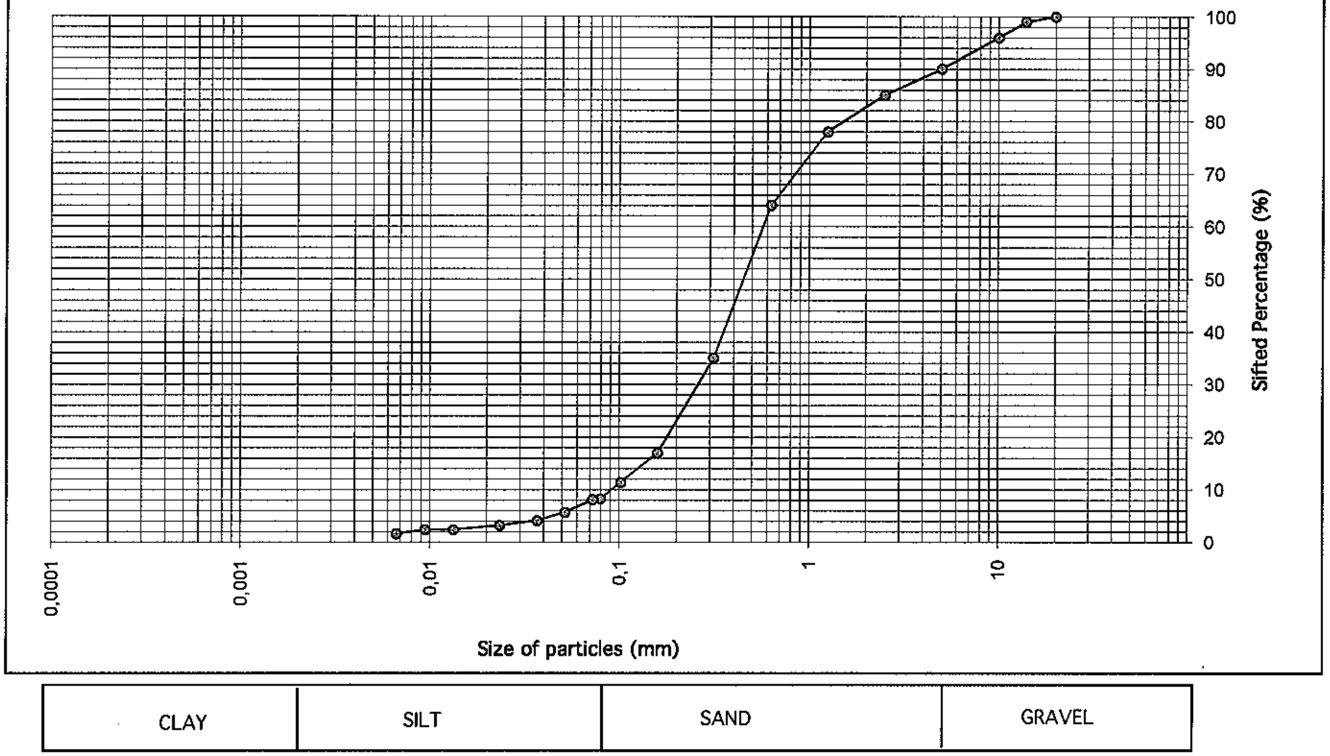
Prepared by: 2009-10-07
Sylvie Daigle, Tech.

Verified by: 2009-10-07
Sonya Graveline, Ing.

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
20	100
14	99
10	96
5	90
2,5	85
1,250	78
0,630	64
0,3150	35
0,1600	17
0,1020	11,4
0,0800	8,3
0,0728	8,1
0,0518	5,7
0,0369	4,1
0,0234	3,2
0,0134	2,4
0,0095	2,4
0,0067	1,6

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2142

Type of material: Sand, some gravel, traces silt.

File #: **F099382200**

Source: Material on site, 09-CDF-07,SS-1, Depth: 0,6 to 1,2 m.

Customer: **Alcoa**

Approuved by : ______ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

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LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2304

File Number : F099382200
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : 09-2143
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-CDF-07, SS-8, Depth.: 5,6 to 6,2 m.
Tests completed on : 2009-10-02

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 1,148
C.U. 3,789
Unified Classification:
Fineness Module: 1,51

% Gravel: 1,6
% Sand: 90,9
% Silt: 7,5
% Clay:

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: 2009-10-07
Sylvie Daigle, Tech.

Verified by: 2009-10-07
Sonya Graveline, Ing.

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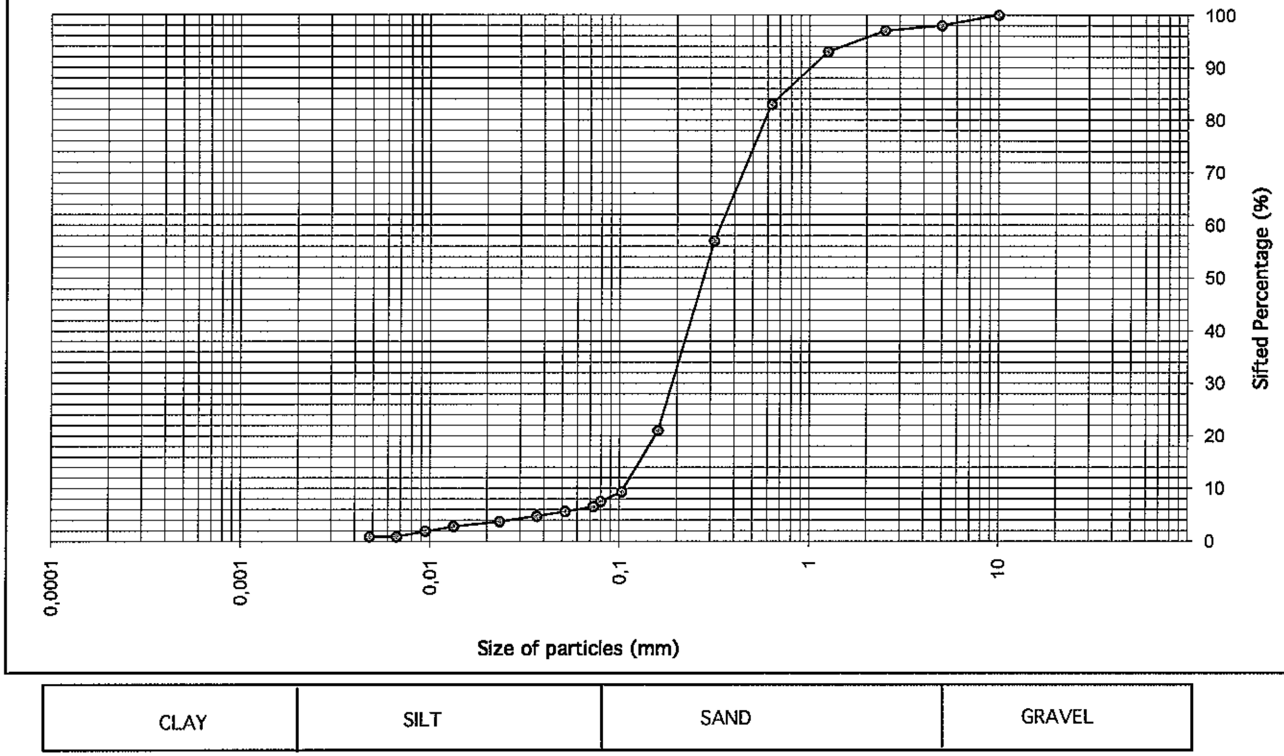
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
10	100
5	98
2,5	97
1,250	93
0,630	83
0,3150	57
0,1600	21
0,1027	9,3
0,0800	7,5
0,0731	6,5
0,0518	5,6
0,0368	4,7
0,0233	3,7
0,0134	2,8
0,0095	1,9
0,0067	0,9
0,0048	0,9

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2143

Type of material: Sand, traces silt & gravel.

File #: **F099382200**

Source: Material on site, 09-CDF-07,SS-8, Depth: 5,6 to 6,2 m.

Customer: **Alcoa**

Approuved by : ____________ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

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LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2308

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2144**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-CDF-07, SS-24, Depth.: 17 to 17,5 m.
Tests completed on : 2009-10-02

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	1,338	% Gravel:	
C.U.	3,979	% Sand:	77
Unified Classification:		% Silt:	22
Fineness Module: 0,61		% Clay:	1

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

Prepared by: 2009-10-07
Sylvie Daigle, Tech.

Verified by: 2009-10-07
Sonya Graveline, Ing.

N.B. These results are exclusively for analysis sampled.

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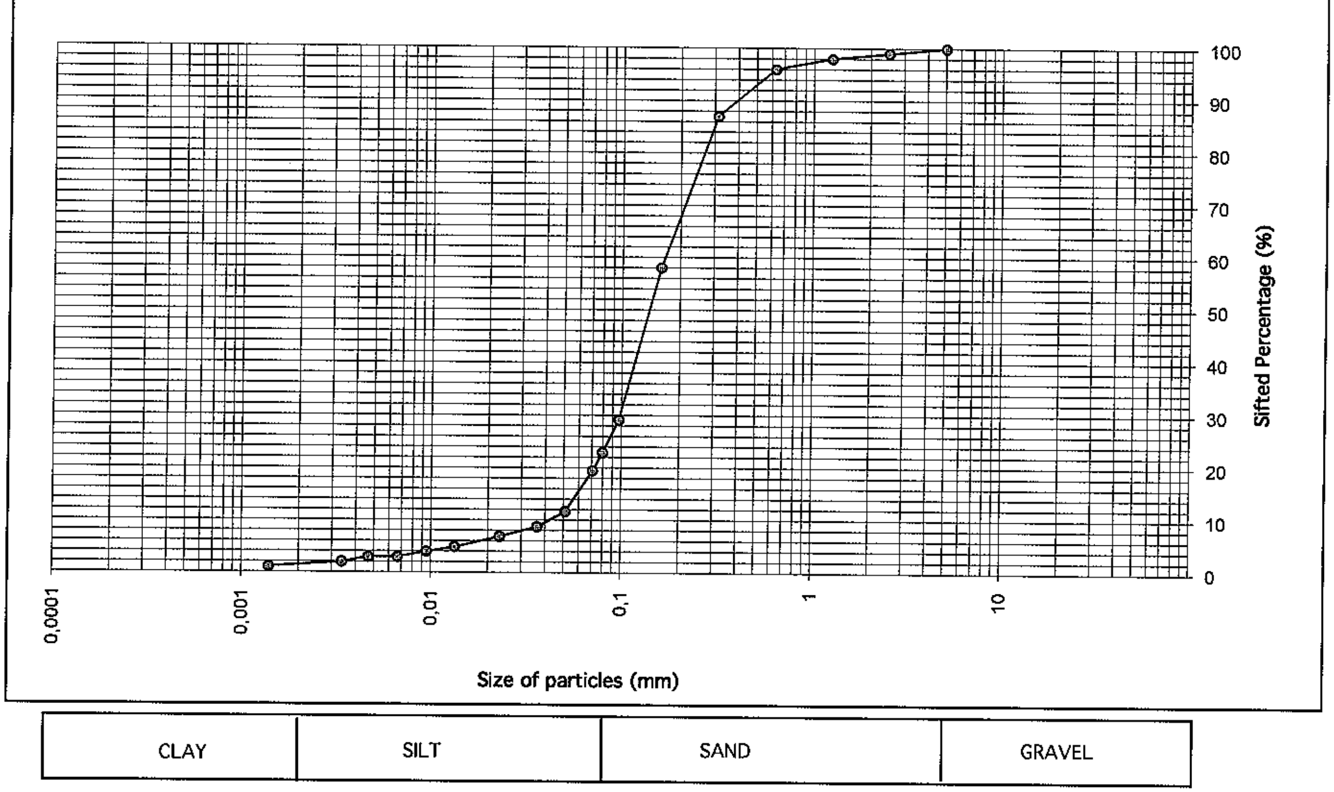
Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
5	100
2,5	99
1,250	98
0,630	96
0,3150	87
0,1600	58
0,0970	29,1
0,0800	22,9
0,0708	19,4
0,0510	11,6
0,0364	8,7
0,0231	6,8
0,0134	4,8
0,0095	3,9
0,0067	2,9
0,0047	2,9
0,0034	1,9
0,0014	1,0

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2144

Type of material: Silty sand, traces clay.

File #: **F099382200**

Source: Material on site, 09-CDF-07,SS-24, Depth: 17 to 17,5 m.

Customer: **Alcoa**

Approuved by : Date : 30/10/2009.

'FLS-079 (06-2007) rév. 1

Labo S.M. inc

BORING LOG

PROJECT: New wharf #4			**BOREHOLE:** 09-DR-01
SITE: Alcoa - Baie-Comeau smelter (Quebec)			**PAGE:** 1 of 1
LOCATION OF BOREHOLE: X : 258800,64 Y : 5457069,94		**CASING:** HW	**FILE NO:** F099382300
EQUIPEMENT USED: D-50	**SAMPLER:** Indicated	**CORE BARREL-**	**TECHNICIAN:** Simon Marois, tech.
SURFACE ELEVATION (m): -11.18	**BORING DATE START:** 2009-09-21 11:00:00	**END:** 2009-09-21 14:00:00	

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

⊠	Remoulded
▨	Intact
■	Lost
◧	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value
Nd:	DCPT Nd-Value
Su:	Field Vane
GSA:	Grain size analysis
CU:	Uniformity coefficient
W:	Water Content
Wp:	Plastic limit
Wl:	Liquid limit
Ip:	Plasticity index:
D:	Specific density
Cu:	Swedish cone
C:	Consolidation
PP:	Preconsolidation pressure
Cc:	Compression index
Ccr:	Recompression index
UC:	Unconfined compression
DS:	Direct shear
Phi':	Angle of internal friction
c':	Cohesion
CUT:	Consolidation undrained triaxial

Water level

Date:	Time:	Elev.(m):

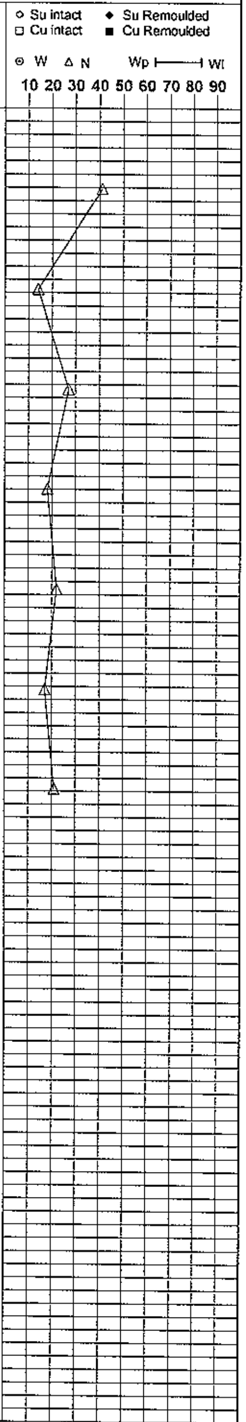
Installation:

STRATIGRAPHY

SAMPLES

LABO AND IN SITU TESTS

Depth	Elev. Depth -11.18	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
	0.00	Gray fine sand with some silt; occasionaly sea shell; medium dense.									
				⊠	SS-1	B	42	41	16-24-17-23		
1											
				⊠	SS-2	B	54	14	13-9-5-5		GSA, CU=1.9
2											
				⊠	SS-3	B	38	27	9-12-15-18		
				⊠	SS-4	B	46	18	5-8-10-10		GSA, CU=2.3
3											
				⊠	SS-5	B	42	22	9-10-12-14		
4											
				⊠	SS-6	B	50	17	7-9-8-12		
5											
				⊠	SS-7	B	50	21	8-9-12-12		
	-16.67 5.49	End of borehole									
6											
7											
8											
9											



Notes:

Approved by :
Sonya Graveline, ing.

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2293

File Number : F099382200
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : 09-2141
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-DR-01, SS-2, Depth.: 1,0 to 1,7 m.
Tests completed on : 2009-10-02

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C.	1,156	% Gravel:	0
C.U.	1,875	% Sand:	86,2
Unified Classification:		% Silt:	13,8
Fineness Module: 0,22		% Clay:	

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

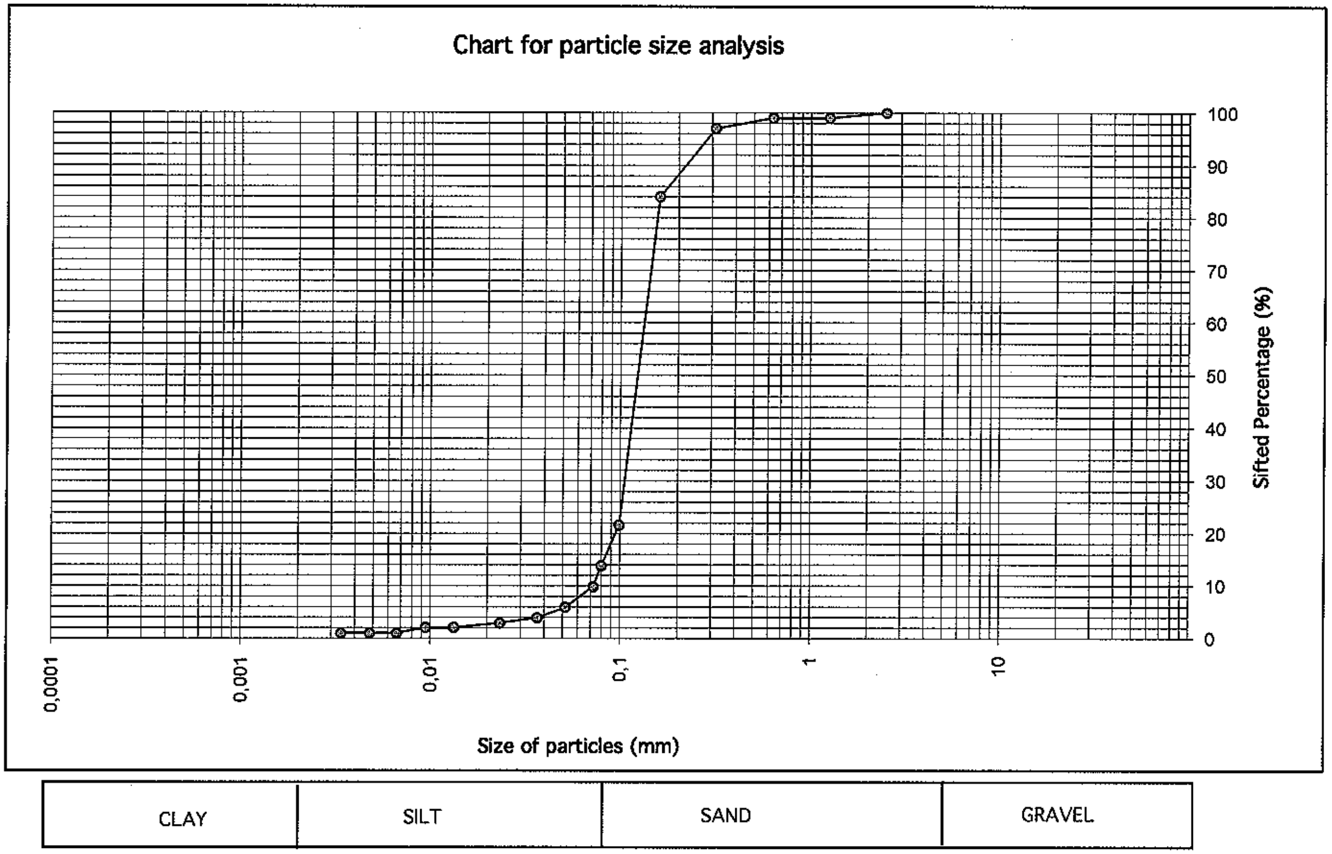
Prepared by: Sylvie Daigle, Tech. 2009-10-07

Verified by: Sonya Graveline, Ing. 2009-10-07

SMi

LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
2,5	100
1,250	99
0,630	99
0,3150	97
0,1600	84
0,0990	21,6
0,0800	13,8
0,0724	9,8
0,0517	5,9
0,0368	3,9
0,0233	2,9
0,0134	2,0
0,0095	2,0
0,0067	1,0
0,0048	1,0
0,0034	1,0



Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

Laboratory No. : 09-2141

Type of material: Sand, some silt.

Source: Material on site, 09-DR-01,SS-2, Depth: 1,0 to 1,7 m.

Approuved by : ______ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SM
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2292

File Number	**: F099382200**		
Customer	: Alcoa	Type of Material	: -----
Address	: 100, route Maritime	Caliber	: ------
City	: Baie-Comeau (Québec)	Uses	: ------
Postal Code	:	Sampled by	: Simon Marois,Tech.
Project	: New Baie-Comeau Wharf		:
Site	:		:
Laboratory No.	**: 09-2140**	Source	: 09-DR-01, SS-4, Depth.: 2,6 to 3,2 m.
Sample No.	: ------	Tests completed on	: 2009-10-02

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 1,238
C.U. 2,332
Unified Classification:
Fineness Module: 0,47

% Gravel: 2
% Sand: 81
% Silt: 16
% Clay: 1

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

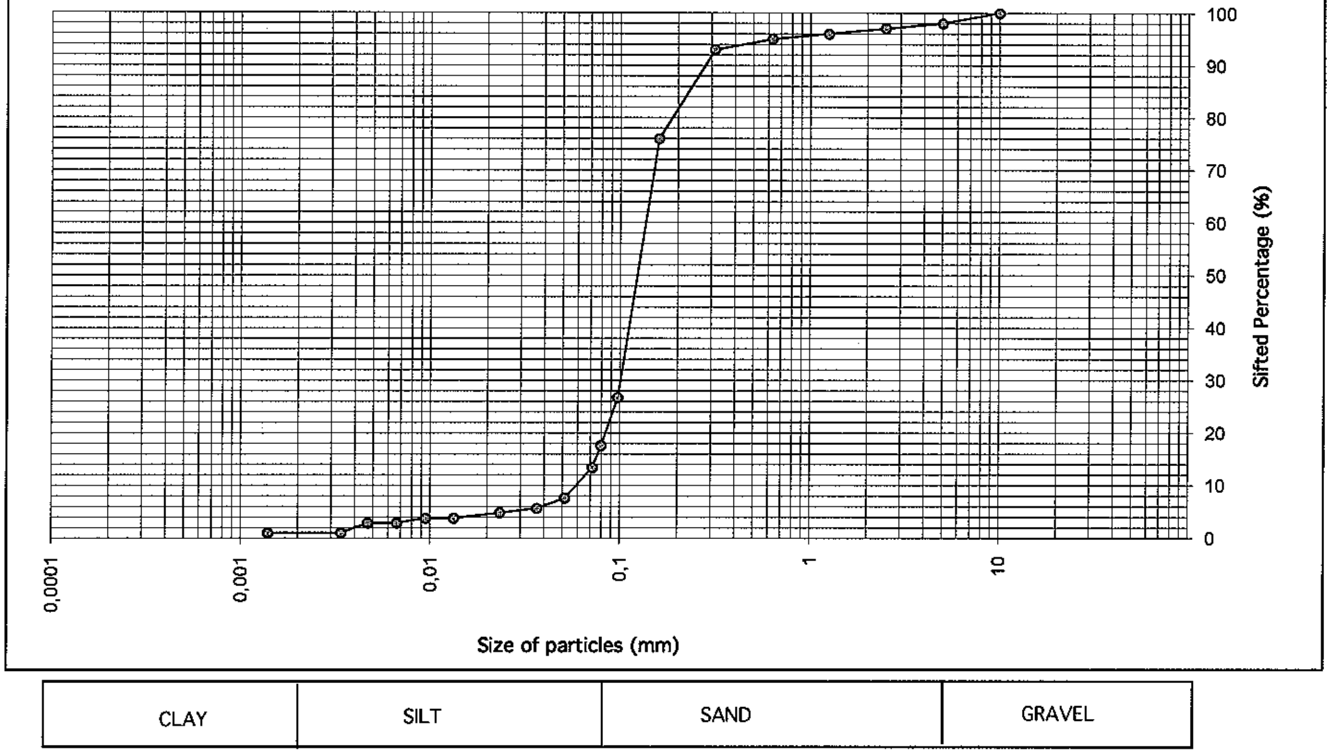
Prepared by: 2009-10-07
Sylvie Daigle, Tech.

Verified by: 2009-10-07
Sonya Graveline, Ing.

SM*i*
LABO S.M. INC.

Sediments Analysis NO 2501-025	
Size (mm)	% Sifted (%)
10	100
5	98
2,5	97
1,250	96
0,630	95
0,3150	93
0,1600	76
0,0976	26,7
0,0800	17,6
0,0719	13,4
0,0515	7,6
0,0367	5,7
0,0233	4,8
0,0134	3,8
0,0095	3,8
0,0067	2,9
0,0047	2,9
0,0034	1,0
0,0014	1,0

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2140

Type of material: Sand, some silt, traces gravel & clay.

File #: **F099382200**

Source: Material on site, 09-DR-01,SS-4, Depth: 2,6 to 3,2 m.

Customer: **Alcoa**

Approuved by : ________ Date : 30/10/2009

'FLS-079 (06-2007) rév. 1

SM Labo S.M. inc

BORING LOG

PROJECT: New wharf #4
SITE: Alcoa - Baie-Comeau smelter (Quebec)
LOCATION OF BOREHOLE: X : 258801,68 Y : 5457110,44
CASING: HW
EQUIPEMENT USED: D-50
SAMPLER: Indicated
CORE BARREL-
SURFACE ELEVATION (m): -10.96
BORING DATE START: 2009-09-24 10:00:00 END: 2009-09-24 13:00:00

BOREHOLE: 09-DR-02
PAGE: 1 of 1
FILE NO: F099382300
TECHNICIAN: Simon Marois, tech.

Type of Sampler

SS:	Split Spoon
DC:	Diamond Core
WS:	Wash Sample
HT:	Hydraulic Trust
HW:	Hammer Weight
SP:	Shelby and Piston
AS:	Auger Sampler
ST:	Thin Walled Shelby Tube

⊠	Remoulded
▨	Intact
■	Lost
◧	Rock Core

Laboratory and in situ tests - Parameters

N:	SPT N-Value	Ip:	Plasticity index:	DS:	Direct shear
Nd:	DCPT Nd-Value	D:	Specific density	Phi':	Angle of internal friction
Su:	Field Vane	Cu:	Swedish cone	c':	Cohesion
GSA:	Grain size analysis	C:	Consolidation	CUT:	Consolidation undrained triaxial
CU:	Uniformity coefficient	PP:	Preconsolidation pressure		
W:	Water Content	Cc:	Compression index		
Wp:	Plastic limit	Ccr:	Recompression index		
Wl:	Liquid limit	UC:	Unconfined compression		

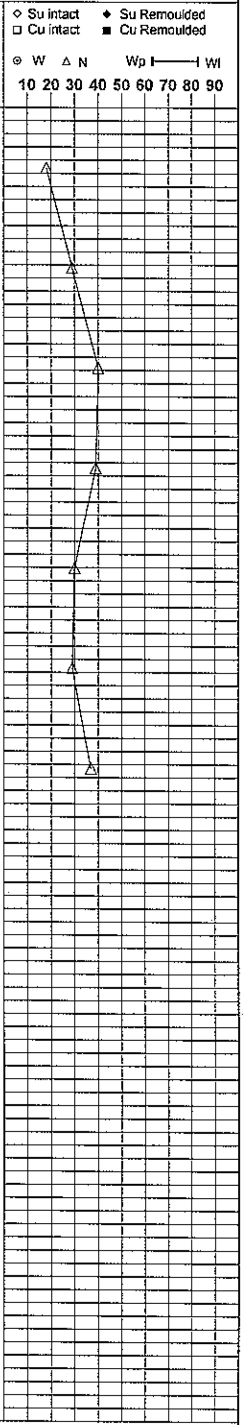
Water level

Date: Time: Elev.(m):

Installation:

STRATIGRAPHY | SAMPLES | LABO AND IN SITU TESTS

Depth	Elev. Depth	Soils and Rock Description	Symbol	Condition	Type No	Cal.	Rec. %	N/ RQD	Blows 300 mm	Water level	Test & remarks
	-10.96 0.00	Gray sand with some to trace silt and trace gravel; occasionally sea shell; dense.									
				⊠	SS-1	B	29	18	15-8-10-10		GSA, CU=3.4
1				⊠	SS-2	B	50	29	12-14-15-12		
2				⊠	SS-3	B	58	40	12-19-21-23		GSA, CU=2.4
				⊠	SS-4	B	25	39	14-18-21-20		
3											
				⊠	SS-5	B	46	30	13-16-14-20		
4											
				⊠	SS-6	B	71	29	11-11-18-20		
5				⊠	SS-7	B	58	37	11-16-21-26		
	-16.29 5.33	End of borehole									
6											
7											
8											
9											



Notes:

Approved by :
Sonya Graveline, ing.

SOIL MATERIALS ANALYSIS REPORT

SM
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2504

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2304**
Sample No. : ------

Type of Material : ------
Caliber : -----
Uses : ------
Sampled by : Simon Marois,Tech.
:
:
Source : 09-DR-02, SS-1, Depth.: 0,15 to 0,76 m.
Tests completed on : 2009-10-19

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 0,649
C.U. 3,426
Unified Classification:
Fineness Module: 1,50

% Gravel: 5,2
% Sand: 87,2
% Silt: 7,6
% Clay:

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

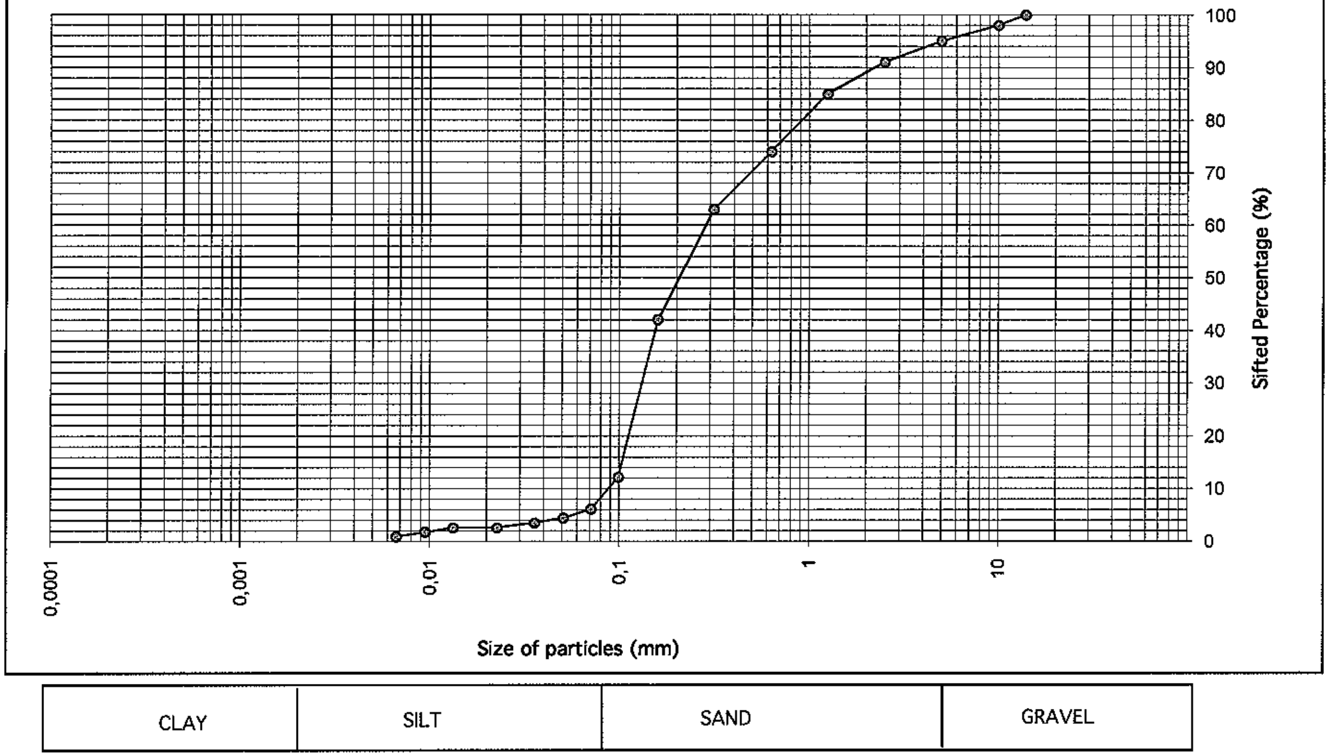
Prepared by: 2009-10-21
Sylvie Daigle, Tech.

Verified by: 2009-10-21
Sonya Graveline, Ing.

SM*i*
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
14,0	100
10,0	98
5,00	95
2,500	91
1,250	85
0,630	74
0,3150	63,0
0,1600	42,0
0,0993	12,2
0,0714	6,1
0,0508	4,4
0,0360	3,5
0,0228	2,6
0,0134	2,6
0,0095	1,7
0,0067	0,9

Chart for particle size analysis



Project: New Baie-Comeau wharf

Laboratory No. : 09-2304

Type of material: Sand,traces clay & gravel.

File #: **F099382200**

Source: Material on site, 09-DR-02,SS-1, Depth: 0,15 to 0,76 m.

Customer: **Alcoa**

Approuved by :

Date : 30/10/2009

FLS-079 (06-2007) rév. 1

SOIL MATERIALS ANALYSIS REPORT

SMi
LABO S.M. INC.

740 Galt ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566-8855 - Télécopieur (819) 566-0224

Report n°: 09LS2503

File Number : **F099382200**
Customer : Alcoa
Address : 100, route Maritime
City : Baie-Comeau (Québec)
Postal Code :
Project : New Baie-Comeau Wharf
Site :
Laboratory No. : **09-2305**
Sample No. : ------

Type of Material : ------
Caliber : ------
Uses : -----
Sampled by : Simon Marois,Tech.
:
:
Source : 09-DR-02, SS-3, Depth.: 1,7 to 2,3 m.
Tests completed on : 2009-10-19

Particle Size Analysis
LC 21-040

Sieve (mm)	**% Sifted** (%)	**Specifications** (Min. - Max.)

C.C. 1,247
C.U. 2,365
Unified Classification:
Fineness Module: 0,24

% Gravel:
% Sand: 79
% Silt: 21
% Clay:

PHYSICAL AND MECHANICAL PROPERTIES

Analysis	Standard	Results	Requirements

Legend : *** =Results not in conformity**

Remarks: See following chart for sediments analysis.

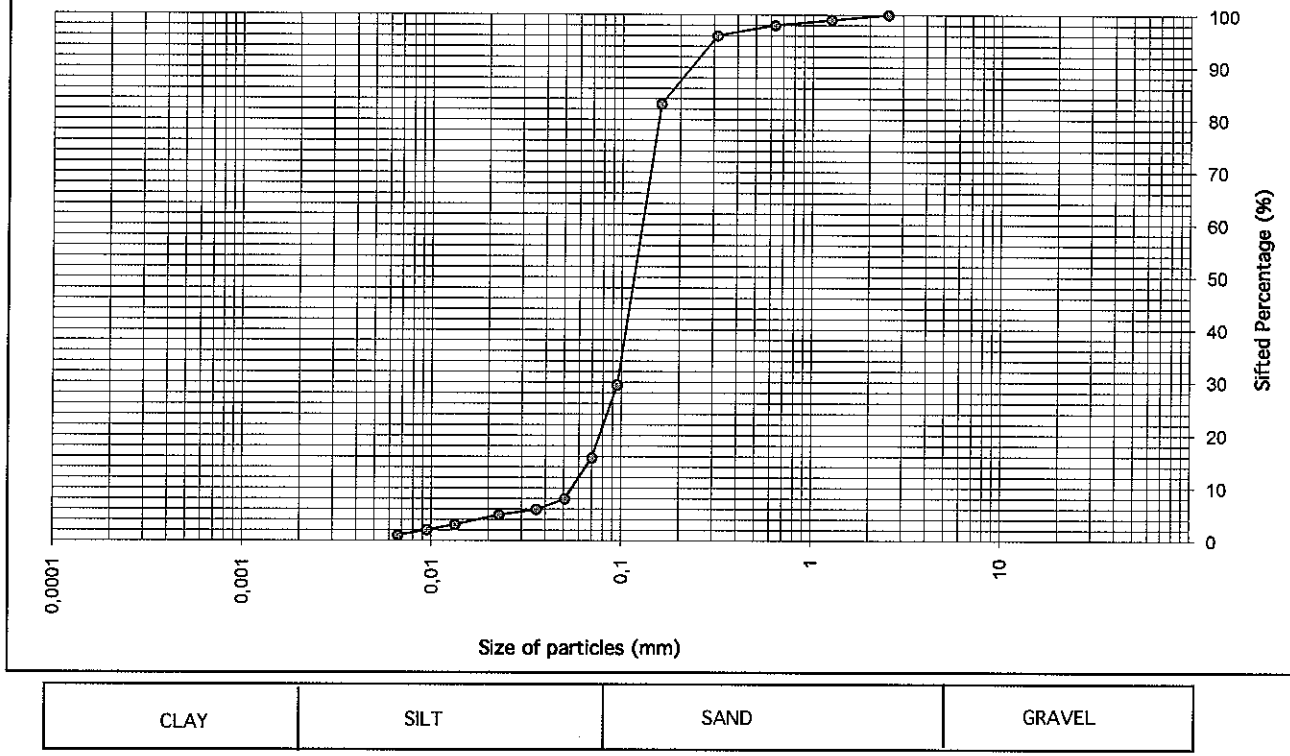
Prepared by: 2009-10-21
Sylvie Daigle, Tech.

Verified by: 2009-10-21
Sonya Graveline, Ing.

SMi
LABO S.M. INC.

Sediments Analysis NQ 2501-025	
Size (mm)	% Sifted (%)
2,500	100
1,250	99
0,630	98
0,3150	96,0
0,1600	83,0
0,0952	29,5
0,0702	15,7
0,0506	7,9
0,0360	5,9
0,0229	4,9
0,0134	3,0
0,0095	2,0
0,0067	1,0

Chart for particle size analysis



Project: New Baie-Comeau wharf

File #: **F099382200**

Customer: **Alcoa**

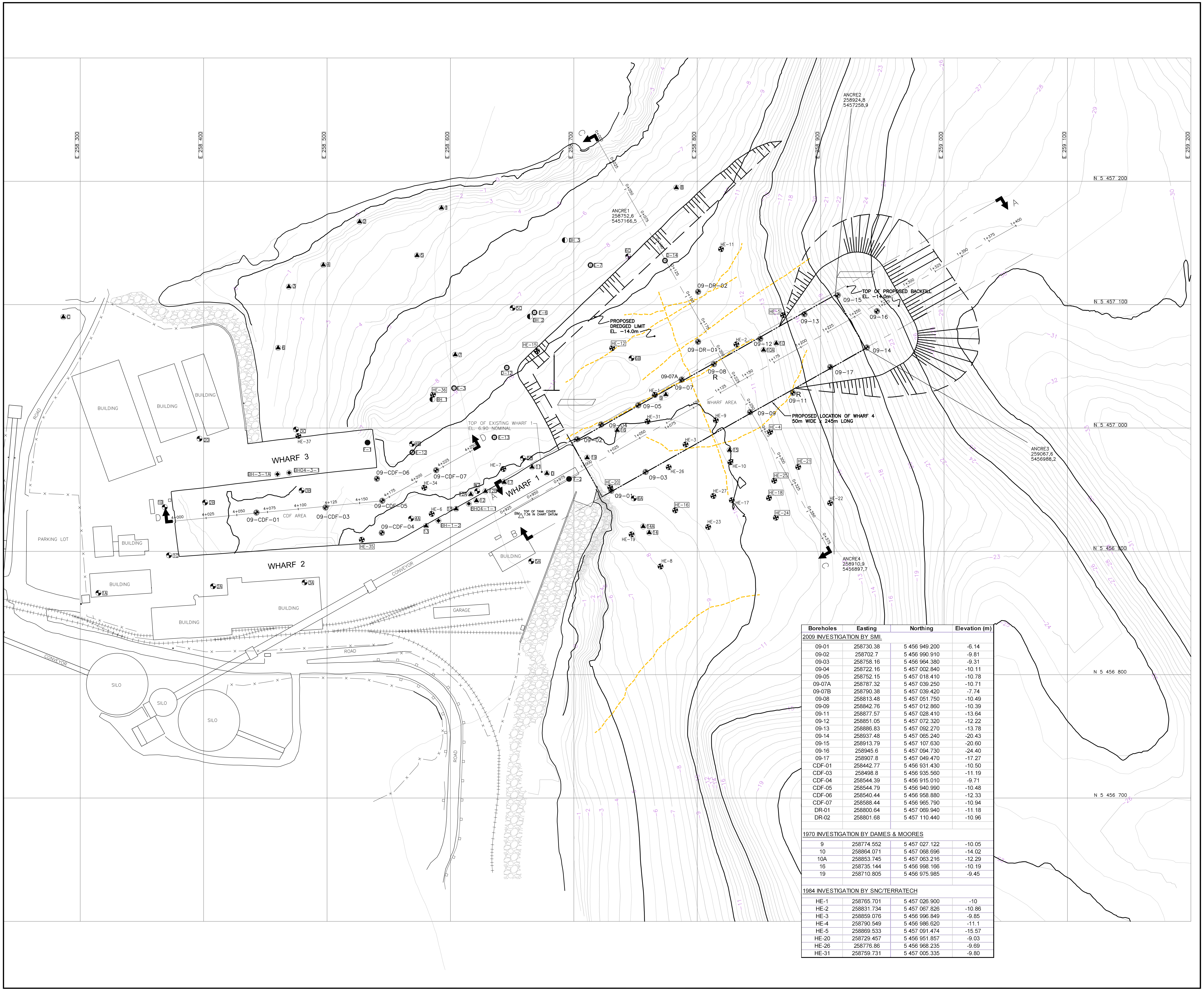
Laboratory No. : 09-2305

Type of material: Silty sand.

Source: Material on site, 09-DR-02, SS-3, Depth: 1,7 to 2,3 m.

Approuved by : Date : 30/10/2009

'FLS-079 (06-2007) rév. 1



Boreholes	Easting	Northing	Elevation (m)
2009 INVESTIGATION BY SMI.			
09-01	258730.38	5 456 949.200	-6.14
09-02	258702.7	5 456 990.910	-9.81
09-03	258758.16	5 456 964.380	-9.31
09-04	258722.16	5 457 002.840	-10.11
09-05	258752.15	5 457 018.410	-10.78
09-07A	258787.32	5 457 039.250	-10.71
09-07B	258790.38	5 457 039.420	-7.74
09-08	258813.48	5 457 051.750	-10.49
09-09	258842.76	5 457 012.860	-10.39
09-11	258877.57	5 457 028.410	-13.64
09-12	258851.05	5 457 072.320	-12.22
09-13	258886.83	5 457 092.270	-13.78
09-14	258937.48	5 457 065.240	-20.43
09-15	258913.79	5 457 107.630	-20.60
09-16	258945.6	5 457 094.730	-24.40
09-17	258907.8	5 457 049.470	-17.27
CDF-01	258442.77	5 456 931.430	-10.50
CDF-03	258498.8	5 456 935.560	-11.19
CDF-04	258544.39	5 456 915.010	-9.71
CDF-05	258544.79	5 456 940.990	-10.48
CDF-06	258540.44	5 456 958.880	-12.33
CDF-07	258588.44	5 456 965.790	-10.94
DR-01	258800.64	5 457 069.940	-11.18
DR-02	258801.68	5 457 110.440	-10.96
1970 INVESTIGATION BY DAMES & MOORES			
9	258774.552	5 457 027.122	-10.05
10	258864.071	5 457 068.696	-14.02
10A	258853.745	5 457 063.216	-12.29
16	258735.144	5 456 998.166	-10.19
19	258710.805	5 456 975.985	-9.45
1984 INVESTIGATION BY SNC/TERRATECH			
HE-1	258765.701	5 457 026.900	-10
HE-2	258831.734	5 457 067.826	-10.86
HE-3	258859.076	5 456 996.849	-9.85
HE-4	258790.549	5 456 986.620	-11.1
HE-5	258869.533	5 457 091.474	-15.57
HE-20	258729.457	5 456 951.857	-9.03
HE-26	258776.86	5 456 968.235	-9.69
HE-31	258759.731	5 457 005.335	-9.80

L E G E N D

STRATIGRAPHICS SYMBOLS

A	▨	COMPACT UPPER SAND DEPOSIT
B	▨	FIRM CONSISTENCY CLAYEY DEPOSIT
C	▥	VERY LOOSE SILTY–SAND DEPOSIT
D	▨	COMPACT TO VERY DENSE SILTY–SAND DEPOSIT
E	▨	COMPACT TO VERY DENSE LOWER SAND DEPOSIT
F	▨	EXCELLENT QUALITY GRANITIC ROCK
	▽	WATER LEVEL

BOREHOLES IDENTIFICATION

09–12	2009 INVESTIGATION BY SMI
16	1970 INVESTIGATION BY DAMES & MOORES
HE–X	1984 INVESTIGATION BY SNC/TERRATECH

SYMBOLS (investigation)

⊕	SMI 2009

PREVIOUS INVESTIGATIONS:

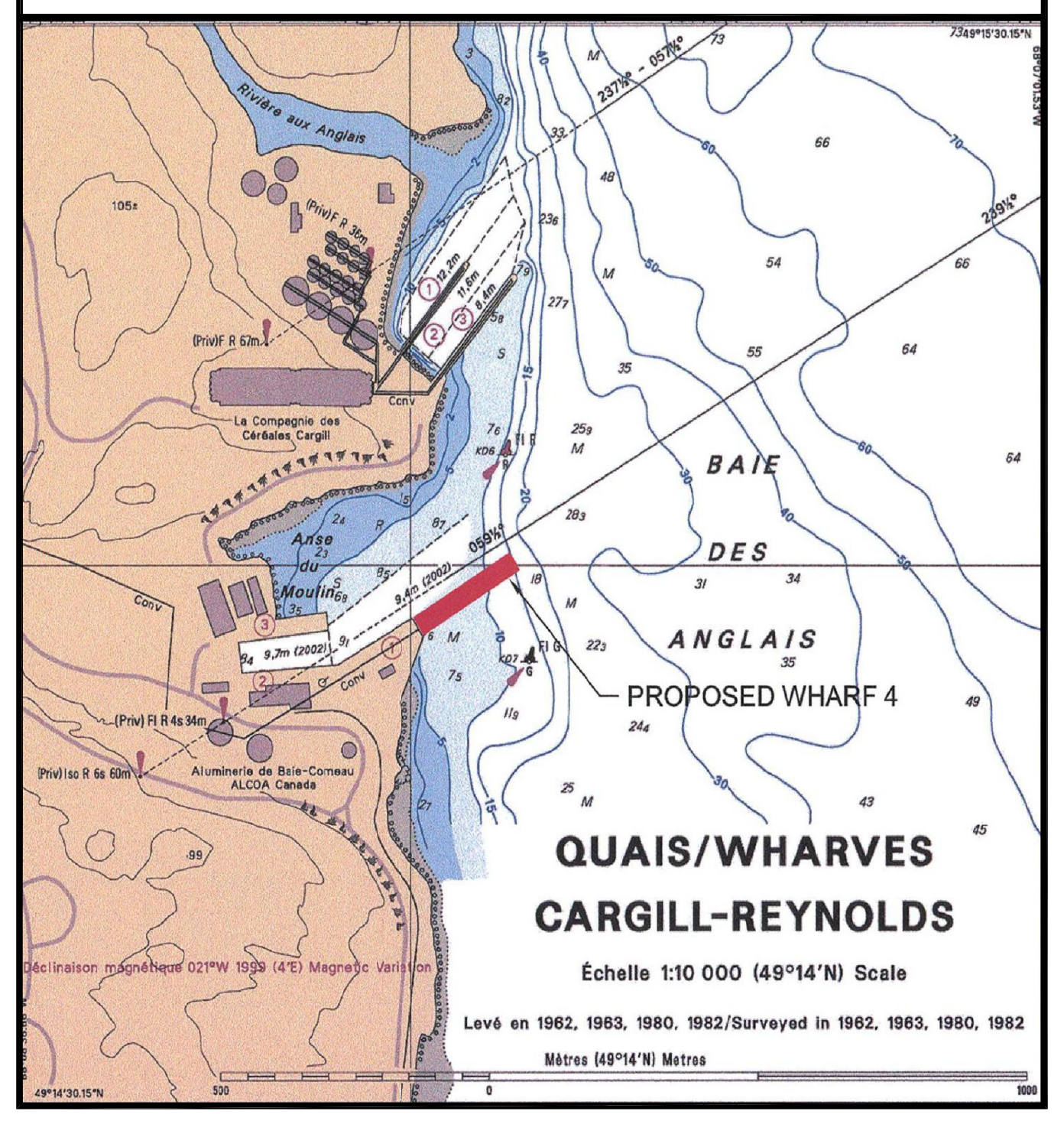
◐	GEOCON 1955	⊕	TERRATECH 1984
◐	GOLDER 1967	⊙	AMEC 2004
▲	DAMES & MOORES 1970	●	QUALITAS 2004
⊗	SNC/TERRATECH 1984	◆	QUALITAS 2005

LINE

—·—·—	PROPOSED LOCATION OF WHARF #4
– – – –	GEOPHYSICS LINE

NOTE:

1. THE SURVEY DATUM IS BASED ON THE FOLLOWING GEODEDIC REFERENCE MARK.
   - 85K0370
   - N: 5 472 48.686 ; E: 258 676.469
   - GEODEDIC DATUM: 12.220 ; CHART DATUM: 14.030
   - NAD 83 (NON CSRS), 3° MTM ZONE 6
2. ALL ELEVATIONS SHOWN ON THIS DRAWING ARE CHART DATUM WHICH THE "0" LEVEL IS 1.8m BELOW THE GEODEDIC DATUM.



QUAIS/WHARVES CARGILL-REYNOLDS

Échelle 1:10 000 (49°14'N) Scale

Levé en 1962, 1963, 1980, 1982/Surveyed in 1962, 1963, 1980, 1982

Mètres (49°14'N) Metres

NO	REFERENCES	NO
01	H310011–ABC197–0100–10–017–0001.dwg	HATCH

NO	MODIFICATIONS	INIT.	DATE
A	PRELIMINARY	S.G.	9/12/09

SEALS:

Sonya Graveline 116692

Alain Philibert 26750

LABO S.M. INC.
740, rue Galt Ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566–8855 – Fax: (819) 566–0224 www.groupesm.com

CLIENT:
Aluminerie de Baie-Comeau
100 ROUTE MARITIME BAIE-COMEAU, QUÉ. G4Z-2L6
TÉLÉPHONE (418) 296-3311, TÉLÉCOPIEUR (418) 296-7121

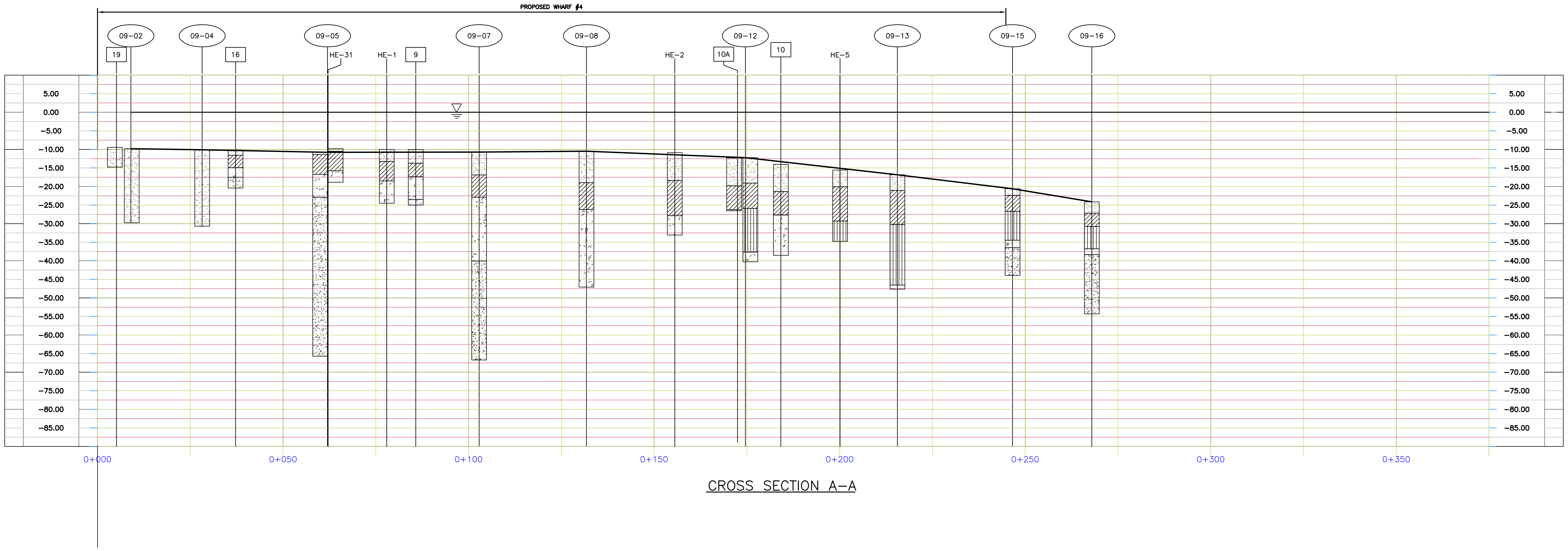
PROJECT:

GEOTECHNICAL INVESTIGATION
NEW WHARF #4
ALCOA BAIE–COMEAU SMELTER

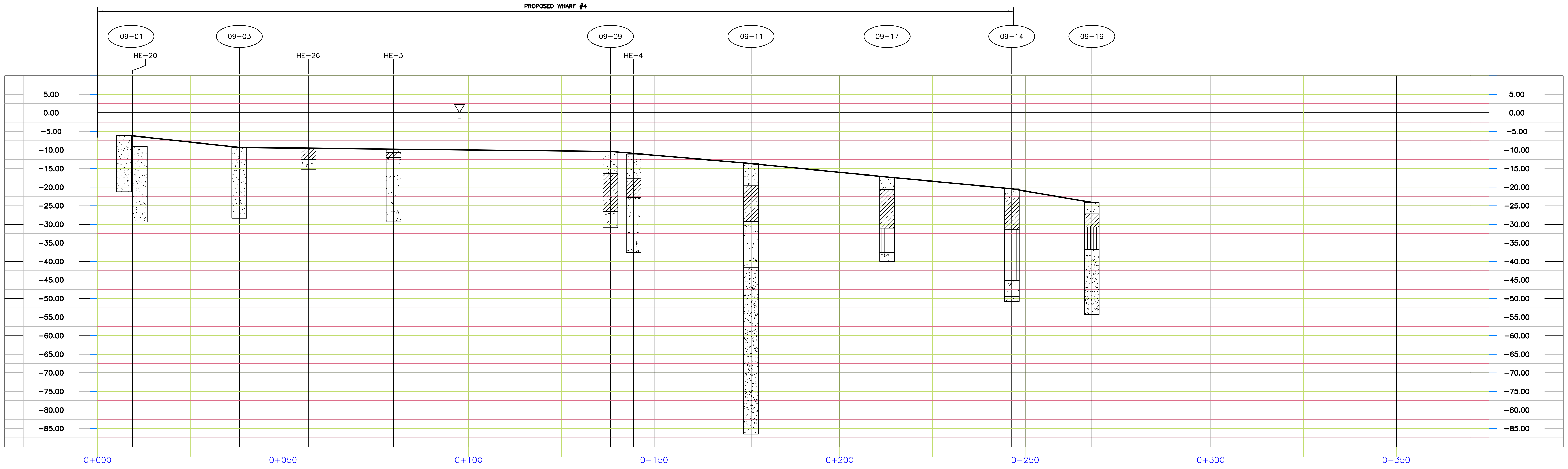
TITLE

BOREHOLE LOCATIONS

DRAWN BY: A. BENOIT tech.	PROJECTED BY: S. GRAVELINE ing.
VERIFIED BY: S. CERMINARA tech.	APPROVED BY: S. GRAVELINE ing.
SCALE: 1:1000 0 10 20 30 40 50 METERS	DATE: 9/12/2009
	CAD FILE: 9382300K001.dwg
DRAWING NO.: F0993823 00K001	REV.: –A



CROSS SECTION A–A



CROSS SECTION B–B

LEGEND

STRATIGRAPHICS SYMBOLS

A	COMPACT UPPER SAND DEPOSIT
B	FIRM CONSISTENCY CLAYEY DEPOSIT
C	VERY LOOSE SILTY–SAND DEPOSIT
D	COMPACT TO VERY DENSE SILTY–SAND DEPOSIT
E	COMPACT TO VERY DENSE LOWER SAND DEPOSIT
F	EXCELLENT QUALITY GRANITIC ROCK
▽	WATER LEVEL

BOREHOLES IDENTIFICATION

09–12	2009 INVESTIGATION BY SMI
16	1970 INVESTIGATION BY DAMES & MOORES
HE–X	1984 INVESTIGATION BY SNC/TERRATECH

SYMBOLS (investigation)

⌖ SMI 2009

PREVIOUS INVESTIGATIONS:

◕	GEOCON 1955	⊕	TERRATECH 1984
◐	GOLDER 1967	◉	AMEC 2004
▲	DAMES & MOORES 1970	●	QUALITAS 2004
✱	SNC/TERRATECH 1984	◈	QUALITAS 2005

LINE

—·-·—	PROPOSED LOCATION OF WHARF #4
— — —	GEOPHYSICS LINE

NOTE:

1. THE SURVEY DATUM IS BASED ON THE FOLLOWING GEODEDIC REFERENCE MARK.
   - 85K0370
   - N: 5 472 48.686 ; E: 258 676.469
   - GEODEDIC DATUM: 12.220 ; CHART DATUM: 14.030
   - NAD 83 (NON CSRS), 3° MTM ZONE 6
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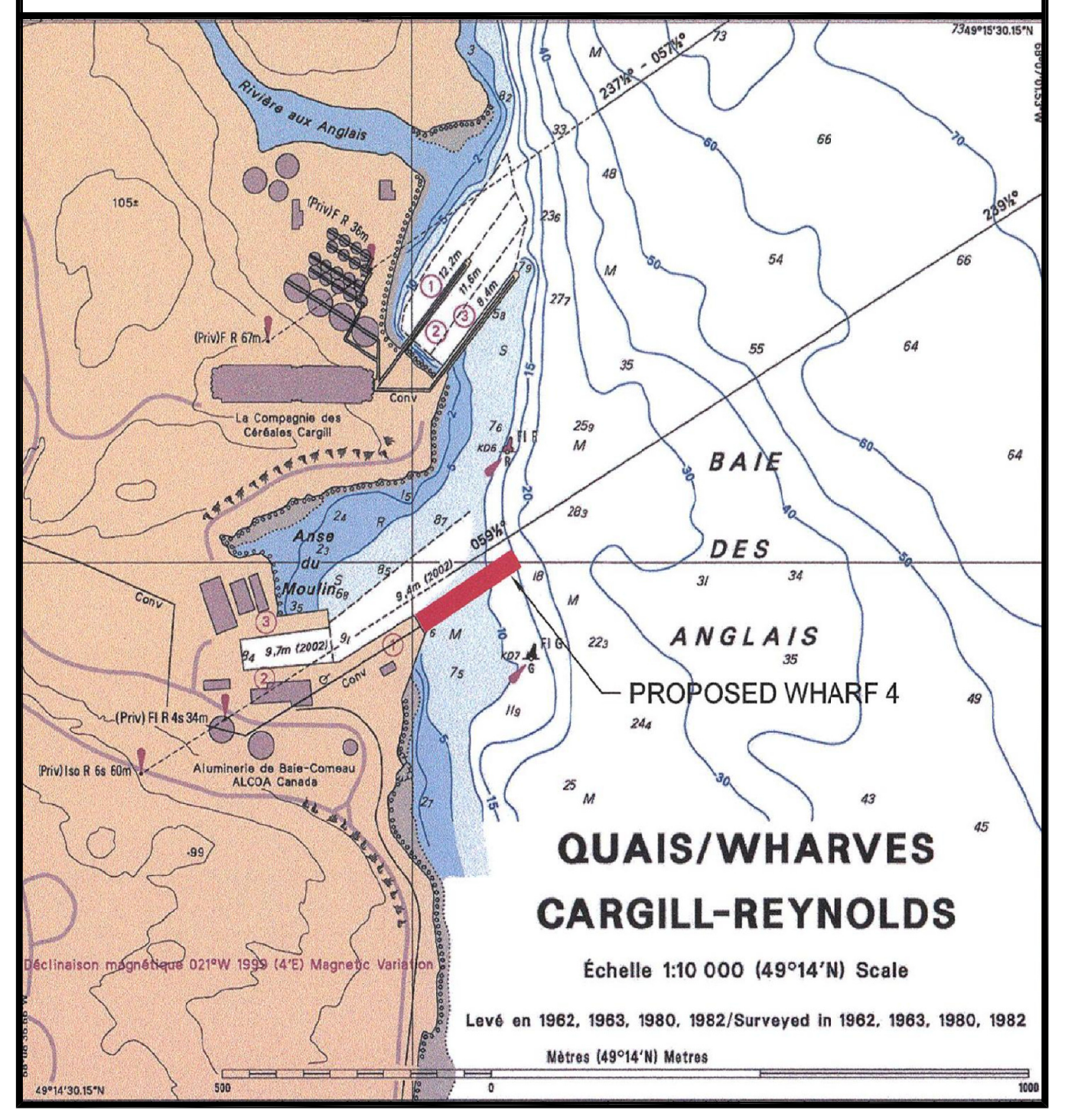

QUAIS/WHARVES
CARGILL-REYNOLDS
Échelle 1:10 000 (49°14'N) Scale
Levé en 1962, 1963, 1980, 1982/Surveyed in 1962, 1963, 1980, 1982
Mètres (49°14'N) Metres

NO	REFERENCES	NO
01	H310011–ABC197–0100–10–017–0001.dwg	HATCH

NO	MODIFICATIONS	INIT.	DATE
A	PRELIMINARY	S.G.	9/12/09

SEALS:

Sonya Graveline 116692
Alain Philibert 26750

LABO S.M. INC.
740, rue Galt Ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566–8855 – Fax: (819) 566–0224 www.groupesm.com

CLIENT:
Aluminerie de Baie-Comeau
100 ROUTE MARITIME BAIE-COMEAU, QUÉ. G4Z-2L6
TÉLÉPHONE (418) 296-3311, TÉLÉCOPIEUR (418) 296-7121

PROJECT:
GEOTECHNICAL INVESTIGATION
NEW WHARF #4
ALCOA BAIE–COMEAU SMELTER

TITLE
CROSS SECTIONS
A–A
B–B

DRAWN BY: A. BENOIT tech.	PROJECTED BY: S. GRAVELINE ing.
VERIFIED BY: S. CERMINARA tech.	APPROVED BY: S. GRAVELINE ing.
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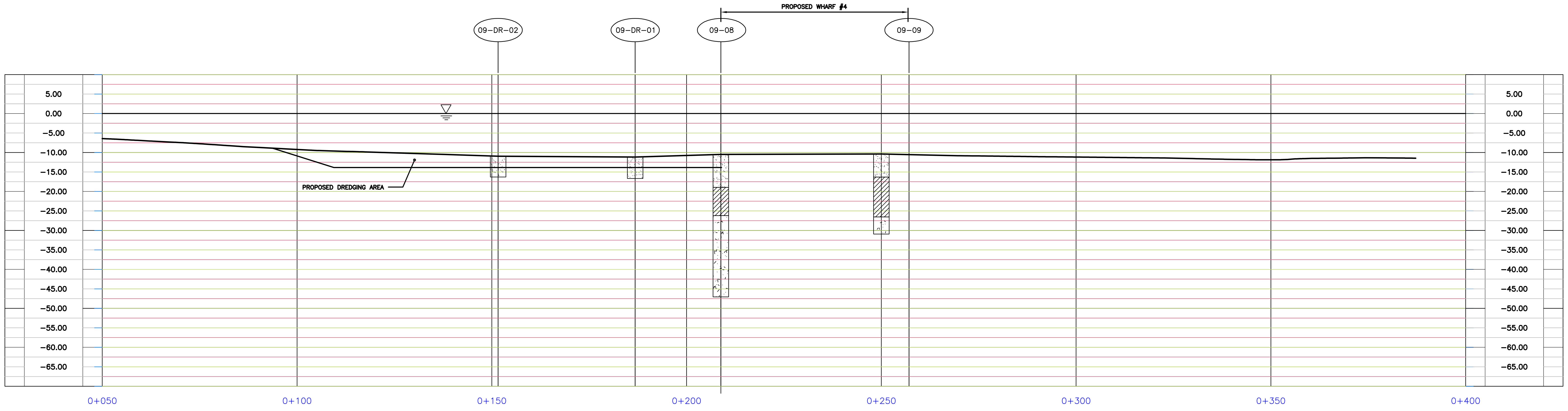
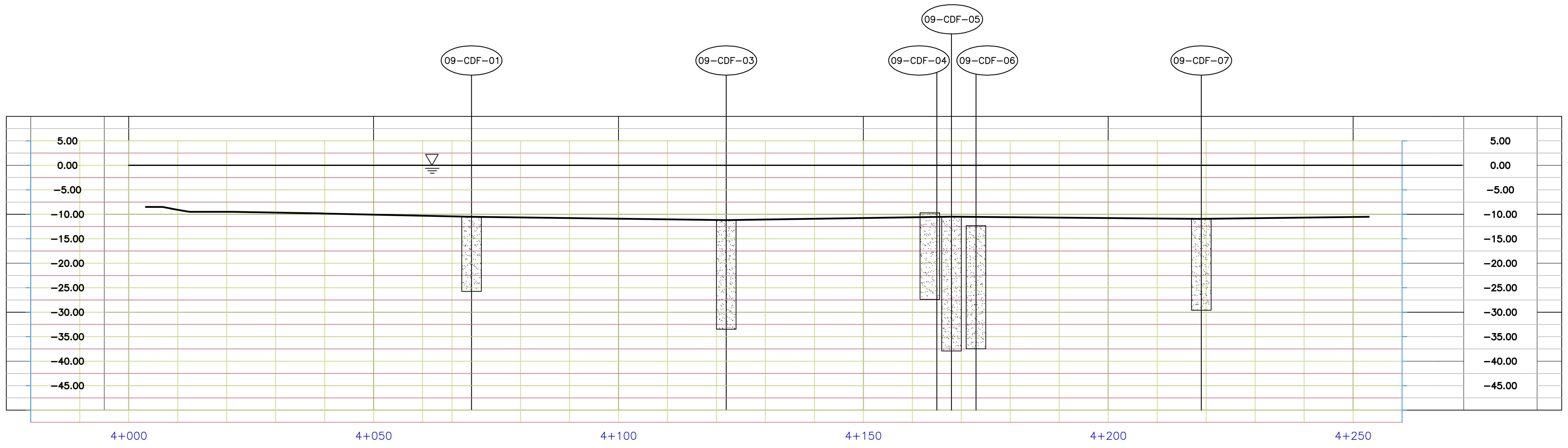
	CAD FILE: 9382300K001.dwg

DRAWING NO.: F099382300K002
REV.: –A



CROSS SECTION C–C



CROSS SECTION D–D

L E G E N D

STRATIGRAPHICS SYMBOLS

A	▨	COMPACT UPPER SAND DEPOSIT	E	▨	COMPACT TO VERY DENSE LOWER SAND DEPOSIT
B	▨	FIRM CONSISTENCY CLAYEY DEPOSIT	F	▨	EXCELLENT QUALITY GRANITIC ROCK
C	▥	VERY LOOSE SILTY–SAND DEPOSIT		▽	WATER LEVEL
D	▨	COMPACT TO VERY DENSE SILTY–SAND DEPOSIT			

BOREHOLES IDENTIFICATION

09–12	2009 INVESTIGATION BY SMI
16	1970 INVESTIGATION BY DAMES & MOORES
HE–X	1984 INVESTIGATION BY SNC/TERRATECH

SYMBOLS (investigation)

⊕ SMI 2009

PREVIOUS INVESTIGATIONS:

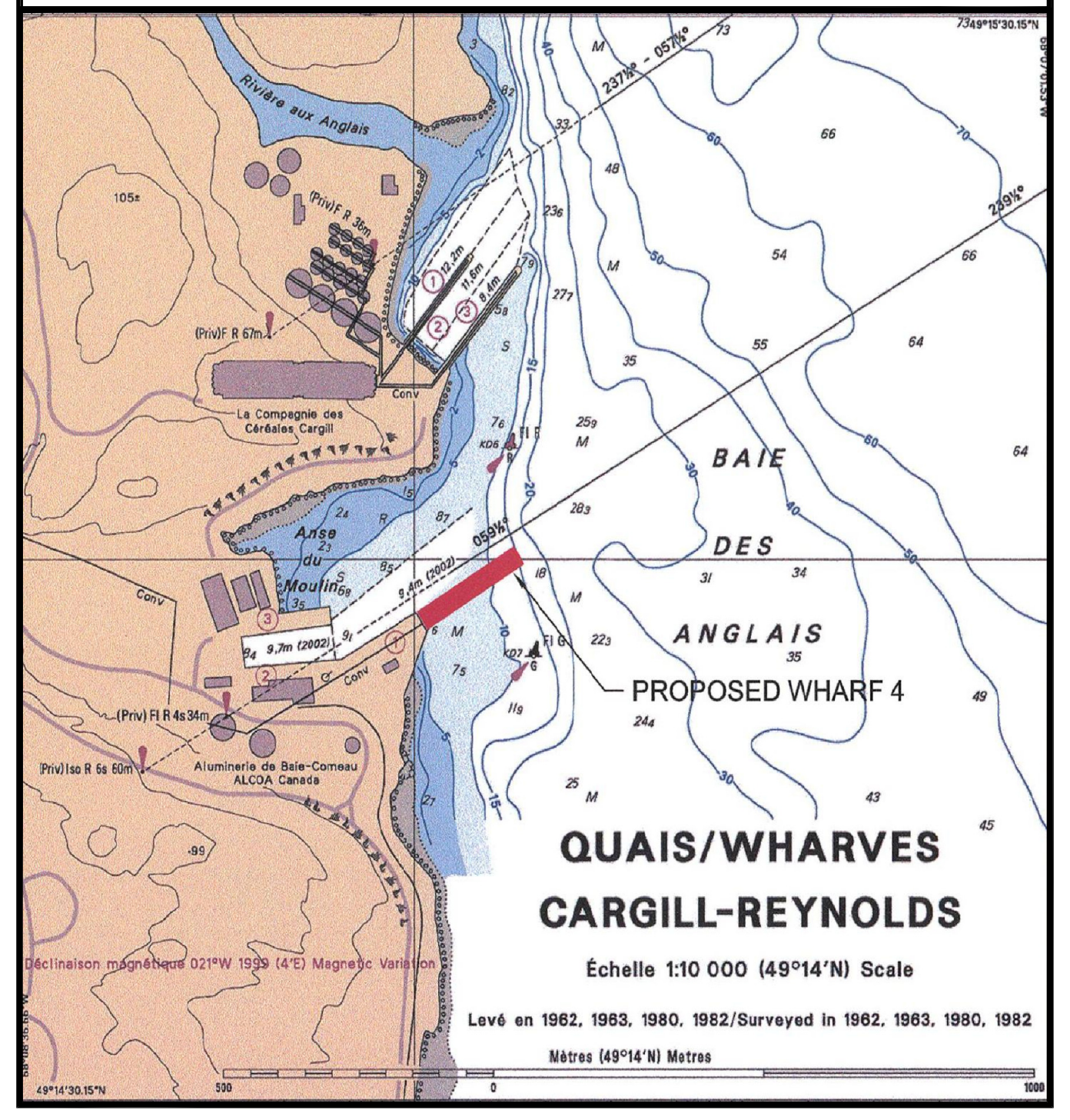
◕	GEOCON 1955	⊕	TERRATECH 1984
◐	GOLDER 1967	⊙	AMEC 2004
▲	DAMES & MOORES 1970	●	QUALITAS 2004
⊗	SNC/TERRATECH 1984	◆	QUALITAS 2005

LINE

—·–·—	PROPOSED LOCATION OF WHARF #4
– – – –	GEOPHYSICS LINE

NOTE:

1. THE SURVEY DATUM IS BASED ON THE FOLLOWING GEODEDIC REFERENCE MARK.
   - 85K0370
   - N: 5 472 48.686 ; E: 258 676.469
   - GEODEDIC DATUM: 12.220 ; CHART DATUM: 14.030
   - NAD 83 (NON CSRS), 3° MTM ZONE 6
2. ALL ELEVATIONS SHOWN ON THIS DRAWING ARE CHART DATUM WHICH THE "0" LEVEL IS 1.8m BELOW THE GEODEDIC DATUM.



NO	REFERENCES	NO
01	H310011–ABC197–0100–10–017–0001.dwg	HATCH

NO	MODIFICATIONS	INIT.	DATE
A	PRELIMINARY	S.G.	9/12/09

SEALS:

Sonya Graveline 116692

Alain Philibert 26750

LABO S.M. INC.
740, rue Galt Ouest, 2e étage, Sherbrooke (Québec) J1H 1Z3
(819) 566–8855 – Fax: (819) 566–0224 www.groupesm.com

CLIENT:
Aluminerie de Baie-Comeau
100 ROUTE MARITIME BAIE-COMEAU, QUÉ. G4Z-2L6 TÉLÉPHONE (418) 296-3311, TÉLÉCOPIEUR (418) 296-7121

PROJECT:
GEOTECHNICAL INVESTIGATION
NEW WHARF #4
ALCOA BAIE–COMEAU SMELTER

TITLE
CROSS SECTIONS
C–C
D–D

DRAWN BY: A. BENOIT tech.	PROJECTED BY: S. GRAVELINE ing.
VERIFIED BY: S. CERMINARA tech.	APPROVED BY: S. GRAVELINE ing.
SCALE: 1:500 0 5 10 15 20 25 METERS	DATE: 9/12/2009
	CAD FILE: 9382300K001.dwg

DRAWING NO.: F09938230 0K003 REV.: –A

APPENDIX B
SUMMARY OF ENGINEERING TESTING

TABLE OF CONTENTS

List of Tables

List of Attachments

LIST OF ACRONYMS AND ABBREVIATIONS

ADM	Anse du Moulin
ARA	Analysis of Rehabilitation Alternatives
ARI	Analytical Resources, Inc.
CDF	confined disposal facility
CST	column settling testing
DTA	differential thermal analysis
ESIA	Environmental and Socioeconomic Impact report
GC-MS	gas chromatography-mass spectrometry
MDDEP	Ministère du Dèveloppement Durable, de l'Environnement et des Parcs
MET	modified elutriate testing
MIBC	methyl isobutyl carbinol
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCLT	Pancake Column Leachate Testing
RA	rehabilitation alternatives
SOC	soot organic carbon
TOC	total organic carbon
TSS	total suspended sediment
WQC	Water Quality Criteria

1 INTRODUCTION

This appendix is part of the Analysis of Rehabilitation Alternatives (ARA) report and includes a summary of engineering testing performed to support development and evaluation of rehabilitation alternatives (RAs) for the Alcoa Baie-Comeau facility (ABC facility) and the Anse du Moulin (ADM).

Engineering testing included field sampling and laboratory analyses of sediment and surface water samples collected from the ADM. Field investigations and laboratory analyses results are discussed in more detail in Sections 3, and 4 of the ARA report.

The results of the engineering testing are discussed in Sections 2 through 4 of this appendix. As indicated in those sections, additional details are presented in attachments to this appendix.

2 CST, MET, AND PCLT

In support of anticipated design activities for the confined disposal facility (CDF) included in RAs 2, 3, and 4 for disposal of dredged material, sediment and surface water samples were collected during the 2008 and 2009 investigations for engineering testing. These are more typically detailed data that are collected to support design and are therefore beyond the usual level of detail for an analysis of the feasibility of RAs. However, Alcoa supported collecting these data to provide additional data for the ARA report, and to prepare for design.

The purpose of the engineering testing was to evaluate sediment properties that relate to CDF management of dredged material. These properties include the settling properties of sediment solids in water within the CDF during disposal (column settling testing [CST]), the dissociation of sediment contaminants from sediment to CDF water within the CDF during disposal (modified elutriate testing [MET]), and from dredged material within the CDF to groundwater that develops in the CDF after disposal (Pancake Column Leachate Testing [PCLT]). These tests are described in more detail below. Sediment and water volumes were collected from sample locations for the tests. Sample locations are shown on Figure 3-1 to the main ARA report.

2008 laboratory analyses for PCLT and CST were conducted by Analytical Resources, Inc. (ARI), of Tukwila, Washington, and laboratory analyses for MET were conducted by ARI (2008) and Maxxam Analytique, Inc., of St.-Laurent, Quebec (2009).

2.1 Column Settling Test

The CST is intended to provide information regarding the settling characteristics of dredged material placed within the CDF. Dredged material solids will separate from water entrained in the sediment during dredging and dredged material transport, and from water located within the CDF. The settling characteristics of the sediment are determined by the specific gravity and shape of the sediment particles within the dredged material, the presence of cohesive sediments and other materials, and flow characteristics of the water contained within the CDF. Other inferences can be drawn from CST results including the general settling characteristics of sediment once suspended in surface water in natural conditions.

CSTs were performed on two samples in 2008, samples CST-4 and CST-22. The CST includes mixing sediment and water in a 7-foot-high by 10.76-inch-diameter test column, and bubbling air onto the test column to maintain sediment in suspension until the test starts. Once the test starts, the air supply is shut off, and the sediment solids can begin to settle from suspension. The total suspended sediment (TSS) concentration is measured periodically in a sample of water withdrawn from the column, and the height of the accumulated sediment is measured over a longer period of time to evaluate the volume of solids that have settled, and the degree of consolidation, including initial zone settling and longer-term compression settling, of the settled solids.

A summary of CST information and results are presented in the ARI laboratory report presented in Attachment B-1.

The results of the CST indicate the following:

- In general, the TSS concentrations in the column were less than 1 percent of initial TSS concentrations within 1 hour of test start and maintained that level (except for a minor spike to approximately 1.5 percent at day 10 for CST-4) for 10 days.
- Self-weight consolidation measurements for sample CST-22 indicated the sediment completed initial zone settling within 2 hours, and approached maximum compression settling shortly thereafter. Consolidation measurements were not performed on sample CST-4 because of the relatively small sample volume received by the laboratory.

These results indicate dredged material placed within the CDF should settle and consolidate under self-weight relatively quickly. TSS in water located within the CDF should also decrease relatively rapidly. Aqueous concentrations of contaminants that sorb to sediment solids, particularly polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs), should also decrease relatively quickly. These findings are consistent with expectations based on the grain size analysis results for sediment discussed in Section 4 of the main ARA report that indicate the sediment is on average 80 percent sand.

2.2 Modified Elutriate Test

The MET is intended to represent conditions in effluent from a CDF as it is being filled. The MET is designed to simulate the quality of water generated as effluent from a CDF and accounts for geochemical changes occurring in the CDF during disposal. Test procedures allow for estimates of dissolved contaminant concentrations in milligrams per litre and total aqueous contaminants (including dissolved and sediment solid-sorbed contaminants) under quiescent settling conditions.

MET was performed on one sample collected during the 2008 investigation (MET 422) and two samples collected during the 2009 investigation (DA-2 and DA-6). The MET included mixing a sediment sample with ADM water to form a slurry, allowing the slurry to settle under conditions that approximate those in a CDF, then extracting effluent elutriate samples for chemical analysis. One sample was filtered to remove sediment solids and, therefore, measured dissolved phase contaminant concentrations. The other sample was unfiltered and, therefore, retained suspended sediment solids and is referred to in Table B-1 as a “total” concentration. The contaminant concentration measured in that sample, therefore, included dissolved and solid-sorbed contaminants.

Testing data are used to evaluate compliance with ADM receiving water quality criteria and are preliminarily compared to available Quebec Water Quality Criteria (WQC). The results presented in Table B-1 indicate the following:

- Among the metals, only copper exceeds WQC in total and dissolved phases.
- Chromium and nickel laboratory detection limits exceed WQC and, therefore, it is not known if the actual concentrations exceed the WQC.
- For PAHs, fluoranthene and phenanthrene exceed WQC.

Phenanthrene exceeded WQC in both the dissolved and total samples. Fluoranthene exceeded WQC only in the DA-1 total sample, and in both total and dissolved samples for sample MET 422.

These results indicate effluent within the CDF may require treatment to achieve discharge standards, assuming no mixing zone allowance. If required, treatment would likely include solids removal to reduce total concentrations associated with solid-sorbed contaminants, and to reduce dissolved phase concentrations to acceptable discharge limits. It is assumed in the ARA report that treatment would include gravity settling in the CDF for initial solids removal, followed by filtration through sand and carbon filters to remove solids and dissolved phase contaminants, respectively. As discussed in Section 2.1, the CST results support initial settling of solids in the CDF.

2.3 Pancake Column Leachate Test

The PCLT is intended to provide information on the longer term (compared to information derived from MET results) leaching characteristics of sediment contaminants. That information is used in evaluating chemical migration in groundwater that develops within the CDF and migrates from the CDF. RAs 2 through 4 include an earthen containment berm through which groundwater that develops in the CDF is expected to migrate.

The PCLT is used to evaluate potential leachate quality in dredged material and serves as a laboratory-scale physical model of contaminant elution from dredged material that includes advection-dispersion, colloid release, and other mass-transfer effects.

Testing includes mixing, weighing, and loading sediment into a column leaching apparatus. Site surface water that would be mixed with sediment during dredging is introduced into the loaded column over an extended time interval. Water flow is controlled by a constant volume pump. Leachate samples are collected at specified time intervals and are analyzed for contaminants and other sediment chemicals as needed to evaluate test results. The PCLT allows comparison of paired bulk sediment/leachate data to derive site-specific partitioning relationships.

PCLT was performed on sample PCLT 422 collected in 2008 PCLT, and re-run. The results of the testing are summarized in Table B-2 and are presented graphically in Attachment B-2. The results indicate that pH and dissolved oxygen remained relatively constant over time/porewater volumes as the tests proceeded. There was a slight increase in salinity (and as would be expected, conductivity) observed during the test. Oxidation-reduction potential (Redox Potential) fluctuated in one test, and showed a slight but consistent decrease in the other test. Certain metals had consistently relatively low (relative to detection limits) concentrations in both samples, including arsenic, cadmium, and lead. Chromium and mercury were initially relatively high in one sample and then decreased to relatively low, consistent concentrations measured in the other sample. Silver concentrations similarly decreased in both samples to relatively low levels after initial sampling and analysis. Total PAHs reduced to near detection limits after approximately 15 weeks in one sample but in the other sample was highest at 15 weeks and took 30 weeks to reduce to near detection limits..

PCLT and other site-specific data will be used to develop partition relationships for further evaluation during more detailed design of the CDF. The CDF modeling included in Appendix F to the main ARA report used literature-derived values as a conservative approach for the ARA report. As discussed in Appendix F, PAH K_{OC} values calculated[1] from PCLT results were found to be on average approximately 10 percent higher than the selected literature-based values.

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[1] K_{OC} values were derived from PCLT results by dividing the sediment concentration in each test sample by the product of the maximum resultant aqueous concentration and the estimated f_{oc}. The maximum result was considered to be a conservative approximation of equilibrium conditions in the field (in lieu of actual porewater data).

3 SEPARATION TESTING

Separation testing (SEP) was undertaken to investigate the possibility of reducing or concentrating contaminated sediment volume. This would allow for optimizing CDF capacity by placing the more contaminated dredged material fraction in the CDF, and reusing the less contaminated dredged material elsewhere on the site, or for open ocean disposal, depending on the extent to which the dredged material could be decontaminated/detoxified via separation and accumulation of sediment contaminants. SEP was undertaken in response to a preference by the Ministère du Dèveloppement Durable, de l'Environnement et des Parcs (MDDEP) for ex-situ dredged material treatment to reduce the volume of dredged material requiring CDF management. SEP methods and procedures are presented in Attachment B-3.

3.1 Sampling

Two samples were collected during the 2009 investigation (09-AQ-DA-05-SEP and 09-AQ-DA-06-SEP). Samples were characterized and scoping tests were developed to assess the potential possible removal of pencil pitch. Pencil pitch and PAHs were characterized based on total organic carbon (TOC) as a proxy. Larger particles of pencil pitch were identified by heating the sample to melt the pencil pitch. Melting was an indicator to confirm that a particle was pitch. Sufficient particles were recovered to allow melting point determination using differential thermal analysis (DTA) and chemical content by leaching in dichloromethane and analyzing extracts for PAH.

3.2 Initial Testing

Scoping tests were performed on minus 200-mesh material to determine the potential of TOC concentration using froth flotation and on minus 10- by plus 200-mesh material using heavy liquid (sink-float) separation to determine the approximate specific gravity for separating the TOC and pencil pitch from the sediments.

The two sediments had different grain size distributions. The 09-AQ-DA-05-SEP sample was sandy with 6.3 percent passing 200 mesh, whereas the 09-AQ-DA-06-SEP sample was finer in grain size with 35.3 percent passing 200 mesh. The TOC analyses showed that the 09-AQ-DA-05-SEP sample was higher in organic content.

A high TOC percentage was reported for the minus 200-mesh fractions, 60.8 percent for the 09-AQ-DA-05-SEP sample and 77.2 percent for the 09-AQ-DA-06-SEP sample.

Optical examination of the screen fractions from both samples showed that the main components are quartz, feldspar, and mica. Material resembling pitch was reported to be present in variable amounts. In some of the fractions, the occurrence of the material was not obvious. Other constituents included shell fragments, graphite, other forms of carbon, pyroxene, magnetite, rutile, other minerals present in relatively smaller amounts, all occurring in small amounts except for the shells, which occurred frequently.

A small amount of pencil pitch from various coarse fractions was separated and identified (by handpicking with a tweezers and touching with a hot needle) as sufficient for DTA to determine the melting characteristics of the pitch. It appears pencil pitch particles had melting temperatures in the range of 130 to 140 °C. Particles of pencil pitch were subjected to a leach using dichloromethane (methylene chloride). The leach extracts were submitted for PAH analysis by Methods SW846 8270C and 3520C that includes 18 PAH compounds. Results were reported as milligrams of each compound found in the extract.

Dichloromethane was selected as the leach solution matrix in preparation for PAH analysis by gas chromatography-mass spectrometry (GC-MS). The total amount of reported PAH in the pitch is 92,217 mg/kg, or approximately 9 percent of the pitch weight, with the remainder consisting of heavier compounds in the extract and 39.5 percent of the pitch that did not dissolve in the extract.

It is worth noting that 170 milligrams of pencil pitch were removed from the plus 20-mesh portion of 20 kilograms each (40 kilograms total) of the 09-AQ-DA-05-SEP and 09-AQ-DA-06-SEP samples. The plus 20-mesh material accounts for approximately 3 percent of the total weight, or approximately 1.2 kilograms; therefore, the pencil pitch in the plus 20-mesh material calculates to approximately 142 milligrams per kilogram, of which approximately 9 percent are PAH compounds, or approximately 13 milligrams per kilogram PAH. As another example, pyrene at 9,696 milligrams per kilogram of pencil pitch is 10.5 percent of the total concentration in the pitch, yielding a calculated concentration of 1.4 milligrams pyrene per kilogram plus 20-mesh sediment.

Most likely, pencil pitch pieces may be found in all fractions, including the minus 200-mesh fraction, but it was not possible to identify them visually.

3.3 Separation Testing

Froth flotation scoping tests were performed on the minus 200-mesh fractions, and sink-float scoping tests were performed on the 10- by 200-mesh fractions of both sediments.

Froth flotation scoping tests were performed on the minus 200-mesh fractions using kerosene as collector, which makes organic carbon hydrophobic in water, and methyl isobutyl carbinol (MIBC) as a frother, which creates tiny bubbles that attach to the hydrophobic carbon particles. Kerosene and MIBC are chemicals commonly used in froth flotation. They were used only to determine if flotation of organics was possible and not to define full-scale process conditions. It was also recognized that these organics would contribute to TOC analyses even though the dosages were very low, approximately 1 to 3 milligrams reagents per kilogram solids.

Results showed that for the 09-AQ-DA-05-SEP material, 70.2 percent of the organic carbon was recovered in 11.0 percent of the sample weight. For the 09-AQ-DA-06-SEP material, 39.4 percent of the organic carbon was recovered in 16.2 percent of the sample weight. Flotation appears to be a viable option for removing organic carbon, including pencil pitch, from the sediments; however, the removal rate when applied to sediment PAH concentration is not sufficient to achieve reductions sufficient for reuse of dredged material.

Gravity separation using heavy liquid was performed on dried, split samples of the plus 200-mesh screen material from each sediment. The samples were dry-screened at 10 mesh, and the 10- by 200-mesh screen fractions were used for the separations. Fines and slimes must be removed from a sample for effective sink-float separations. Based on the occurrence of fines in sediment and an active biological community identified in previous investigations in the ADM, it is expected fines and slimes would occur frequently in ADM sediments and, therefore, would be problematic for gravity separation.

Initial separation was performed using diluted lithium metatungstate at a specific gravity of 1.5. The float product from both samples was further separated using lithium metatungstate diluted to 1.4 specific gravity. Lithium metatungstate was used because it is inorganic and would not contribute to TOC analyses and because it is easy to adjust the specific gravity to suit the test conditions. Other more benign and economical heavy media separation methods would be considered for any full-scale applications.

Overall, the bulk of the weight for each sample appeared in the 1.5 specific gravity sink, at 93 percent for the sandier 09-AQDA-05-SEP sample and 62.6 percent for the finer 09-AQ-DA-06-SEP sample. Results show that carbon can be concentrated by both sink-float and froth flotation. It appears that the specific gravity of the pencil pitch is between 1.4 and 1.5.

Gravity separation was considered potentially effective in separating TOC and/or pencil pitch from sediments on a bench scale. Full-scale application performance would be more uncertain due to the presence of fines and slime in sediment; however, based on the bench-scale findings, this process option was investigated further via additional bench-scale testing.

Organic carbon was separated from the samples at the bench-scale level. A new 20-kilogram split of each sample was wet-screened to remove the plus 10-mesh material. The minus 10-mesh material was air-dried in preparation for this phase of testing, which included additional froth flotation testing, sink-float testing, and gravity separation testing using a shaking table, all to evaluate the potential for full-scale separation. Dried samples were used as starting material for these tests in order to have accurate starting weights for material balance purposes.

Froth flotation testing was performed on 1-kilogram splits of the minus 10-mesh material from each sample using kerosene as a conditioning agent and MIBC as a frother. An initial diagnostic test (no assays) was first performed on each sample to confirm that the organic material could be floated under the specified conditions and to provide underflow (non-floating) material for microscopic evaluation to determine if pitch was removed into the froth. The underflow was screened at 40 mesh (420 micrometres), and the plus material was examined under the microscope to determine whether organic matter and, in particular, particles of pitch could be found. It appeared that the organic matter was effectively removed from the sediments, and no pitch was found in either sample. The conclusion from these diagnostic tests is that flotation appears to be very selective in removing organic matter under controlled circumstances on a small scale.

The flotation tests were repeated to provide material for TOC analysis. For the 09-AQ-DA-05-SEP sample, approximately 64 percent of the TOC was removed into 1.2 percent of the sample weight, and for the 09-AQ-DA-06 SEP sample, only approximately 45 percent of the TOC was removed into 9.5 percent of the sample weight; however, no attempt was made to optimize the flotation conditions. It is believed that with optimization, recoveries could be improved for both samples, and it may be possible to float the organic carbon, including pencil pitch, without the use of a collector.

Gravity separation used the differences in the specific gravity between various minerals or particles to achieve a separation. On a shaking table, the particle separation is assisted by the backwards and forwards motion (stroke) of the table, the tilt (both longitudinally and laterally), wash water applied along the length of the table, and riffles. Shaking table tests were performed on 1-kilogram splits of the minus 10-mesh material from each sample. In both cases, the product (slimes and rougher concentrate) from the first pass was re-tabled to further concentrate organics (cleaner concentrate). The minus 10-mesh feed and the table products were analyzed for TOC content. For both samples, it appears that the TOC distributions generally follow the weight distributions, indicating that tabling was not effective in concentrating the TOC. The pencil pitch content in the TOC distribution was not determined.

Based on visual inspection, little pencil pitch was observed in the coarse (plus 10-mesh) fractions of the samples. Although most of the TOC was contained in the minus 200-mesh fraction, preliminary PAH analyses of this size fraction did not show significant PAH in the fines of either sample; therefore, it is unlikely that size separation alone will effectively concentrate the PAH into a low-weight fraction.

Gravity separation was not effective in concentrating the TOC. Flotation did effectively concentrate the TOC; however, variable sediment grain size conditions and the likely presence of biological slimes are likely to limit the effectiveness of froth flotation.

3.4 Conclusions and Recommendations

Additional unit operations would be needed to prepare the feed for flotation and to process the flotation products, increasing the cost and complexity of this operation. The expected variability of the dredged material with regard to particle size, biological material, and contaminant concentration increases the uncertainty of the full-scale effectiveness of separation technologies. Additionally, extensive processing of the sediment samples was required, even on the bench scale, to achieve separation of pitch from sediment. This level of processing on a full scale is likely not practical, based on experience on other environmental dredging projects. Pilot testing would be required, at a significant expense, to reduce uncertainty associated with full-scale implementation of separation technology.

4 FIELD DEWATERING TESTING

Field dewatering tests were performed to support evaluation of ex-situ thermal treatment of dredged material. Like SEP, field dewatering testing was undertaken to address MDDEP preference for ex-situ treatment of dredged material, except that the ex-situ treatment evaluated is high temperature thermal desorption. Dredged material typically has a high water content. Experience with thermal treatment of dredged material indicates water content is a key factor in environmentally sound, cost-effective, efficient thermal treatment of dredged material contaminants. If the water content is too high (generally higher than 10 to 15 percent), significant fuel/energy is required to vaporize the water prior to achieving required destruction temperatures in the reactor vessel.

The field dewatering tests were performed to evaluate the moisture content of the dredged material after free drainage of water from the sediment. The test method was a modified version of a bag dewatering test typically used to evaluate the potential efficacy of dewatering. Sediment was mixed with ADM surface water and added to a geosynthetic bag, and water was allowed to drain from the bag. Sediment samples were collected periodically from the bag and submitted to the laboratory for moisture content testing. Laboratory reports are included in the Environmental and Socioeconomic Impact Assessment report. Laboratory moisture contents and field measurements of weights of water drained from sample, and retained sediment solids are summarized in Table B-3.

Field dewatering tests were performed on three shallow sediment samples (11DW1, 11DW2, and 11DW3) collected during the 2011 investigation using a Ponar sampler. A total of five tests were performed. A polymer was added to the sediment/water mixture for two of the five tests.

The initial moisture content of the sediment samples ranged from approximately 19.1 percent to 23.3 percent. After water was added to the sediment, moisture contents were measured in samples collected initially (i.e., within 15 to 20 minutes of pouring sediment/water or sediment/water/polymer mixture into bags) in three of the five tests. Moisture contents were measured again in samples approximately 1 hour after initial measurements, and final moisture contents were measured in samples collected approximately 18 to 19 hours after the start of testing.

Moisture contents decreased from initial water contents of 21.6 to 24.7 percent to 17.6 to 20.8 percent. The decrease in moisture content ranged from 0.8 to 7.1 percent. The addition of polymer appeared to have limited effect on moisture content—the moisture content in this sample decreased by 2.3 percent, and minimum water content in the sample was 20.3 percent.

The field dewatering test results indicate the material is relatively free draining, but the residual moisture content remains near 20 percent or higher. Additional effort would be required to further reduce moisture content for rehabilitation options that require low moisture content, most notably thermal treatment of dredged material.

5 REFERENCES

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Hawthorne, S.B., C.B. Grabanski, and D.J. Miller, 2006. Measured partitioning coefficients for parent and alkyl polycyclic aromatic hydrocarbons in 114 historically contaminated sediments: Part 1. Koc values. *Environ. Toxicol. Chem.* 25(11):2901-2911.

TABLES

Table B-1
Summary of Modified Elutriate Test Results

Analyte	Location Sample Type Year Unit	MET 422 Dissolved 2008	MET 422 Total 2008	DA-1 Dissolved 2009	DA-1 Total 2009	DA-6 Dissolved 2009	DA-6 Total 2009	Quebec Water Quality Criteria (Chronic Effect)
Metal								
Arsenic	mg/L	0.2 U	0.05 U	0.002 U	0.002 U	**0.007**	**0.006**	0.036
Barium	mg/L	0.02 U	0.003 U	NA	NA	NA	NA	
Cadmium	mg/L	0.01 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0093
Chromium	mg/L	0.02 U	0.005 U	0.03 U	0.03 U	0.03 U	0.03 U	0.011
Copper	mg/L	NA	NA	**0.005**	**0.009**	**0.017**	**0.004**	0.0037
Lead	mg/L	0.1 U	0.02 U	0.001 U	**0.001**	0.001 U	0.001 U	0.0085
Mercury	mg/L	0.0001 U	0.0001 U	0.0001 U	**0.0002**	0.0001 U	0.0001 U	0.0011
Nickel	mg/L	NA	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.0083
Zinc	mg/L	NA	NA	0.003 U	**0.011**	**0.012**	**0.004**	0.086
Selenium	mg/L	0.2 U	0.005 U	NA	NA	NA	NA	0.071
Silver	mg/L	0.02	0.003 U	NA	NA	NA	NA	0.1
Parent Polycyclic Aromatic Hydrocarbons (EPA 17)								
2-Methylnaphthalene	µg/L	0.10 U	0.10 U	0.1 U	0.1 U	0.1 U	0.1 U	
Acenaphthene	µg/L	16	18	**0.380**	**0.470**	0.05 U	0.05 U	38
Acenaphthylene	µg/L	0.12	0.13	0.1 U	0.1 U	0.1 U	0.1 U	
Anthracene	µg/L	3.0	4.3	**0.370**	**0.900**	0.03 U	0.03 U	
Benzo(a)anthracene	µg/L	0.76	0.66	0.02 U	**0.530**	0.02 U	0.02 U	
Benzo(a)pyrene	µg/L	0.13	0.1	0.008 U	**0.380**	0.008 U	0.008 U	
Benzo(b,j,k)fluoranthenes	µg/L	0.48	0.32	0.04 U	**0.990**	0.04 U	0.04 U	
Benzo(g,h,i)perylene	µg/L	0.10 U	0.10 U	0.1 U	**0.300**	0.1 U	0.1 U	
Chrysene	µg/L	0.85	0.73	0.03 U	**0.670**	0.03 U	0.03 U	
Dibenzo(a,h)anthracene	µg/L	0.10 U	0.10 U	0.02 U	**0.060**	0.02 U	0.02 U	
Fluoranthene	µg/L	12	12	**0.940**	**6.500**	0.01 U	**0.040**	1.6
Fluorene	µg/L	4.1	4.9	**0.540**	**0.760**	0.01 U	0.01 U	12
Indeno(1,2,3-c,d)pyrene	µg/L	0.10 U	0.10 U	0.01 U	**0.190**	0.01 U	0.01 U	
Naphthalene	µg/L	0.10 U	0.10 U	**0.110**	**0.170**	**0.070**	**0.120**	11
Phenanthrene	µg/L	5.1	13	**3.100**	**6.100**	**0.030**	**0.050**	1.4
Pyrene	µg/L	7.4	7.8	**0.480**	**4.000**	0.01 U	**0.020**	
Total PAH17 (calculated)	µg/L	**49.940**	**61.940**	**5.920**	**22.020**	**0.100**	**0.230**	
Substituted Polycyclic Aromatic Hydrocarbons								
1,3-Dimethylnaphtalene	µg/L	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	
1-Methylnaphthalene	µg/L	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	
2,3,5-Trimethylnaphthalene	µg/L	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	
3-Methylcholanthrene	µg/L	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	
4+5+6-Methylchrysene	µg/L	NA	NA	0.3 U	0.3 U	0.3 U	0.3 U	
7,12-Dimethylbenz(a)anthracene	µg/L	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	
7H-Dibenzo(c,g)carbazole	µg/L	NA	NA	0.3 U	0.3 U	0.3 U	0.3 U	
Benzo(c)phenanthrene	µg/L	NA	NA	0.1 U	**0.1**	0.1 U	0.1 U	
Benzo(e)pyrene	µg/L	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	
Dibenzo(a,e)pyrene	µg/L	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	
Dibenzo(a,h)pyrene	µg/L	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	
Dibenzo(a,i)pyrene	µg/L	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	
Dibenzo(a,l)pyrene	µg/L	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	
Total Petroleum Hydrocarbons								
Petroleum Hydrocarbons (C10-C50)	µg/L	NA	NA	**220**	**290**	**250**	**290**	

Notes:

Bold = Detected result

J = estimated value

U = compound analyzed, but not detected above detection limit

🟨 = exceedance of water quality criteria

µg/L = micrograms per liter

mg/L = milligrams per liter

N = normal sample

NA = compound not analyzed

ND = compound analyzed, but not detected above detection limit

Quebec Water Quality Criteria available at: *http://www.mddep.gouv.qc.ca/eau/criteres_eau/index.asp*

Water quality criteria are not available for chemicals for which no criteria are listed above.

When more than one criteria was listed, the lowest criterion was selected for inclusion in this table.

Table B-2
Summary of Pancake Column Leachate Testing Results

Task:	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**
Sample ID:	**PCLT2-PV1**	**PCLT2-PV2**	**PCLT2-PV3**	**PCLT2-PV4**	**PCLT2-PV5**	**PCLT2-PV6**	**PCLT2-PV7**	**PCLT2-PV8**	**PCLT2-PV9**	**PCLT2-PV10**	**PCLT2-PV11**	**PCLT2-PV12**	**PCLT2-PV13**
Sample Date:	**01/30/2009**	**02/06/2009**	**02/12/2009**	**02/19/2009**	**02/26/2009**	**03/05/2009**	**03/12/2009**	**03/19/2009**	**03/26/2009**	**04/02/2009**	**04/09/2009**	**04/16/2009**	**04/23/2009**
Metals (µg/l)													
Arsenic	4 100 U	5 100 U	**5**	**3**	**1**	--	**2**	--	**2**	--	**3**	--	**2**
Barium	**29 27**	**18 17**	**15**	**16**	**14**	--	**20**	--	**15**	--	**27**	--	**28**
Cadmium	1 4 U	1 U4 U	1 U	1 U	1 U	--	1 U	--	1 U	--	1 U	--	1 U
Chromium	**241 170**	40 10 U	**6**	**5**	**3**	--	2 U	--	**3**	--	2 U	--	2 U
Lead	5 U40 U	5 U40 U	5 U	5 U	5 U	--	5 U	--	5 U	--	5 U	--	5 U
Mercury	0.0669 0.1 U	0.0326 0.1 U	0.02 U	0.02 U	0.02 U	0.02 U	--	--	--	--	--	--	--
Selenium	14 100 U	16 100 U	**17**	**10**	**6**	--	**8**	--	**7**	--	**12**	--	**7**
Silver	**20 25**	1 6 U	1 U	1 U	**1**	--	**2**	--	1 U	--	1 U	--	1 U
Aromatic Hydrocarbons (µg/l)													
1-Methylnaphthalene	**0.3**	**0.44**	**0.37**	**0.4**	**0.41**	**0.46**	**0.49**	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
2-Methylnaphthalene	0.11 U	0.13 U	0.1 U	0.1 U	0.13 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Acenaphthene	**11**	**25**	**21**	**18**	**20**	**17**	**22**	**33**	**21**	**30**	**38**	**44**	**37**
Acenaphthylene	0.11 U	0.13 U	0.1 U	0.1 U	0.13 U	0.1 U	0.1 U	0.1 U	**0.3**	0.1 U	0.1 U	**0.56**	**0.52**
Anthracene	0.11 U	0.13 U	0.1 U	0.1 U	0.13 U	0.1 U	0.1 U	**0.3**	**0.36**	**0.37**	**0.19**	**0.3**	**0.24**
Benzo(a)anthracene	0.11 U	0.13 U	0.1 U	0.1 U	0.13 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	**0.11**	**0.11**
Benzo(a)pyrene	0.11 U	0.13 U	0.1 U	0.1 U	0.13 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Benzo(b)fluoranthene	0.11 U	0.13 U	0.1 U	0.1 U	0.13 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Benzo(g,h,i)perylene	0.11 U	0.13 U	0.1 U	0.1 U	0.13 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Benzo(k)fluoranthene	0.11 U	0.13 U	0.1 U	0.1 U	0.13 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Chrysene	0.11 U	0.13 U	0.1 U	0.1 U	0.13 U	0.1 U	0.1 U	0.1 U	0.1 U	**0.1**	0.1 U	**0.1**	**0.11**
Dibenzo(a,h)anthracene	0.11 U	0.13 U	0.1 U	0.1 U	0.13 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Fluoranthene	**1**	**3**	**3.8**	**3.2**	**4**	**3.8**	**3.8**	**3.4**	**2.8**	**4.9**	**4.9**	**5.7**	**4.9**
Fluorene	**2**	**3.9**	**3.5**	**3.7**	**3.7**	**4.4**	**4.5**	**1.9**	**0.34**	**1.2**	**1.9**	**0.25**	**0.18**
Indeno(1,2,3-c,d)pyrene	0.11 U	0.13 U	0.1 U	0.1 U	0.13 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Naphthalene	0.11 U	0.13 U	**0.16**	**0.16**	**0.3**	**0.22**	**0.28**	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Phenanthrene	**4.1**	**10**	**11**	**9.2**	**10**	**8.9**	**12**	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Pyrene	**0.35**	**1.3**	**1.8**	**1.4**	**1.8**	**1.7**	**1.8**	**0.17**	**0.55**	**0.53**	**0.26**	0.1 U	0.1 U
Semivolatile Organics (µg/l)													
Dibenzofuran	**1.6**	**2.8**	**2.7**	**2.7**	**2.7**	**3.2**	**3.1**	**2.9**	**0.62**	**1.6**	**2.4**	**0.2**	0.1 U

Notes:

Bold = Detected result

J = Estimated value

U = Compound analyzed, but not detected above detection limit

UJ = Compound analyzed, but not detected above estimated

R = Rejected

Table B-2
Summary of Pancake Column Leachate Testing Results

Task:	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**
Sample ID:	**PCLT2-PV14**	**PCLT2-PV19**	**PCLT-PV1**	**PCLT-PV2**	**PCLT-PV3**	**PCLT-PV4**	**PCLT-PV5**	**PCLT-PV7**	**PCLT-PV9**	**PCLT-PV13**	**PCLT-PV15**	**PCLT-PV18**
Sample Date:	**04/30/2009**	**06/04/2009**	**09/05/2008**	**09/12/2008**	**09/19/2008**	**09/25/2008**	**10/02/2008**	**10/16/2008**	**10/30/2008**	**11/26/2008**	**12/11/2008**	**12/31/2008**
Metals (µg/l)												
Arsenic	--	**4**	100 U	2 100 U100 U	4 100 U100 U	3 100 U	3 100 U	**1**	**1**	**3**	**4**	--
Barium	--	**26**	**50**	**34 30 33**	**34 36 42**	**33 34**	**33 35**	**37**	**35**	**35**	**37**	--
Cadmium	--	--	4 U	1 U4 U4 U	1 U4 U4 U	1 U4 U	1 U4 U	1 U	1 U	--	--	--
Chromium	--	--	**10**	3 10 U10 U	2 U10 U10 U	7 10 U	2 U10 U	**2**	**4**	--	--	--
Lead	--	--	40 U	5 U40 U40 U	5 U40 U40 U	5 U40 U	5 U40 U	5 U	5 U	--	--	--
Mercury	--	--	0.1 U	0.1 U0.1 U	0.1 U0.1 U	0.1 U	0.1 U	--	--	--	--	--
Selenium	--	**10**	100 U	10 100 U100 U	14 100 U100 U	11 100 U	10 100 U	**6**	**6**	**10**	**10**	--
Silver	--	--	**6**	1 U6 U6 U	1 U10 6 U	1 U6 U	1 U6 U	1 U	1 U	--	--	--
Aromatic Hydrocarbons (µg/l)												
1-Methylnaphthalene	0.1 U	0.1 U	**2.4**	**-- R**	**-- R**	--	--	--	--	--	--	**2.3**
2-Methylnaphthalene	0.1 U	0.1 U	1 U	**-- R**	**-- R**	--	--	--	--	--	--	0.1 U
Acenaphthene	**41**	**2.5**	**65**	**-- R**	**40 J**	--	--	--	--	--	--	**120**
Acenaphthylene	**0.57**	0.1 U	1 U	**-- R**	**1.5 J**	--	--	--	--	--	--	0.1 U
Anthracene	**0.22**	**0.29**	**6.2**	**0.54 J**	**0.57 J**	--	--	--	--	--	--	0.1 U
Benzo(a)anthracene	**0.11**	0.1 U	1 U	**-- R**	**-- R**	--	--	--	--	--	--	**0.2**
Benzo(a)pyrene	0.1 U	0.1 U	1 U	**-- R**	**-- R**	--	--	--	--	--	--	0.1 U
Benzo(b)fluoranthene	0.1 U	0.1 U	1 U	**-- R**	**-- R**	--	--	--	--	--	--	0.1 U
Benzo(g,h,i)perylene	0.1 U	0.1 U	1 U	**-- R**	**-- R**	--	--	--	--	--	--	0.1 U
Benzo(k)fluoranthene	0.1 U	0.1 U	1 U	**-- R**	**-- R**	--	--	--	--	--	--	0.1 U
Chrysene	**0.12**	0.1 U	1 U	**-- R**	**-- R**	--	--	--	--	--	--	**0.17**
Dibenzo(a,h)anthracene	0.1 U	0.1 U	1 U	**-- R**	**-- R**	--	--	--	--	--	--	0.1 U
Fluoranthene	**4.7**	**2.1**	**3.9**	**-- R**	**2.5 J**	--	--	--	--	--	--	**13**
Fluorene	**0.23**	0.1 U	**12**	**-- R**	**-- R**	--	--	--	--	--	--	**16**
Indeno(1,2,3-c,d)pyrene	0.1 U	0.1 U	1 U	**-- R**	**-- R**	--	--	--	--	--	--	0.1 U
Naphthalene	0.1 U	0.1 U	1 U	**-- R**	**-- R**	--	--	--	--	--	--	**0.18**
Phenanthrene	0.1 U	0.1 U	**30**	**-- R**	**-- R**	--	--	--	--	--	--	**58**
Pyrene	0.1 U	0.1 U	**2.4**	**-- R**	**-- R**	--	--	--	--	--	--	**7.3**
Semivolatile Organics (µg/l)												
Dibenzofuran	0.1 U	0.1 U	**11**	**-- R**	**-- R**	--	--	--	--	--	--	**14**

Notes:
Bold = Detected result
J = Estimated value
U = Compound analyzed, but not detected above detection limit
UJ = Compound analyzed, but not detected above estimated
R = Rejected

Table B-2
Summary of Pancake Column Leachate Testing Results

Task:	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**	**2008 CDF Design**
Sample ID:	**PCLT-PV19**	**PCLT-PV20**	**PCLT-PV21**	**PCLT-PV22**	**PCLT-PV23**	**PCLT-PV24**	**PCLT-PV25**	**PCLT-PV26**	**PCLT-PV27**	**PCLT-PV28**	**PCLT-PV29**	**PCLT-PV30**
Sample Date:	**01/09/2009**	**01/16/2009**	**01/26/2009**	**01/29/2009**	**02/06/2009**	**02/12/2009**	**02/19/2009**	**02/26/2009**	**03/05/2009**	**03/09/2009**	**03/16/2009**	**03/23/2009**
Metals (µg/l)												
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--
Lead	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	--	--
Selenium	--	--	--	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--	--	--	--	--	--
Aromatic Hydrocarbons (µg/l)												
1-Methylnaphthalene	**2.4**	**1.2**	**0.56**	**1.3**	0.13 U	**0.56**	0.1 U	0.12 U	0.12 U	**0.86**	0.1 U	0.1 U
2-Methylnaphthalene	0.5 U	0.1 U	0.1 U	0.1 U	0.13 U	0.1 U	0.1 U	0.12 U	0.12 U	0.1 U	0.1 U	0.1 U
Acenaphthene	**130**	**97**	**79**	**95**	**110**	**86**	**64**	**71**	**42**	**67**	**5**	**20**
Acenaphthylene	0.5 U	**2.2**	**1.2**	**0.95**	**2.7**	**1.2**	**1.6**	**1.6**	**1.2**	**0.93**	**0.11**	**0.64**
Anthracene	**3.2**	**0.59**	**1**	**2.3**	**0.38**	**1.8**	**0.49**	**1.6**	**0.52**	**5.6**	**0.51**	**0.52**
Benzo(a)anthracene	0.5 U	**0.21**	**0.18**	**0.21**	**0.24**	**0.24**	**0.16**	**0.2**	**0.18**	**0.22**	**0.24**	**0.16**
Benzo(a)pyrene	0.5 U	0.1 U	0.1 U	0.1 U	0.13 U	0.1 U	0.1 U	0.12 U	0.12 U	0.1 U	0.1 U	0.1 U
Benzo(b)fluoranthene	0.5 U	0.1 U	0.1 U	0.1 U	0.13 U	0.1 U	0.1 U	0.12 U	0.12 U	0.1 U	0.1 U	0.1 U
Benzo(g,h,i)perylene	0.5 U	0.1 U	0.1 U	0.1 U	0.13 U	0.1 U	0.1 U	0.12 U	0.12 U	0.1 U	0.1 U	0.1 U
Benzo(k)fluoranthene	0.5 U	0.1 U	0.1 U	0.1 U	0.13 U	0.1 U	0.1 U	0.12 U	0.12 U	0.1 U	0.1 U	0.1 U
Chrysene	0.5 U	**0.18**	**0.14**	**0.15**	**0.17**	**0.16**	**0.11**	**0.13**	**0.14**	**0.17**	**0.17**	**0.15**
Dibenzo(a,h)anthracene	0.5 U	0.1 U	0.1 U	0.1 U	0.13 U	0.1 U	0.1 U	0.12 U	0.12 U	0.1 U	0.1 U	0.1 U
Fluoranthene	**16**	**14**	**9.8**	**12**	**12**	**12**	**8.5**	**9**	**9.4**	**11**	**7.6**	**8.1**
Fluorene	**18**	**3.1**	**1.4**	**5.4**	**0.74**	**4.7**	**0.22**	**1.8**	**0.72**	**9.2**	**0.19**	0.1 U
Indeno(1,2,3-c,d)pyrene	0.5 U	0.1 U	0.1 U	0.1 U	0.13 U	0.1 U	0.1 U	0.12 U	0.12 U	0.1 U	0.1 U	0.1 U
Naphthalene	0.5 U	**0.13**	0.1 U	**0.12**	0.13 U	0.1 U	0.1 U	0.12 U	0.12 U	0.1 U	0.1 U	0.1 U
Phenanthrene	**55**	0.1 U	0.1 U	0.1 U	0.13 U	0.1 U	0.1 U	0.12 U	0.12 U	**16**	0.1 U	0.1 U
Pyrene	**10**	**7.1**	**5.2**	**6.1**	**1.2**	**4.1**	0.1 U	**1.6**	0.12 U	**3.7**	**0.52**	**0.26**
Semivolatile Organics (µg/l)												
Dibenzofuran	**15**	**4.4**	**3.2**	**5.8**	**2.4**	**5.4**	**1.2**	**3.2**	**2.1**	**8.4**	**0.73**	**0.5**

Notes:

Bold = Detected result

J = Estimated value

U = Compound analyzed, but not detected above detection limit

UJ = Compound analyzed, but not detected above estimated

R = Rejected

Table B-3
Summary of Field Dewatering Test Results

Tests of October 19-20, 2011							
Number	**Date**	**Time**	**Matrix**	**Description**	**Weight (g)**	**Volume (l)**	**Moisture content (%)**
Sediment							
11DW1	19-10-2011	12:51		Original sediment			19.1
11DW2	19-10-2011	12:51		Original sediment			20.6
11DW3	19-10-2011	12:51		Original sediment			23.3
Test 1 **Saturated sediment (water added to sediment only to allow pouring of sediment into bag); start/end of pouring in bag at 13:05/13:14**							
11DW4	19-10-2011	13:24	sediment		355		21.6
11DW4	19-10-2011	13:24	water		442		
11DW5	19-10-2011	14:24	sediment		370		24.4
11DW5	19-10-2011	14:24	water		420	0.4	
11DW10	20-10-2011	8:56	sediment		300		20.8
11DW10	20-10-2011	8:56	water		11*		
Test 2 **50% sediment 50% water from ADM; start/end of pouring in bag at 14:38/14:41**							
11DW6	19-10-2011	14:51	sediment		-		24.7
11DW6	19-10-2011	14:51	water		5200	5.2	
11DW8	19-10-2011	15:50	sediment		455		18.1
11DW8	19-10-2011	15:50	water		3150	3.15	
11DW11	20-10-2011	9:00	sediment		300		17.6
11DW11**	20-10-2011	9:00	water*		350	0.35	
Test 3 **50% sediment 50% water from ADM + polymer; start/end of pouring in bag at 15:15/15:20**							
11DW7	19-10-2011	15 :20	sediment		365		22.6
11DW7	19-10-2011	15 :30	water		850	8.5	
11DW9	19-10-2011	16 :30	sediment		425		21.1
11DW9	19-10-2011	16 :30	water		825	0.825	
11DW12	20-10-2011	9 :10	sediment		300		20.3
11DW12	20-10-2011	9 :10	water*		200	0.2	

Note: **Damaged by the courier

Supplemental Test of October 25-26, 2011							
Test 2 **50% sediment 50% water from ADM; start/end of pouring in bag at 14:14/14:16**							
Nom de l'échantillon	**Date**	**Time**	**Matrix**	**Description**		**Volume (l)**	**Moisture content (%)**
11DW101	25-10-2011	14 :26	water			3.6	
11DW102	25-10-2011	15 :48	water			3.5	
11DW104	25-10-2011	16 :36	water			4.5	
11DW106	26-10-2011	07 :00	water			2	
Test 3 **50% sediment 50% water from ADM + polymer; start/end of pouring in bag at 14:20/14:22**							
11DW103	25-10-2011	15 :54	water			8.6	
11DW105	25-10-2011	16 :44	water			0.18	

ATTACHMENTS

ATTACHMENT B-1- COLUMN SETTLING TEST LABORATORY RESULTS

Analytical Resources, Incorporated
Analytical Chemists and Consultants

October 23, 2008

Christopher R. Torell, P.G.
Anchor Environmental PLLC
290 Elwood Davis Road, Suite 318
Liverpool, NY 13088

RE: ALCOA - Quebec
ARI Job No. NH84

Dear Mr. Torell:

Please find enclosed the chain of custody documentation and the bulk analysis results for samples from the project referenced above.

Five samples were received in good condition on July 29, 2008 under ARI Job NH84. Bulk samples were analyzed for metals and PAH as requested on the COC. A column settling test was performed (CST), and the monitored parameters are also reported here.

One sample for PAH required reanalysis at dilution due to analytes above the calibrated range of the instrument. The metals matrix spike had recovery of selenium just low of control limits. No action was taken as the result is an indication of sample characteristics. Analyses met all other requirements for laboratory QC and matrix QC.

An electronic copy of this report as well as all supporting raw data will remain on file with ARI. Should you have any questions or problems, please feel free to contact me at your convenience.

Sincerely,

ANALYTICAL RESOURCES, INC.

Susan D. Dunnihoo
Director, Client Services
sue@arilabs.com
206-695-6207

Enclosures

cc: eFile NH84

SD/sdrd

N1484

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

Page 1 of 1

Turn Around Requested: per quote 08-1098

Report to: Torell

Company: Anchor

Address: 290 Elwood Davis

Road ste 318

Liverpool NY

Zipcode: 13088

Phone: 315 451 1905

Fax: 315 451 2111

Proj Name: Alcoa Baie Co

Proj Number:

Sampler: Torell

PLEASE COMBINE BAGS

Sample ID	Sample Date	Sample Time	Sample Matrix	No. Containers	COLUMN S.T.	BULK SED METALS	BULK SED PAH	Notes/Comments
ABC-CST 22	7/22		SED	2	X	X	X	BAGS
ABC-CST 4	7/23		SED	2	X	X	X	BAGS, LMT. VOL.
ABC-MET 422	7/23		SED	1		X		] COMPOSITE SED OF 22-4, 4-2, 4-3
ABC-MET 422	7/23		SED	1			X	
NONE	7/23		SED	1	–	–	–	EXTRA VOLUME FROM 22-4; RETAIN ONLY

PLEASE COMBINE BAGS

Relinquished: (Signature)

Printed name: Chris Torell

Company: Anchor

Date: 7/24 Time: 1pm

to [illegible]

Received by: (Signature)

Printed name: BRIAN KEGEL

Company: [illegible]

Date: 7/29/08 Time: 1000

Special Instructions/Notes

Number of Coolers:

Cooler Temp(s): 14.2

COC Seals Intact?

Bottles Intact?

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Anchor
COC No:
Assigned ARI Job No: NH84
Project Name: Alcoa Bases
Delivered by: Fed Ex
Tracking No:

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler? YES [✓ NO]
Were custody papers included with the cooler? .... [✓ YES] NO
Were custody papers properly filled out (ink, signed, etc.) .... [✓ YES] NO
Record cooler temperature (recommended 2.0-6.0 °C for chemistry .... 14.2 °C

Cooler Accepted by: Date: 7/29/08 Time: 1020

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler? .... YES [✓ NO]
What kind of packing material was used? .... BW
Was sufficient ice used (if appropriate)? .... YES [✓ NO]
Were all bottles sealed in individual plastic bags? .... [✓ YES] NO
Did all bottle arrive in good condition (unbroken)? .... [✓ YES] NO
Were all bottle labels complete and legible? .... [✓ YES] NO
Did all bottle labels and tags agree with custody papers? .... [✓ YES] NO
Were all bottles used correct for the requested analyses? .... [✓ YES] NO
Do any of the analyses (bottles) require preservation? (attach preservation checklist) .... YES [✓ NO]
Were all VOC vials free of air bubbles? .... [✓ NA] YES NO
Was sufficient amount of sample sent in each bottle? .... [✓ YES] NO

Samples Logged by: Date: 7/29/08 Time: 1530

***** Notify Project Manager of discrepancies or concerns *****

Explain discrepancies or negative responses:

By: Date:

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Client: Anchor Environmental, Inc. Project No.: NH84

Client Project: ALCOA Quebec

Case Narrative

1. Two samples were submitted for column settling testing. They were received on July 29, 2008.
2. The column settling tests were run according to U. S. Army Corps of Engineers guidance, with some modifications due to small sample size, especially for sample CST-4
3. The sediment and water were mixed and pumped into the column. Air was bubbled up from the bottom to attempt to keep the sediment suspended in the water. However, the samples contained a high percentage of fine sand and it settled quickly, leaving only the silt in suspension. This is why the initial TSS samples taken from the ports were so much lower than the mix ratio.
4. Because the samples settled out quickly, the tests were terminated after 24 hours for sample CST-22 and after 4 hours for CST-4.
5. CST-4 settled so quickly in part because of the limited volume of sediment available for testing, resulting in a low initial TSS. The interface that formed in the first test was essentially absent on the second column. By the 1 hour reading the column was clear and the sand had settled at the bottom.
6. In both tests, the mixing and aeration created some foam which sat at the top of the column. As this foam broke down, some solid particles were released and settled through the column. This caused a small spike in the TSS on the CST-22 column at about 6 hours.
7. The data is provided in summary tables and plots.
8. There were no other noted anomalies in the samples or methods on this project.

Approved by: Date: 10/20/08
Title: Geotechnical Division Manager

ORGANICS ANALYSIS DATA SHEET
PNAs by SW8270D GC/MS
Page 1 of 1

Sample ID: ABC-CST 22
SAMPLE

Lab Sample ID: NH84A
LIMS ID: 08-17929
Matrix: Sediment
Data Release Authorized:
Reported: 08/11/08

QC Report No: NH84-Anchor Environmental
Project: Alcoa Bases
08-1098
Date Sampled: 07/22/08
Date Received: 07/29/08

Date Extracted: 08/05/08
Date Analyzed: 08/07/08 20:22
Instrument/Analyst: NT4/LJR
GPC Cleanup: No
Alumina: No
Silica Gel: Yes

Sample Amount: 8.23 g-dry-wt
Final Extract Volume: 0.5 mL
Dilution Factor: 5.00
Percent Moisture: 22.4%

CAS Number	Analyte	RL	Result
91-20-3	**Naphthalene**	**300**	**510**
91-57-6	2-Methylnaphthalene	300	< 300 U
90-12-0	1-Methylnaphthalene	300	< 300 U
208-96-8	Acenaphthylene	300	< 300 U
83-32-9	**Acenaphthene**	**300**	**1,200**
86-73-7	**Fluorene**	**300**	**1,200**
85-01-8	**Phenanthrene**	**300**	**12,000**
120-12-7	**Anthracene**	**300**	**3,100**
206-44-0	**Fluoranthene**	**300**	**23,000**
129-00-0	**Pyrene**	**300**	**15,000**
56-55-3	**Benzo(a)anthracene**	**300**	**11,000**
218-01-9	**Chrysene**	**300**	**13,000**
205-99-2	**Benzo(b)fluoranthene**	**300**	**14,000**
207-08-9	**Benzo(k)fluoranthene**	**300**	**10,000**
50-32-8	**Benzo(a)pyrene**	**300**	**14,000**
193-39-5	**Indeno(1,2,3-cd)pyrene**	**300**	**5,600**
53-70-3	**Dibenz(a,h)anthracene**	**300**	**2,300**
191-24-2	**Benzo(g,h,i)perylene**	**300**	**5,700**
132-64-9	**Dibenzofuran**	**300**	**650**

Reported in µg/kg (ppb)

Semivolatile Surrogate Recovery	
d14-p-Terphenyl	58.4%
2-Fluorobiphenyl	59.2%

ORGANICS ANALYSIS DATA SHEET
PNAs by SW8270D GC/MS
Page 1 of 1

Sample ID: ABC-CST 4
SAMPLE

Lab Sample ID: NH84B
LIMS ID: 08-17930
Matrix: Sediment
Data Release Authorized:
Reported: 08/11/08

QC Report No: NH84-Anchor Environmental
Project: Alcoa Bases
08-1098
Date Sampled: 07/23/08
Date Received: 07/29/08

Date Extracted: 08/05/08
Date Analyzed: 08/07/08 20:55
Instrument/Analyst: NT4/LJR
GPC Cleanup: No
Alumina: No
Silica Gel: Yes

Sample Amount: 2.92 g-dry-wt
Final Extract Volume: 0.5 mL
Dilution Factor: 5.00
Percent Moisture: 16.6%

CAS Number	Analyte	RL	Result
91-20-3	**Naphthalene**	860	1,200
91-57-6	2-Methylnaphthalene	860	< 860 U
90-12-0	1-Methylnaphthalene	860	< 860 U
208-96-8	Acenaphthylene	860	< 860 U
83-32-9	**Acenaphthene**	860	7,600
86-73-7	**Fluorene**	860	3,300
85-01-8	**Phenanthrene**	860	33,000
120-12-7	**Anthracene**	860	12,000
206-44-0	**Fluoranthene**	860	66,000
129-00-0	**Pyrene**	860	45,000
56-55-3	**Benzo(a)anthracene**	860	37,000
218-01-9	**Chrysene**	860	39,000
205-99-2	**Benzo(b)fluoranthene**	860	63,000
207-08-9	**Benzo(k)fluoranthene**	860	31,000
50-32-8	**Benzo(a)pyrene**	860	61,000
193-39-5	**Indeno(1,2,3-cd)pyrene**	860	26,000
53-70-3	**Dibenz(a,h)anthracene**	860	10,000
191-24-2	**Benzo(g,h,i)perylene**	860	26,000
132-64-9	**Dibenzofuran**	860	1,800

Reported in µg/kg (ppb)

Semivolatile Surrogate	Recovery
d14-p-Terphenyl	50.2%
2-Fluorobiphenyl	50.2%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PNAs by SW8270D GC/MS
Page 1 of 1

Sample ID: ABC-MET 422
SAMPLE

Lab Sample ID: NH84C
LIMS ID: 08-17931
Matrix: Sediment
Data Release Authorized:
Reported: 08/11/08

QC Report No: NH84-Anchor Environmental
Project: Alcoa Bases
08-1098
Date Sampled: 07/23/08
Date Received: 07/29/08

Date Extracted: 08/05/08
Date Analyzed: 08/07/08 21:28
Instrument/Analyst: NT4/LJR
GPC Cleanup: No
Alumina: No
Silica Gel: Yes

Sample Amount: 7.67 g-dry-wt
Final Extract Volume: 0.5 mL
Dilution Factor: 5.00
Percent Moisture: 15.1%

CAS Number	Analyte	RL	Result
91-20-3	**Naphthalene**	330	**1,000**
91-57-6	2-Methylnaphthalene	330	< 330 U
90-12-0	1-Methylnaphthalene	330	< 330 U
208-96-8	Acenaphthylene	330	< 330 U
83-32-9	**Acenaphthene**	330	**6,200**
86-73-7	**Fluorene**	330	**4,300**
85-01-8	**Phenanthrene**	330	**37,000 E**
120-12-7	**Anthracene**	330	**18,000**
206-44-0	**Fluoranthene**	330	**61,000 E**
129-00-0	**Pyrene**	330	**39,000 E**
56-55-3	**Benzo(a)anthracene**	330	**30,000 E**
218-01-9	**Chrysene**	330	**27,000 E**
205-99-2	**Benzo(b)fluoranthene**	330	**38,000 E**
207-08-9	**Benzo(k)fluoranthene**	330	**21,000**
50-32-8	**Benzo(a)pyrene**	330	**36,000 E**
193-39-5	**Indeno(1,2,3-cd)pyrene**	330	**15,000**
53-70-3	**Dibenz(a,h)anthracene**	330	**6,100**
191-24-2	**Benzo(g,h,i)perylene**	330	**13,000**
132-64-9	**Dibenzofuran**	330	**2,200**

Reported in µg/kg (ppb)

Semivolatile Surrogate Recovery	
d14-p-Terphenyl	44.6%
2-Fluorobiphenyl	51.0%

FORM I

ORGANICS ANALYSIS DATA SHEET
PNAs by SW8270D GC/MS
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Sample ID: ABC-MET 422
DILUTION

Lab Sample ID: NH84C
LIMS ID: 08-17931
Matrix: Sediment
Data Release Authorized:
Reported: 08/11/08

QC Report No: NH84-Anchor Environmental
Project: Alcoa Bases
08-1098
Date Sampled: 07/23/08
Date Received: 07/29/08

Date Extracted: 08/05/08
Date Analyzed: 08/09/08 20:42
Instrument/Analyst: NT4/LJR
GPC Cleanup: No
Alumina: No
Silica Gel: Yes

Sample Amount: 7.67 g-dry-wt
Final Extract Volume: 0.5 mL
Dilution Factor: 20.0
Percent Moisture: 15.1%

CAS Number	Analyte	RL	Result
91-20-3	Naphthalene	1,300	< 1,300 U
91-57-6	2-Methylnaphthalene	1,300	< 1,300 U
90-12-0	1-Methylnaphthalene	1,300	< 1,300 U
208-96-8	Acenaphthylene	1,300	< 1,300 U
83-32-9	**Acenaphthene**	**1,300**	**6,900**
86-73-7	**Fluorene**	**1,300**	**4,800**
85-01-8	**Phenanthrene**	**1,300**	**43,000**
120-12-7	**Anthracene**	**1,300**	**20,000**
206-44-0	**Fluoranthene**	**1,300**	**71,000**
129-00-0	**Pyrene**	**1,300**	**54,000**
56-55-3	**Benzo(a)anthracene**	**1,300**	**34,000**
218-01-9	**Chrysene**	**1,300**	**32,000**
205-99-2	**Benzo(b)fluoranthene**	**1,300**	**30,000**
207-08-9	**Benzo(k)fluoranthene**	**1,300**	**33,000**
50-32-8	**Benzo(a)pyrene**	**1,300**	**41,000**
193-39-5	**Indeno(1,2,3-cd)pyrene**	**1,300**	**19,000**
53-70-3	**Dibenz(a,h)anthracene**	**1,300**	**5,400**
191-24-2	**Benzo(g,h,i)perylene**	**1,300**	**19,000**
132-64-9	**Dibenzofuran**	**1,300**	**2,500**

Reported in µg/kg (ppb)

Semivolatile Surrogate Recovery	
d14-p-Terphenyl	D
2-Fluorobiphenyl	D

SW8270 PNA SURROGATE RECOVERY SUMMARY

Matrix: Sediment

QC Report No: NH84-Anchor Environmental
Project: Alcoa Bases
08-1098

Client ID	TER	FBP	TOT OUT
ABC-CST 22	58.4%	59.2%	0
ABC-CST 4	50.2%	50.2%	0
MB-080508	83.2%	75.2%	0
LCS-080508	77.6%	70.4%	0
ABC-MET 422	44.6%	51.0%	0
ABC-MET 422 DL	D	D	0
ABC-MET 422 MS	50.6%	55.6%	0
ABC-MET 422 MSD	46.2%	54.6%	0

	LCS/MB LIMITS	QC LIMITS
(TER) = d14-p-Terphenyl	(30-160)	(30-160)
(FBP) = 2-Fluorobiphenyl	(30-160)	(30-160)

Prep Method: SW3546
Log Number Range: 08-17929 to 08-17931

ANALYTICAL
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ORGANICS ANALYSIS DATA SHEET
PNAs by SW8270D GC/MS
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Sample ID: ABC-MET 422
MS/MSD

Lab Sample ID: NH84C
LIMS ID: 08-17931
Matrix: Sediment
Data Release Authorized:
Reported: 08/11/08

QC Report No: NH84-Anchor Environmental
Project: Alcoa Bases
08-1098
Date Sampled: 07/23/08
Date Received: 07/29/08

Date Extracted MS/MSD: 08/05/08

Date Analyzed MS: 08/07/08 22:01
MSD: 08/07/08 22:34
Instrument/Analyst MS: NT4/LJR
MSD: NT4/LJR
GPC Cleanup: No
Silica Gel Cleanup: Yes

Sample Amount MS: 8.03 g-dry-wt
MSD: 7.81 g-dry-wt
Final Extract Volume MS: 0.5 mL
MSD: 0.5 mL
Dilution Factor MS: 5.00
MSD: 5.00
Alumina Cleanup: No

Analyte	**Sample**	**MS**	**Spike Added-MS**	**MS Recovery**	**MSD**	**Spike Added-MSD**	**MSD Recovery**	**RPD**
Naphthalene	1030	1600	1560	36.5%	8120	1600	443%	134%
2-Methylnaphthalene	< 326	1380	1560	88.5%	3880	1600	242%	95.1%
1-Methylnaphthalene	< 326	1040	1560	66.7%	2380	1600	149%	78.4%
Acenaphthylene	< 326	971	1560	62.2%	877	1600	54.8%	10.2%
Acenaphthene	6230	7210	1560	62.8%	13200	1600	436%	58.7%
Fluorene	4290	4870	1560	37.2%	8610	1600	270%	55.5%
Phenanthrene	36900	34100	1560	NA	49400	1600	781%	36.6%
Anthracene	17800	20200	1560	154%	22400	1600	288%	10.3%
Fluoranthene	61100	53100	1560	NA	67500	1600	400%	23.9%
Pyrene	38800	33900	1560	NA	42100	1600	206%	21.6%
Benzo(a)anthracene	30100	22800	1560	NA	31100	1600	62.5%	30.8%
Chrysene	27000	22200	1560	NA	29200	1600	138%	27.2%
Benzo(b)fluoranthene	37600	31600	1560	NA	40700	1600	194%	25.2%
Benzo(k)fluoranthene	20800	13200	1560	NA	17600	1600	NA	28.6%
Benzo(a)pyrene	36000	26600	1560	NA	35900	1600	NA	29.8%
Indeno(1,2,3-cd)pyrene	14600	11300	1560	NA	14100	1600	NA	22.0%
Dibenz(a,h)anthracene	6070	5090	1560	NA	6260	1600	11.9%	20.6%
Benzo(g,h,i)perylene	13400	10800	1560	NA	13100	1600	NA	19.2%
Dibenzofuran	2240	3150	1560	58.3%	6380	1600	259%	67.8%

Results reported in µg/kg
NA-No recovery due to high concentration of analyte in original sample OR calculated negative recovery OR the reporting of an unspiked analyte.
RPD calculated using sample concentrations per SW846.

ORGANICS ANALYSIS DATA SHEET
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Sample ID: ABC-MET 422
MATRIX SPIKE

Lab Sample ID: NH84C
LIMS ID: 08-17931
Matrix: Sediment
Data Release Authorized:
Reported: 08/11/08

QC Report No: NH84-Anchor Environmental
Project: Alcoa Bases
08-1098
Date Sampled: 07/23/08
Date Received: 07/29/08

Date Extracted: 08/05/08
Date Analyzed: 08/07/08 22:01
Instrument/Analyst: NT4/LJR
GPC Cleanup: No
Alumina: No
Silica Gel: Yes

Sample Amount: 8.03 g-dry-wt
Final Extract Volume: 0.5 mL
Dilution Factor: 5.00
Percent Moisture: 15.1%

CAS Number	Analyte	RL	Result
91-20-3	Naphthalene	310	---
91-57-6	2-Methylnaphthalene	310	---
90-12-0	1-Methylnaphthalene	310	---
208-96-8	Acenaphthylene	310	---
83-32-9	Acenaphthene	310	---
86-73-7	Fluorene	310	---
85-01-8	Phenanthrene	310	---
120-12-7	Anthracene	310	---
206-44-0	Fluoranthene	310	---
129-00-0	Pyrene	310	---
56-55-3	Benzo(a)anthracene	310	---
218-01-9	Chrysene	310	---
205-99-2	Benzo(b)fluoranthene	310	---
207-08-9	Benzo(k)fluoranthene	310	---
50-32-8	Benzo(a)pyrene	310	---
193-39-5	Indeno(1,2,3-cd)pyrene	310	---
53-70-3	Dibenz(a,h)anthracene	310	---
191-24-2	Benzo(g,h,i)perylene	310	---
132-64-9	Dibenzofuran	310	---

Reported in µg/kg (ppb)

Semivolatile Surrogate Recovery	
d14-p-Terphenyl	50.6%
2-Fluorobiphenyl	55.6%

ANALYTICAL
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ORGANICS ANALYSIS DATA SHEET
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Sample ID: ABC-MET 422
MATRIX SPIKE DUPLICATE

Lab Sample ID: NH84C
LIMS ID: 08-17931
Matrix: Sediment
Data Release Authorized:
Reported: 08/11/08

QC Report No: NH84-Anchor Environmental
Project: Alcoa Bases
08-1098
Date Sampled: 07/23/08
Date Received: 07/29/08

Date Extracted: 08/05/08
Date Analyzed: 08/07/08 22:34
Instrument/Analyst: NT4/LJR
GPC Cleanup: No
Alumina: No
Silica Gel: Yes

Sample Amount: 7.81 g-dry-wt
Final Extract Volume: 0.5 mL
Dilution Factor: 5.00
Percent Moisture: 15.1%

CAS Number	Analyte	RL	Result
91-20-3	Naphthalene	320	---
91-57-6	2-Methylnaphthalene	320	---
90-12-0	1-Methylnaphthalene	320	---
208-96-8	Acenaphthylene	320	---
83-32-9	Acenaphthene	320	---
86-73-7	Fluorene	320	---
85-01-8	Phenanthrene	320	---
120-12-7	Anthracene	320	---
206-44-0	Fluoranthene	320	---
129-00-0	Pyrene	320	---
56-55-3	Benzo(a)anthracene	320	---
218-01-9	Chrysene	320	---
205-99-2	Benzo(b)fluoranthene	320	---
207-08-9	Benzo(k)fluoranthene	320	---
50-32-8	Benzo(a)pyrene	320	---
193-39-5	Indeno(1,2,3-cd)pyrene	320	---
53-70-3	Dibenz(a,h)anthracene	320	---
191-24-2	Benzo(g,h,i)perylene	320	---
132-64-9	Dibenzofuran	320	---

Reported in µg/kg (ppb)

Semivolatile Surrogate Recovery	
d14-p-Terphenyl	46.2%
2-Fluorobiphenyl	54.6%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PNAs by SW8270D GC/MS
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Sample ID: LCS-080508
LAB CONTROL

Lab Sample ID: LCS-080508
LIMS ID: 08-17931
Matrix: Sediment
Data Release Authorized:
Reported: 08/11/08

QC Report No: NH84-Anchor Environmental
Project: Alcoa Bases
08-1098
Date Sampled: NA
Date Received: 07/29/08

Date Extracted: 08/05/08
Date Analyzed: 08/06/08 20:24
Instrument/Analyst: NT4/LJR
GPC Cleanup: No
Silica Gel Cleanup: Yes

Sample Amount: 7.50 g
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00
Alumina Cleanup: No

Analyte	**Lab Control**	**Spike Added**	**Recovery**
Naphthalene	1140	1670	68.3%
2-Methylnaphthalene	1510	1670	90.4%
1-Methylnaphthalene	1170	1670	70.1%
Acenaphthylene	1250	1670	74.9%
Acenaphthene	1150	1670	68.9%
Fluorene	1250	1670	74.9%
Phenanthrene	1210	1670	72.5%
Anthracene	1300	1670	77.8%
Fluoranthene	1450	1670	86.8%
Pyrene	1140	1670	68.3%
Benzo(a)anthracene	1240	1670	74.3%
Chrysene	1320	1670	79.0%
Benzo(b)fluoranthene	1320	1670	79.0%
Benzo(k)fluoranthene	1510	1670	90.4%
Benzo(a)pyrene	1340	1670	80.2%
Indeno(1,2,3-cd)pyrene	817	1670	48.9%
Dibenz(a,h)anthracene	987	1670	59.1%
Benzo(g,h,i)perylene	1040	1670	62.3%
Dibenzofuran	1260	1670	75.4%

Semivolatile Surrogate Recovery	
d14-p-Terphenyl	77.6%
2-Fluorobiphenyl	70.4%

Results reported in µg/kg

4B
SEMIVOLATILE METHOD BLANK SUMMARY

BLANK NO.

NH84MBS1

Lab Name: ANALYTICAL RESOURCES, INC

Client: ANCHOR ENVIRONMENTAL

ARI Job No: NH84

Project: ALCOA BASES

Lab File ID: NH84MB

Date Extracted: 08/05/08

Instrument ID: NT4

Date Analyzed: 08/06/08

Matrix: SOLID

Time Analyzed: 1952

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS and MSD:

	CLIENT SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED
01	NH84LCSS1	NH84LCSS1	NH84SB	08/06/08
02	ABC-CST 22	NH84A	NH84A	08/07/08
03	ABC-CST 4	NH84B	NH84B	08/07/08
04	ABC-MET 422	NH84C	NH84C	08/07/08
05	ABC-MET 422 MS	NH84CMS	NH84CMS	08/07/08
06	ABC-MET 422 MSD	NH84CMSD	NH84CMD	08/07/08
07	ABC-MET 422	NH84C	NH84CDL	08/09/08
08				
09				
10				
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12				
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28				
29				
30				

COMMENTS:

ORGANICS ANALYSIS DATA SHEET
PNAs by SW8270D GC/MS
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Sample ID: MB-080508
METHOD BLANK

Lab Sample ID: MB-080508
LIMS ID: 08-17931
Matrix: Sediment
Data Release Authorized:
Reported: 08/11/08

QC Report No: NH84-Anchor Environmental
Project: Alcoa Bases
08-1098
Date Sampled: NA
Date Received: NA

Date Extracted: 08/05/08
Date Analyzed: 08/06/08 19:52
Instrument/Analyst: NT4/LJR
GPC Cleanup: No
Alumina: No
Silica Gel: Yes

Sample Amount: 7.50 g
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00
Percent Moisture: NA

CAS Number	Analyte	RL	Result
91-20-3	Naphthalene	67	< 67 U
91-57-6	2-Methylnaphthalene	67	< 67 U
90-12-0	1-Methylnaphthalene	67	< 67 U
208-96-8	Acenaphthylene	67	< 67 U
83-32-9	Acenaphthene	67	< 67 U
86-73-7	Fluorene	67	< 67 U
85-01-8	Phenanthrene	67	< 67 U
120-12-7	Anthracene	67	< 67 U
206-44-0	Fluoranthene	67	< 67 U
129-00-0	Pyrene	67	< 67 U
56-55-3	Benzo(a)anthracene	67	< 67 U
218-01-9	Chrysene	67	< 67 U
205-99-2	Benzo(b)fluoranthene	67	< 67 U
207-08-9	Benzo(k)fluoranthene	67	< 67 U
50-32-8	Benzo(a)pyrene	67	< 67 U
193-39-5	Indeno(1,2,3-cd)pyrene	67	< 67 U
53-70-3	Dibenz(a,h)anthracene	67	< 67 U
191-24-2	Benzo(g,h,i)perylene	67	< 67 U
132-64-9	Dibenzofuran	67	< 67 U

Reported in µg/kg (ppb)

Semivolatile Surrogate Recovery	
d14-p-Terphenyl	83.2%
2-Fluorobiphenyl	75.2%

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: ABC-CST 22
SAMPLE

Lab Sample ID: NH84A
LIMS ID: 08-17929
Matrix: Sediment
Data Release Authorized:
Reported: 08/21/08

QC Report No: NH84-Anchor Environmental
Project: Alcoa Bases
08-1098
Date Sampled: 07/22/08
Date Received: 07/29/08

Percent Total Solids: 77.8%

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/kg-dry	Q
3050B	08/19/08	6010B	08/20/08	7440-38-2	Arsenic	20	20	U
3050B	08/19/08	6010B	08/20/08	**7440-39-3**	**Barium**	1	**29**	
3050B	08/19/08	6010B	08/20/08	7440-43-9	Cadmium	0.6	0.6	U
3050B	08/19/08	6010B	08/20/08	**7440-47-3**	**Chromium**	2	**8**	
3050B	08/19/08	6010B	08/20/08	7439-92-1	Lead	6	6	U
CLP	08/18/08	7471A	08/19/08	7439-97-6	Mercury	0.05	0.05	U
3050B	08/19/08	6010B	08/20/08	7782-49-2	Selenium	20	20	U
3050B	08/19/08	6010B	08/20/08	7440-22-4	Silver	1	1	U

U-Analyte undetected at given RL
RL-Reporting Limit

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: ABC-CST 4
SAMPLE

Lab Sample ID: NH84B
LIMS ID: 08-17930
Matrix: Sediment
Data Release Authorized:
Reported: 08/21/08

QC Report No: NH84-Anchor Environmental
Project: Alcoa Bases
08-1098
Date Sampled: 07/23/08
Date Received: 07/29/08

Percent Total Solids: 85.1%

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/kg-dry	Q
3050B	08/19/08	6010B	08/20/08	7440-38-2	Arsenic	6	6	U
3050B	08/19/08	6010B	08/20/08	**7440-39-3**	**Barium**	0.3	**29.9**	
3050B	08/19/08	6010B	08/20/08	7440-43-9	Cadmium	0.2	0.2	U
3050B	08/19/08	6010B	08/20/08	**7440-47-3**	**Chromium**	0.6	**9.7**	
3050B	08/19/08	6010B	08/20/08	**7439-92-1**	**Lead**	2	**7**	
CLP	08/18/08	7471A	08/19/08	7439-97-6	Mercury	0.05	0.05	U
3050B	08/19/08	6010B	08/20/08	7782-49-2	Selenium	6	6	U
3050B	08/19/08	6010B	08/20/08	7440-22-4	Silver	0.3	0.3	U

U-Analyte undetected at given RL
RL-Reporting Limit

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: ABC-MET 422
SAMPLE

Lab Sample ID: NH84C
LIMS ID: 08-17931
Matrix: Sediment
Data Release Authorized:
Reported: 08/21/08

QC Report No: NH84-Anchor Environmental
Project: Alcoa Bases
08-1098
Date Sampled: 07/23/08
Date Received: 07/29/08

Percent Total Solids: 80.1%

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/kg-dry	Q
3050B	08/19/08	6010B	08/20/08	7440-38-2	Arsenic	20	20	U
3050B	08/19/08	6010B	08/20/08	**7440-39-3**	**Barium**	0.9	**31.6**	
3050B	08/19/08	6010B	08/20/08	7440-43-9	Cadmium	0.6	0.6	U
3050B	08/19/08	6010B	08/20/08	**7440-47-3**	**Chromium**	2	**12**	
3050B	08/19/08	6010B	08/20/08	7439-92-1	Lead	6	6	U
CLP	08/18/08	7471A	08/19/08	7439-97-6	Mercury	0.05	0.05	U
3050B	08/19/08	6010B	08/20/08	7782-49-2	Selenium	20	20	U
3050B	08/19/08	6010B	08/20/08	7440-22-4	Silver	0.9	0.9	U

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: ABC-CST 22
DUPLICATE

Lab Sample ID: NH84A
LIMS ID: 08-17929
Matrix: Sediment
Data Release Authorized:
Reported: 08/21/08

QC Report No: NH84-Anchor Environmental
Project: Alcoa Bases
08-1098
Date Sampled: 07/22/08
Date Received: 07/29/08

MATRIX DUPLICATE QUALITY CONTROL REPORT

Analyte	Analysis Method	Sample	Duplicate	RPD	Control Limit	Q
Arsenic	6010B	20 U	20 U	0.0%	+/- 20	L
Barium	6010B	29	26	10.9%	+/- 20%	
Cadmium	6010B	0.6 U	0.6 U	0.0%	+/- 0.6	L
Chromium	6010B	8	8	0.0%	+/- 20%	
Lead	6010B	6 U	6 U	0.0%	+/- 6	L
Mercury	7471A	0.05 U	0.05 U	0.0%	+/- 0.05	L
Selenium	6010B	20 U	20 U	0.0%	+/- 20	L
Silver	6010B	1 U	1 U	0.0%	+/- 1	L

Reported in mg/kg-dry

*-Control Limit Not Met
L-RPD Invalid, Limit = Detection Limit

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: ABC-CST 22
MATRIX SPIKE

Lab Sample ID: NH84A
LIMS ID: 08-17929
Matrix: Sediment
Data Release Authorized:
Reported: 08/21/08

QC Report No: NH84-Anchor Environmental
Project: Alcoa Bases
08-1098
Date Sampled: 07/22/08
Date Received: 07/29/08

MATRIX SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Sample		Spike	Spike Added	% Recovery	Q
Arsenic	6010B	20	U	220	257	85.6%	
Barium	6010B	29		296	257	104%	
Cadmium	6010B	0.6	U	64.6	64.2	101%	
Chromium	6010B	8		72	64.2	99.7%	
Lead	6010B	6	U	264	257	103%	
Mercury	7471A	0.05	U	0.50	0.466	107%	
Selenium	6010B	20	U	190	257	73.9%	N
Silver	6010B	1	U	67	64.2	104%	

Reported in mg/kg-dry

N-Control Limit Not Met
H-% Recovery Not Applicable, Sample Concentration Too High
NA-Not Applicable, Analyte Not Spiked

Percent Recovery Limits: 75-125%

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: LAB CONTROL

Lab Sample ID: NH84LCS
LIMS ID: 08-17930
Matrix: Sediment
Data Release Authorized:
Reported: 08/21/08

QC Report No: NH84-Anchor Environmental
Project: Alcoa Bases
08-1098
Date Sampled: NA
Date Received: NA

BLANK SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Spike Found	Spike Added	% Recovery	Q
Arsenic	6010B	222	200	111%	
Barium	6010B	209	200	104%	
Cadmium	6010B	54.0	50.0	108%	
Chromium	6010B	53.1	50.0	106%	
Lead	6010B	215	200	108%	
Mercury	7471A	1.06	1.00	106%	
Selenium	6010B	226	200	113%	
Silver	6010B	52.5	50.0	105%	

Reported in mg/kg-dry

N-Control limit not met
Control Limits: 80-120%

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: METHOD BLANK

Lab Sample ID: NH84MB
LIMS ID: 08-17930
Matrix: Sediment
Data Release Authorized:
Reported: 08/21/08

QC Report No: NH84-Anchor Environmental
Project: Alcoa Bases
08-1098
Date Sampled: NA
Date Received: NA

Percent Total Solids: NA

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/kg-dry	Q
3050B	08/19/08	6010B	08/20/08	7440-38-2	Arsenic	5	5	U
3050B	08/19/08	6010B	08/20/08	7440-39-3	Barium	0.3	0.3	U
3050B	08/19/08	6010B	08/20/08	7440-43-9	Cadmium	0.2	0.2	U
3050B	08/19/08	6010B	08/20/08	7440-47-3	Chromium	0.5	0.5	U
3050B	08/19/08	6010B	08/20/08	7439-92-1	Lead	2	2	U
CLP	08/18/08	7471A	08/19/08	7439-97-6	Mercury	0.05	0.05	U
3050B	08/19/08	6010B	08/20/08	7782-49-2	Selenium	5	5	U
3050B	08/19/08	6010B	08/20/08	7440-22-4	Silver	0.3	0.3	U

U-Analyte undetected at given RL
RL-Reporting Limit

Column Settling Test

Sample ID: CST-22

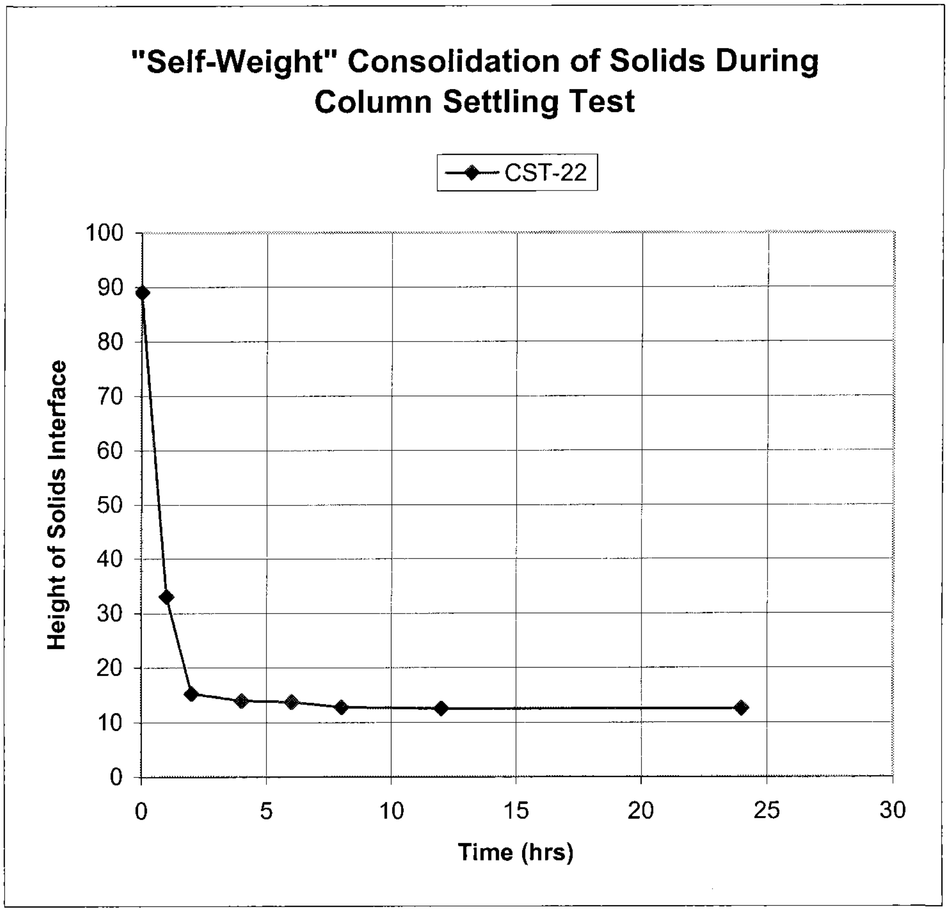
Initial mix:
Water volume, liters: 90
Sediment mass, grams, dry weight basis: 13,400.4
Initial mix ratio, g/L: 148.9
Initial measured TSS, in column: 22.5

Sediment Moisture Content, % of dry weight: 35.1

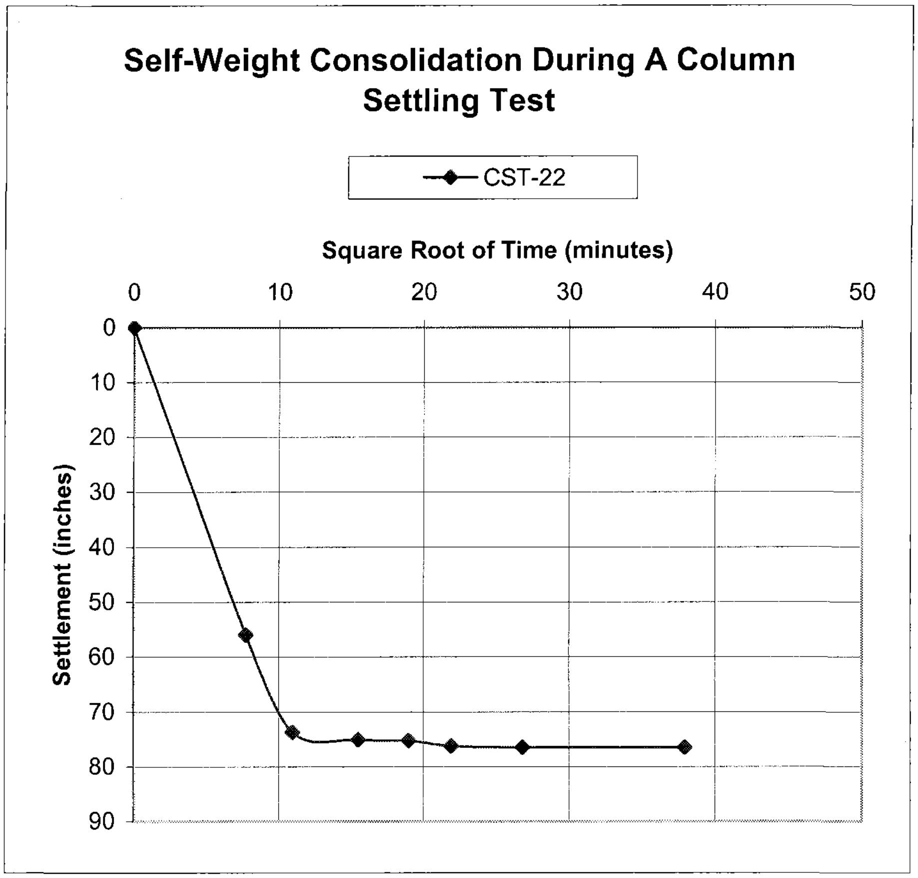
Percent of Initial TSS Concentration over Time

	Depth from Top of Settling Column (ft)										
	0.92	1.42	1.92	2.42	2.92	3.42	3.92	4.42	4.92	5.92	6.42
Time	Port F	Port G	Port H	Port I	Port J	Port K	Port L	Port M	Port N	Port P	Port Q
1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.1		0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1
8	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
12	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
24	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0

Anchor Environmental, PLLC
ALCOA - Quebec



This plot shows the height of the solids interface above the bottom of the column over time, in hours.



This plot shows the settlement in inches versus the square root of time in minutes. The upper portion of the plot shows zone settling of the slurry. The lower portion of the plot shows the start of compression settling.

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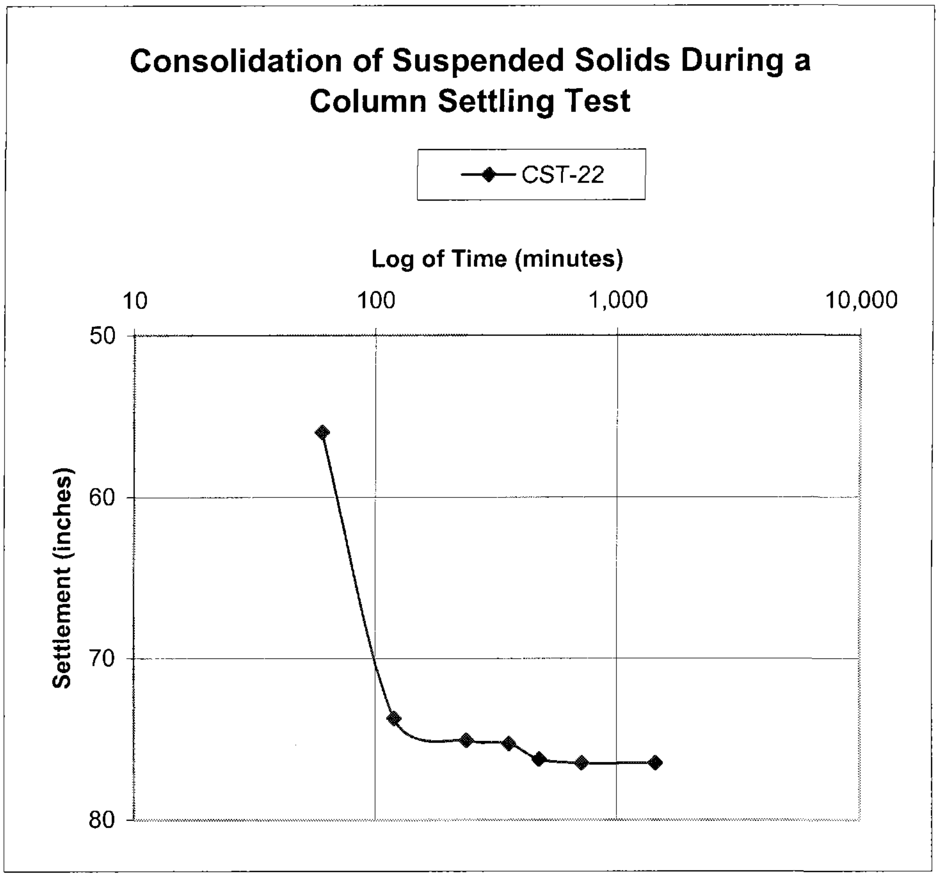
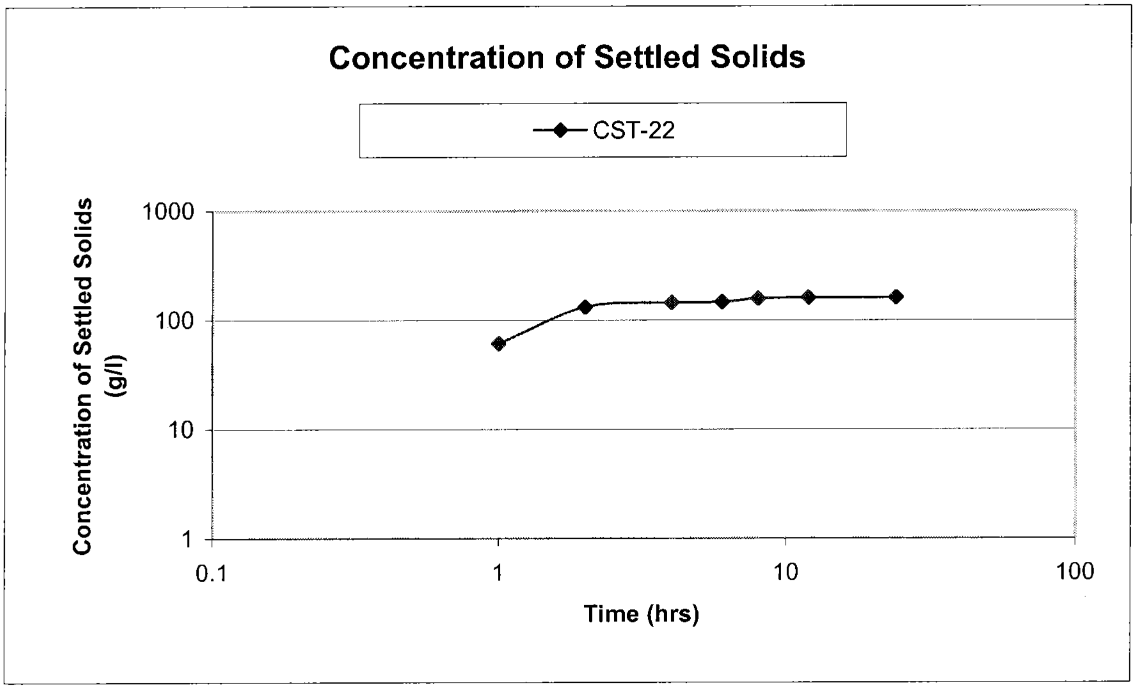
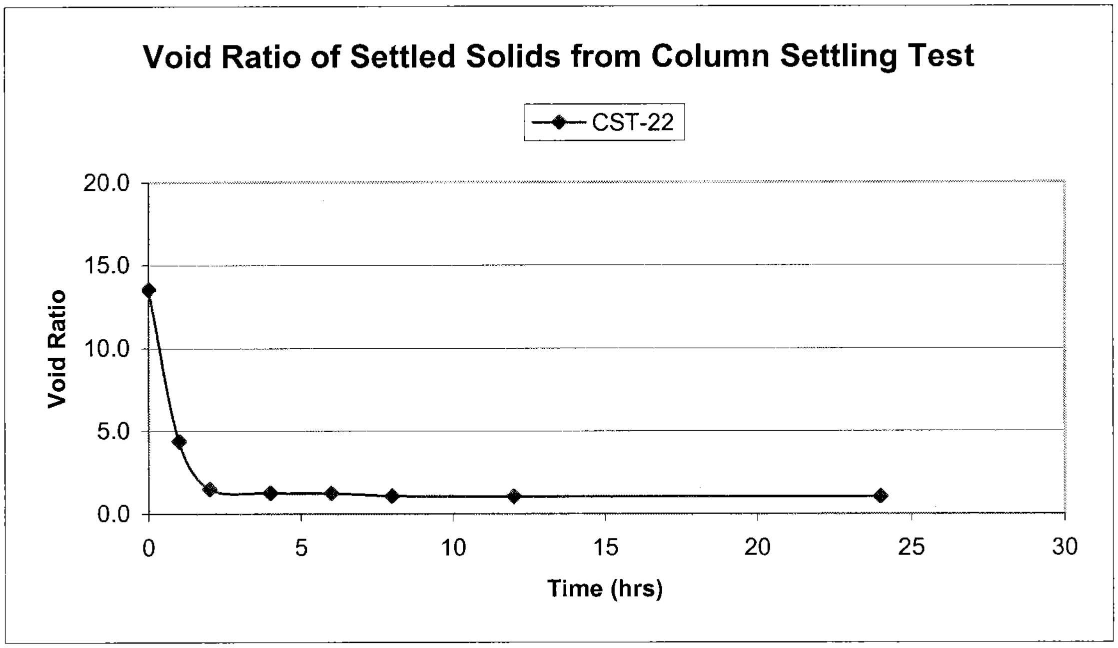


This plot shows the settlement of the suspended solids versus the log of time. The compression settling portion of the curve is distinctly different from the zone settling portion.


Concentration of Settled Solids
CST-22
Concentration of Settled Solids (g/l)
1000
100
10
1
0.1
1
10
100
Time (hrs)


Void Ratio of Settled Solids from Column Settling Test
CST-22
Void Ratio
20.0
15.0
10.0
5.0
0.0
0
5
10
15
20
25
30
Time (hrs)

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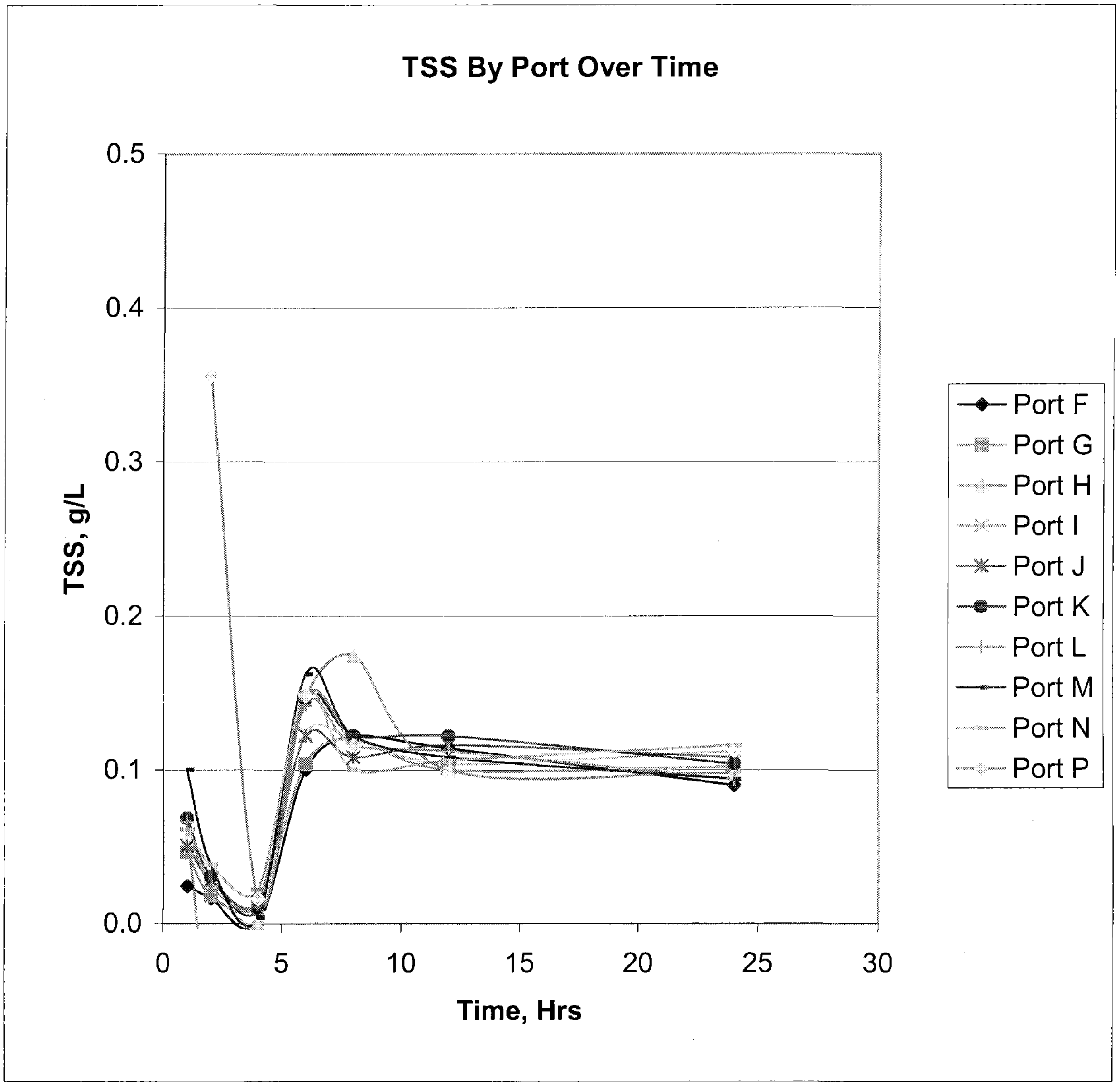
CST-22



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CST-22

Sample Extraction Time (hrs)	Depth of Extraction (ft	Suspended Solids (g/L)	Fraction of Initial SS (%)
1	0.9	0.06	0.3
1	1.4	0.02	0.1
1	1.9	0.05	0.2
1	2.4	0.06	0.2
1	2.9	0.05	0.2
1	3.4	0.07	0.3
1	3.9	0.07	0.3
1	4.4	0.10	0.4
1	4.9	0.06	0.3
1	5.4	0.00	0.0
1	5.9	0.00	0.0
2	0.9	0.02	0.1
2	1.4	0.02	0.1
2	1.9	-0.04	-0.2
2	2.4	0.03	0.1
2	2.9	0.03	0.1
2	3.4	0.03	0.1
2	3.9	0.02	0.1
2	4.4	0.04	0.2
2	4.9	0.04	0.2
2	5.4	0.36	1.6
2	5.9	0.29	1.3
4	0.9	0.00	0.0
4	1.4	0.01	0.1
4	1.9	0.00	0.0
4	2.4	0.00	0.0
4	2.9	0.01	0.1
4	3.4	0.01	0.0
4	3.9	0.01	0.1
4	4.4	0.00	0.0
4	4.9	0.02	0.1
4	5.4	0.02	0.1
4	5.9	0.03	0.1
6	0.9	0.10	0.4
6	1.4	0.10	0.5
6	1.9	0.15	0.7
6	2.4	0.12	0.6
6	2.9	0.12	0.5
6	3.4	0.15	0.7
6	3.9	0.14	0.6
6	4.4	0.16	0.7
6	4.9	0.15	0.7
6	5.4	0.15	0.7
6	5.9	0.15	0.7

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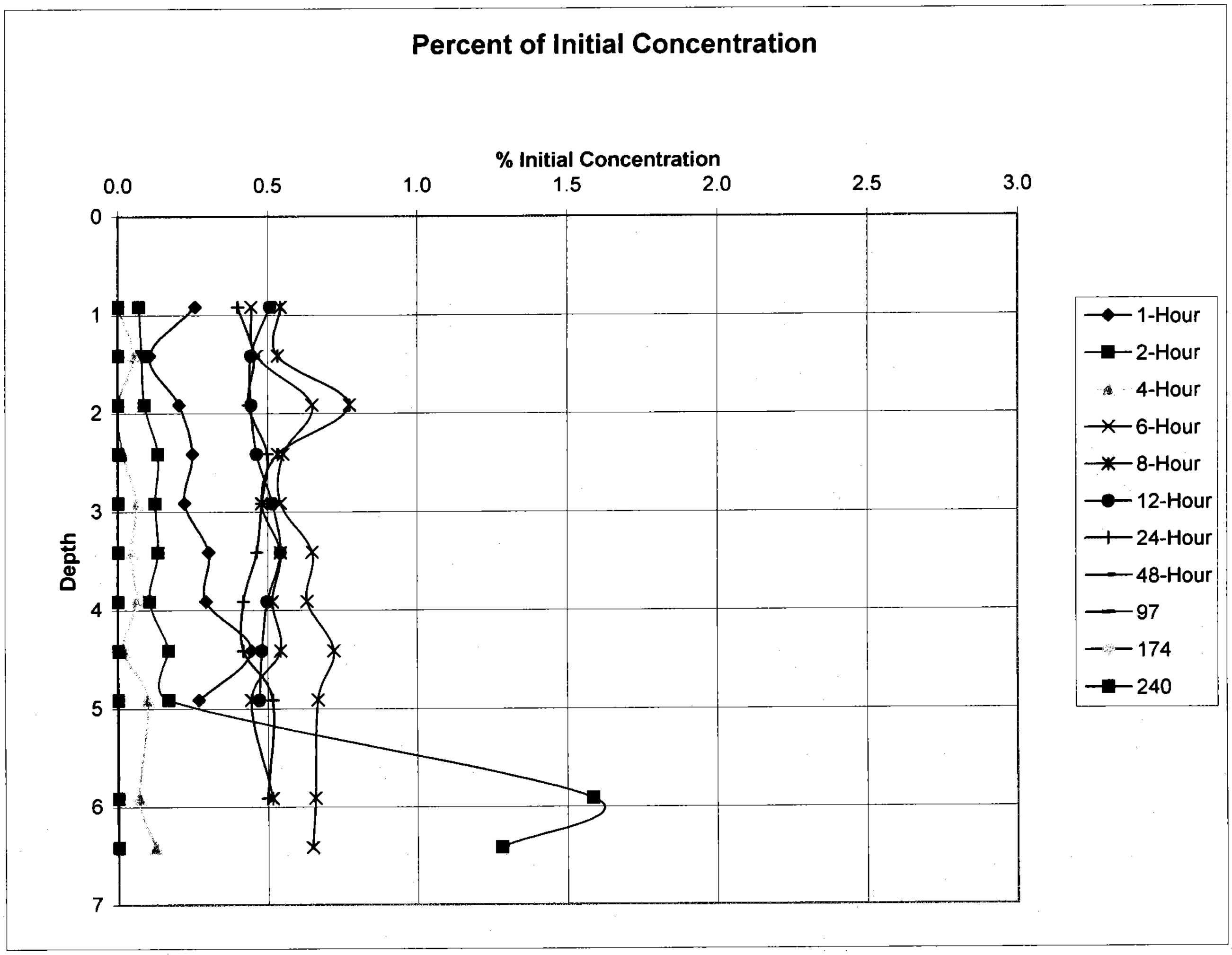
ALCOA - Quebec

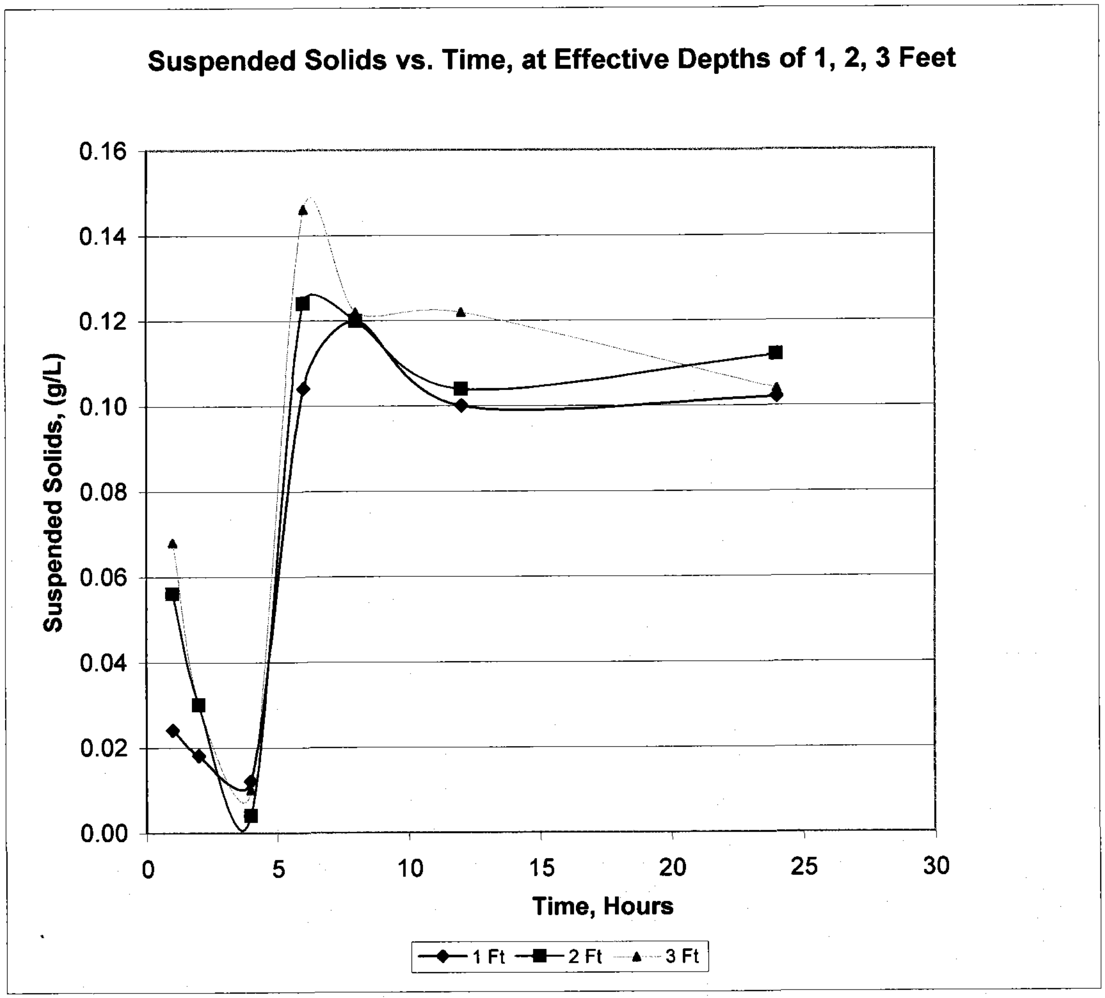
CST-22

Sample Extraction Time (hrs)	Depth of Extraction (ft	Suspended Solids (g/L)	Fraction of Initial SS (%)
8	0.9	0.12	0.5
8	1.4	0.12	0.5
8	1.9	0.17	0.8
8	2.4	0.12	0.5
8	2.9	0.11	0.5
8	3.4	0.12	0.5
8	3.9	0.12	0.5
8	4.4	0.12	0.5
8	4.9	0.10	0.4
8	5.4	0.12	0.5
8	5.9	NA	NA
12	0.9	0.11	0.5
12	1.4	0.10	0.4
12	1.9	0.10	0.4
12	2.4	0.10	0.5
12	2.9	0.12	0.5
12	3.4	0.12	0.5
12	3.9	0.11	0.5
12	4.4	0.11	0.5
12	4.9	0.11	0.5
12	5.4	NA	NA
12	5.9	NA	NA
24	0.9	0.09	0.4
24	1.4	0.10	0.5
24	1.9	0.10	0.4
24	2.4	0.11	0.5
24	2.9	0.11	0.5
24	3.4	0.10	0.5
24	3.9	0.09	0.4
24	4.4	0.09	0.4
24	4.9	0.12	0.5
24	5.4	0.11	0.5
24	5.9	0.00	0.0

Anchor Environmental, PLLC
ALCOA - Quebec
CST-22



Anchor Environmental, PLLC
ALCOA - Quebec
CST-22



Column Settling Test

Sample ID: CST-4

Sediment Moisture Content, % of dry weight: 28.1

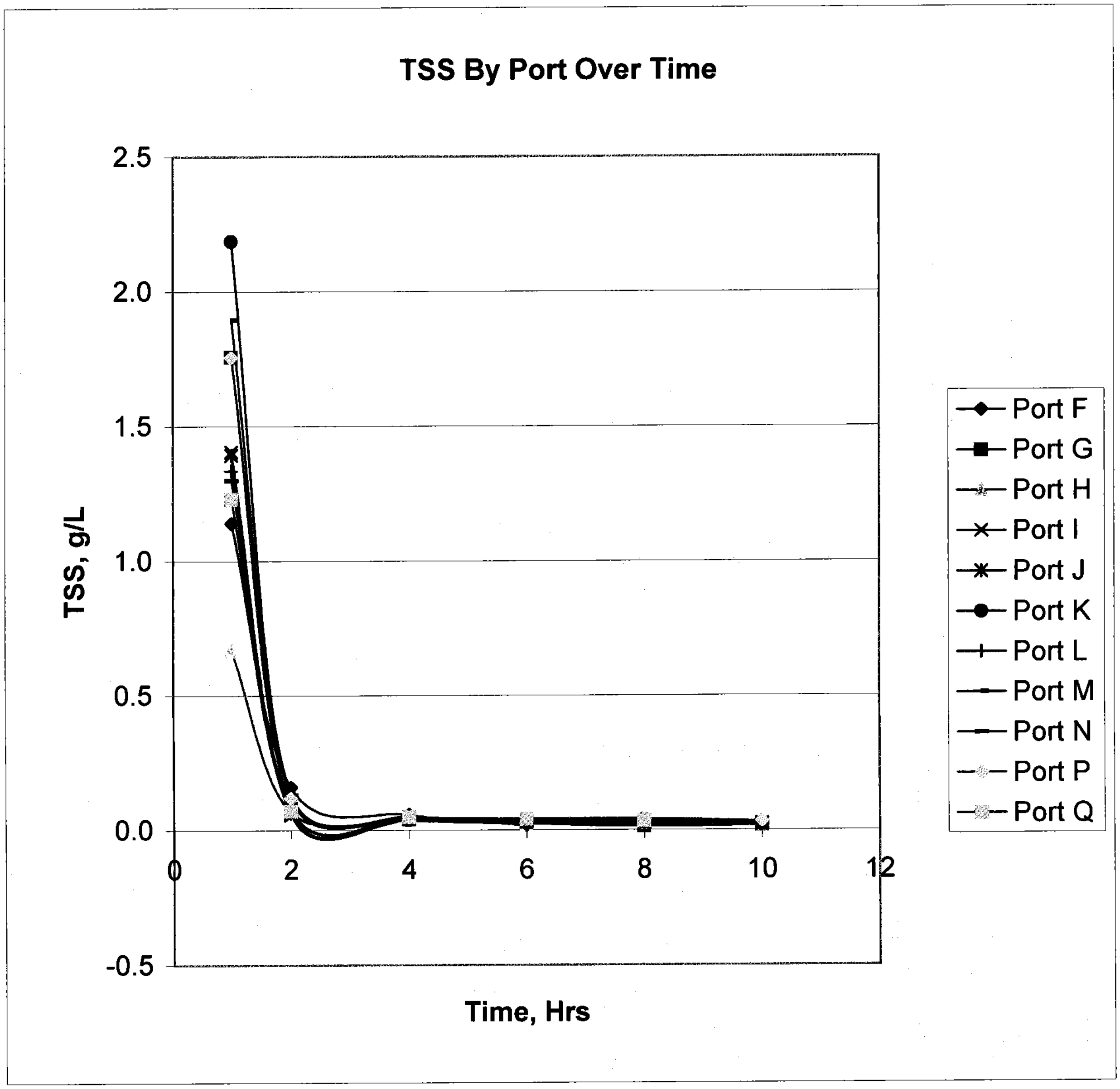
Initial mix:	
Water volume, liters:	72
Sediment mass, grams, dry weight basis:	8,141.4
Initial mix ratio, g/L:	113.1
Initial measured TSS, in column:	23.5

Percent of Initial TSS Concentration over Time

Depth from Top of Settling Column (ft)

	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.50	6.00
Time	Port F	Port G	Port H	Port I	Port J	Port K	Port L	Port M	Port N	Port P	Port Q
1	1.1	1.8	0.7	1.4	1.4	2.2	1.3	1.9	1.3	1.8	1.2
2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Anchor Environmental, Inc.
ALCOA
CST-4



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ALCOA

CST-4

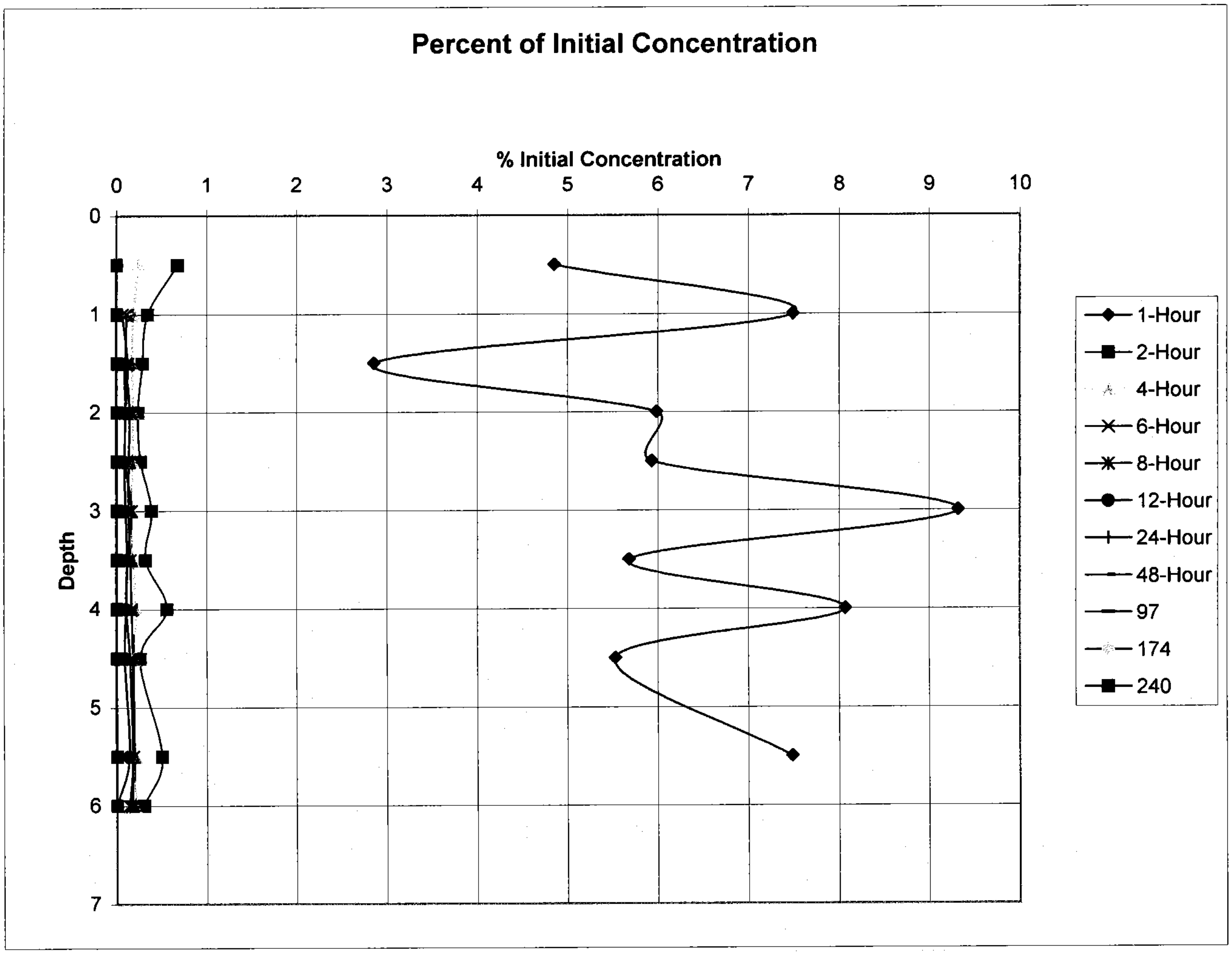
Sample Extraction Time (hrs)	Depth of Extraction (ft	Suspended Solids (g/L)	Fraction of Initial SS (%)
1	0.5	1.14	4.9
1	1.0	1.76	7.5
1	1.5	0.67	2.9
1	2.0	1.40	6.0
1	2.5	1.39	5.9
1	3.0	2.19	9.3
1	3.5	1.33	5.7
1	4.0	1.89	8.1
1	4.5	1.30	5.5
1	5.0	1.76	7.5
1	5.5	1.23	5.2
2	0.5	0.16	0.7
2	1.0	0.08	0.3
2	1.5	0.07	0.3
2	2.0	0.06	0.2
2	2.5	0.06	0.3
2	3.0	0.09	0.4
2	3.5	0.08	0.3
2	4.0	0.13	0.6
2	4.5	0.06	0.3
2	5.0	0.12	0.5
2	5.5	0.07	0.3
4	0.5	0.06	0.2
4	1.0	0.04	0.2
4	1.5	0.04	0.2
4	2.0	0.04	0.2
4	2.5	0.04	0.2
4	3.0	0.04	0.2
4	3.5	0.04	0.2
4	4.0	0.05	0.2
4	4.5	0.05	0.2
4	5.0	0.05	0.2
4	5.5	0.05	0.2
6	0.5	0.02	0.1
6	1.0	0.03	0.1
6	1.5	0.03	0.1
6	2.0	0.03	0.1
6	2.5	0.03	0.1
6	3.0	0.03	0.1
6	3.5	0.04	0.2
6	4.0	0.04	0.2
6	4.5	0.04	0.2
6	5.0	0.04	0.2
6	5.5	0.04	0.2

Anchor Environmental, Inc.
ALCOA

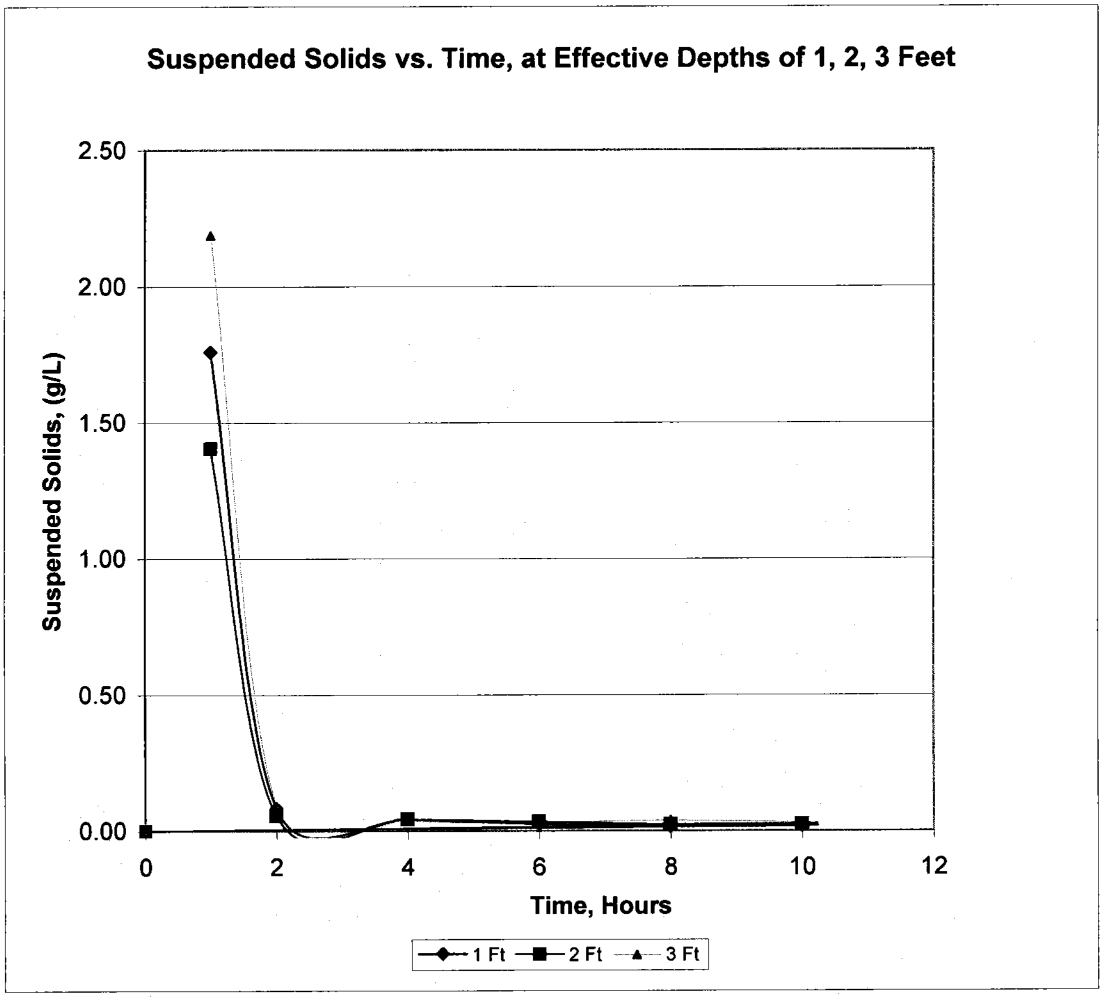
CST-4

Sample Extraction Time (hrs)	Depth of Extraction (ft	Suspended Solids (g/L)	Fraction of Initial SS (%)
8	0.5	NA	NA
8	1.0	0.02	0.1
8	1.5	0.03	0.1
8	2.0	0.02	0.1
8	2.5	0.02	0.1
8	3.0	0.04	0.2
8	3.5	0.03	0.1
8	4.0	0.03	0.1
8	4.5	0.04	0.1
8	5.0	0.04	0.2
8	5.5	0.03	0.1
10	0.5	NA	NA
10	1.0	0.02	0.1
10	1.5	0.02	0.1
10	2.0	0.02	0.1
10	2.5	0.02	0.1
10	3.0	0.02	0.1
10	3.5	0.03	0.1
10	4.0	0.03	0.1
10	4.5	0.02	0.1
10	5.0	0.03	0.1

Anchor Environmental, Inc.
ALCOA
CST-4

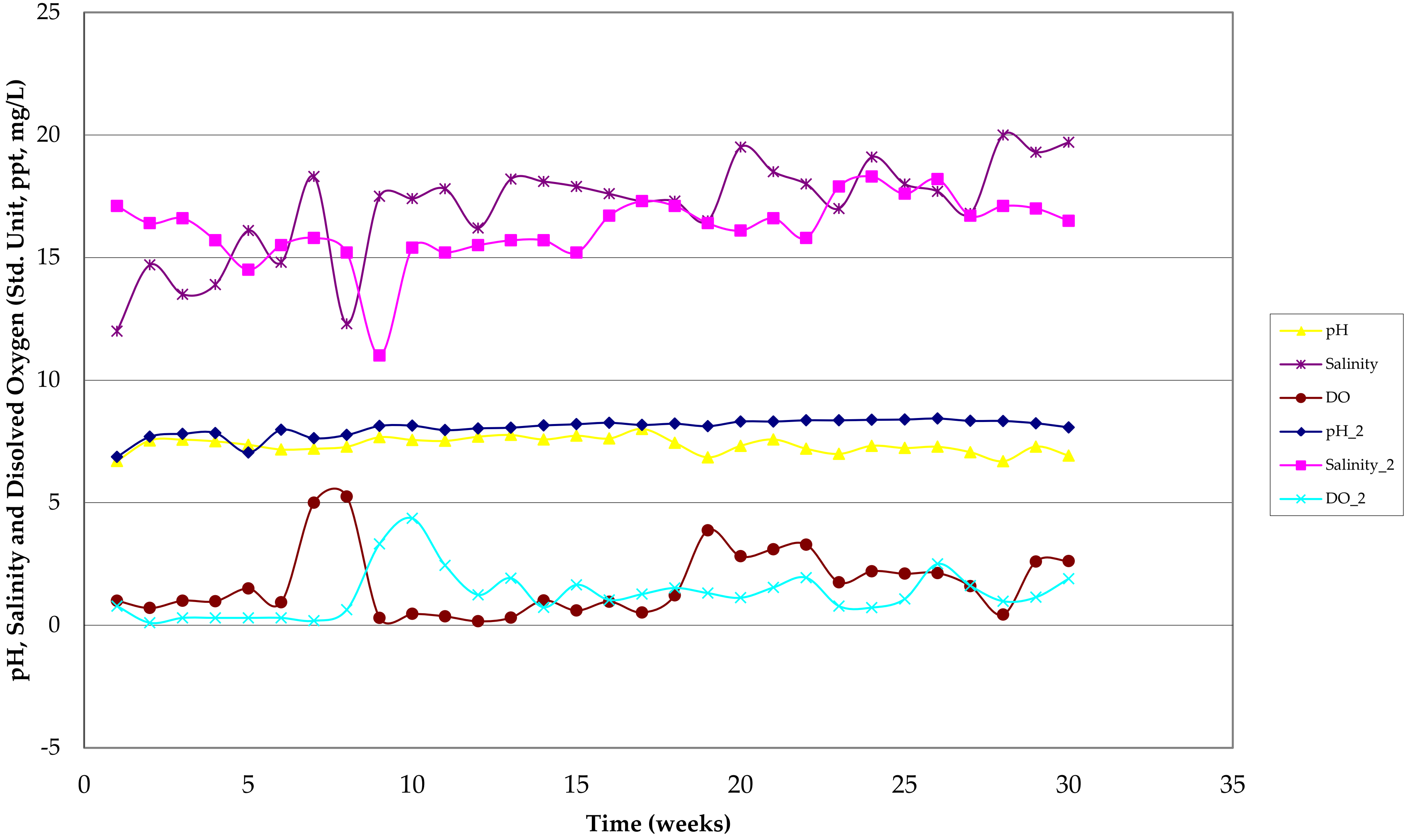


Anchor Environmental, Inc.
ALCOA
CST-4

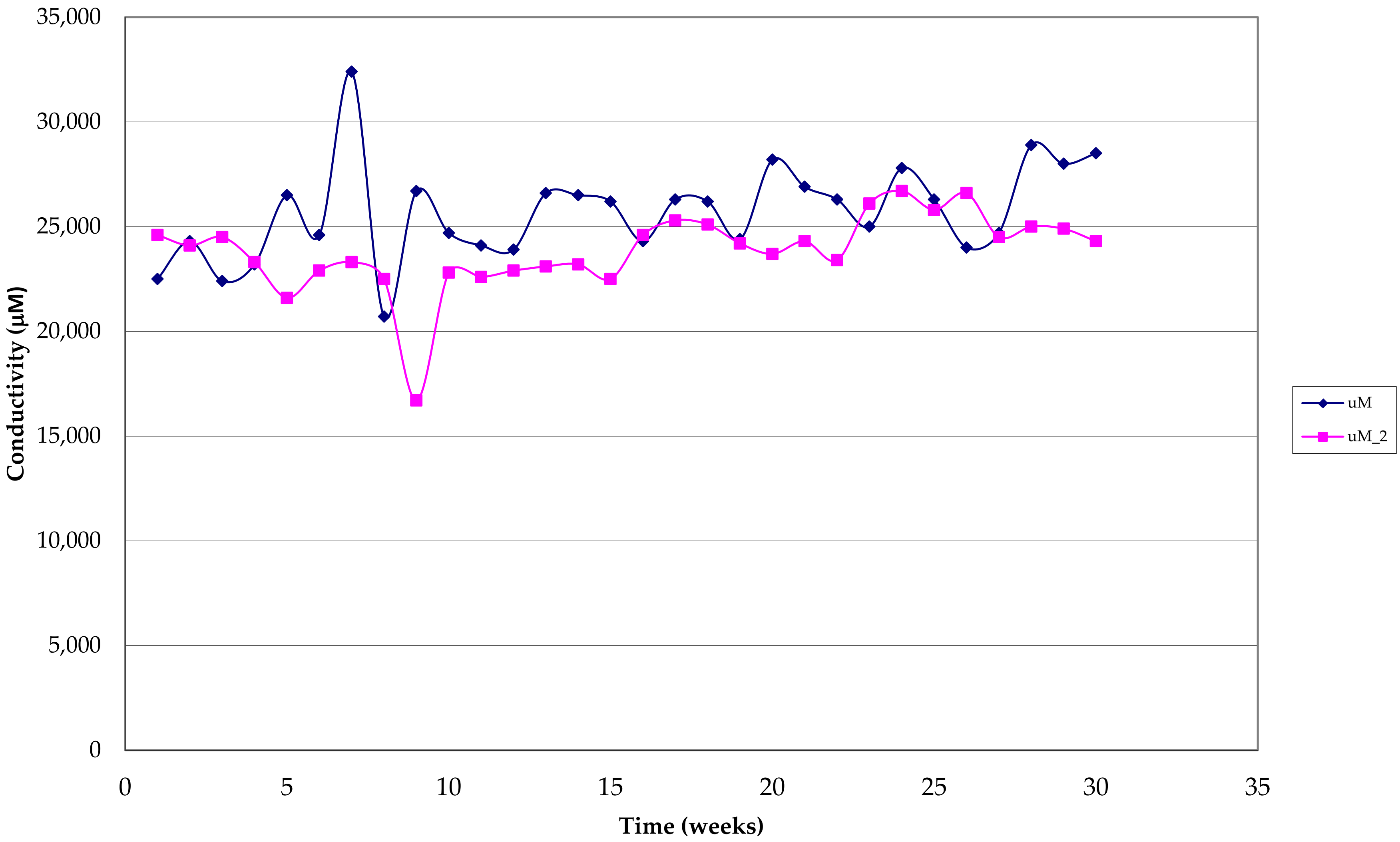


ATTACHMENT B-2- PANCAKE COLUMN LEACHATE TESTING RESULTS

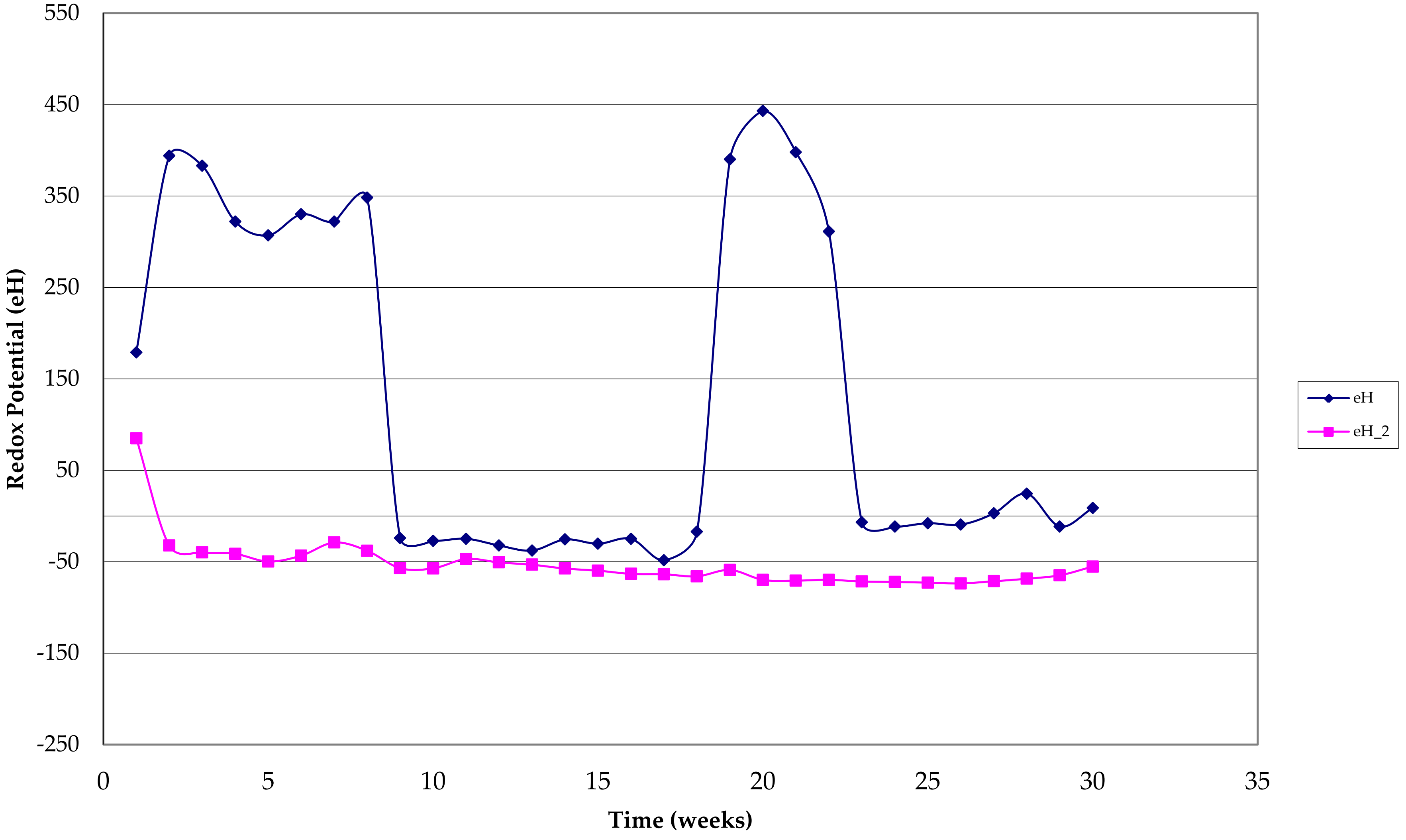
BAIE COMEAU CONVENTIONALS DATA
pH, Salinity and Dissolved Oxygen vs Time



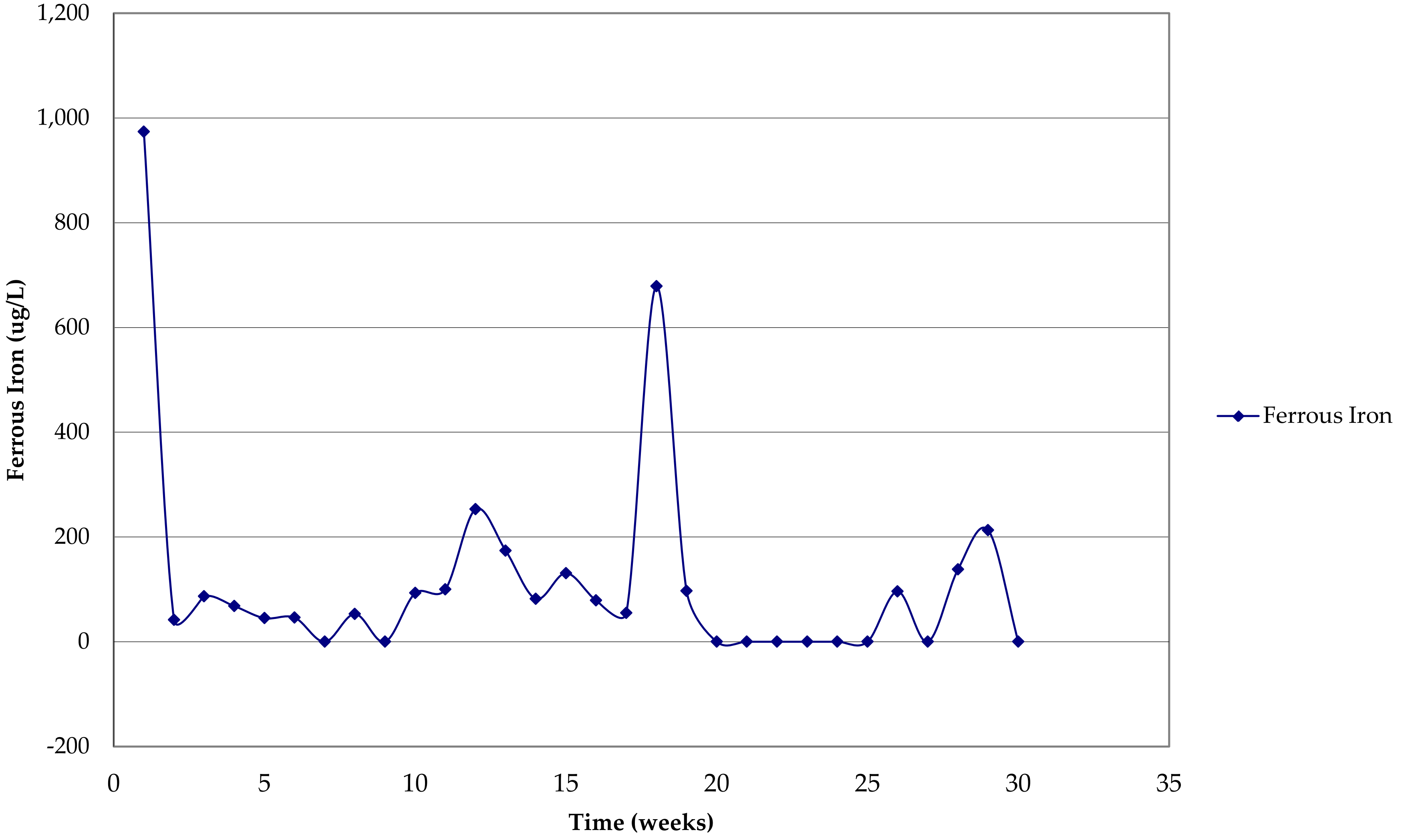
BAIE COMEAU PCLT CONVENTIONALS DATA
Conductivity vs Time

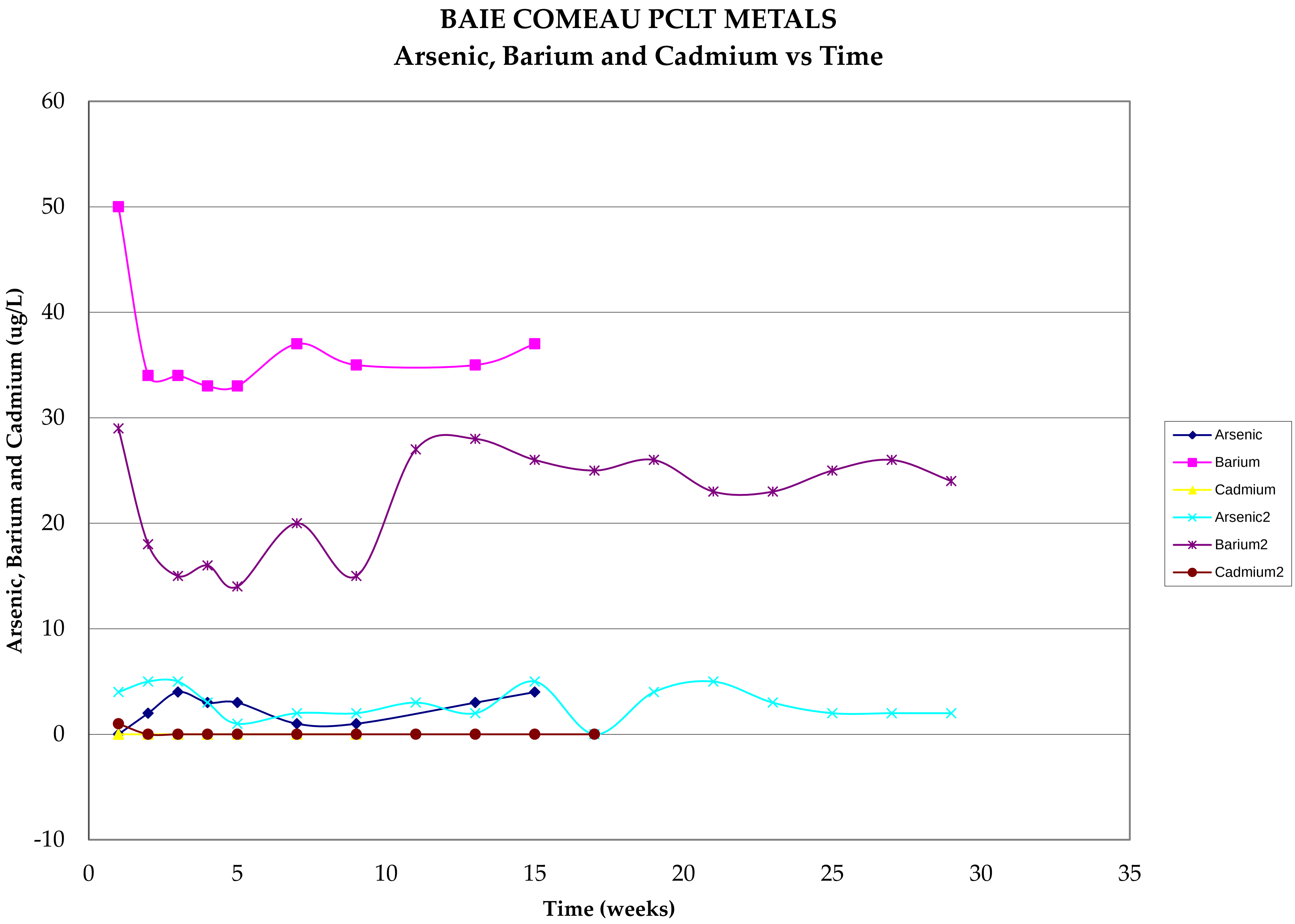


BAIE COMEAU CONVENTIONALS DATA
Redox Potential vs Time

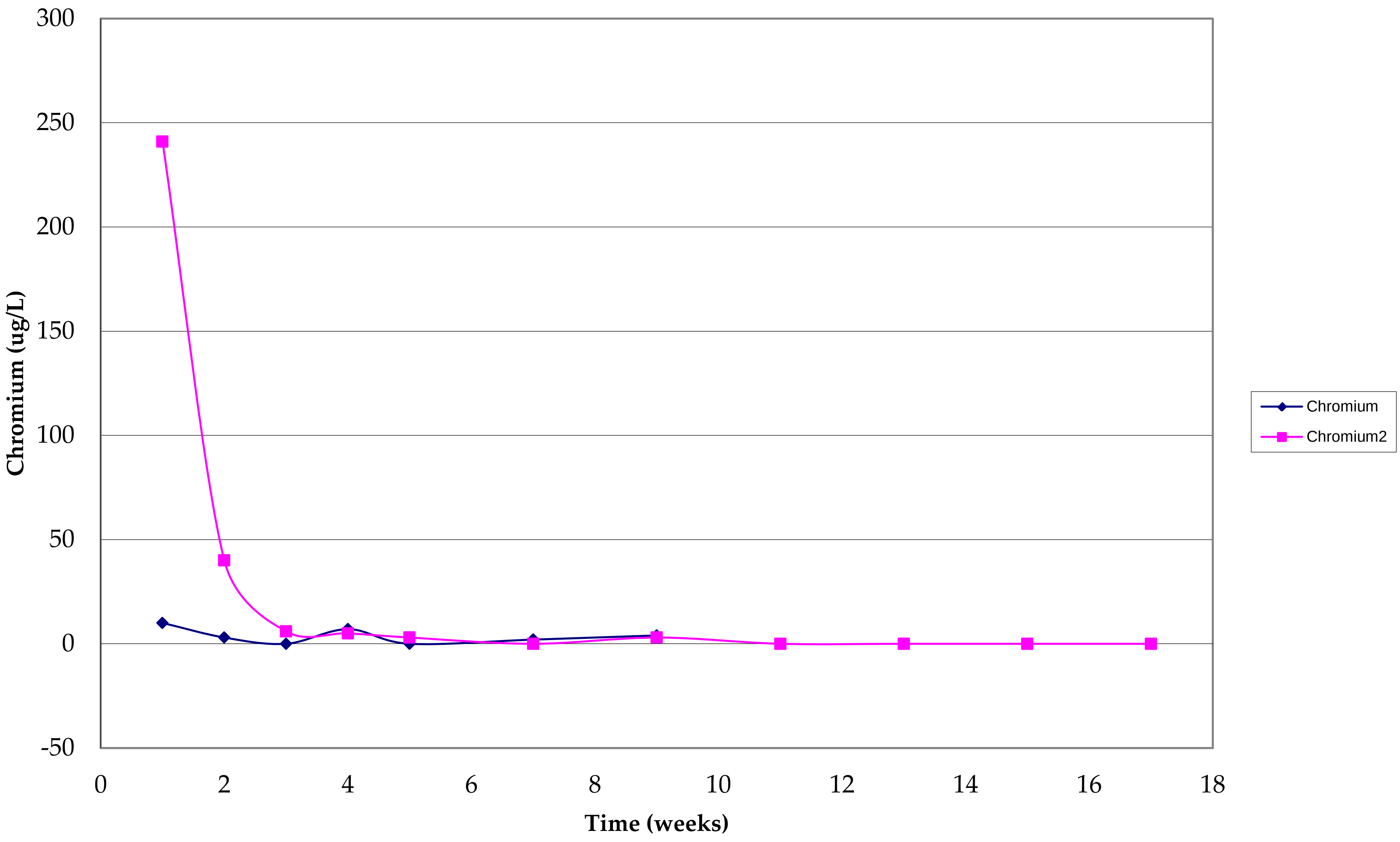


BAIE COMEAU PCLT CONVENTIONALS DATA
Ferrous Iron vs Time

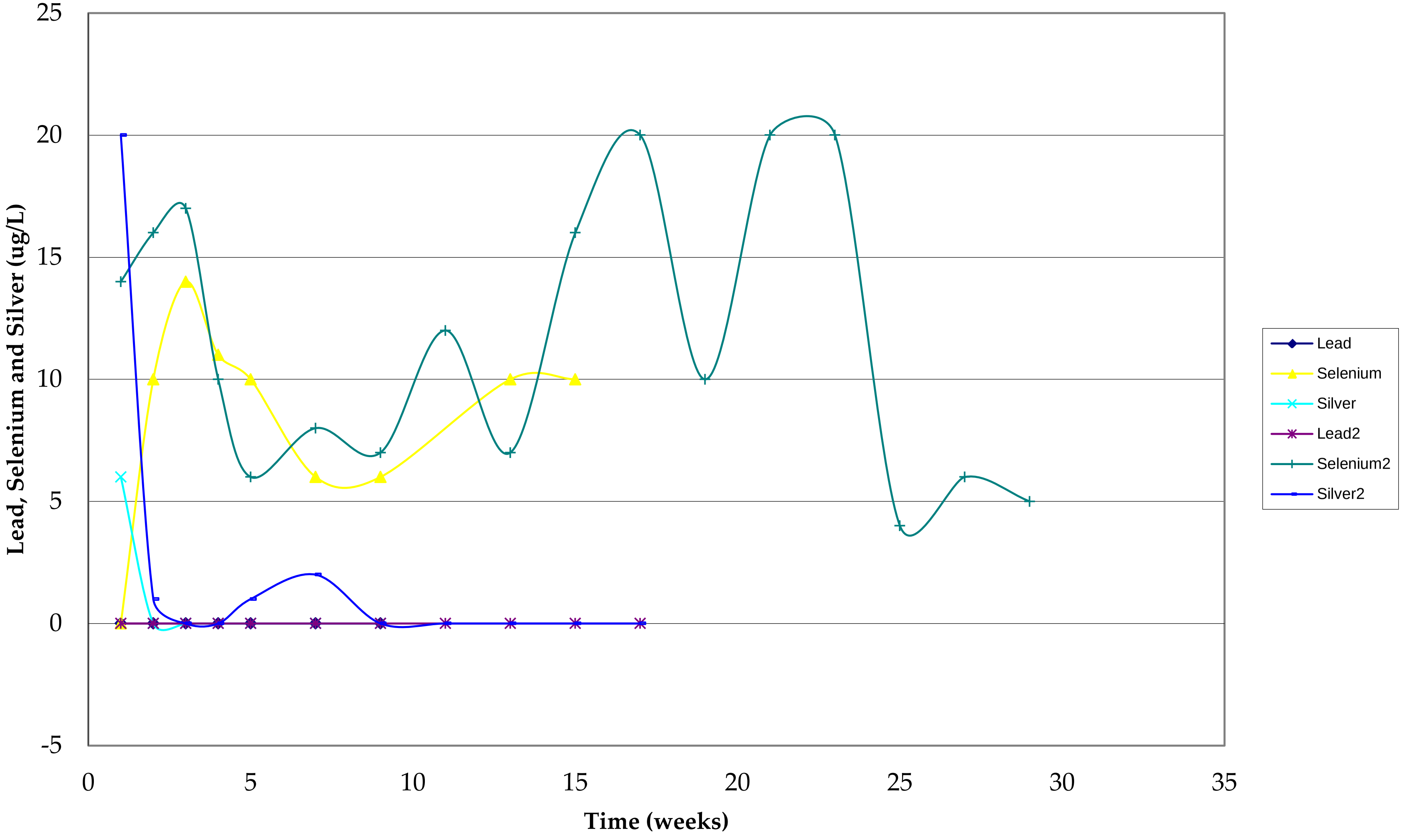



BAIE COMEAU PCLT METALS
Arsenic, Barium and Cadmium vs Time
Arsenic, Barium and Cadmium (ug/L)
60
50
40
30
20
10
0
-10
0
5
10
15
20
25
30
35
Time (weeks)
Arsenic
Barium
Cadmium
Arsenic2
Barium2
Cadmium2

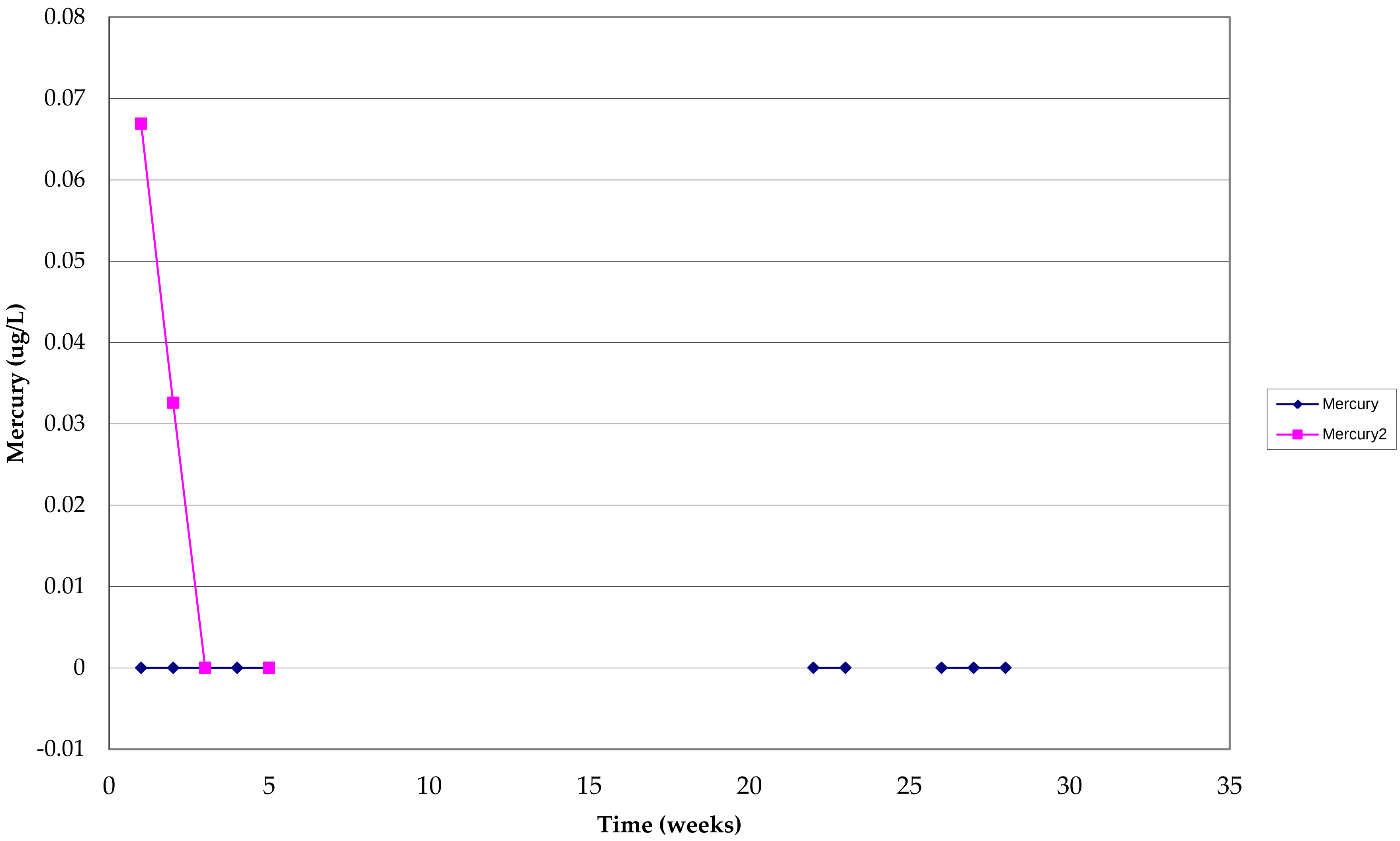
BAIE COMEAU PCLT METALS
Chromium vs Time



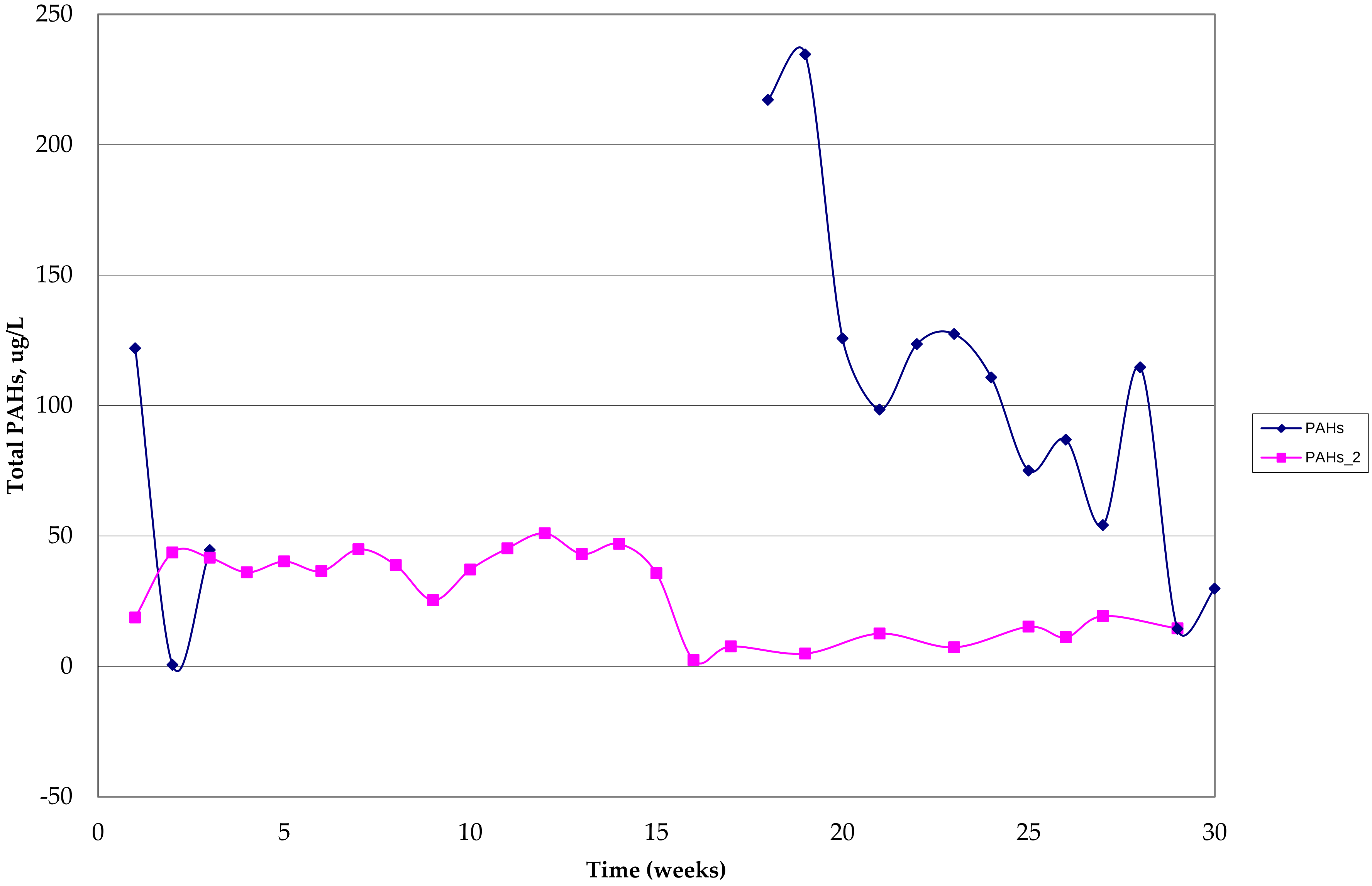
BAIE COMEAU PCLT METALS
Lead, Selenium and Silver vs Time



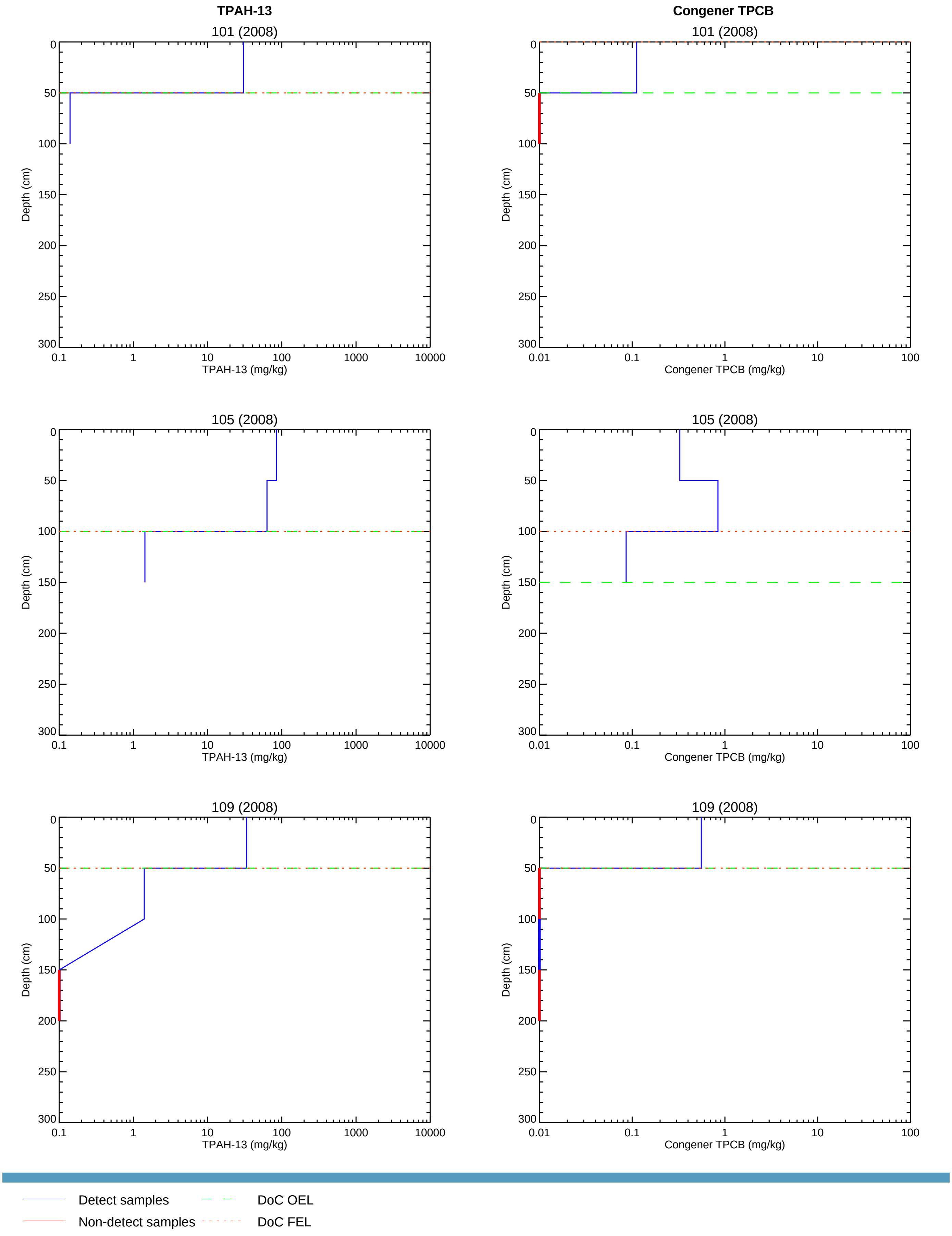
BAIE COMEAU PCLT
Mercury vs Time



BAIE COMEAU PCLT SVOC Data
Total PAHs vs Time



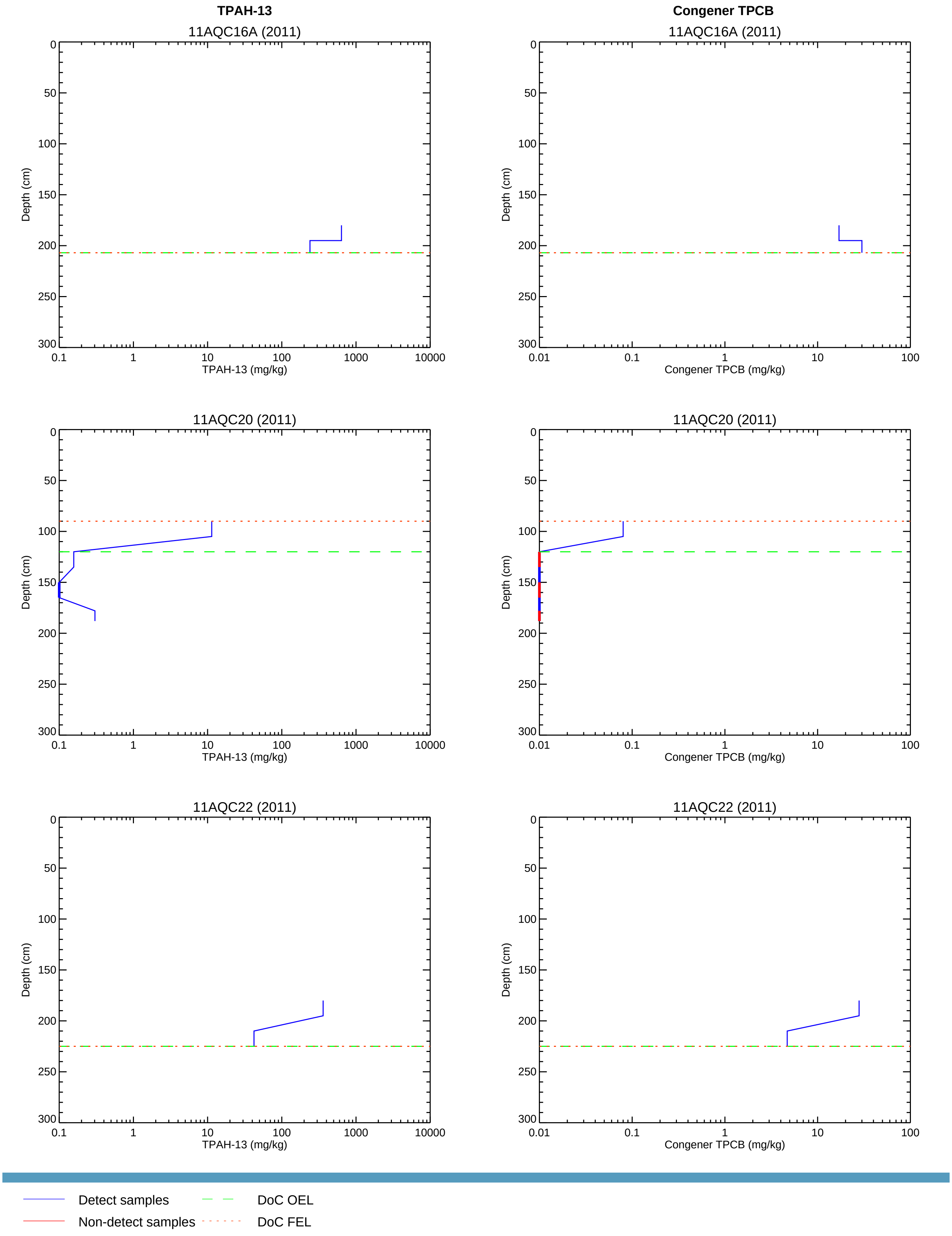
APPENDIX C
SEDIMENT VERTICAL PROFILES



ANCHOR QEA

Total PAH-13 and Total Congener PCB Depth Profiles: ADM

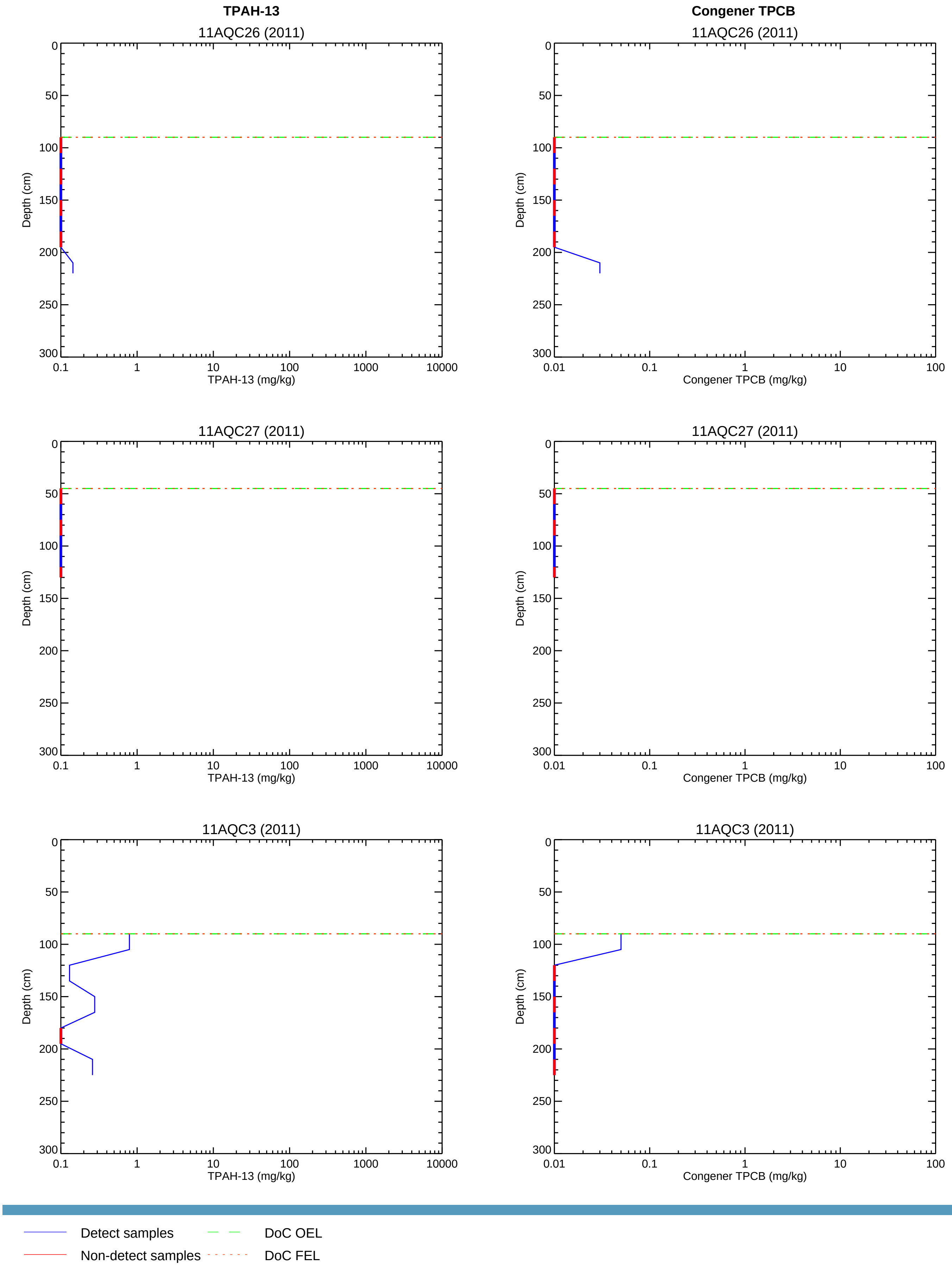
Note: Only cores with >= 2 segments were used. Values < x-axis min shown with thicker lines.
Non-detect values set to the x-axis minimum. 11/01/2012 database.
Cores C-8, C-4, C-32 and MNR-3 were combined with 2011 co-located cores with prefix "11AQ##"
TPAH-13: OEL= 2.43 mg/kg, FEL= 21.26 mg/kg. TPCB: OEL= 0.059 mg/kg, FEL= 0.49 mg/kg.



ANCHOR QEA

Total PAH-13 and Total Congener PCB Depth Profiles: ADM

Note: Only cores with >= 2 segments were used. Values < x-axis min shown with thicker lines.
Non-detect values set to the x-axis minimum. 11/01/2012 database.
Cores C-8, C-4, C-32 and MNR-3 were combined with 2011 co-located cores with prefix "11AQ##"
TPAH-13: OEL= 2.43 mg/kg, FEL= 21.26 mg/kg. TPCB: OEL= 0.059 mg/kg, FEL= 0.49 mg/kg.



ANCHOR QEA

Total PAH-13 and Total Congener PCB Depth Profiles: ADM

Note: Only cores with >= 2 segments were used. Values < x-axis min shown with thicker lines.
Non-detect values set to the x-axis minimum. 11/01/2012 database.
Cores C-8, C-4, C-32 and MNR-3 were combined with 2011 co-located cores with prefix "11AQ##"
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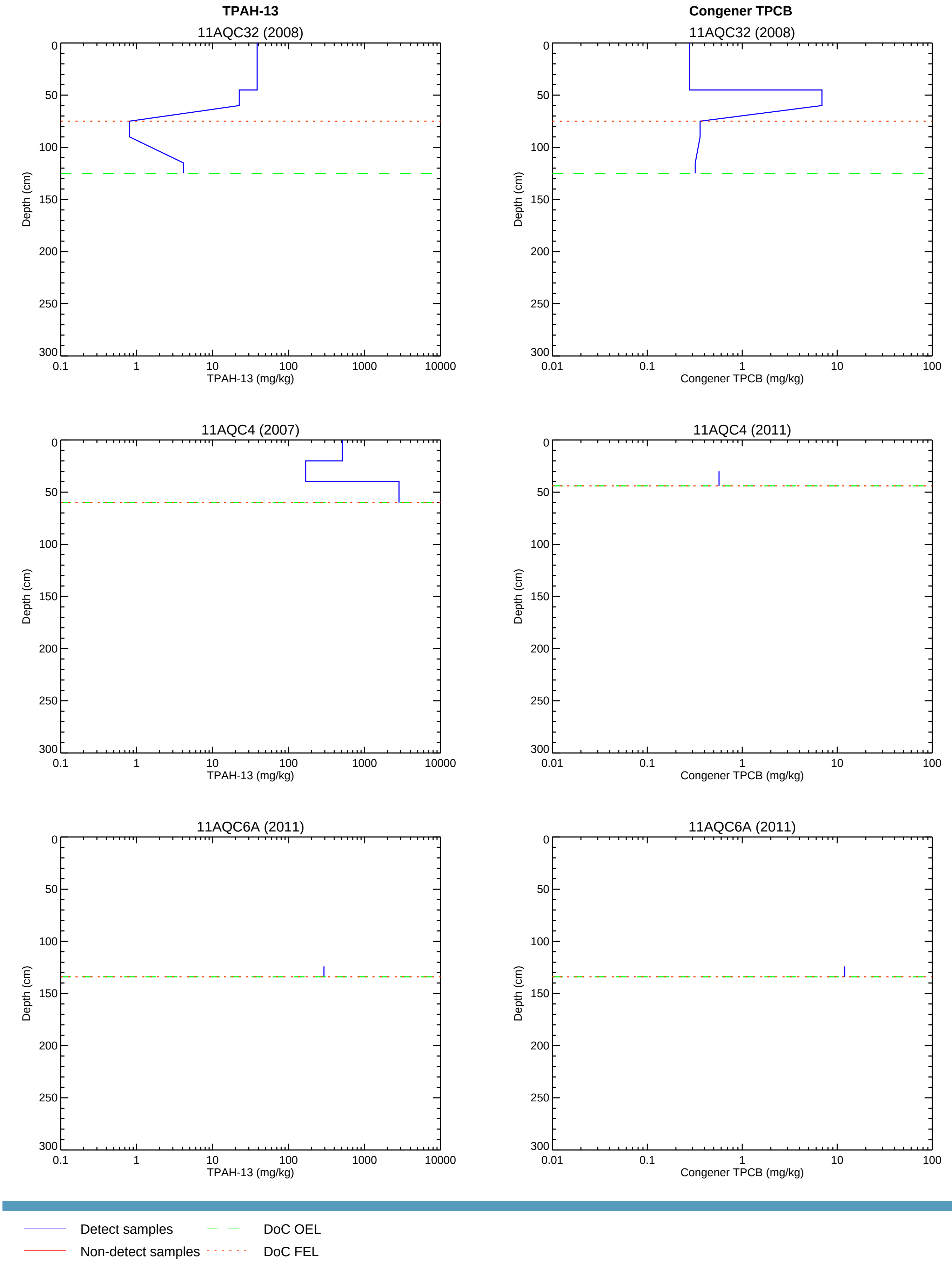

ANCHOR QEA

Total PAH-13 and Total Congener PCB Depth Profiles: ADM

Note: Only cores with >= 2 segments were used. Values < x-axis min shown with thicker lines.
Non-detect values set to the x-axis minimum. 11/01/2012 database.
Cores C-8, C-4, C-32 and MNR-3 were combined with 2011 co-located cores with prefix "11AQ##"
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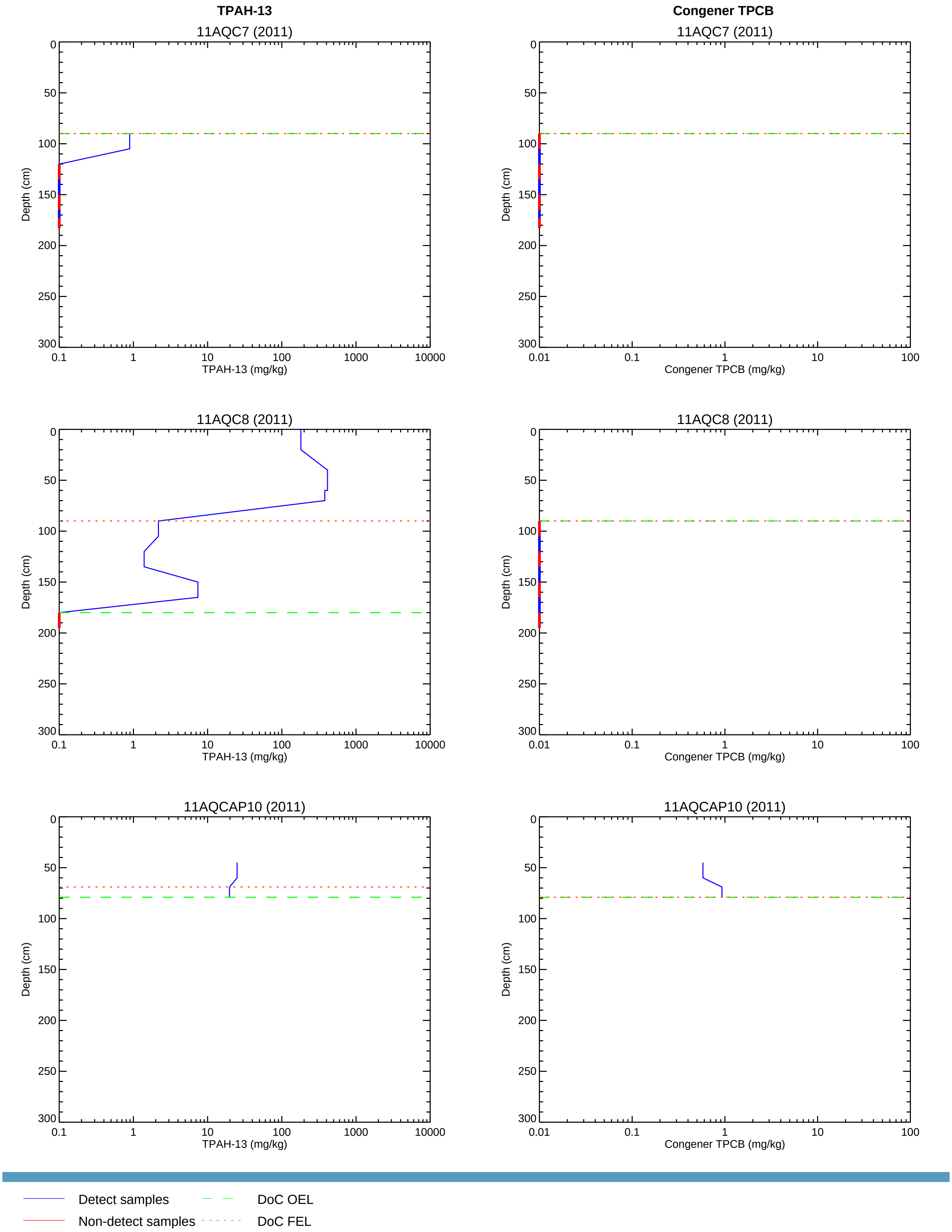

ANCHOR QEA

Total PAH-13 and Total Congener PCB Depth Profiles: ADM

Note: Only cores with >= 2 segments were used. Values < x-axis min shown with thicker lines.
Non-detect values set to the x-axis minimum. 11/01/2012 database.
Cores C-8, C-4, C-32 and MNR-3 were combined with 2011 co-located cores with prefix "11AQ##"
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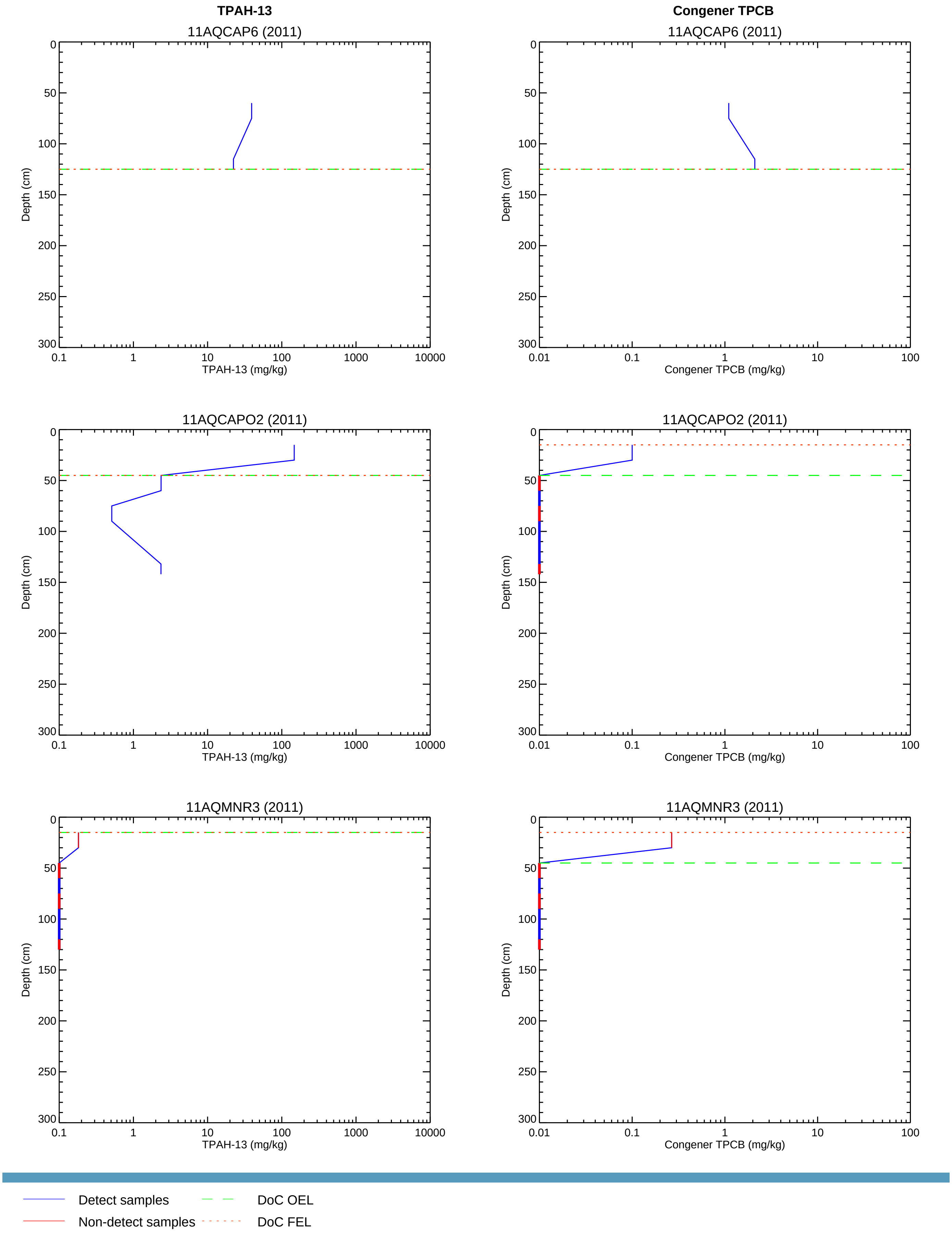

Total PAH-13 and Total Congener PCB Depth Profiles: ADM

Note: Only cores with >= 2 segments were used. Values < x-axis min shown with thicker lines.
Non-detect values set to the x-axis minimum. 11/01/2012 database.
Cores C-8, C-4, C-32 and MNR-3 were combined with 2011 co-located cores with prefix "11AQ##"
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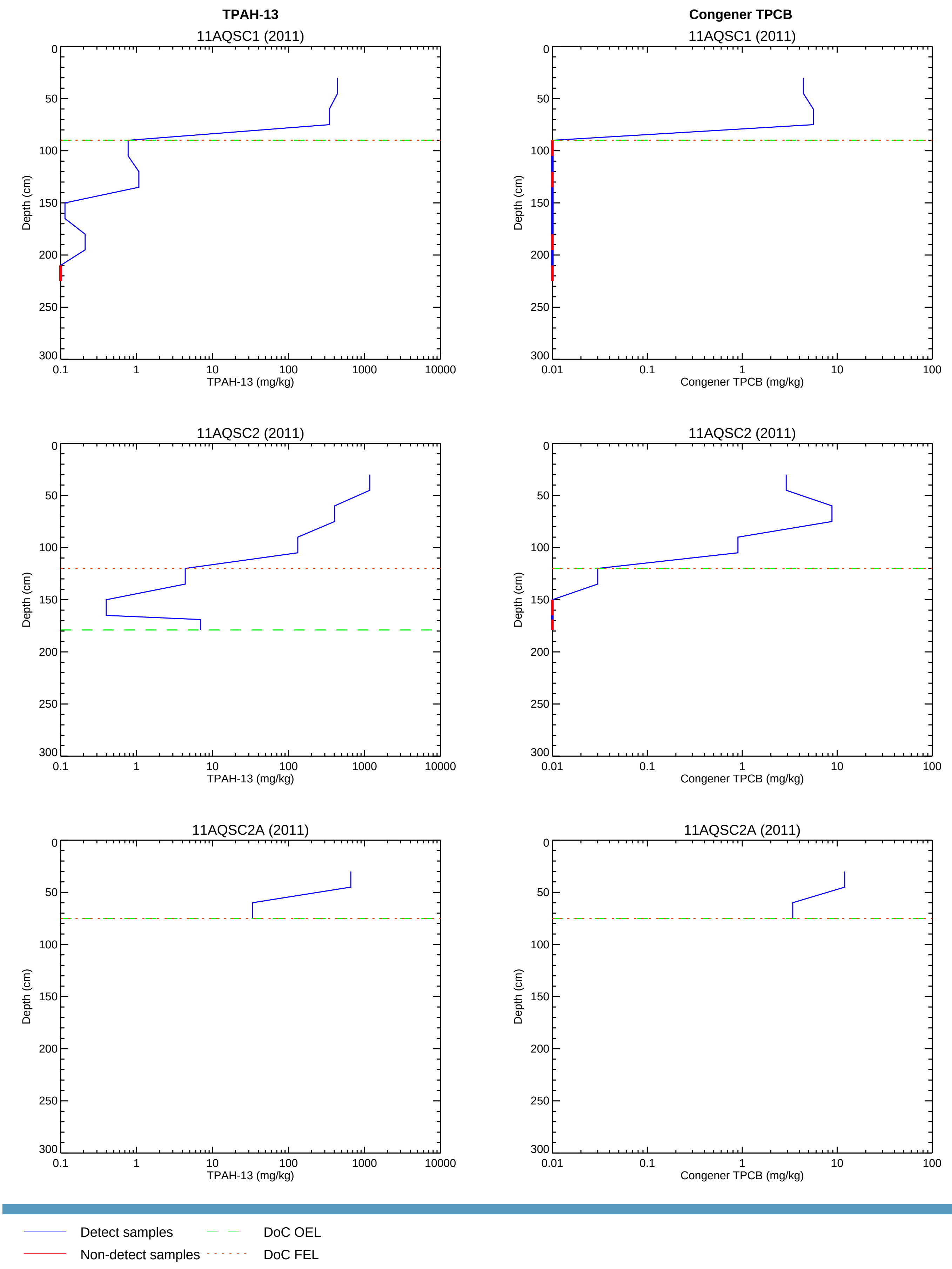

ANCHOR QEA

Total PAH-13 and Total Congener PCB Depth Profiles: ADM

Note: Only cores with >= 2 segments were used. Values < x-axis min shown with thicker lines.
Non-detect values set to the x-axis minimum. 11/01/2012 database.
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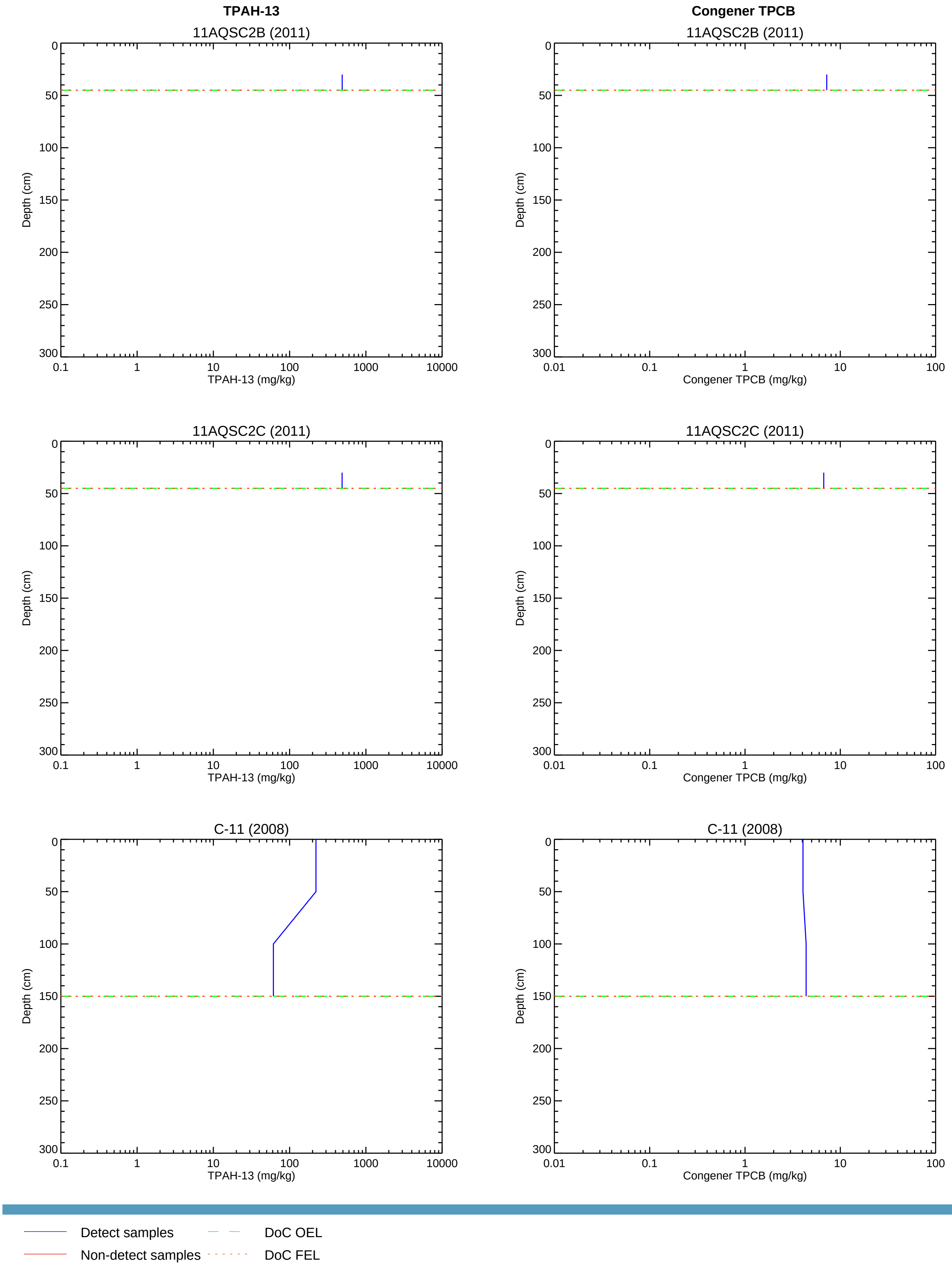
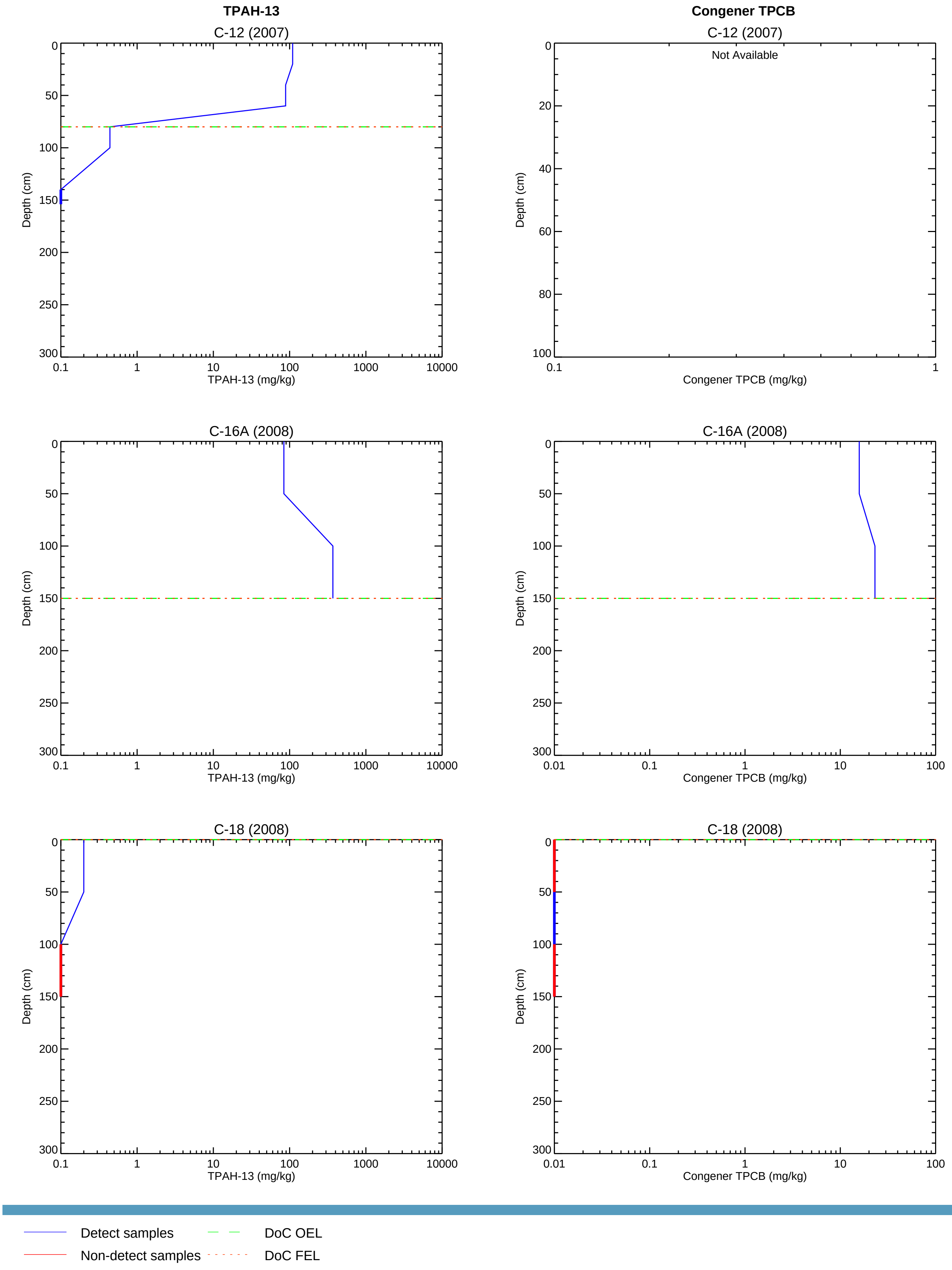
TPAH-13: OEL= 2.43 mg/kg, FEL= 21.26 mg/kg. TPCB: OEL= 0.059 mg/kg, FEL= 0.49 mg/kg.



Total PAH-13 and Total Congener PCB Depth Profiles: ADM

Note: Only cores with >= 2 segments were used. Values < x-axis min shown with thicker lines.
Non-detect values set to the x-axis minimum. 11/01/2012 database.
Cores C-8, C-4, C-32 and MNR-3 were combined with 2011 co-located cores with prefix "11AQ##"
TPAH-13: OEL= 2.43 mg/kg, FEL= 21.26 mg/kg. TPCB: OEL= 0.059 mg/kg, FEL= 0.49 mg/kg.



ANCHOR QEA

Total PAH-13 and Total Congener PCB Depth Profiles: ADM

Note: Only cores with >= 2 segments were used. Values < x-axis min shown with thicker lines.
Non-detect values set to the x-axis minimum. 11/01/2012 database.
Cores C-8, C-4, C-32 and MNR-3 were combined with 2011 co-located cores with prefix "11AQ##"
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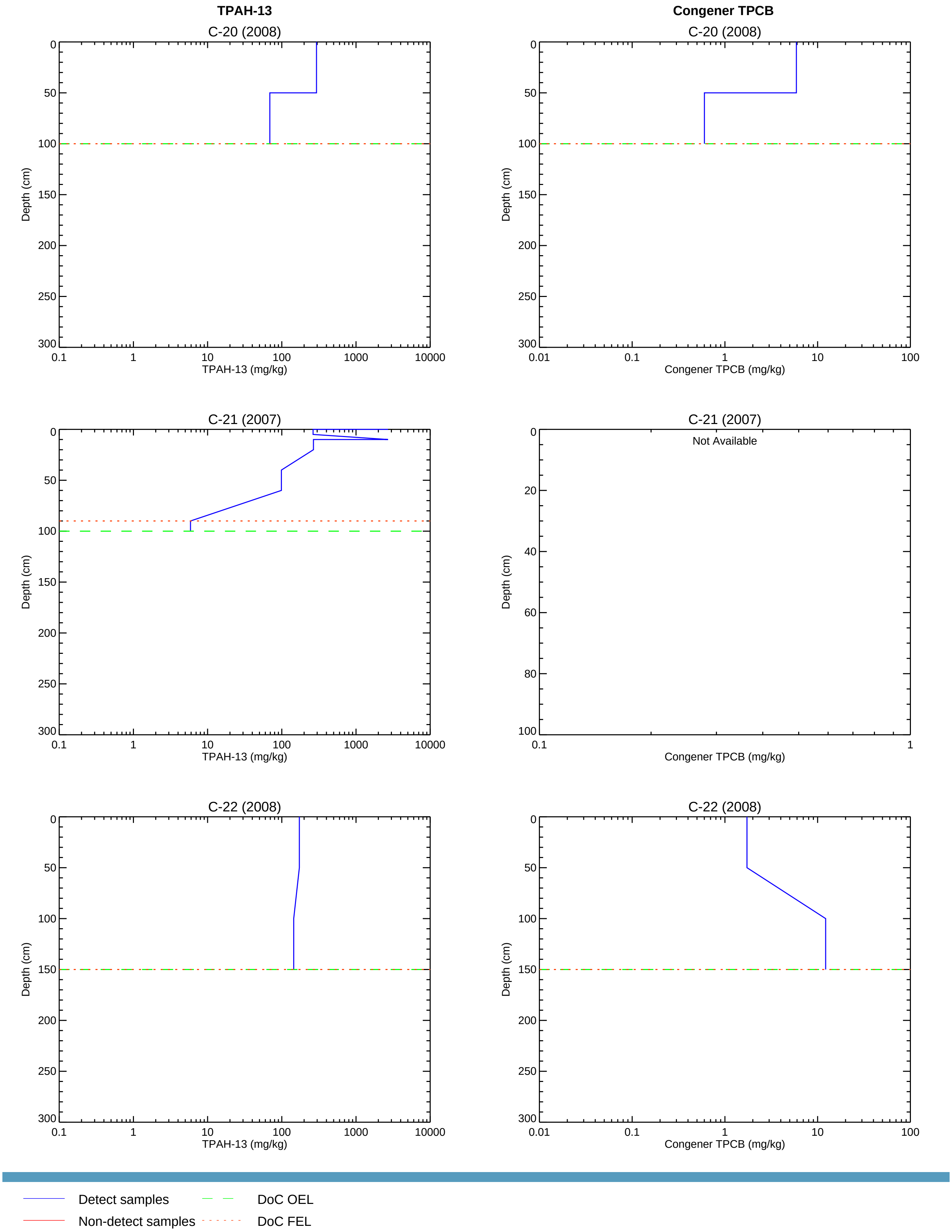
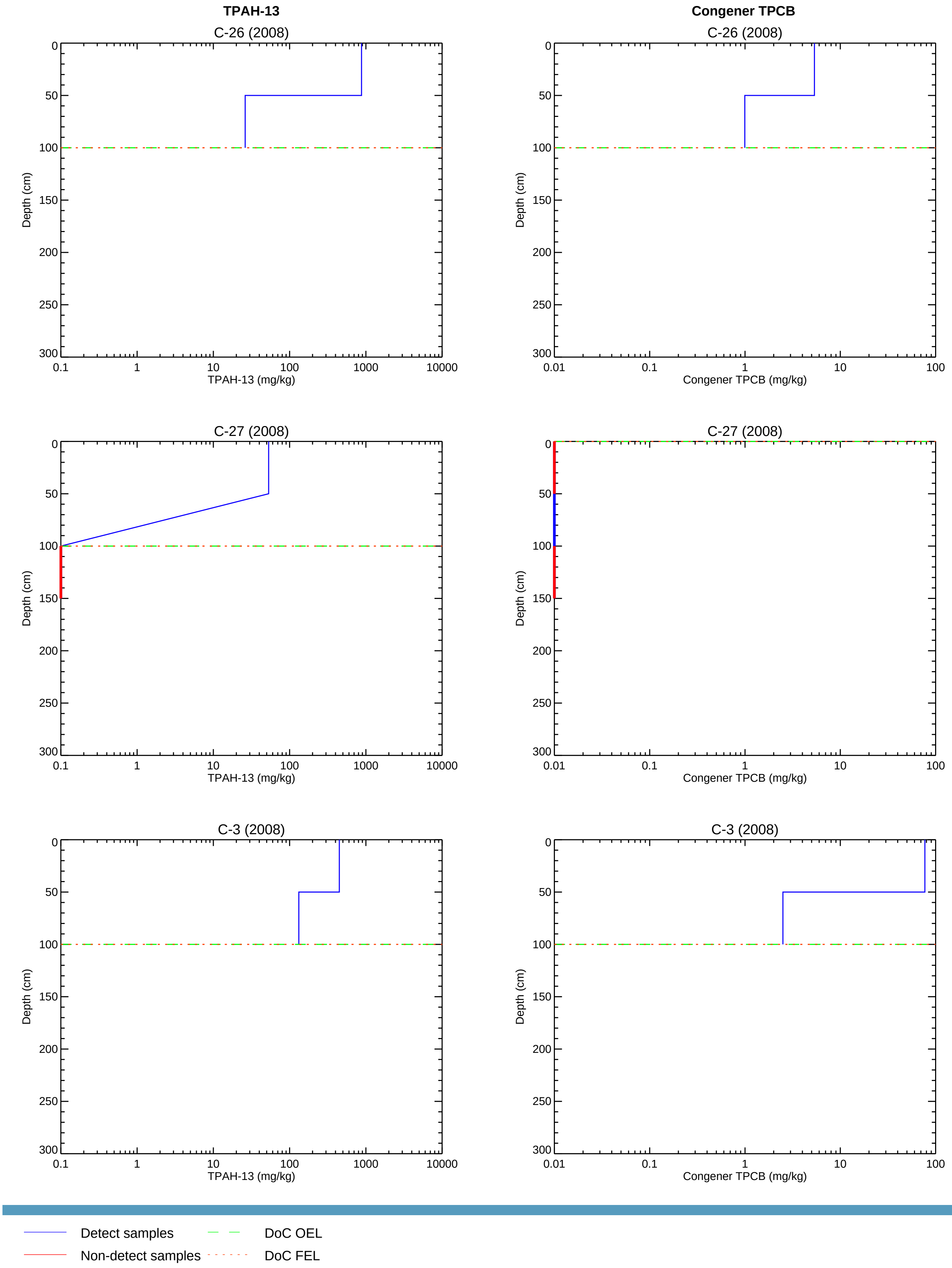


Total PAH-13 and Total Congener PCB Depth Profiles: ADM

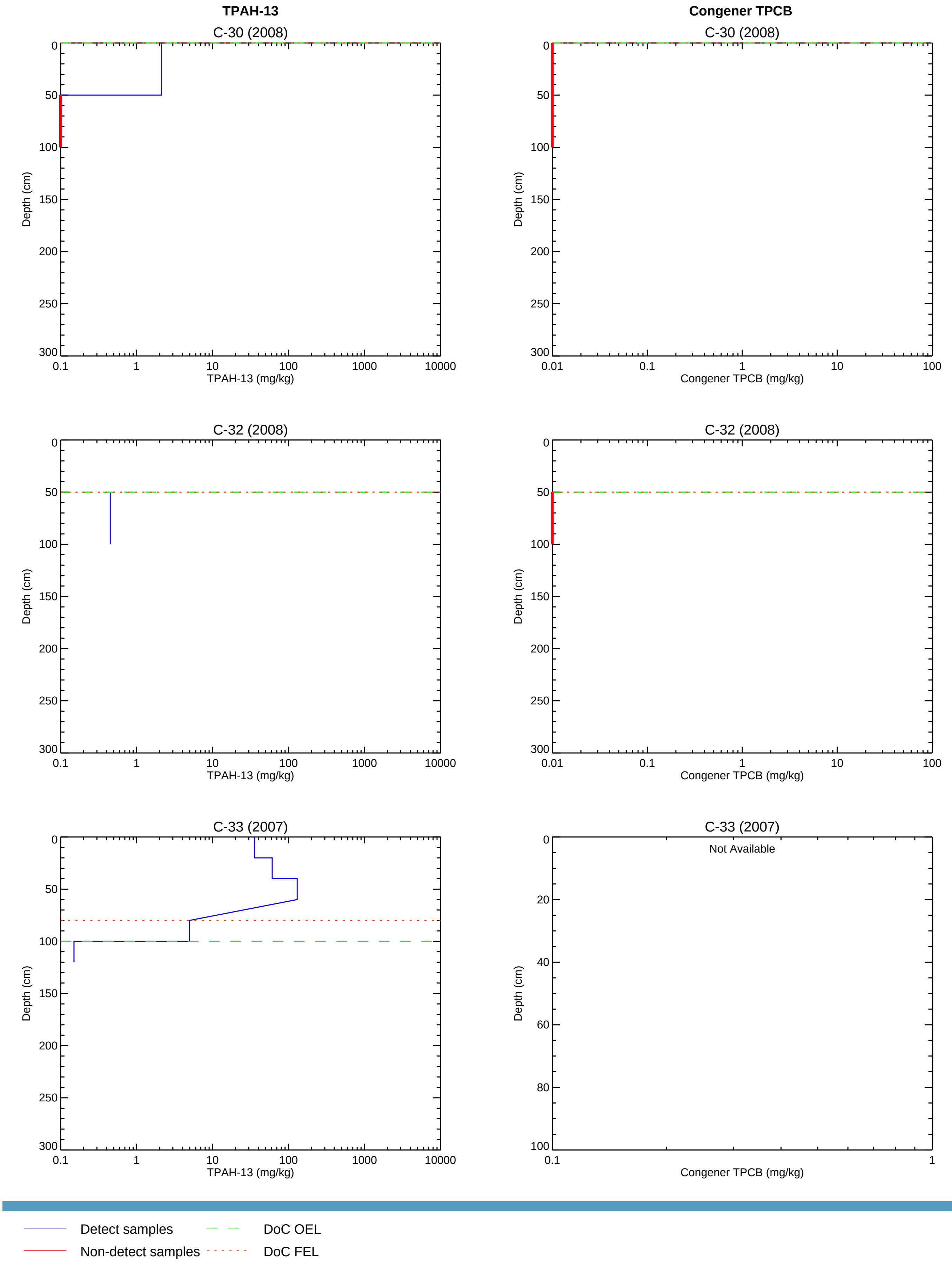
Note: Only cores with >= 2 segments were used. Values < x-axis min shown with thicker lines.
Non-detect values set to the x-axis minimum. 11/01/2012 database.
Cores C-8, C-4, C-32 and MNR-3 were combined with 2011 co-located cores with prefix "11AQ##"
TPAH-13: OEL= 2.43 mg/kg, FEL= 21.26 mg/kg. TPCB: OEL= 0.059 mg/kg, FEL= 0.49 mg/kg.



ANCHOR QEA

Total PAH-13 and Total Congener PCB Depth Profiles: ADM

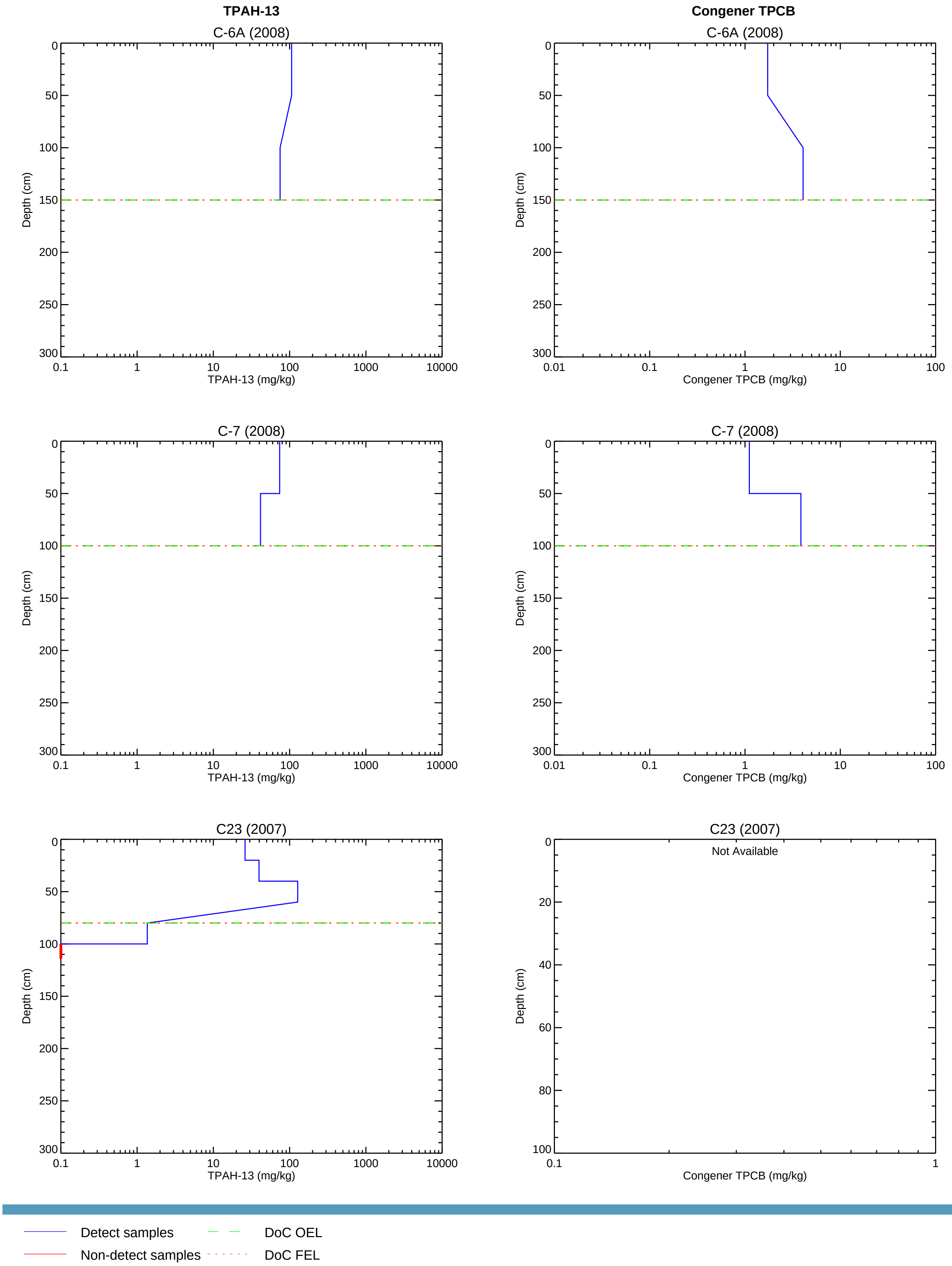
Note: Only cores with >= 2 segments were used. Values < x-axis min shown with thicker lines.
Non-detect values set to the x-axis minimum. 11/01/2012 database.
Cores C-8, C-4, C-32 and MNR-3 were combined with 2011 co-located cores with prefix "11AQ##"
TPAH-13: OEL= 2.43 mg/kg, FEL= 21.26 mg/kg. TPCB: OEL= 0.059 mg/kg, FEL= 0.49 mg/kg.



ANCHOR QEA

Total PAH-13 and Total Congener PCB Depth Profiles: ADM

Note: Only cores with >= 2 segments were used. Values < x-axis min shown with thicker lines.
Non-detect values set to the x-axis minimum. 11/01/2012 database.
Cores C-8, C-4, C-32 and MNR-3 were combined with 2011 co-located cores with prefix "11AQ##"
TPAH-13: OEL= 2.43 mg/kg, FEL= 21.26 mg/kg. TPCB: OEL= 0.059 mg/kg, FEL= 0.49 mg/kg.



ANCHOR QEA

Total PAH-13 and Total Congener PCB Depth Profiles: ADM

Note: Only cores with >= 2 segments were used. Values < x-axis min shown with thicker lines.
Non-detect values set to the x-axis minimum. 11/01/2012 database.
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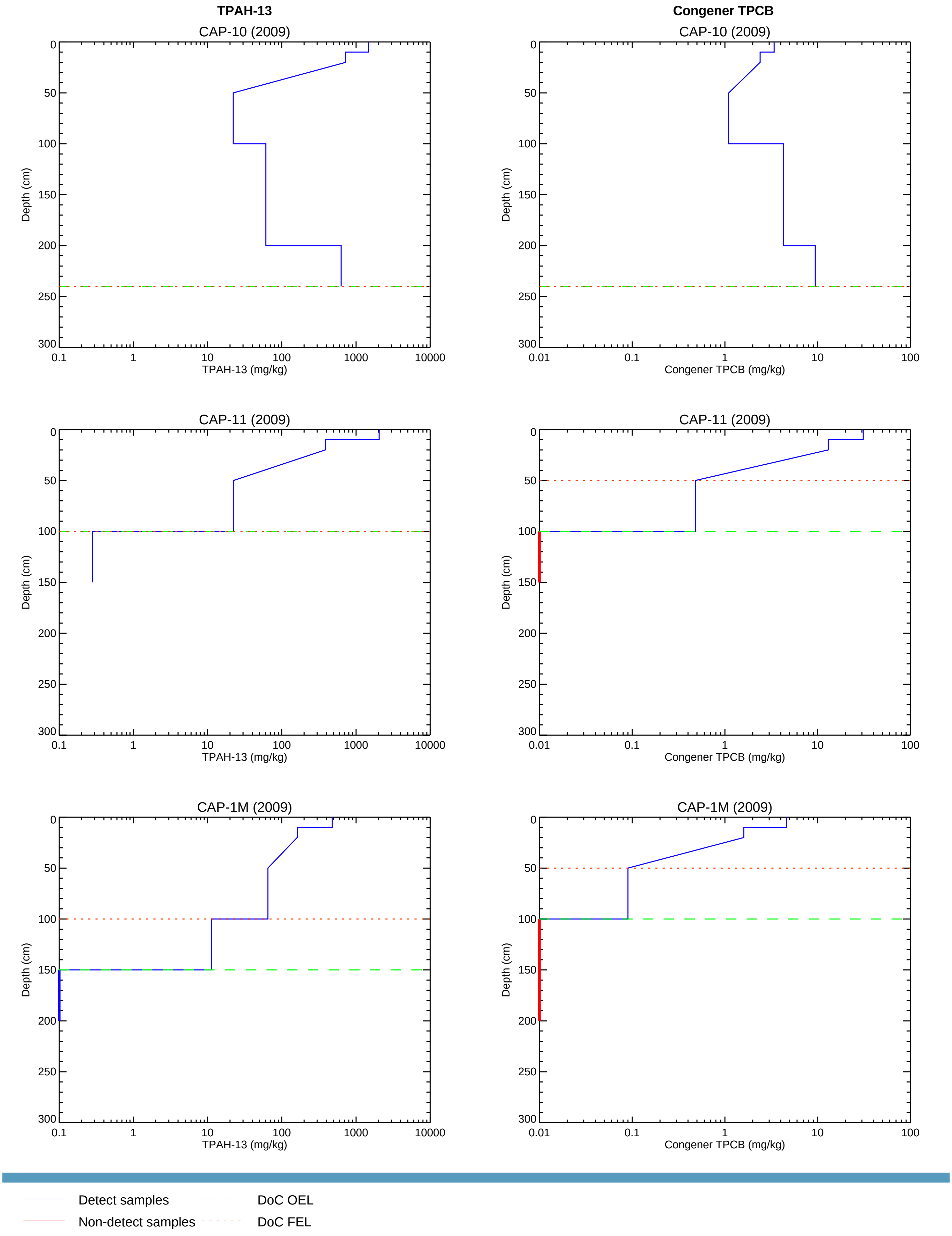

Total PAH-13 and Total Congener PCB Depth Profiles: ADM

Note: Only cores with >= 2 segments were used. Values < x-axis min shown with thicker lines.
Non-detect values set to the x-axis minimum. 11/01/2012 database.
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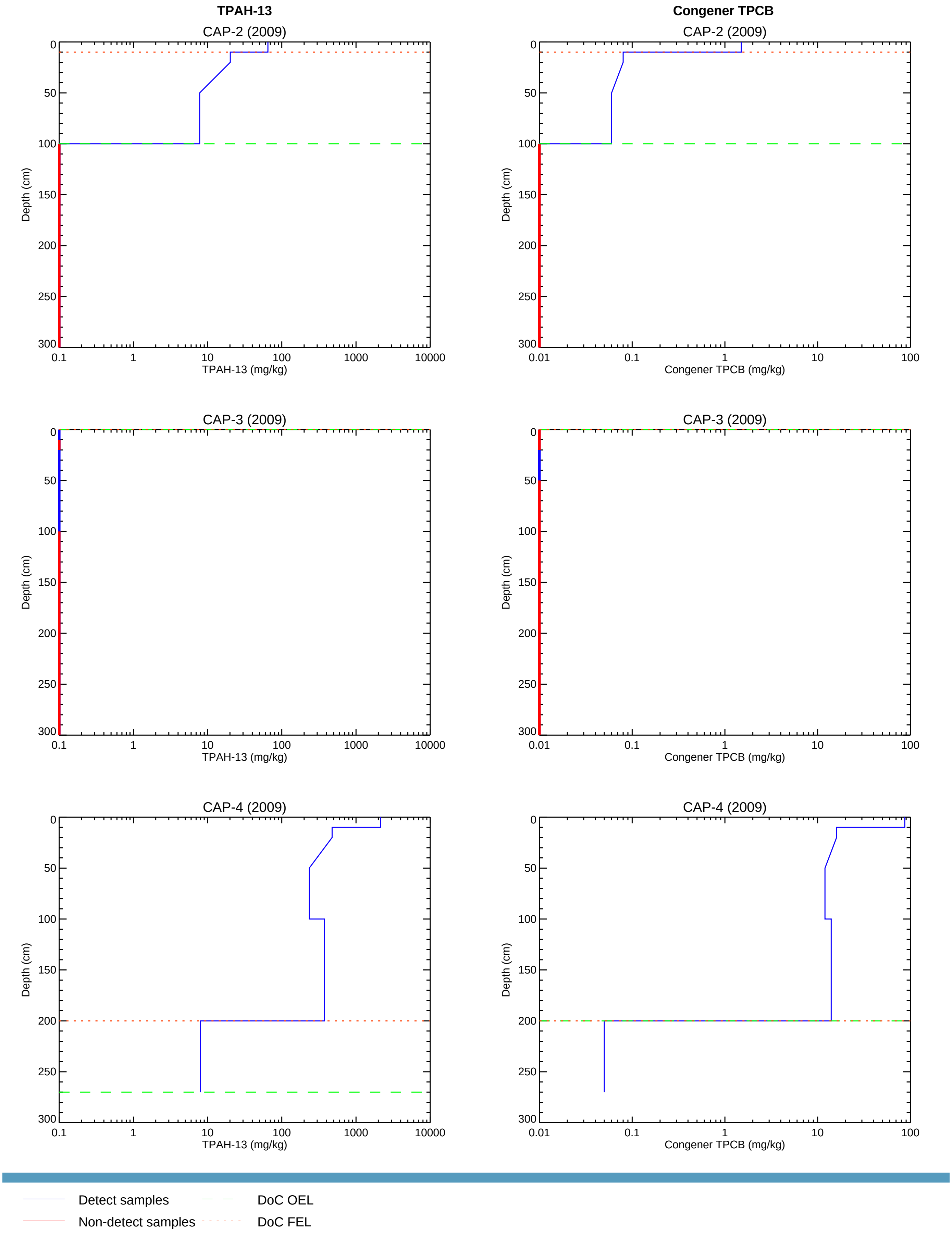
TPAH-13: OEL= 2.43 mg/kg, FEL= 21.26 mg/kg. TPCB: OEL= 0.059 mg/kg, FEL= 0.49 mg/kg.



Total PAH-13 and Total Congener PCB Depth Profiles: ADM

Note: Only cores with >= 2 segments were used. Values < x-axis min shown with thicker lines.
Non-detect values set to the x-axis minimum. 11/01/2012 database.
Cores C-8, C-4, C-32 and MNR-3 were combined with 2011 co-located cores with prefix "11AQ##"
TPAH-13: OEL= 2.43 mg/kg, FEL= 21.26 mg/kg. TPCB: OEL= 0.059 mg/kg, FEL= 0.49 mg/kg.

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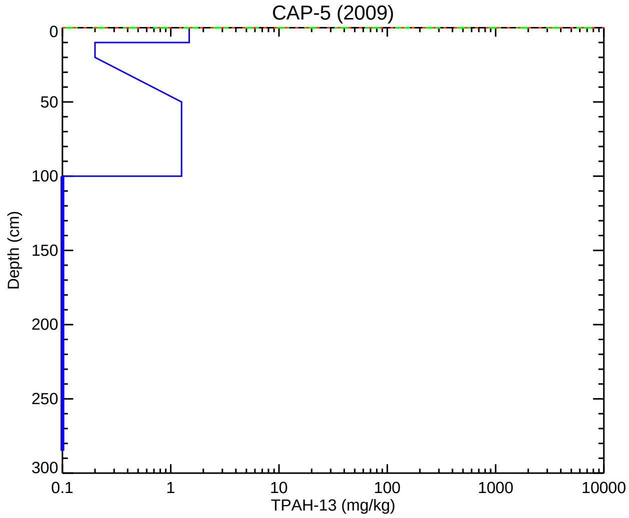
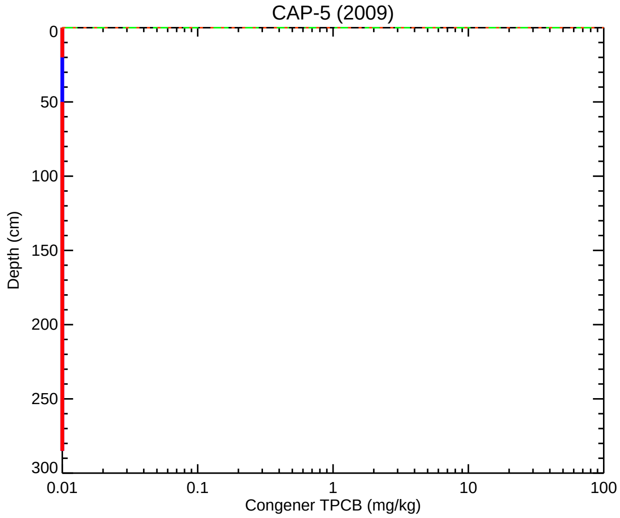
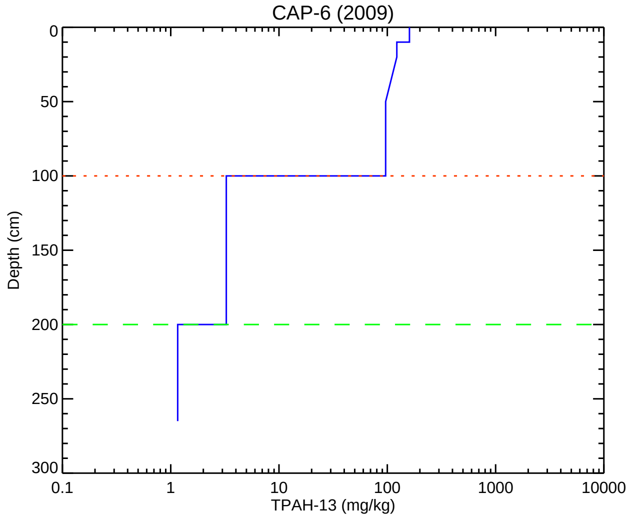
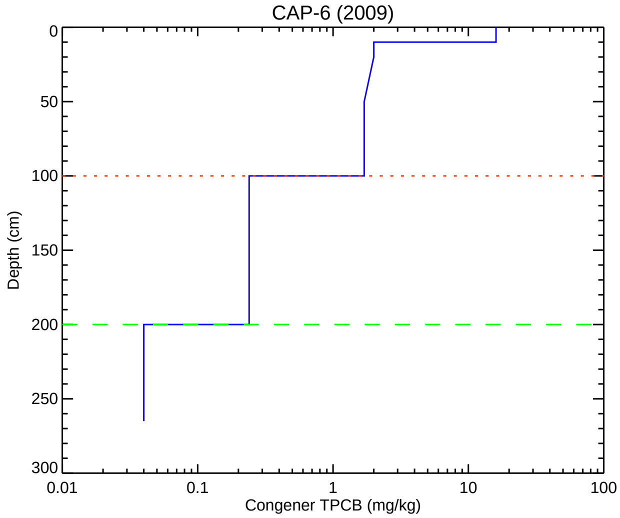
TPAH-13

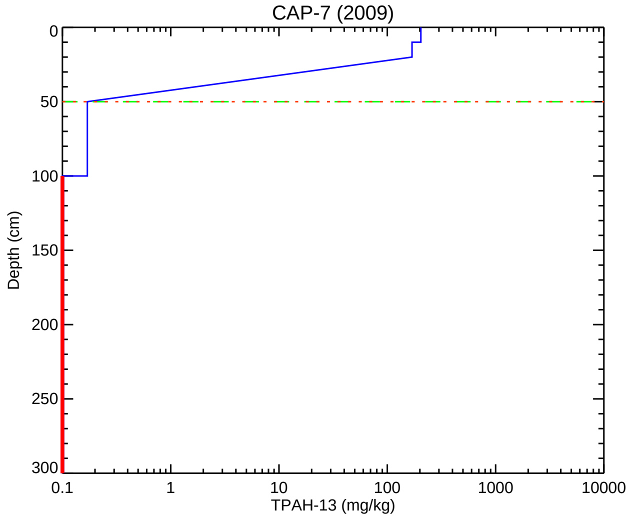
Congener TPCB

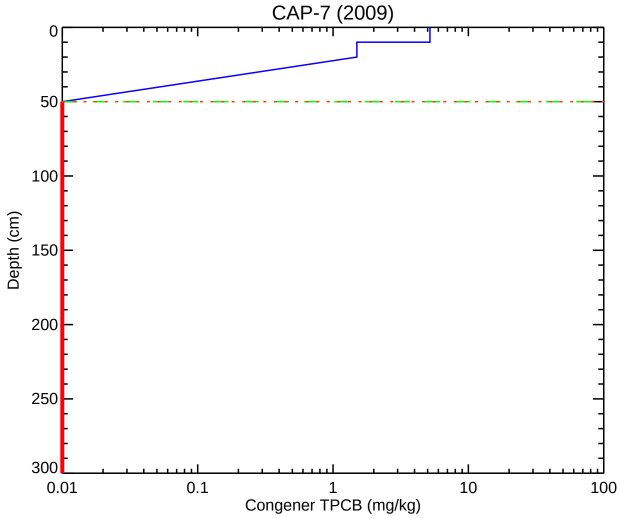












—	Detect samples	– –	DoC OEL
—	Non-detect samples	· · · ·	DoC FEL

ANCHOR QEA

Total PAH-13 and Total Congener PCB Depth Profiles: ADM

Note: Only cores with >= 2 segments were used. Values < x-axis min shown with thicker lines.
Non-detect values set to the x-axis minimum. 11/01/2012 database.
Cores C-8, C-4, C-32 and MNR-3 were combined with 2011 co-located cores with prefix "11AQ##"
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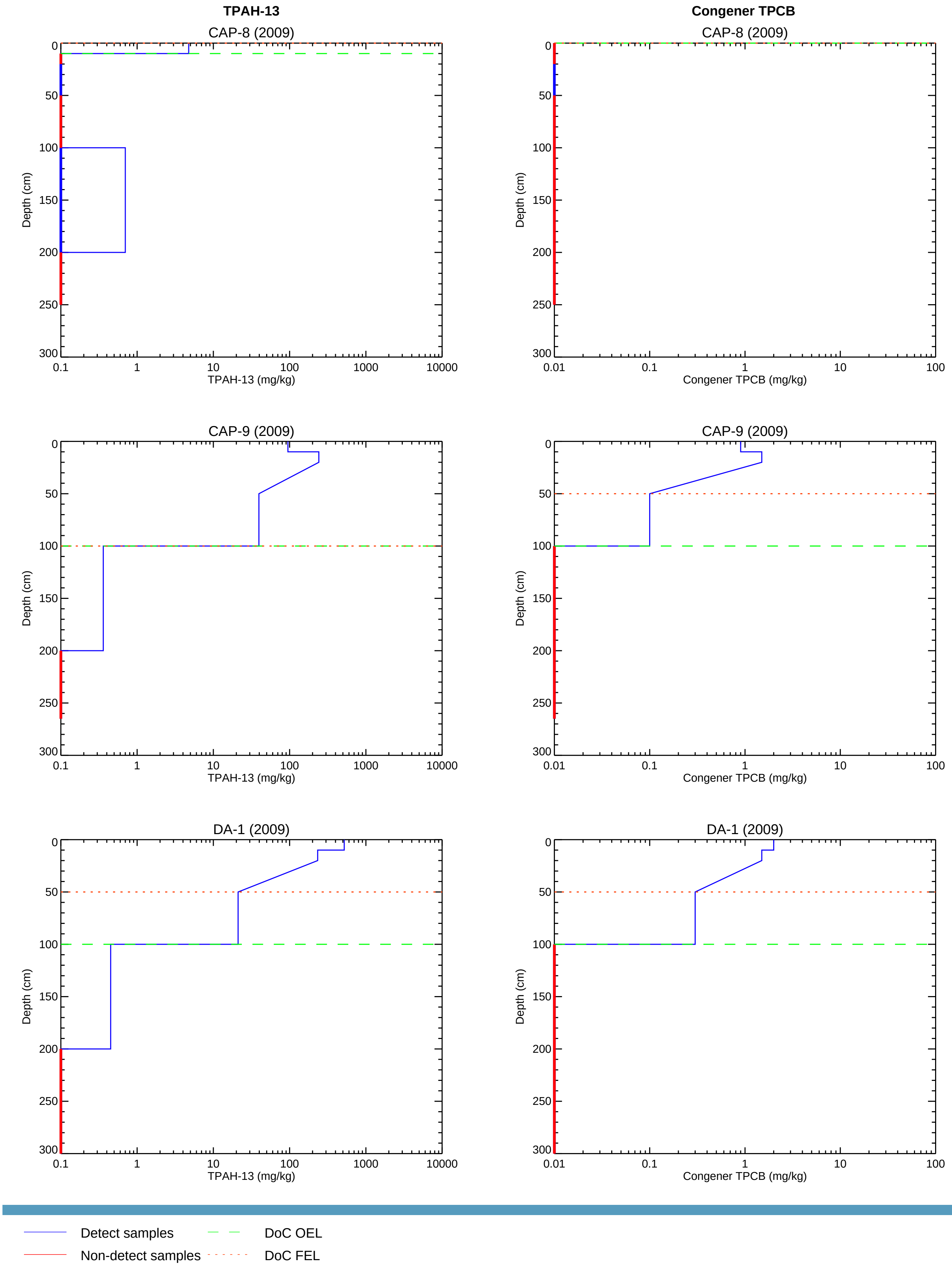

ANCHOR QEA

Total PAH-13 and Total Congener PCB Depth Profiles: ADM

Note: Only cores with >= 2 segments were used. Values < x-axis min shown with thicker lines.
Non-detect values set to the x-axis minimum. 11/01/2012 database.
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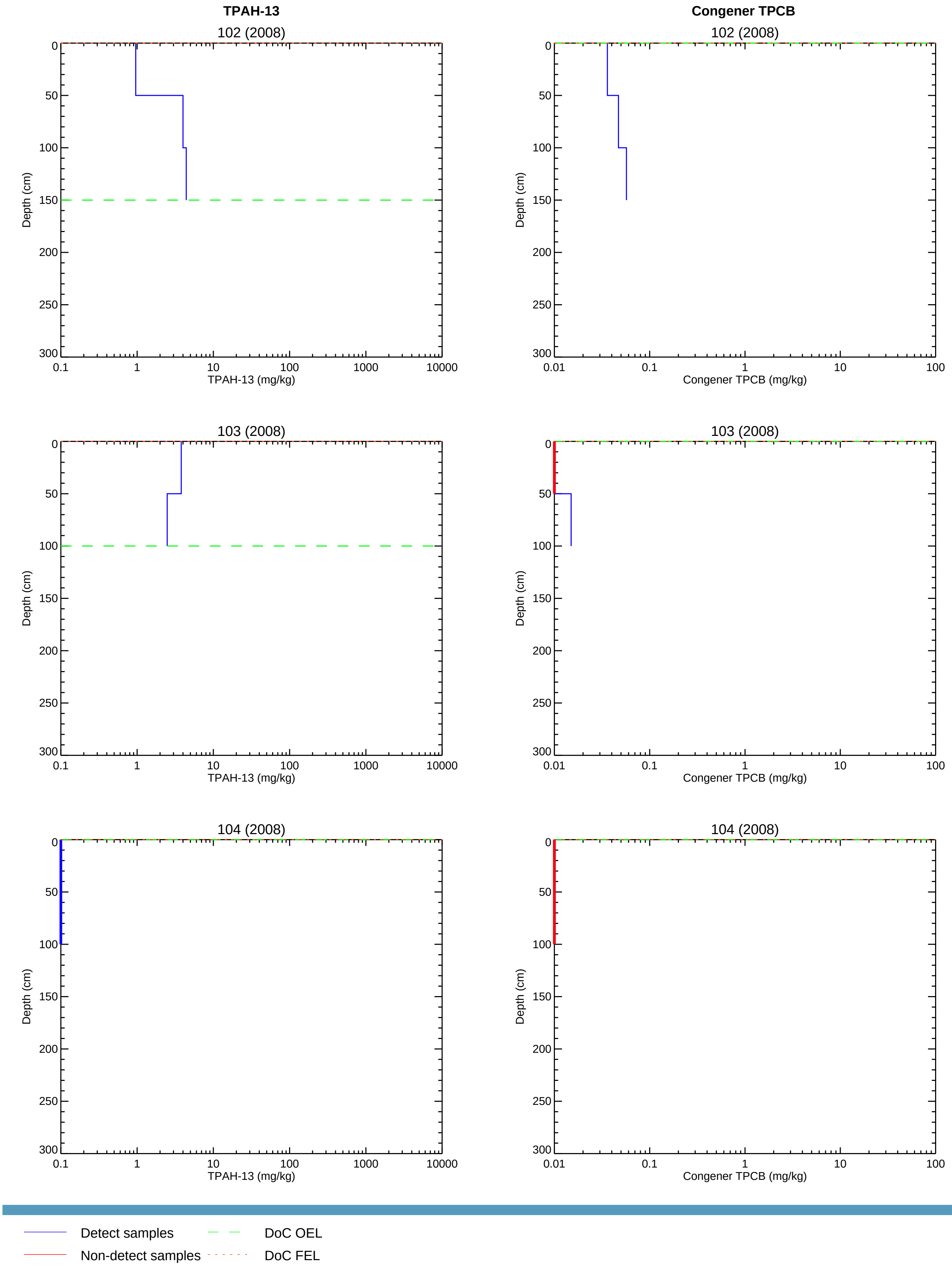

Total PAH-13 and Total Congener PCB Depth Profiles: BDA

Note: Only cores with >= 2 segments were used. Values < x-axis min shown with thicker lines.
Non-detect values set to the x-axis minimum. 11/01/2012 database.
Cores C-8, C-4, C-32 and MNR-3 were combined with 2011 co-located cores with prefix "11AQ##"
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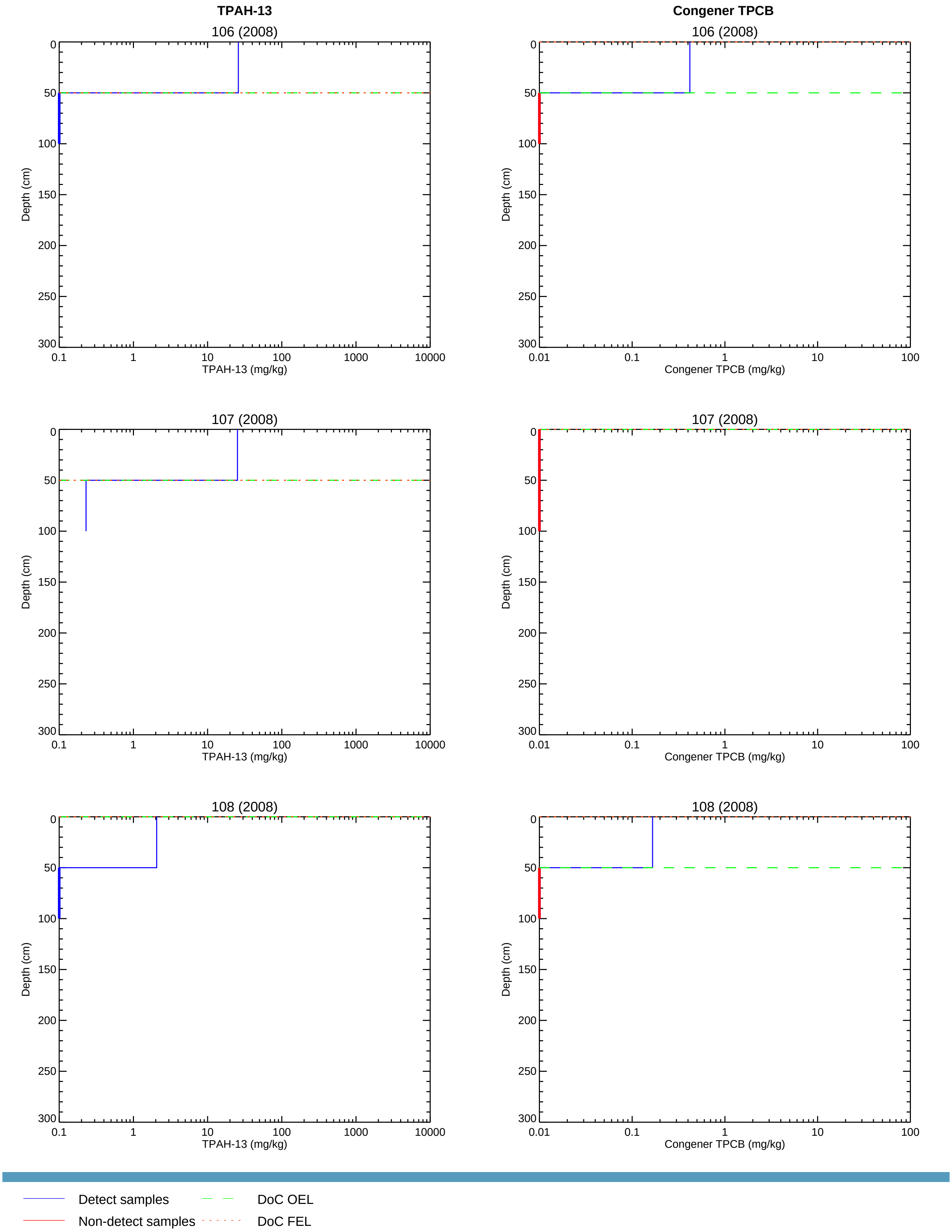

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QEA

Total PAH-13 and Total Congener PCB Depth Profiles: BDA

Note: Only cores with >= 2 segments were used. Values < x-axis min shown with thicker lines.
Non-detect values set to the x-axis minimum. 11/01/2012 database.
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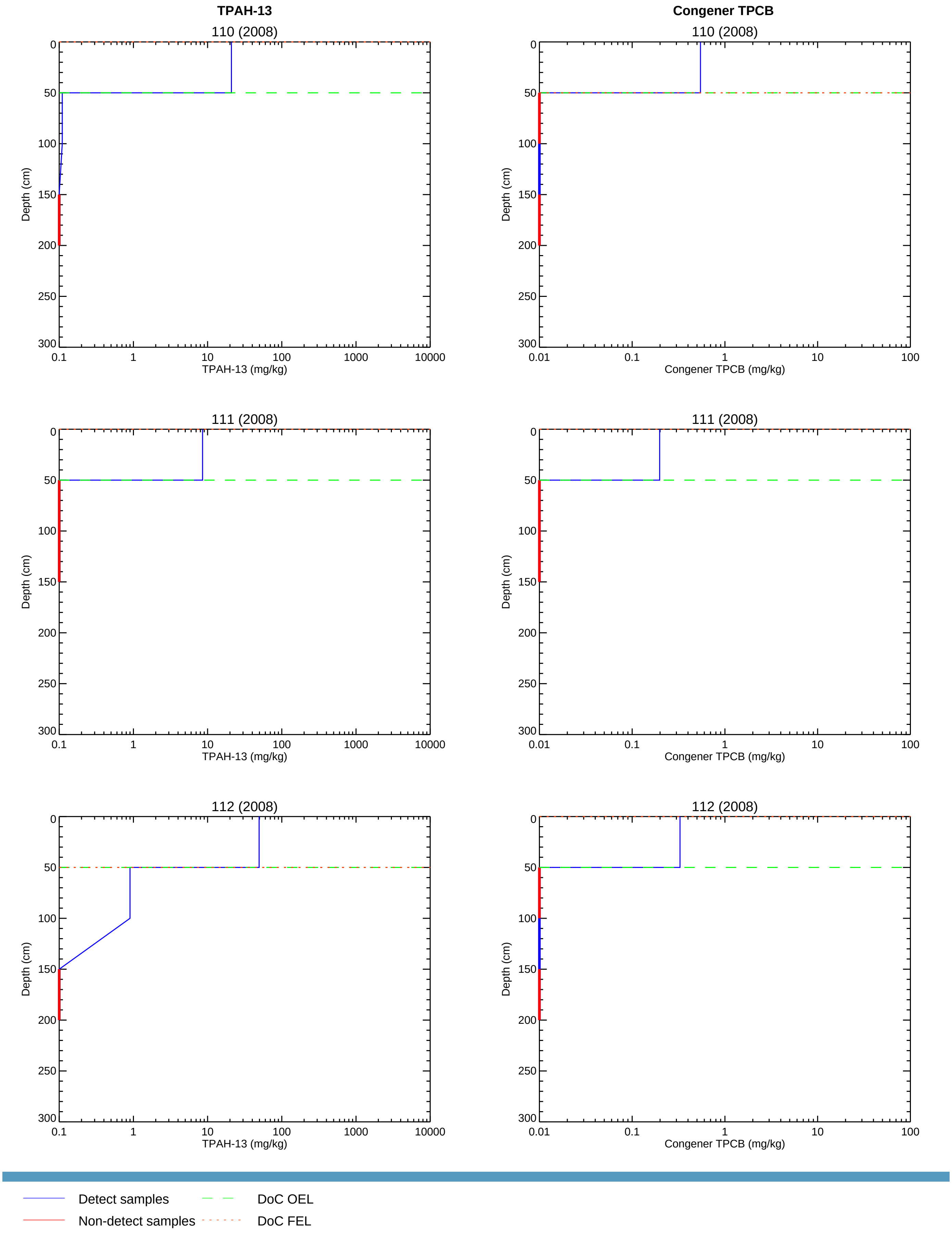
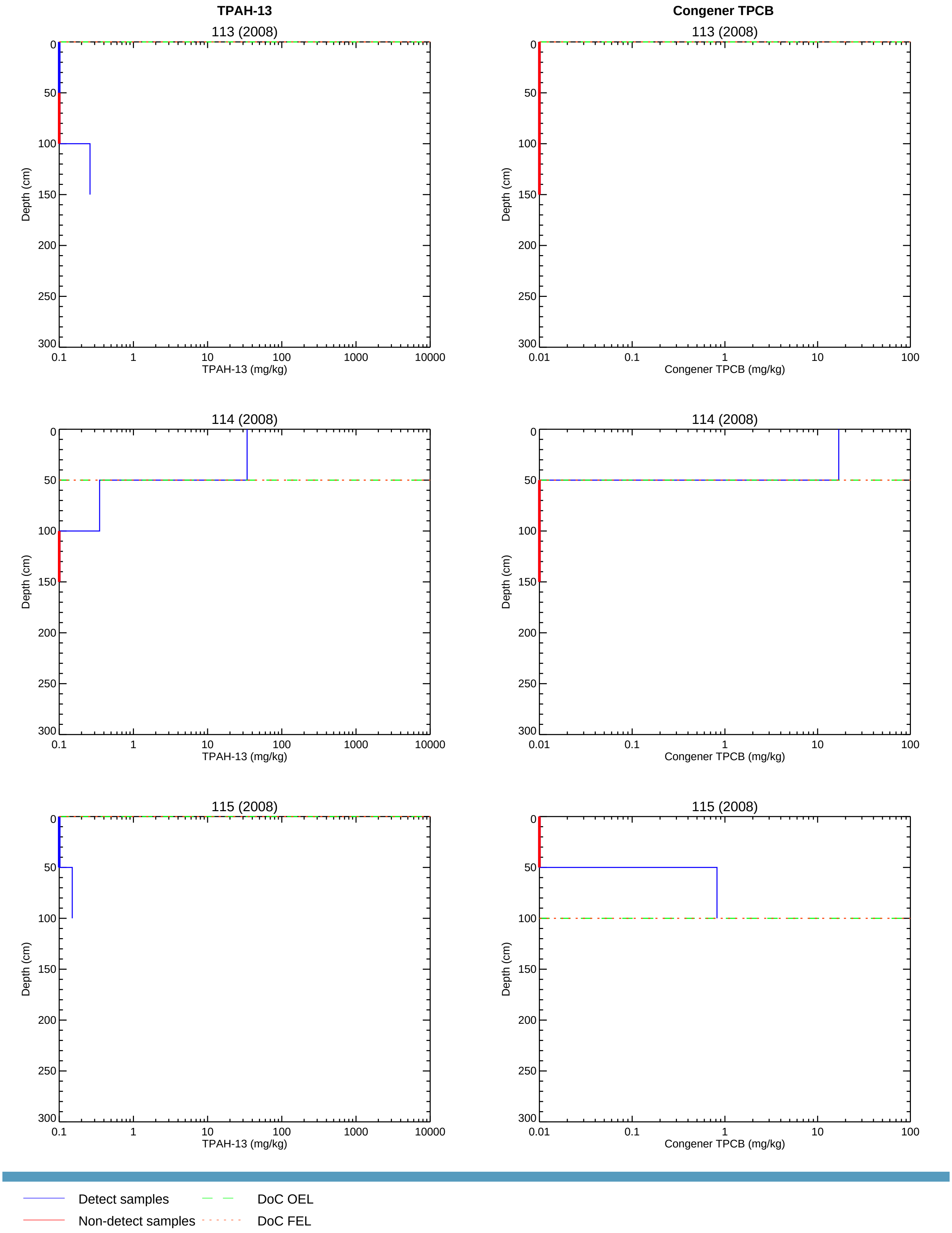


Total PAH-13 and Total Congener PCB Depth Profiles: BDA

Note: Only cores with >= 2 segments were used. Values < x-axis min shown with thicker lines. Non-detect values set to the x-axis minimum. 11/01/2012 database. Cores C-8, C-4, C-32 and MNR-3 were combined with 2011 co-located cores with prefix "11AQ##" TPAH-13: OEL= 2.43 mg/kg, FEL= 21.26 mg/kg. TPCB: OEL= 0.059 mg/kg, FEL= 0.49 mg/kg.



Total PAH-13 and Total Congener PCB Depth Profiles: BDA

Note: Only cores with >= 2 segments were used. Values < x-axis min shown with thicker lines.
Non-detect values set to the x-axis minimum. 11/01/2012 database.
Cores C-8, C-4, C-32 and MNR-3 were combined with 2011 co-located cores with prefix "11AQ##"
TPAH-13: OEL= 2.43 mg/kg, FEL= 21.26 mg/kg. TPCB: OEL= 0.059 mg/kg, FEL= 0.49 mg/kg.

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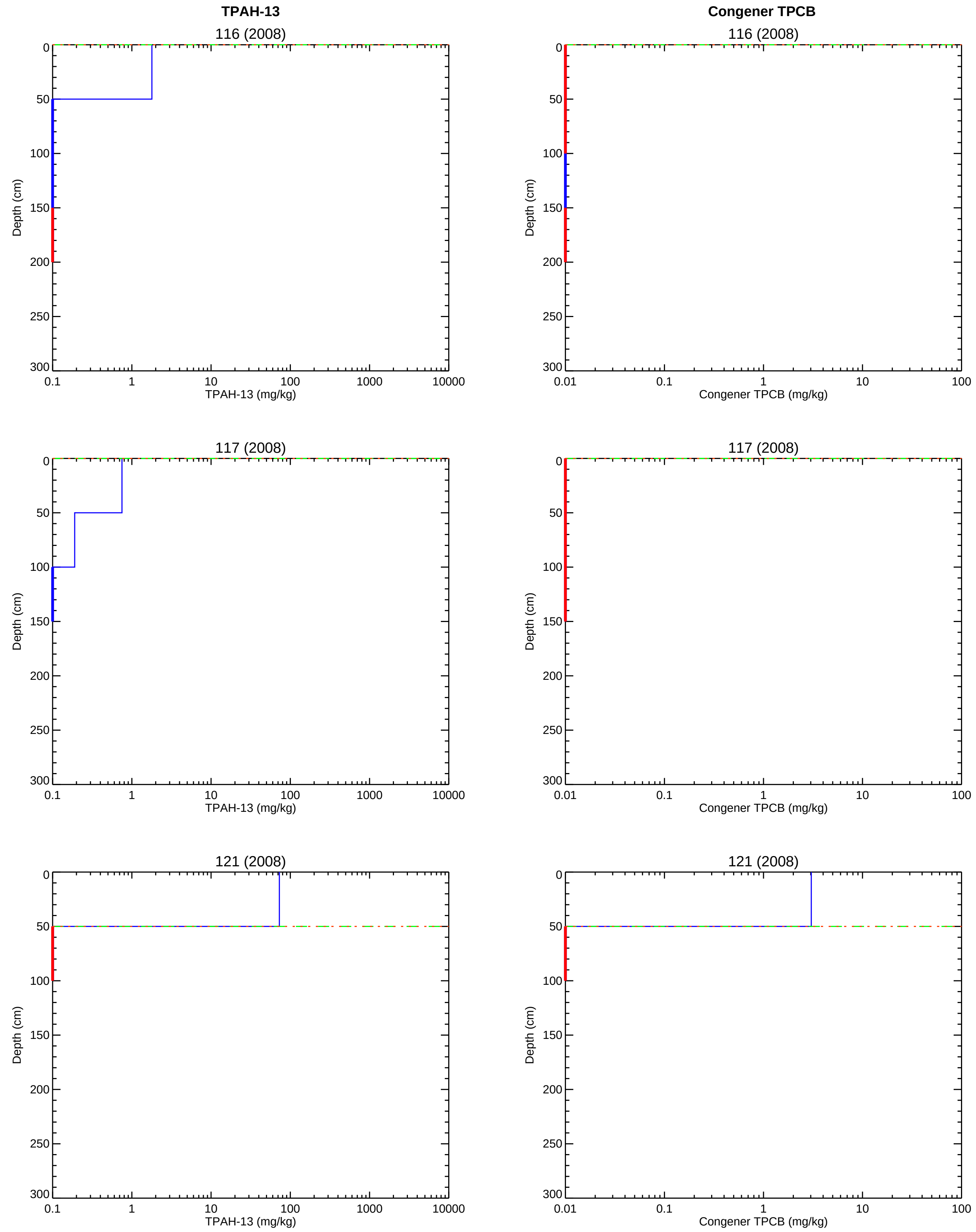

— Detect samples
— Non-detect samples
— — DoC OEL
· · · · · · DoC FEL

ANCHOR QEA

Total PAH-13 and Total Congener PCB Depth Profiles: BDA

Note: Only cores with >= 2 segments were used. Values < x-axis min shown with thicker lines.
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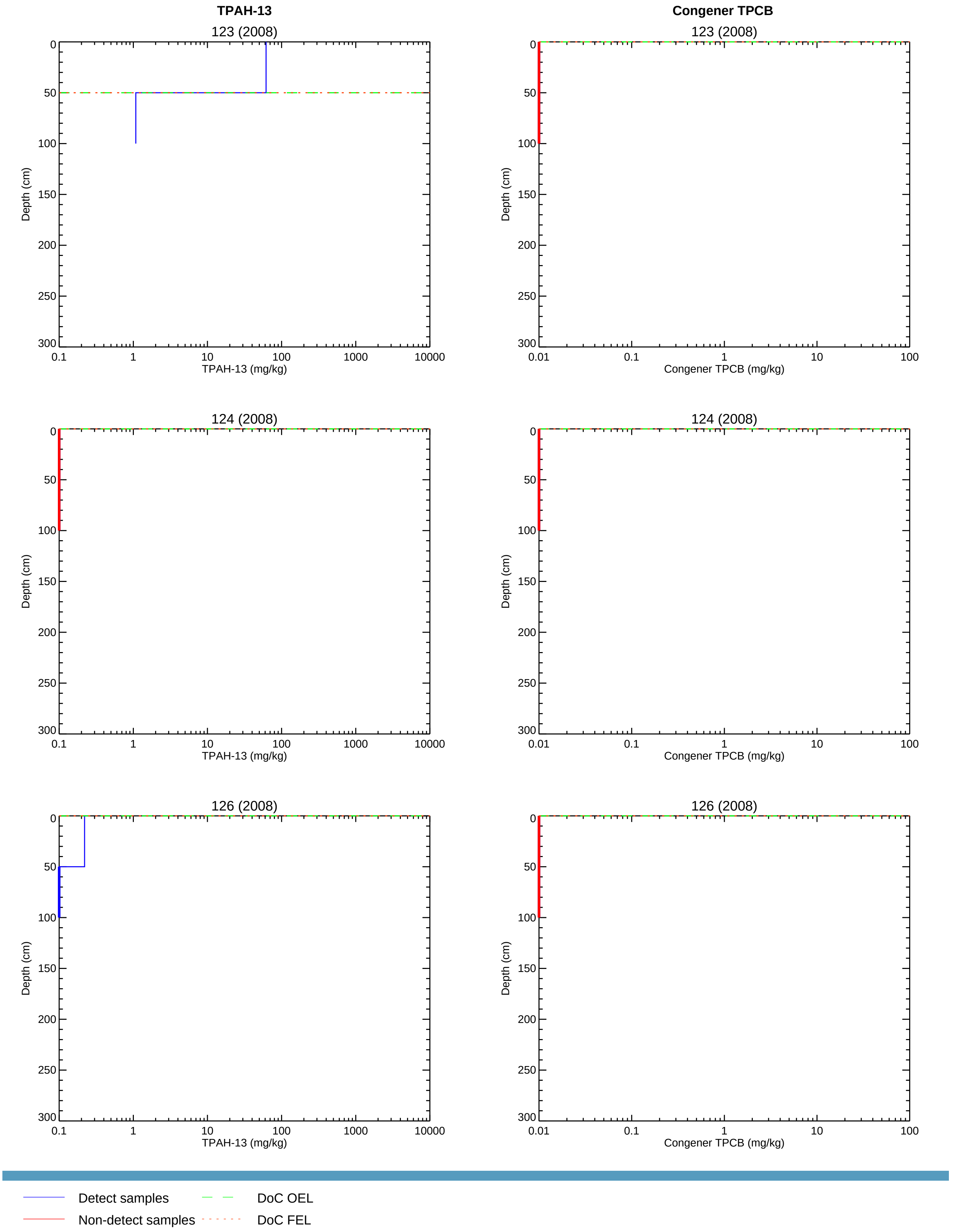

Total PAH-13 and Total Congener PCB Depth Profiles: BDA

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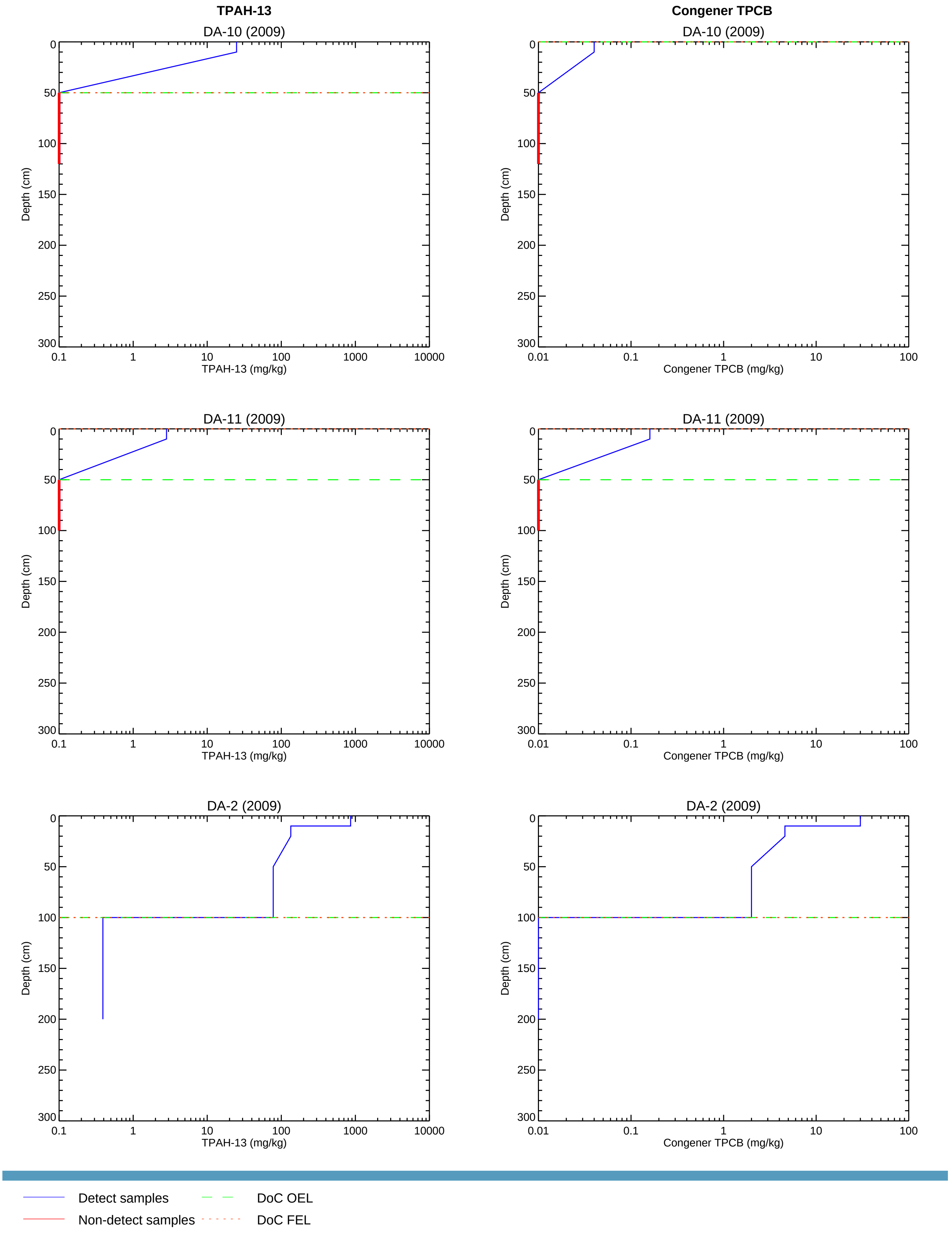

ANCHOR QEA

Total PAH-13 and Total Congener PCB Depth Profiles: BDA

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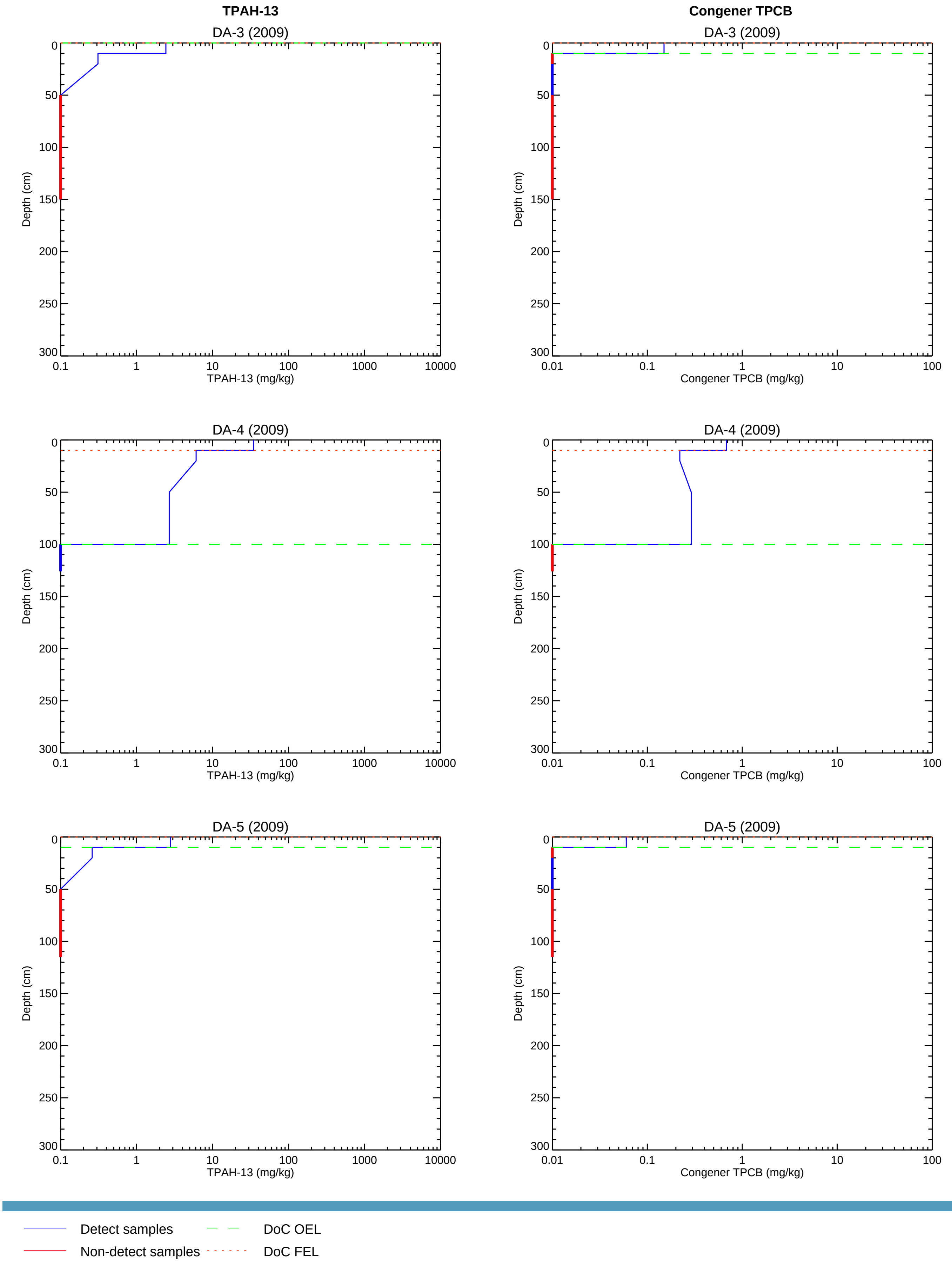

ANCHOR QEA

Total PAH-13 and Total Congener PCB Depth Profiles: BDA

Note: Only cores with >= 2 segments were used. Values < x-axis min shown with thicker lines.
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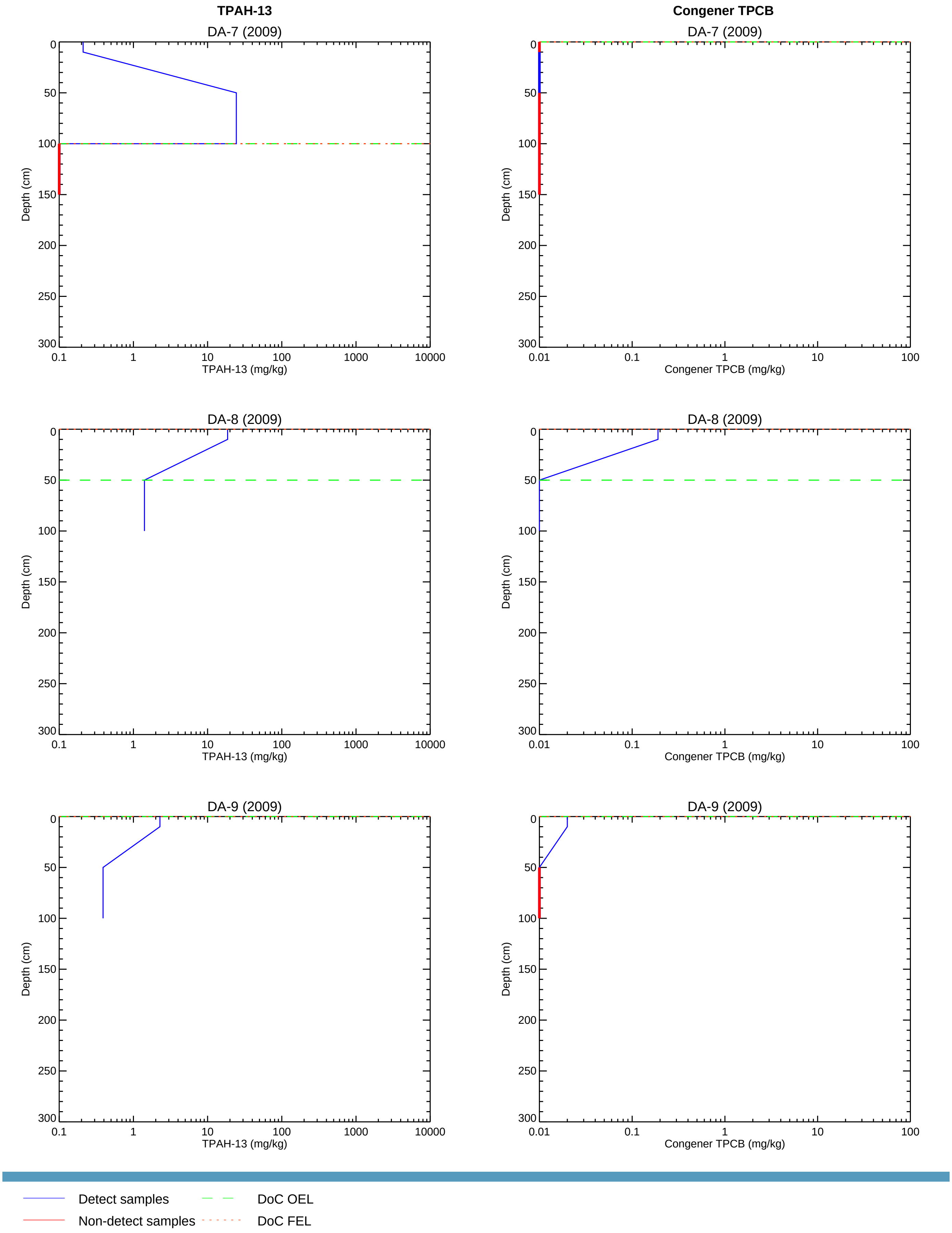
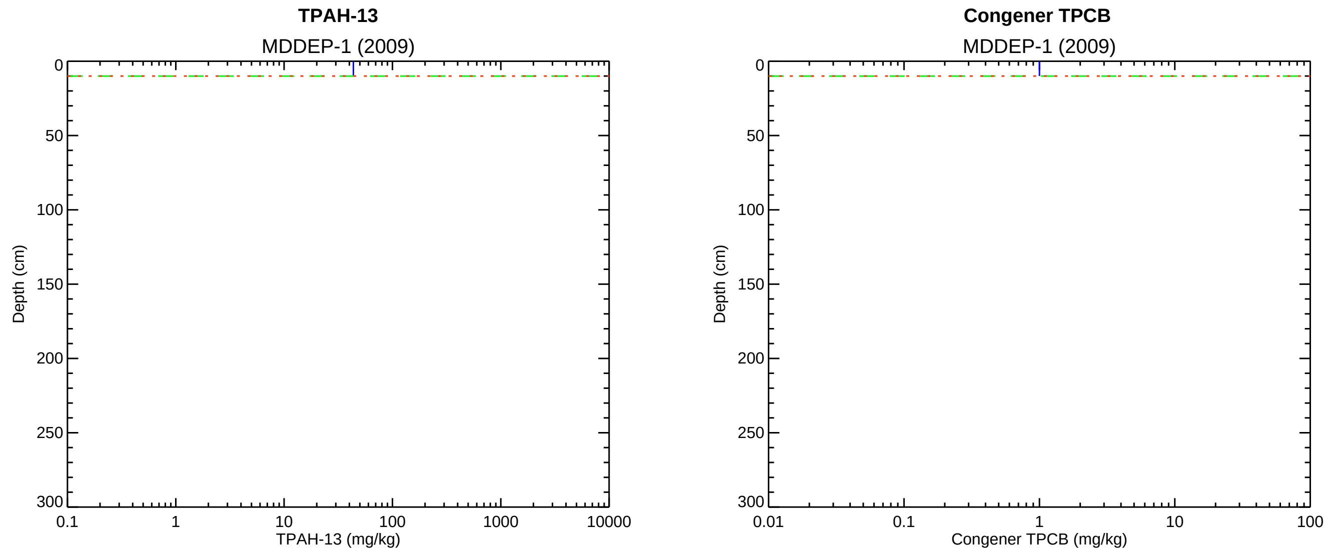


Total PAH-13 and Total Congener PCB Depth Profiles: BDA

Note: Only cores with >= 2 segments were used. Values < x-axis min shown with thicker lines.
Non-detect values set to the x-axis minimum. 11/01/2012 database.
Cores C-8, C-4, C-32 and MNR-3 were combined with 2011 co-located cores with prefix "11AQ##"
TPAH-13: OEL= 2.43 mg/kg, FEL= 21.26 mg/kg. TPCB: OEL= 0.059 mg/kg, FEL= 0.49 mg/kg.



―	Detect samples	— —	DoC OEL
―	Non-detect samples	- - - - - -	DoC FEL

ANCHOR QEA

Total PAH-13 and Total Congener PCB Depth Profiles: BDA

Note: Only cores with >= 2 segments were used. Values < x-axis min shown with thicker lines.
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APPENDIX D
SUMMARY OF PLANT OUTFALL DATA

Aluminerie ALCOA - Baie Comeau

SYNTHÈSE EFFLUENT FINAL (E1)

	Production d'aluminium Moyenne mensuelle (kt/mois)	Débit (m3/mois)	pH (5,5 ≤ pH ≤ 9,5) Hors intervalle (min/mois)	Aluminium (kg/mois)	Fluorures totaux (kg/mois)	MES (kg/mois)	DCO (kg/mois)	C10-C50 (kg/mois)	BPC (g/mois)	HAP (g/mois)	CN	Cd	Cu	Pb	Zn	Ni	E3 Purge Coulée C10-C50 (mg/l)
Fréquence suivi		1x/jour	3x/sem	3x/sem	3x/sem	3x/sem	1x/sem	1x/sem	1x/mois	1x/mois	1x/ 3 mois						3x/sem
Norme			180														0.75
2007																	
Jan/2007		30349		226.7	597.6	1333.9	1602.4	0.0									
Feb/2007		8820		33.9	144.0	176.0	260.2	1.4	0.74	35.28							
Mar/2007		35654		280.8	761.6	1621.5	935.9	2.9	0.00	89.13							
Apr/2007		81766		427.9	1450.5	3949.8	1733.4	1.8	5.64	63.78							
May/2007		44496		121.1	614.0	663.4	919.6	5.8	3.11	13.35							
Jun/2007		89167		422.0	1436.6	1471.7	1396.4	0.0	5.17	0.00							
Jul/2007		86005		270.4	1204.2	1158.9	2081.3	0.0	4.30	249.42							
Aug/2007		71705		184.0	888.0	773.5	2832.4	0.0	15.06	7.17							
Sep/2007		64772		359.5	1246.3	2513.2	1570.7	0.0									
Oct/2007		90380		424.0	1341.9	4428.3	1735.3	5.1	9.04	578.43							
Nov/2007		126455		568.9	1823.4	3877.9	2876.8	4.7	25.29	3325.76							
Dec/2007		40530		181.6	669.3	1229.2	851.1	0.0	24.72	441.78							
Totaux annuels		**770101**		**3500.7**	**12177.4**	**23197.5**	**18795.6**	**21.7**			**11.5**	**3.9**	**53.7**	**3.9**	**104.0**	**15.4**	
	tonnes/an	m3/an		kg/an	kg/an	kg/an	kg/an	kg/an	g/an	g/an	kg/an	kg/an	kg/an	kg/an	kg/an	kg/an	mg/l
	Nb de données	365		339	339	327	53	53	11	11	4	4	4	4	4	4	145

Toxicité:

Inscrire ici un commentaire sur les résultats…

	Production d'aluminium Moyenne mensuelle (kt/mois)	Débit (m3/mois)	pH Hors intervalle (min/mois)	Aluminium (kg/mois)	Fluorures totaux (kg/mois)	MES (kg/mois)	DCO (kg/mois)	C10-C50 (kg/mois)	BPC (g/mois)	HAP (g/mois)	CN	Cd	Cu	Pb	Zn	Ni	E3 Purge Coulée C10-C50 (mg/l)
2008																	
Jan/2008	37.1	56274	0	229.2	974.9	2481.9	1012.9	0.0	6.19	22.51							
Feb/2008	34.5	15511	0	55.8	206.1	246.8	318.0	0.5	1.86	12.41							
Mar/2008	37.2	17915	180	105.0	297.5	717.3	634.2	1.4	5.55	45.68							
Apr/2008	35.3	212765	0	1200.0	4012.7	10533.2	3191.5	7.4	0.00	234.04							
May/2008	37.8	66593	0	283.6	1227.7	1460.5	1328.5	2.0	0.00	26.64							
Jun/2008	36.1	73413	0	254.4	1059.2	1503.8	1703.2	10.0	5.14	102.78							
Jul/2008	36.9	125839	0	317.2	1428.8	1229.2	1635.9	0.0	5.16	843.12							
Aug/2008	36.4	137639	0	272.9	1169.3	945.8	2236.6	0.0	4.54	30.28							
Sep/2008	35.7	95903	0	159.2	879.5	679.3	1227.6	0.0	34.53	19.18							
Oct/2008	36.5	78984	0	162.8	972.9	712.0	1717.9	0.0	3.24	71.09							
Nov/2008	34.0	108962	0	392.0	1631.9	2153.7	2015.8	0.0	1.96	32.69							
Dec/2008	32.5	36879	0	142.5	656.1	657.1	722.8	3.1	3.69	44.99							

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SYNTHÈSE EFFLUENT FINAL (E1)

E3 Purge Coulée

	Production d'aluminium Moyenne mensuelle (kt/mois)	Débit (m3/mois)	pH (5,5 ≤ pH ≤ 9,5) Hors intervalle (min/mois)	Aluminium (kg/mois)	Fluorures totaux (kg/mois)	MES (kg/mois)	DCO (kg/mois)	C10-C50 (kg/mois)	BPC (g/mois)	HAP (g/mois)	CN	Cd	Cu	Pb	Zn	Ni	E3 Purge Coulée C10-C50 (mg/l)
Fréquence suivi		1x/jour	3x/sem	3x/sem	3x/sem	3x/sem	1x/sem	1x/sem	1x/mois	1x/mois	1x/ 3 mois						3x/sem
Norme			180														0.75
Totaux annuels	**430.0** tonnes/an	**1026678** m3/an	**180** minutes	**3574.8** kg/an	**14516.5** kg/an	**23320.6** kg/an	**17744.9** kg/an	**24.4** kg/an	**71.86** g/an	**1485.41** g/an	**15.1** kg/an	**3.8** kg/an	**66.0** kg/an	**5.5** kg/an	**102.7** kg/an	**10.3** kg/an	mg/l
	Nb de données	366		187	187	187	52	52	13	13	4	3	4	3	4	3	147

Toxicité:

4 tests de toxicité aiguë (truite), tous <1UT, 4 tests de toxicité aiguë (daphnie), 5.7, 3.3, <1 et <1 UT, 1
test de toxicité chronique (méné) : < 1 UT, 1 test de toxicité chronique (algue) : 4.8UT

2009

	Production d'aluminium	Débit	pH	Aluminium	Fluorures totaux	MES	DCO	C10-C50	BPC	HAP	CN	Cd	Cu	Pb	Zn	Ni	E3 C10-C50
Jan/2009	32.4	13921	0	40.0	205.8	267.8	417.6	2.9	9.2	8.21	0.07						
Feb/2009	30.2	14501	0	100.5	235.4	1022.3	427.8	1.4	6.2	17.55							
Mar/2009	33.4	38549	0	192.5	652.8	1667.9	786.4	1.2	5.8	29.30							
Apr/2009	32.3	169791	0	803.0	3090.0	5278.8	3463.7	0.0	12.2	1152.88	5.60						
May/2009	33.6	50434	0	231.3	900.8	1351.2	945.6	57.6	2.1	15.13							
Jun/2009	32.4	69208	0	365.5	1202.1	1999.0	1328.8	4.7	38.0	774.78							
Jul/2009	33.4	100760	0	407.7	1647.1	2036.6	1612.2	9.1	2.7	50.38	1.21						
Aug/2009	33.4	104184	0	349.2	1206.7	1711.8	1958.7	17.9	5.7	739.71							
Sep/2009	32.6	42322	0	211.7	782.1	1073.9	1015.7	12.4	1.2	137.55							
Oct/2009	33.9	60505	0	259.9	1280.4	1199.5	1164.7	12.3	3.3	196.64	0.97						
Nov/2009	33.0	58578	0	175.1	957.8	860.9	1159.8	1.5	13.5	29.87							
Dec/2009	34.0	32725	5	204.3	641.3	974.0	744.5	3.6	8.8	106.36							
Totaux annuels	**394.5** tonnes/an	**755479** m3/an	**5** minutes	**3340.5** kg/an	**12802.2** kg/an	**19443.6** kg/an	**15025.6** kg/an	**124.4** kg/an	**108.9** kg/an	**3258.36** g/an	**12.47** g/an	**2.1** kg/an	**48.7** kg/an	**2.8** kg/an	**63.1** kg/an	**9.0** kg/an	mg/l
	Nb de données	365		153	154	154	51	70	13	13	4	4	4	4	4	4	130

Toxicité:

4 tests de toxicité aiguë (truite), tous <1UT, 4 tests de toxicité aiguë (daphnie), 2.3, 3.3, 1.3, 3.7 UT, 1
test de toxicité chronique (méné) : < 1UT, 2 tests de toxicité chronique (algue) : 12.5, 11.6 UT

2010

	Production d'aluminium	Débit	pH	Aluminium	Fluorures totaux	MES	DCO	C10-C50	BPC	HAP	CN	Cd	Cu	Pb	Zn	Ni	E3 C10-C50
Jan/2010	34.3	25724	0	131.6	489.1	983.2	887.5	0.0	2.55	11.83							
Feb/2010	30.6	28759	0	208.7	597.3	1397.0	740.5	2.9	5.75	93.47							
Mar/2010	34.1	28648	0	115.9	506.2	615.1	550.0	0.7	2.84	24.35							
Apr/2010	32.7	72759	0	342.3	1385.0	2303.8	1364.2	0.0	12.37	2364.67							

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SYNTHÈSE EFFLUENT FINAL (E1)

	Production d'aluminium Moyenne mensuelle (kt/mois)	Débit (m3/mois)	pH (5,5 ≤ pH ≤ 9,5) Hors intervalle (min/mois)	Aluminium (kg/mois)	Fluorures totaux (kg/mois)	MES (kg/mois)	DCO (kg/mois)	C10-C50 (kg/mois)	BPC (g/mois)	HAP (g/mois)	CN	Cd	Cu	Pb	Zn	Ni	E3 Purge Coulée C10-C50 (mg/l)
Fréquence suivi		1x/jour	3x/sem	3x/sem	3x/sem	3x/sem	1x/sem	1x/sem	1x/mois	1x/mois	1x/ 3 mois						3x/sem
Norme			180														0.75
May/2010	33.9	45460	0	144.7	870.1	997.5	891.0	0.0	12.27	486.42							
Jun/2010	32.8	73026	0	254.4	917.4	1437.2	1424.0	0.0	3.07	576.91							
Jul/2010	33.8	106723	0	293.3	1171.4	1848.5	2641.4	0.0	11.74	693.70							
Aug/2010	33.7	87611	0	149.7	648.5	1169.2	1857.3	1.6	3.33	284.73							
Sep/2010	32.9	104483	0	370.8	1561.3	1660.5	3578.6	0.0	22.99	339.57							
Oct/2010	34.2	108613	0	407.8	1956.0	1683.5	2443.8	0.0	22.81	39.10							
Nov/2010	33.3	52071	10	316.2	1126.3	1708.9	1145.6	13.1	12.50	38.01							0.06
Dec/2010	34.5	132277	0	609.0	2548.3	4408.9	2050.3	13.6	27.78	429.90							0.01
Totaux annuels	400.7	866154	10	3344.2	13776.9	20213.4	19574.3	31.9	139.98	5382.66	24.5	4.3	23.0	4.3	40.1	23.8	
	tonnes/an	m3/an	minutes	kg/an	kg/an	kg/an	kg/an	kg/an	g/an	g/an	kg/an	kg/an	kg/an	kg/an	kg/an	kg/an	mg/l
	Nb de données	365		154	154	154	52	54	12	12	4	4	4	4	4	4	137

Toxicité:

4 tests de toxicité aiguë (truite), tous <1UT,   4 tests de toxicité aiguë (daphnie), <1, <1, 2.1, <1 UT,   1test de toxicité chronique (méné) : < 1UT, 1 test de toxicité chronique (algue) : 6.1 UT

2011

	Production d'aluminium Moyenne mensuelle (kt/mois)	Débit (m3/mois)	pH (5,5 ≤ pH ≤ 9,5) Hors intervalle (min/mois)	Aluminium (kg/mois)	Fluorures totaux (kg/mois)	MES (kg/mois)	DCO (kg/mois)	C10-C50 (kg/mois)	BPC (g/mois)	HAP (g/mois)	CN	Cd	Cu	Pb	Zn	Ni	E3 Purge Coulée C10-C50 (mg/l)
Jan/2011	34.6	20914	0	57.8	338.3	379.4	549.0	11.0	5.23	63.37							0.03
Feb/2011	31.1	7653	0	19.1	107.4	133.1	300.0	12.3	1.99	6.89							0.05
Mar/2011	34.4	48069	0	374.6	1057.0	2725.8	1105.6	29.6	6.73	55.28							0.02
Apr/2011	32.8	123146	0	561.6	2182.1	4076.0	2001.1	28.6	7.64	233.98							0.05
May/2011	32.8	118508	0	623.8	2332.7	3610.6	1777.6	2.8	11.26	139.84							0.02
Jun/2011	31.4	60626	0	229.0	1015.3	1600.1	1091.3	2.4	5.46	285.55							0.00
Jul/2011	31.5	105322	0	262.2	874.4	1648.7	1632.5	0.0	11.59	116.91							0.00
Aug/2011	32.9	123767	0	311.3	1231.0	1649.7	1980.3	5.0	13.61	0.00							0.00
Sep/2011	32.3	88571	0	266.7	1286.6	1333.7	1682.8	19.7	13.29	139.06							0.00
Oct/2011	33.7	37423	0	120.1	651.7	842.5	778.4	19.9	15.72	12.35							0.00
Nov/2011	33.1	58961	0	287.1	1004.3	1917.2	1326.6	14.0	15.33	0.00							0.00
Dec/2011	34.4	44818	0	263.5	874.4	1604.9	907.6	61.0	15.69	34.06							0.00
Totaux annuels	394.9	837779	0	3376.8	12955.2	21521.5	15132.8	206.4	123.52	1087.28	15.7	3.2	25.6	3.1	51.1	10.5	0.02
	tonnes/an	m3/an	minutes	kg/an	kg/an	kg/an	kg/an	kg/an	g/an	g/an	kg/an	kg/an	kg/an	kg/an	kg/an	kg/an	mg/l
	Nb de données	365		153	153	153	52	51	12	12	4	4	4	4	4	4	150

Toxicité:

Aluminerie ALCOA - Baie Comeau

SYNTHÈSE EFFLUENT FINAL (E1)

	Production d'aluminium Moyenne mensuelle *(kt/mois)*	**Débit** *(m3/mois)*	**pH** (5,5 ≤ pH ≤ 9,5) **Hors intervalle** *(min/mois)*	**Aluminium** *(kg/mois)*	**Fluorures totaux** *(kg/mois)*	**MES** *(kg/mois)*	**DCO** *(kg/mois)*	**C10-C50** *(kg/mois)*	**BPC** *(g/mois)*	**HAP** *(g/mois)*	**CN**	**Cd**	**Cu**	**Pb**	**Zn**	**Ni**	**E3 Purge Coulée** **C10-C50** *(mg/l)*
Fréquence suivi		1x/jour	3x/sem	3x/sem	3x/sem	3x/sem	1x/sem	1x/sem	1x/mois	1x/mois	1x/ 3 mois						3x/sem
Norme			180														0.75

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2012																	
Jan/2012	34.6	20642	0	59.5	360.2	461.8	531.5	21.6	7.22	6.61							0.00
Feb/2012	0.0	17922	0	60.3	263.8	560.9	516.1	19.2	6.00	45.07							0.55
Mar/2012	0.0	32460	0				616.7	8.8	10.06	54.21							0.03
Apr/2012	0.0	0	0														
May/2012	0.0	0	0														
Jun/2012	0.0	0	0														
Jul/2012	0.0	0	0														
Aug/2012	0.0	0	0														
Sep/2012	0.0	0	0														
Oct/2012	0.0	0	0														
Nov/2012	0.0	0	0														
Dec/2012	0.0	0	0														
Totaux annuels	**34.6**	**71025**	**0**								**0.9**	**0.0**	**3.0**	**0.1**	**7.8**	**2.3**	
	tonnes/an	m3/an	minutes	kg/an	kg/an	kg/an	kg/an	kg/an	g/an	g/an	kg/an	kg/an	kg/an	kg/an	kg/an	kg/an	mg/l
	Nb de données	78		31	31	31	10	10	3	3	2	1	1	1	1	1	28

Toxicité:

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2013																	
Jan/2013	0.0	0	0														
Feb/2013	0.0	0	0														
Mar/2013	0.0	0	0														
Apr/2013	0.0	0	0														
May/2013	0.0	0	0														
Jun/2013	0.0	0	0														
Jul/2013	0.0	0	0														
Aug/2013	0.0	0	0														
Sep/2013	0.0	0	0														

Aluminerie ALCOA - Baie Comeau

SYNTHÈSE EFFLUENT FINAL (E1)

E3 Purge Coulée

	Production d'aluminium Moyenne mensuelle (kt/mois)	Débit (m3/mois)	pH (5,5 ≤ pH ≤ 9,5) Hors intervalle (min/mois)	Aluminium (kg/mois)	Fluorures totaux (kg/mois)	MES (kg/mois)	DCO (kg/mois)	C10-C50 (kg/mois)	BPC (g/mois)	HAP (g/mois)	CN	Cd	Cu	Pb	Zn	Ni	E3 Purge Coulée C10-C50 (mg/l)
Fréquence suivi		1x/jour	3x/sem	3x/sem	3x/sem	3x/sem	1x/sem	1x/sem	1x/mois	1x/mois	1x/ 3 mois						3x/sem
Norme			180														0.75
Oct/2013	0.0	0	0														
Nov/2013	0.0	0	0														
Dec/2013	0.0	0	0														
Totaux annuels	**0.0** tonnes/an	**0** m3/an	**0** minutes	kg/an	kg/an	kg/an	kg/an	kg/an	g/an	g/an	kg/an	kg/an	kg/an	kg/an	kg/an	kg/an	mg/l
	Nb de données	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0

Toxicité:

Inscrire ici un commentaire sur les résultats…

APPENDIX E
CDF MODELING

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LIST OF ACRONYMS AND ABBREVIATIONS

CDF	confined disposal facility
cm/yr	centimeters per year
EPA	U.S. Environmental Protection Agency
EPI	Estimation Program Interface
f_{OC}	fraction organic carbon
kg/m^3	kilograms per cubic meter
m	meters
MLW	mean low water
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCLT	pancake column leaching test
USGS	U.S. Geological Survey

This appendix describes the use of a numerical model to simulate groundwater flow and contaminant fate and transport dynamics within the area of the proposed confined disposal facility (CDF) that is being evaluated at the Alcoa Baie Comeau site as part of the Analysis of Alternatives report. The remainder of this appendix describes the model objectives, details on the model development (including use of site-specific data), and presents results from preliminary application of the model to evaluate long-term contaminant transport characteristics of the CDF.

1 BACKGROUND AND OBJECTIVES

1.1 Background

A CDF at the site is being considered for disposal of sediments containing organic contaminants that are planned to be dredged from the adjacent Anse du Moulin (ADM). The CDF would be constructed between existing Wharf 2 and Wharf 3 (Figure E-1), and would consist of dredge material overlain by cap/cover layers approximately to existing grade of the wharfs. It would be separated from the Anse by a berm that would be constructed of generally high permeability materials. Groundwater that naturally flows from upland areas into the Anse, as well as water that may infiltrate into the CDF, would be free to flow through the dredge material and berm and into the Anse. The modeling described herein is intended to evaluate the contaminant transport associated with such flow. A schematic longitudinal cross section of the system considered in this evaluation is shown on Figure E-2.

1.2 Objective

The primary objective of this modeling evaluation is to develop a quantitative tool that can be used to evaluate long-term contaminant transport within the CDF system. To support this Analysis of Alternatives, the model has been developed and used as a screening tool to evaluate the efficacy of a CDF, with regards to potential impacts to surface water (if any) from contaminants contained in the dredge material after placement in the CDF. Potential uses for the model to help support future design activities for the CDF include: 1) evaluating the need for a low permeability cover over the dredge material (versus a permeable material that allows precipitation to infiltrate the CDF); and 2) developing recommendations for berm material properties (e.g., hydraulic conductivity, sorptive capacity, organic carbon content).

2 MODEL DEVELOPMENT

2.1 Key Processes

The following are key processes that affect transport of contaminants in the CDF system described above:

- Groundwater advective flow driven by the following:
  - Hydraulic gradients from the upland to the Anse (including temporal variations associated with tidal action and seasonal changes in water elevations)
  - Precipitation recharge within the CDF
  - Density differences between fresh groundwater and brackish/saline water in the Anse
- Dispersive mixing from both flow through porous media (i.e., within the upland aquifer materials, the CDF fill, and the CDF berm) and tidal exchange between groundwater and surface water within the CDF berm[1]
- Partitioning of contaminants between the dissolved and solid phases
- Biodegradation of certain contaminants (under aerobic and/or anaerobic conditions)

2.2 Model Framework

The model framework selected to simulate the processes described above consists of coupled groundwater flow and contaminant fate and transport models. Flow of groundwater from the upland and into/through the berm is simulated with the widely used U.S. Geological Survey (USGS) MODFLOW model (e.g., McDonald and Harbaugh 1988), and contaminant transport is simulated by the widely used companion model MT3DMS (e.g., Zheng and Wang 1998). These models or other similar numerical models are frequently used to support evaluations of contaminant transport within CDF systems (e.g., Boatman and Hotchkiss 1997; Anchor QEA, LLC [Anchor QEA] 2012).

---

[1] Dispersive mixing from tidal exchange can readily be incorporated into the model by specifying time-varying surface water elevations, but this process is not explicitly accounted for in the simulations presented herein. The preliminary analysis presented in this appendix is meant to assess the viability of a CDF as a disposal option with a relatively basic model; however, the influence of this factor, which is expected to be relatively minor, can be evaluated during future design phases.

Due to the potential importance of density-dependent flow within the berm (due to salinity and temperature differences between groundwater and surface water at the site), this modeling framework can also be expanded to use the USGS SEAWAT code (Langevin et al. 2007) during future design phases, if the CDF option is carried forward and if there is a demonstrated need for representing density-driven flow.[2]

2.3 Model Configuration

The predominant direction of flow through the CDF will be along its length (west to east), with flow on its northern and southern sides limited by existing sheetpile walls along Wharf 2 and Wharf 3 (Figure E-1). Because there is no outlet for water flowing through the CDF along the lateral extents, it is reasonable to assume that the lateral variations are relatively unimportant for quantifying the mass of contaminants transported within the CDF berm and exported to the Anse. Thus, a two-dimensional model was developed to represent the vertical and longitudinal variations in flow and contaminant transport within the CDF and berm system, as well as portions of the underlying sediments and upland soils.

2.3.1 Model Domain and Grid

2.3.1.1 Horizontal Extent

The horizontal extent of the model was designed to utilize available upland data for defining boundary conditions. The western extent of the model domain upland of the CDF was therefore terminated at the group of piezometers closest to the CDF (i.e., piezometers A-100, A-200, and A-300; see Figure E-3). This approach provided a basis for specifying heads that controlled flow through the aquifer and the CDF. The CDF berm interfaces with the Anse on the eastern end of the model domain, which forms a natural boundary for the model; however, below the CDF the sediments extend longitudinally out into the Anse. Because there were no data available to define a flux or hydrostatic boundary condition within the

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[2] SEAWAT is an explicitly coupled version of MODFLOW and MT3DMS that is specifically designed to simulate density-dependent flow conditions (i.e., by simultaneously solving the equations of groundwater flow and salinity and heat transport). Average salinity in the Anse is approximately 30 parts per thousand. The density difference relative to groundwater (which is fresh) at this salinity could have an influence on the groundwater-surface water exchanges within the CDF, but it was not considered for this preliminary evaluation. If the CDF option is carried forward to design, the model described herein can be readily converted to the SEAWAT framework, with minor changes to the model inputs to represent density-driven effects.

sediments below the anticipated edge of the berm, the model domain was extended farther out beneath the Anse for approximately 100 meters (m). This was done to minimize potential artifacts associated with uncertainty in this boundary condition.
Overall, the model grid is 400 m long. The first 300 m of the model domain extends from the piezometer cluster to the outer edge of the CDF berm and was discretized uniformly into 3-m segments. The segment lengths in the 100-m portion of the sediments underlying the Anse past the outer edge of the berm were gradually increased to approximately 18 m. Overall, the model contains 108 longitudinal segments.

2.3.1.2 Vertical Extent

A stratigraphic cross section was developed based on available bore hole information along a longitudinal transect that runs roughly through the center of the CDF (see Figure E-4a). Borehole log information is summarized on Figure E-4b. Based on the sediment units observed in the borings, it is apparent that two predominant geologic units comprise the upland soils and native sediments (beneath the proposed CDF). Much of the native material is composed of gray sand with traces of silt and gravel. This is underlain by granite bedrock, which was encountered at depths between 30 and 40 m below mean low water (MLW) in the area underlying where the CDF and berm would be situated.

In addition to the hydrogeological units of the native material, the CDF would be filled with silty to sandy dredge material, overlaid by cover material that has been assumed to be sandy fill. The dredge material would be retained in place by a berm constructed with gravel/sandy core and stone riprap, as discussed in Section 8.4 of the main report. Thus, five hydrogeological units were used in the model, with the bedrock represented as a no-flow boundary. The representation of these units in the model is shown on Figure E-5. In addition, a vertical sheetpile wall is present at the west end of the CDF at the shoreline between Wharf 2 and Wharf 3. This wall was represented as a no-flow barrier in the model.[3]

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[3] The condition of the sheetpile wall between Wharf 2 and Wharf 3 may be degraded. The impacts of potential flow through the wall would be evaluated further during future design phases.

Overall, the model domain was discretized vertically into 48 uniform layers extending from 7.4 m above MLW datum to -40 m below MLW datum; the layers are approximately 1 m in thickness. The finite difference grid used in the model is shown on Figure E-6.

2.3.2 Temporal Scale

The flow model was developed for steady state conditions because the interest is primarily in long-term average system response. During future design phases, if it is deemed necessary to simulate shorter-term processes such as tidally induced dispersion and year-to-year differences in upland groundwater elevations or precipitation, the model can be readily used to perform transient simulations. For contaminant transport, a 100-year period was selected to assess the potential long-term contaminant migration to the Anse.

2.3.3 Selected Contaminants

Contaminants of concern from dredged material in Baie Comeau are polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs). In addition to total PCBs, three representative PAHs—acenaphthene, chrysene, and fluoranthene—were selected for modeling. The selection of PAH compounds to simulate was based on factors such as range of mobility, detection frequency in site sediment data, fraction of total PAH in site sediment data, and relative toxicity.

2.4 Boundary Conditions

2.4.1 Flow

2.4.1.1 Upland and Anse

Groundwater elevation data collected from piezometer clusters A-100/A-200/A-300 and B-100/B-200/CC-1, located approximately 150 m west and northwest of the proposed CDF respectively (see Figure E-3), were reviewed in order to establish the general hydraulic gradient of groundwater in the vicinity of the CDF. An average head was calculated from approximately 15 years of groundwater elevation measurements (approximately biannually from 1993 to 2008) at these locations. The average head from the shallowest piezometers (i.e., A-100 and B-100) was calculated to be approximately 6 m above MLW. This value was specified for the upland constant boundary (Figure E-6).

A constant head of 1.8 m above MLW (representing the mean tidal elevation) was calculated for the ADM from approximately 22 years of daily average tidal elevation data[4]. Nonetheless, the elevation of the surface water boundary in the model was set equal to MLW (i.e., elevation 0) to provide a conservative representation of groundwater flow from the upland into the Anse for the purposes of the screening level evaluation. If the CDF option is carried forward into design, additional modeling analyses based on refined boundary conditions would be conducted (such as potentially including time-variable simulations including tidal fluctuations as discussed above).

The constant head values used for the upland and Anse boundaries are shown on Figure E-6.

2.4.1.2 Recharge

The average precipitation in Baie Comeau (obtained from the internet[5]) is approximately 100 centimeters per year (cm/yr). The conceptual CDF design (see Section 8.4 of the main report) assumes it would be paved with an asphalt cover. The range of runoff coefficients for asphalt (applicable for the rational method) is 0.70 – 0.95 (Lindeburg 2003). To conservatively provide the maximum recharge into the CDF (i.e. 30 percent infiltration), a runoff coefficient of 0.7 has therefore been assumed for the purpose of this modeling analysis.

2.4.2 Contaminants

In order to explicitly evaluate the influence of contaminants from the CDF dredge material on the Anse, background concentrations used for boundary conditions in the upland groundwater, within the sediment porewater below the CDF, and within the Anse were assumed to be zero for the purposes of this modeling analysis.

2.5 Initial Conditions

The initial concentrations of contaminants in the dredge material, expressed in terms of porewater concentrations, are the only initial condition specified in the model (i.e., all other contaminant initial conditions were set to zero). In modeling the dredged sediments, it was

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[4] Data from 1969 to 1991 – Fisheries and Oceans Canada (www.dfo-mpo.gc.ca)

[5] http://www.wunderground.com

assumed that the material would be generally homogenized during placement in the CDF. Available sediment data collected between 2007-2009 and 2011 from within the dredge area were used to calculate average initial concentrations to specify in the model. Depth-weighted averages were calculated for available sediment cores located within the dredging footprint, where the depth of each core generally extended 1 to 2 meters. The overall average sediment concentrations, presented in Table E-1, were then calculated from the individual depth-weighted results.

Table E-1
Initial Contaminant Sediment Concentrations

Contaminant	Average Concentration (milligrams per kilogram)
Acenaphthene	4.0
Chrysene	33
Fluoranthene	53
Total PCBs	8.4

These solid phase concentrations were converted to aqueous phase (i.e., porewater) model inputs using partitioning formulations, as described in Section 2.6.2.1 below.

2.6 Model Input Parameters

2.6.1 Porous Media Properties

2.6.1.1 Bulk Soil Properties

The bulk soil properties specified in the model included dry bulk density, porosity, and fraction organic carbon (f_{OC}). Values for these three parameters were specified for each unique model zone depicted on Figure E-5 (i.e., closure cap [sand], dredge material [silty sand], berm support [granite riprap], berm [sandy gravel], and upland soils and native sediments underlying the CDF [silty sand]). Material properties were not specified for the underlying bedrock, because this was represented as a no-flow boundary in the model. These properties were specified as follows:

- A bulk density value equivalent to 1,602 kilograms per cubic meter (kg/m^3) was specified for the closure cap and berm materials, and a value of 2,082 kg/m^3 for the riprap berm support (D_{50} of approximately 1.4 m). A bulk density of 1,487 kg/m^3 was specified for the dredge material and upland soils, based on the average dry density from pancake column leaching test (PCLT) results performed with site sediments (discussed below and in Section 9.2 and Appendix B of the main report).

- A porosity value of 0.45 was specified for all materials. The model is not sensitive to this value, and it doesn't vary greatly over the range of material types simulated in the model (Domenico and Schwartz 1990).
- The f_{oc} values for the sand materials used for the berm and closure cap were set to a low value of 0.1 percent, based on experience from other projects. Likewise, the berm support riprap was specified to have a negligible amount of organic carbon (i.e., f_{oc} = 0.01 percent). The f_{oc} of the dredge material was calculated based on sediment core data using the procedure described above for specifying contaminant concentrations— that average value (f_{oc} = 3.0 percent) was assumed to be applicable to the upland soils and native sediments as well.

2.6.1.2 Hydraulic Conductivity

Horizontal and vertical hydraulic conductivity values for all hydrogeological units were selected from ranges reported in the literature (e.g., Freeze and Cherry 1979; Domenico and Schwartz 1990; Spitz and Moreno 1996) for the corresponding material types. The horizontal hydraulic conductivity of the closure cap was specified to be 305 cm/d (10 ft/d = 4E-3 cm/s), a representative value for graded sand. The dredge material and upland soils/native sediments were assigned half that value (152 cm/d = 5 ft/d = 2E-3 cm/s) to account for the lower hydraulic conductivity associated with the increased silt content of these materials. The sand material in the berm core was taken to be a coarse sand, and was therefore assigned a horizontal hydraulic conductivity of ten times the value used for the sand closure cap in the model (3,048 cm/d = 100 ft/d = 4E-2 cm/s). For the berm riprap, an arbitrarily large value five times higher than that of the coarse sand of the berm core (i.e., 15,240 cm/d = 500 ft/d = 2E-1 cm/s) was selected to ensure that the model contains minimal impedance to flow in this unit.

Vertical hydraulic conductivities were specified to be the same as horizontal for the engineered materials (i.e., the berm core, berm support, and closure cap). The upland soils and native sediments were specified to have a vertical anisotropy ratio of 1:10 (i.e., vertical hydraulic conductivity ten times lower than horizontal), which is typical for sedimentary deposits. The vertical anisotropy ratio of the dredge material was specified to be 1:2, to reflect some sorting of material that would be expected to occur as the material is placed within the CDF.

2.6.1.3 Dispersivities

Typical longitudinal dispersivity values used in groundwater models are taken to be 3 percent to 10 percent of domain/plume length, with a median value of approximately 5 percent (Gelhar et al. 1992). In this modeling evaluation, the domain of interest is the transport of contaminants within the CDF and berm, which has a total longitudinal length of approximately 150 m. Thus, a value of 7.5 m was used for the longitudinal dispersivity for all units, with the exception of the berm. The berm will be subjected to tidally induced dispersion; to account for this process, a higher longitudinal dispersivity that corresponds to double the base value, or 10 percent of the domain length (i.e., 15 m), was used for the berm materials. Similar scale-up to account for tidal dispersion has been determined through tracer simulations in other CDF models (e.g., Anchor QEA 2012).

Vertical dispersivity is typically 10 to 100 times lower than longitudinal values in stratified aquifer materials (Gelhar et al. 1992). Values for the upland soils and native sediments were, therefore, set to a tenth of longitudinal dispersivity. For materials that exhibit little to no vertical heterogeneity, as in the case of the engineered berm materials, there might not be a reason to expect vertical dispersivity to differ much from the longitudinal value.

Compaction, sorting, and stratification can be anticipated in the dredge material leading to some heterogeneity, but the engineered cap and berm are expected to be uniform. Thus, vertical dispersivity values for the dredge material and engineered (i.e., cap, berm, and berm riprap) materials were specified to be half of and equal to the corresponding longitudinal dispersivity values, respectively.

2.6.1.4 Summary

The various material property and hydraulic parameters used in the model for each hydrogeological zone are summarized in Table E-2 below.

Table E-2
Porous Media Parameters used in Fate and Transport Model

Description	Bulk Density (kg/m^3)	Porosity	Fraction Organic Carbon (%)	Hydraulic Conductivity (cm/d)	Vertical Anisotropy Ratio	Dispersivity (m)	
						Longitudinal	Vertical
Bedrock	NA – modeled as no-flow boundary						
Closure Cap (sand)	1,602	0.45	0.10	305	1.0	7.5	7.5
Dredge Material	1,486	0.45	3.0	152	0.5	7.5	0.75
Berm Support (riprap)	2,082	0.45	0.01	15,240	1.0	15	15
Berm	1,602	0.45	0.10	3,048	1.0	15	15
Upland Soils	1,486	0.45	3.0	152	0.1	7.5	0.075

Notes:
cm/d – centimeters per day
kg/m^3 – kilograms per cubic meter
m – meters
NA – not applicable

2.6.2 Contaminant Properties

Two chemical-specific parameters are used in the model to simulate contaminant transport: partition coefficients and degradation rates.

2.6.2.1 Partition Coefficients (K_{OC})

An important modeling parameter for each compound is the equilibrium partitioning coefficient, which represents the ratio between the concentration sorbed to the solid phase to that in the aqueous phase. Due to the propensity of hydrophobic organic compounds to sorb to organic carbon, partitioning for the modeled compounds is a function of the organic content of the sediment and was expressed in the model as an organic carbon partition coefficient (K_{OC}).

K_{OC} values for PAHs were selected based on information provided in U.S. Environmental Protection Agency's (EPA's) Estimation Program Interface (EPI) Suite[6]. The KOCWIN™ program within EPI Suite provides estimates for K_{OC} using several different methods[7]. Values from these methods were tabulated for each compound along with values presented in other sources (EPA 1996, 2003; Mackay et al. 1992). Experimentally measured values (only available for select compounds; EPA 1996, 2011) were then compared to the tabulated literature values. The estimated values from KOCWIN™ noted as being closest to the available experimentally measured values were used in this modeling effort.

PAH K_{OC} values calculated[8] from PCLT results (discussed in Section 9.2 and Appendix B of the main report) were found to be on average approximately 10 percent higher than the selected literature-based values. In addition, PAH K_{OC} values calculated based on directly measured sediment and porewater in the Anse have been found to be 10- to 100-fold greater than literature-based values (The RETEC Group 2007). Therefore, the literature-based PAH K_{OC} values selected for the purpose of this modeling analysis are very conservative given that in situ data suggests sediments would generate on the order of 10 times lower porewater concentrations (and hence 10 times lower mobility).

A partition coefficient was also calculated for total PCBs. First, a log K_{OC} was calculated for each PCB homolog group based on the mean octanol-water partition coefficient (K_{OW}) of individual congener values (Hawker and Connell 1988) within each group, and a commonly used correlation between K_{OW} and K_{OC}[9]. A weighted harmonic mean was then calculated based on the fractional distribution of homolog groups observed in congener-specific sediment PCB data collected from within the dredge area.

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[6] http://www.epa.gov/oppt/exposure/pubs/episuite.htm

[7] Based on a Quantitative Structure-Activity Relationship model utilizing Molecular Connectivity Index, based on empirical correlations to a compound's log octanol-water partition coefficient (log K_{OW}), and based on a database of experimental results (available only for select compounds).

[8] K_{OC} values were derived from PCLT results by dividing the sediment concentration in each test sample by the product of the maximum resultant aqueous concentration and the estimated f_{oc}. The maximum result was considered to be a conservative approximation of equilibrium conditions in the field (in lieu of actual porewater data).

[9] $\log K_{OC} = 0.00028 + (0.983 \times \log K_{OW})$ (Di Toro 1985)

2.6.2.2 Degradation Rates

Simulating fate and transport through the CDF and berm was performed both with and without biodegradation, in order to gauge the relative sensitivity of this component and given the uncertainty inherent in applying laboratory-derived biodegradation rates to the field scale. The following summarizes the sources of biodegradation rates utilized and the zones that were modeled as aerobic or anaerobic.

Aqueous phase biodegradation rates were simulated in both anaerobic and aerobic zones. Aerobic biodegradation was only simulated in the berm and berm support (riprap) zones, as tidal exchange would be expected to provide a source of oxygen-rich water to the relatively permeable berm. The remaining hydrogeological units were assumed to be anoxic. Relatively conservative rates for both aerobic and anaerobic biodegradation were developed based on a review and evaluation of data found in several relevant literature sources. Reviewed sources for PAH biodegradation rates included Aronson and Howard (1997), Aronson (1999), Howard et al. (1991), Mackay et al. (1992), Rothermich et al. (2002), values found in EPA's EPI Suite program (for soil [aerobic] and for sediment [anaerobic]) (EPA 2011), as well as others.

For PCBs, a number of documents were reviewed for biodegradation rates, though the reported rates were typically specific to particular congeners or congener groups. The aerobic degradation rate specified in this modeling effort was the slowest reported rate from these sources (a half-life of approximately 500 years). Due to the wide range of reported rates, no degradation was assumed for modeling total PCBs in the anaerobic zones (dredge material, upland soils, and native sediments).

2.6.2.3 Summary

The Koc values, initial porewater concentrations (calculated based on the Koc values and the sorbed phase concentrations and f_{oc} values listed in Tables E-1 and E-2, respectively), and first order decay rates developed for use in this modeling are listed in Table E-3.

Though the ranges of aerobic biodegradation rates presented below were generally reported in the literature based on studies of aqueous environments (e.g., surface water), the ranges of anaerobic biodegradation rates were generally associated with bulk sediments. Therefore, it is important to note that anaerobic (and aerobic) biodegradation was only simulated for the aqueous phase (i.e., in porewater) because that is where the majority of degradation is expected to occur. Sorbed phase degradation, which was not simulated in the model, is expected to occur at rates orders of magnitude slower than in the aqueous phase and is, therefore, expected to have an insignificant contribution in reducing contaminant mass over the 50-year simulation period. Therefore, as the modeled rates are only applicable to the degradation of contaminants in porewater, a degree of conservatism has been incorporated by selecting anaerobic rates for the aqueous phase based on the range of values reported in the literature for bulk sediments (i.e., as degradation in bulk sediments would necessarily be slower, equal to the net degradation in both the sorbed and aqueous phases)[10].

Table E-3

Chemical-specific Parameters used in Fate and Transport Model

	log K_{OC} (L/kg OC)	Initial Porewater Concentration[1] (µg/L)	Aqueous Phase Biodegradation Half-life (days [unless otherwise noted])[2]			
			Aerobic Zones		Anaerobic Zones	
			Literature Range	Model Value	Literature Range	Model Value
Acenaphthene	3.70	27	12 - 102	75	49 - 408	350
Chrysene	5.26	6.0	60 - 993	495	476 - 4,015	1,100
Fluoranthene	4.74	32	60 - 440	230	540 - 1,759	800
Total PCBs	5.75	0.5	50 days - 500 years	500 years	50 days - 500 years	no decay

Notes:
1 Applied for dredge material only, values set to zero elsewhere.
2 Aerobic zones – berm and berm support (riprap); anaerobic zones – dredge material, upland soils, and native sediments
L/kg – liters per kilogram
µg/L – micrograms per liter

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[10] It is generally understood that microbial biodegradation occurs only in the dissolved (mobile) phase in sediments (Fredrickson et al. 2003), and the model used in this assessment considers degradation in that phase only. Literature-reported degradation rates are typically measured from bulk sediments, which are slower than would be measured solely in porewater. This is because contaminants bound to sediment particles must first desorb in order for this fraction to be available for degradation, and this desorption can be a rate limiting step. Therefore, using literature-reported bulk rates to develop the values used in the model is conservative because bulk rates are slower than true dissolved phase rates, which is what the model uses.

3 MODEL RESULTS

3.1 Groundwater Heads and Flow Pattern

Figure E-7 shows a color flood of steady state groundwater heads and flow vectors (magnitude and direction) simulated by the model. The flow vectors are shown exaggerated on the lower panel of Figure E-7. Based on the velocity vectors it is clear that flow from the upland area is predicted to be generally small relative to the flow introduced due to recharge entering through the CDF cover. Moreover, the sheetpile wall is predicted to limit much of the upland flow from entering the dredge material (i.e., it is predicted to flow horizontally and remain beneath the CDF fill material and berm). The highest predicted velocities are encountered through the riprap, which is expected because this zone is represented with a high hydraulic conductivity. It is also interesting to note that the model predicts much of the recharge to flow to the Anse through the upper portion of the berm, with very little flow reaching the bottom of the berm (see bottom panel of Figure E-7).

3.2 Long-term Contaminant Transport Predictions

3.2.1 Contaminant Patterns in CDF and Berm

Simulated spatial distributions of chrysene, fluoranthene, acenaphthene, and total PCBs, for the case where degradation is simulated, are shown at four snapshots in time on Figures E-8a through E-8d, respectively. These figures illustrate the model-predicted extent of transport of contaminants within the berm, and also the extent to which contaminant concentrations are predicted to be reduced in the dredge material over time (in some cases) due to flushing associated with advection (driven by recharge) and dispersion, and to a lesser extent biodegradation.

Among the three simulated PAH compounds, the model predictions for chrysene show much less transport into the berm and very little decline in porewater concentrations within the dredge material compared to fluoranthene and acenaphthene (see Figures E-8a, E-8b, and E-8c, respectively), due to its higher K_{oc} and slower degradation dates (see Table E-3). Fluoranthene is relatively more mobile and reactive compared to chrysene and, therefore, is predicted to advance farther into the berm (see Figures E-8a and E-8b). The model predicted fluoranthene concentrations within the dredge material show little observable change over time, with the exception of the region immediately adjacent to the berm and at the bottom, which is due to advection and dispersion, and degradation within the berm to a minor extent. Acenaphthene is the most mobile and also most reactive among the contaminants simulated (see Table E-3). A mass balance analysis (discussed subsequently in Section 3.2.3) indicated that the decay rate for acenaphthene is large enough so that the model predicts more of it to be degraded within the berm than transported into the Anse. Furthermore, the decay rate within the dredge material is sufficient enough to contribute to predicted slight reductions in porewater concentrations throughout the dredge material at the end of 100 years; additional larger decreases in dredge material concentrations are predicted adjacent to the berm and at the bottom as a result of advection and dispersion (see Figure E-8c).

PCBs are the least mobile and least reactive (no degradation within the dredge material and very slow decay rate in the berm [500 year half-life; see Table E-3]) among the contaminants simulated. This is clear from the model-predicted spatial patterns (Figure E-8d), which show very little transport into the berm and essentially no decline in total PCB porewater concentrations within the dredge material.

3.2.2 Contaminant Concentrations at Berm/Anse Interface

To evaluate contaminant migration to the Anse as a means of evaluating potential for surface water impacts, temporal profiles of the average porewater concentrations were developed along the model grid cells at the outer face of the berm (see Figure E-9). For reference, the model-predicted porewater concentration at the center of the dredge material, and the chronic water quality criterion (where available) are also shown on Figure E-9. It should be noted that the porewater will undergo significant dilution when it mixes with the surface water and flows out into the Anse. Thus, a direct comparison of the predicted porewater concentrations within the outer edge of the berm to the chronic surface water criterion is a highly conservative means of evaluating potential surface water impacts from the CDF. To provide a basis for comparison of contaminant transport, results from a conservative (i.e., non-reactive and non-sorptive) tracer simulation are also shown on Figure E-9 (upper left panel).

As expected only the more mobile contaminants (i.e., acenaphthene and fluoranthene) are predicted to reach the berm/Anse interface at any appreciable concentration during the

100-year simulation. It is clear that the concentration of acenaphthene is predicted to stabilize at a value that is more than an order of magnitude lower than that within the center of the dredge material. This is a consequence of the relatively rapid aerobic degradation rate simulated in the berm (half-life of 75 days) compared to the transport (average velocity within the berm of 0.03 meters per day [m/d]) and dilution/dispersion within the berm. The tracer simulation shows that a non-sorptive contaminant is predicted to be flushed out at a much more rapid rate (porewater concentration within the dredge material is predicted to decline to less than a millionth of the initial concentration at the end of 100 years). Due to sorption, the decline in strengths of the contaminants in the dredge material (shown as dashed purple line on Figure E-9) is very small (acenaphthene) to imperceptible (total PCBs). The average concentration at the outer berm face is predicted to be far less than the water quality criterion for the protection of aquatic life (chronic)[11] for acenaphthene but is predicted to exceed the chronic criterion after approximately 80 years for fluoranthene[12], though only by a small amount. As discussed previously, comparing the porewater concentration to the surface water chronic criterion is extremely conservative because of the lack of consideration of dilution that would occur at the berm-Anse interface. Thus, even though the porewater concentrations are predicted to be slightly higher than the chronic criterion, actual exceedance in the surface water is unlikely due to dilution by many orders of magnitude at the berm-Anse interface.

Therefore, these simulation results indicate that the conceptual CDF design evaluated in this Analysis of Alternatives would not be expected to produce adverse surface water impacts, especially given that this comparison does not take into account subsequent dilution that would occur within the Anse. Furthermore, the model developed herein would be refined further during design, and if such an analysis indicates unacceptable concentrations, additional design measures would be evaluated (e.g., adding a sorptive amendment to the CDF berm core materials).

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[11] Ministère du Développement durable, de l'Environnement et des Parcs (http://www.mddep.gouv.qc.ca/eau/criteres_eau/)

[12] Water quality criteria were not available for chrysene or total PCBs.

3.2.3 Mass Budget for Contaminants

A model mass budget calculation was performed to understand the contribution of loss processes and the potential migration of contaminants from the CDF to the Anse. The calculations are summarized in Table E-4. It is clear from this table that the model predicts degradation to dominate advective loss to the Anse. However, degradation is not predicted to be sufficient to reduce total contaminant mass by an appreciable amount, with the exception of acenaphthene (approximately 17 percent reduction of total system mass). In the 100-year period that was simulated, the total predicted mass transport to the Anse is negligible for all contaminants.

Table E-4

Mass Budget for Contaminants Simulated in the CDF Model

Contaminant	Mass in System (kilograms) Initial	Mass in System (kilograms) Final	Mass Migrated to Anse Amount (kilograms)	Mass Migrated to Anse Percent of Initial System Mass	Mass Lost through Degradation Amount (kilograms)	Mass Lost through Degradation Percent of Initial System Mass
Chrysene	1595.87	1593.59	1.76E-02	0.00%	2.26	0.14%
Fluoranthene	2570.11	2549.66	1.66	0.06%	18.79	0.73%
Acenaphthene	193.23	160.40	0.94	0.48%	31.90	16.51%
Total PCBs	404.99	404.99	2.76E-10	0.00%	4.53E-05	0.00%

Note:
Total simulation time = 100 years

3.2.4 Sensitivity to Degradation

The results described above indicate that degradation has a modest role, at least for acenaphthene, in reducing the mass within the CDF, as well as in affecting the mass exported to the Anse. A sensitivity analysis was performed to evaluate degradation in the model by conducting a second simulation in which degradation was not simulated for any of the contaminants. In this case, sorption is the primary fate process that controls the mobility of the contaminants and advection and dispersion are the only processes that can result in transport through the berm and reductions in concentration within the dredge material.

Figures E-10a through E-10d show the predicted spatial contaminant distributions at the same snapshots in time as those presented in Section 3.2.2 (Figure E-8) for chrysene, fluoranthene, acenaphthene, and total PCBs respectively. The most significant difference is observed for acenaphthene (compare Figure E-10c to Figure E-8c), which shows a greater predicted efflux of contaminants into the berm and then eventually into the Anse when degradation is not simulated. A similar pattern, but to a much lesser extent, is observed for fluoranthene (compare Figure E-10b to Figure E-8b). Differences for chrysene and total PCBs are minimal suggesting that sorption controls their fate rather than degradation.

Figure E-11 shows the average concentration of contaminants at the edge of the berm predicted by the model for the simulation with no degradation. As expected, acenaphthene concentrations approach a steady state value at the outer face of the berm sooner than the other contaminants. Moreover, in the absence of degradation, concentrations of acenaphthene are predicted to be higher at the berm interface by approximately a factor of five compared to the base simulation that included degradation (compare Figures E-11 and E-9). For fluoranthene, the model-predicted concentrations in the absence of degradation are only slightly higher than those with degradation, and the average concentration predicted at the outer berm face again exceeds the chronic water quality criterion by a small amount; it is predicted to exceed the criterion approximately 10 years sooner than the case with decay (i.e., at approximately 70 years). As discussed previously, because the porewater will undergo substantial dilution when it mixes with the surface water, it is unlikely that the concentration in the surface water would exceed the chronic criterion in the vicinity of the CDF. Furthermore, additional refinements (e.g., adding sorptive material to CDF berm) could be made to the CDF design to further limit transport within the berm. For the other contaminants, differences between Figures E-9 and E-11 are negligible, as expected, because degradation is not a significant process controlling their fate in the model.

Table E-5 shows mass budget calculations for the sensitivity analysis in which degradation was not simulated. In this case, contaminant migration to the Anse is the only loss mechanism. In the absence of degradation, advection is predicted to transport approximately 3 percent of acenaphthene mass to the Anse over the 100-year period, whereas for other contaminants predicted transport to the Anse remains negligibly small.

Table E-5

Mass Budget for Contaminants Simulated in the CDF Model without First Order Decay

	Mass in System (kilograms)		Mass Exported to Anse	
Contaminant	**Initial**	**Final**	**Amount (kilograms)**	**Percent of Initial System Mass**
Chrysene	1595.87	1595.85	1.85E-02	0.00%
Fluoranthene	2570.11	2568.02	2.09	0.08%
Acenaphthene	193.23	187.60	5.64	2.92%
Total PCBs	404.99	404.99	2.75E-10	0.00%

Note:
Total simulation time = 100 years

4 SUMMARY

The viability of a CDF for the disposition of contaminated sediments dredged from the ADM has been evaluated. Transport of PAHs and PCBs through the dredge material and berm is likely to occur due to the flow of groundwater from upland areas as well as infiltration of rainfall into the CDF. A coupled groundwater flow and contaminant fate and transport model was employed to assess the degree of transport, and estimate the potential for long-term impacts to surface water from contaminants contained within the dredge material after placement in the CDF.

The transport of total PCBs and three representative PAHs—selected based on range of mobility, detection frequency, and relative toxicity—were simulated over a 100-year period. Relatively conservative parameters were selected for use in the model. For example, boundary conditions and recharge values were selected to result in a conservatively high flow rate through the CDF. Likewise, literature-based partitioning coefficients were used, even though site-specific data indicate mobility could potentially be an order of magnitude or more less. For two of the modeled contaminants, acenaphthene and fluoranthene, available surface water quality criteria for the protection of aquatic life (chronic) were considered in evaluating the simulated concentrations at the berm/Anse interface. Model results indicate that concentrations within the outer edge of the berm were predicted to be below the criterion for acenaphthene throughout the 100-year simulation, but that fluoranthene concentrations were predicted to exceed its criterion by a small amount after approximately 70 to 80 years. However, these comparisons are extremely conservative because they do not account for the fact that flow through the berm would be immediately diluted upon entering the Anse. These results were generally consistent for the likely case with degradation (specifying relatively conservative half-lives) and a case without degradation. Results indicated that for all contaminants but acenaphthene only a miniscule percent of mass would be transported from the CDF to the Anse over 100 years. For acenaphthene, the proportion of mass relative to the initial mass placed in the dredge material that was predicted to migrate to the Anse was 3 percent or less over 100 years. Overall, the simulation results indicate that the conceptual CDF design evaluated in this Analysis of Alternatives would not be expected to produce adverse impacts to surface water.

The simulations discussed herein, using a steady state two dimensional model, have provided a screening level assessment of the transport of contaminants expected to occur through the CDF under consideration. During future design phases, the evaluations presented herein can be refined as necessary, where such phenomena as density-dependent flow within the berm (due to salinity and temperature differences between groundwater and surface water at the site) and tidally induced dispersion can be considered. Modifications to any assumptions regarding the CDF features, such as alternative covers (vegetated cover as opposed to asphalt), and modifications to further limit contaminant migration (e.g., through increased sorptive capacity of the berm core material) also can be considered at that time.

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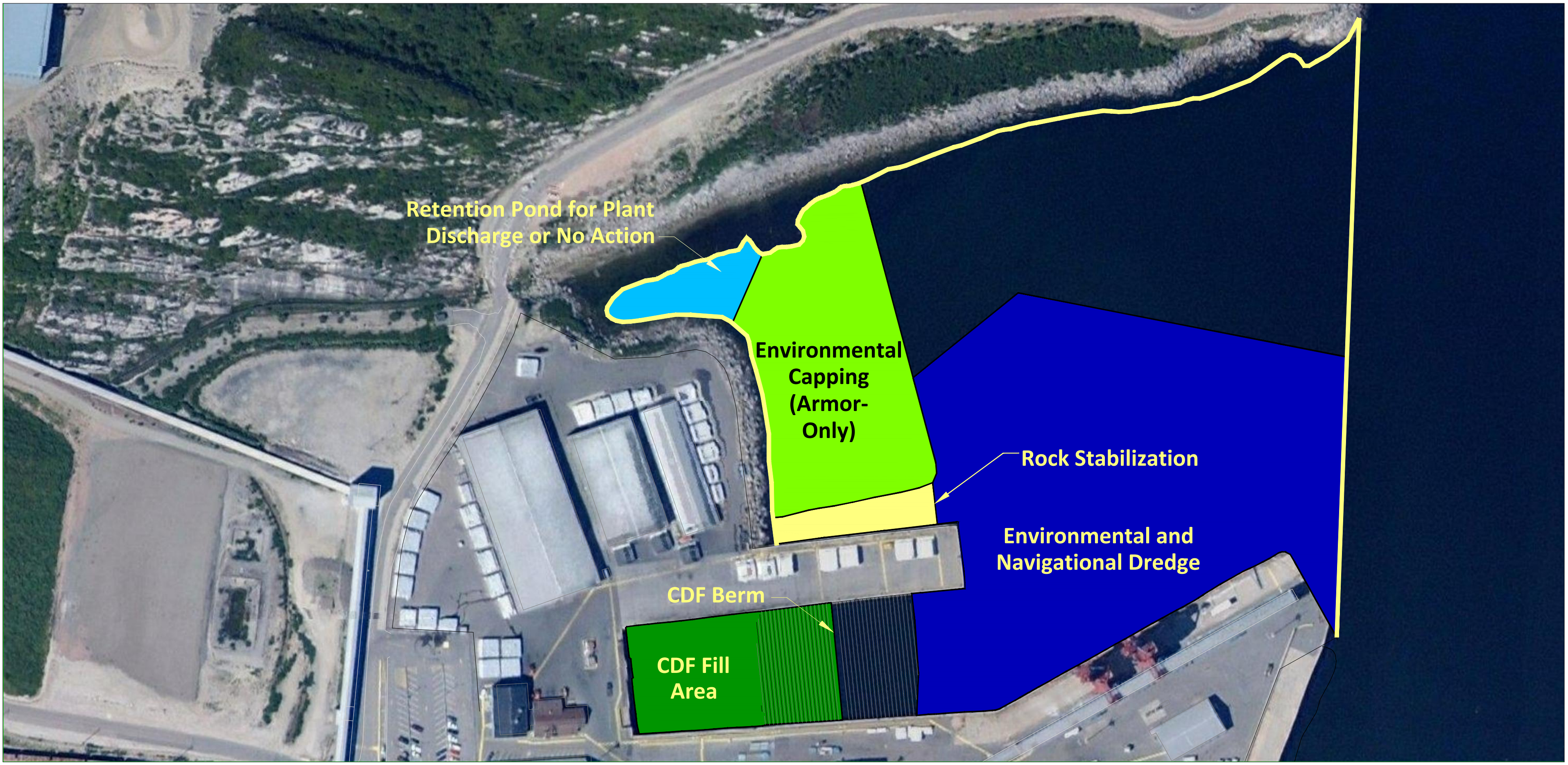
FIGURES



SOURCE: Aerial photo by XEOS, 2009.
HORIZONTAL DATUM: MTM Fuseau 6, NAD83, metres.
VERTICAL DATUM: Chart datum, metres.

NOTES:
1. Base map provided by Hatch Engineering.
2. Alignments of proposed remedial areas should be considered approximate, and subject to change.
3. This plan is for informational use only, not to be used for construction.

Figure E-1
CDF Plan View
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

ANCHOR QEA

A:\CAD - Boston\PROJECTS\090002-03 - BAIE COMEAU\2012 Projects_AofA\ANC-BAIE-COMEAU-2012-Base and Sections Alts 2-4 - FIGURE C-1.dwg Figure C-1 (Alt 2)

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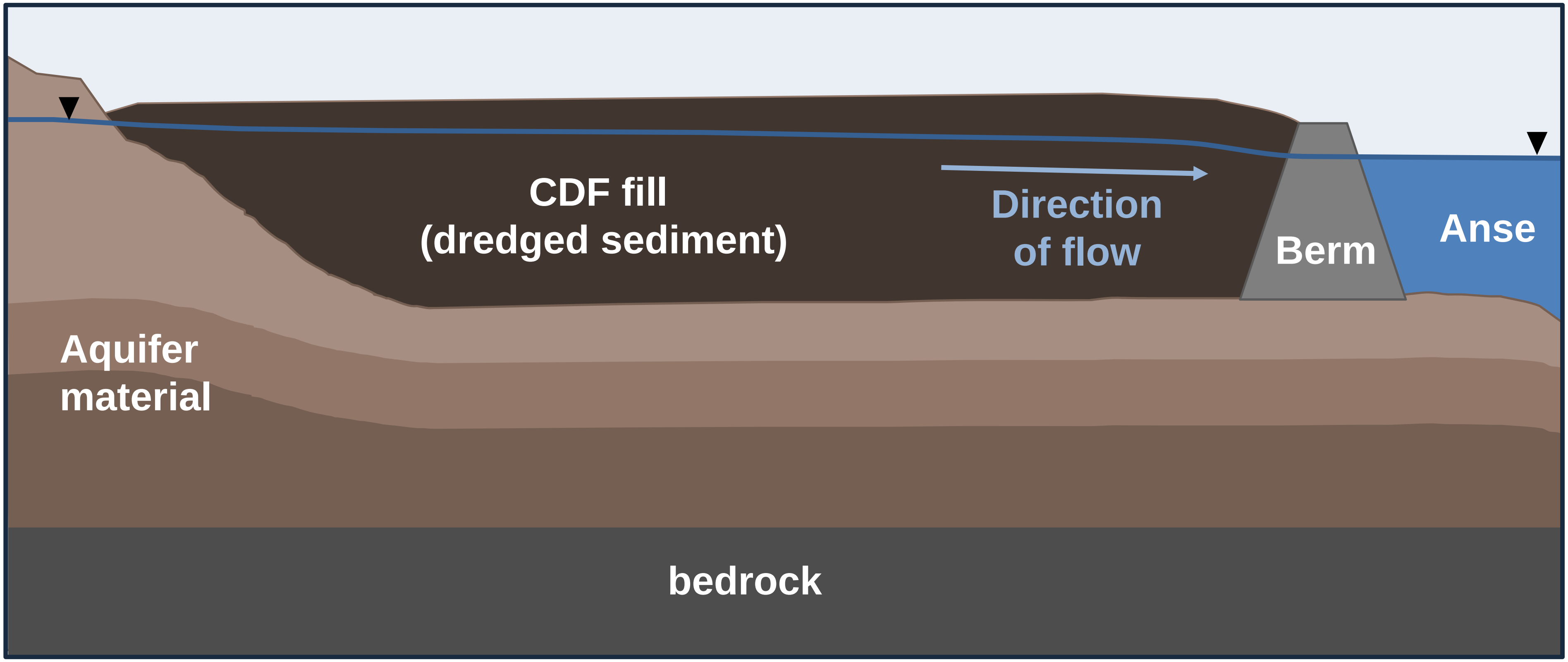
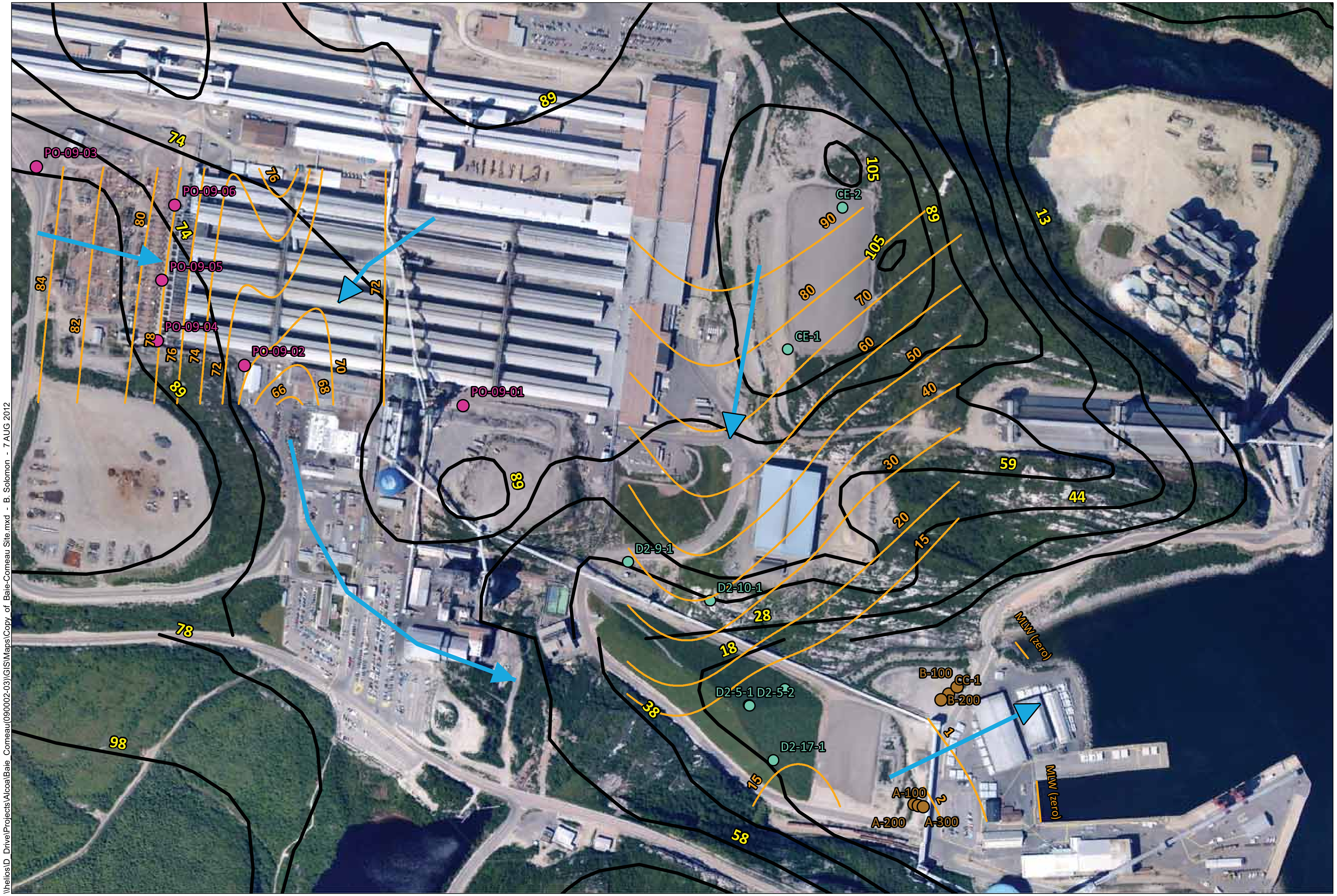


Figure E-2
Hypothetical CDF Cross Section
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec



LEGEND

● Piezometers nearest to proposed CDF

● Other piezometers

● Piezometers installed June 2009

— estimated groundwater contour (metres)*

— surface elevation contour (metres)**

↘ General groundwater flow direction (estimated and/or inferred)

* Contours based on mean groundwater elevations above MLW, using all available measurement data.

** Surface elevation contours referenced to MLW obtained from National Topographic Database (NTDB), Government of Canada, Natural Resources Canada, Centre for Topographic Information.

MLW - mean low water vertical tidal datum

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0 125 250 500 metres

Figure E-3
General Groundwater Features
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

0 50

Scale in Metres

LEGEND:

09-CDF-07 ⊕	Boring Location
● 4A	Boring Location

SOURCE: Drawing prepared from Hatch Engineering drawing entitled "Wharf Extension Geotechnical Investigations Proposed Borehole Locations," dated June 9, 2009. Bathymetry from Entreprises Normand Juneau, Inc. (ENJI), drawing entitled "Plan des Profondeurs Maregraphiques," reference number 07-066, dated December 2007, provided by GENIVAR. Elevations referenced to Chart Datum. Aerial photo provided by XEOS Imaging, Inc.

HORIZONTAL DATUM: NAD83 MTM Fuseau 6, metres.

Figure E-4a

Geotechnical Cross Section

Analysis of Rehabilitation Alternatives

Alcoa, Baie-Comeau, Quebec

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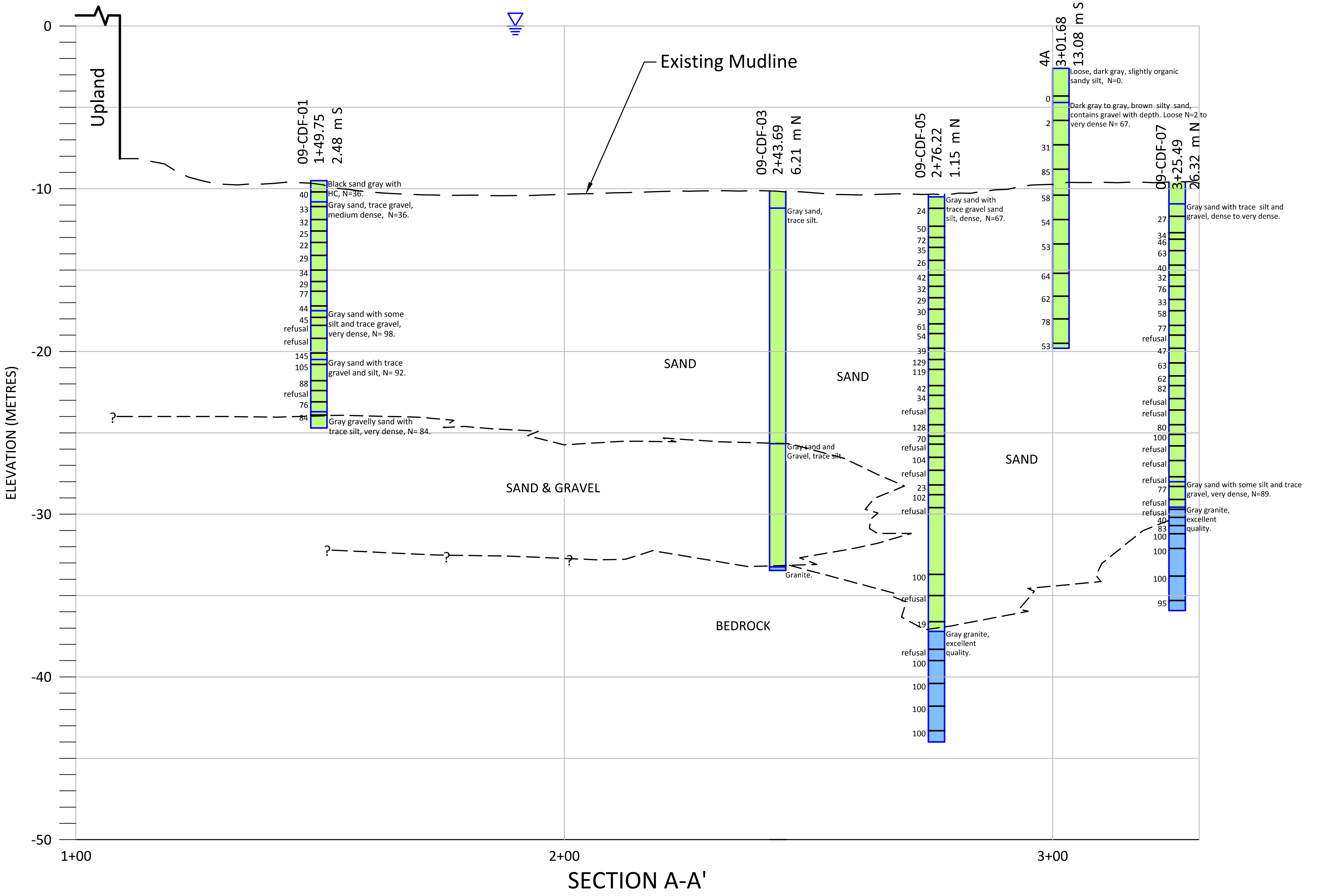

SECTION A-A'

LEGEND:

N/RQD VALUE	BORING	DESCRIPTION
8	🟩	Gray sand with trace silt
100	🟦	Gray granite
refusal		

SOURCE: Drawing prepared from Hatch Engineering drawing entitled "Wharf Extension Geotechnical Investigations Proposed Borehole Locations," dated June 9, 2009.
HORIZONTAL DATUM: NAD83 MTM Fuseau 6, metres.
VERTICAL DATUM: Chart Datum, metres.

NOTE:

1. All elevations shown on this drawing are to Chart Datum, which is 1.8 metres below Geodetic Datum.
2. Drawing is not to scale.
3. N (Blow Counts)
4. RQD (Rock Quality Designation)

C:\Users\chewett\appdata\local\temp\AcPublish_24440\0002_RP_001.dwg Figure 2

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Figure E-4b
Borehole Cross Sections
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

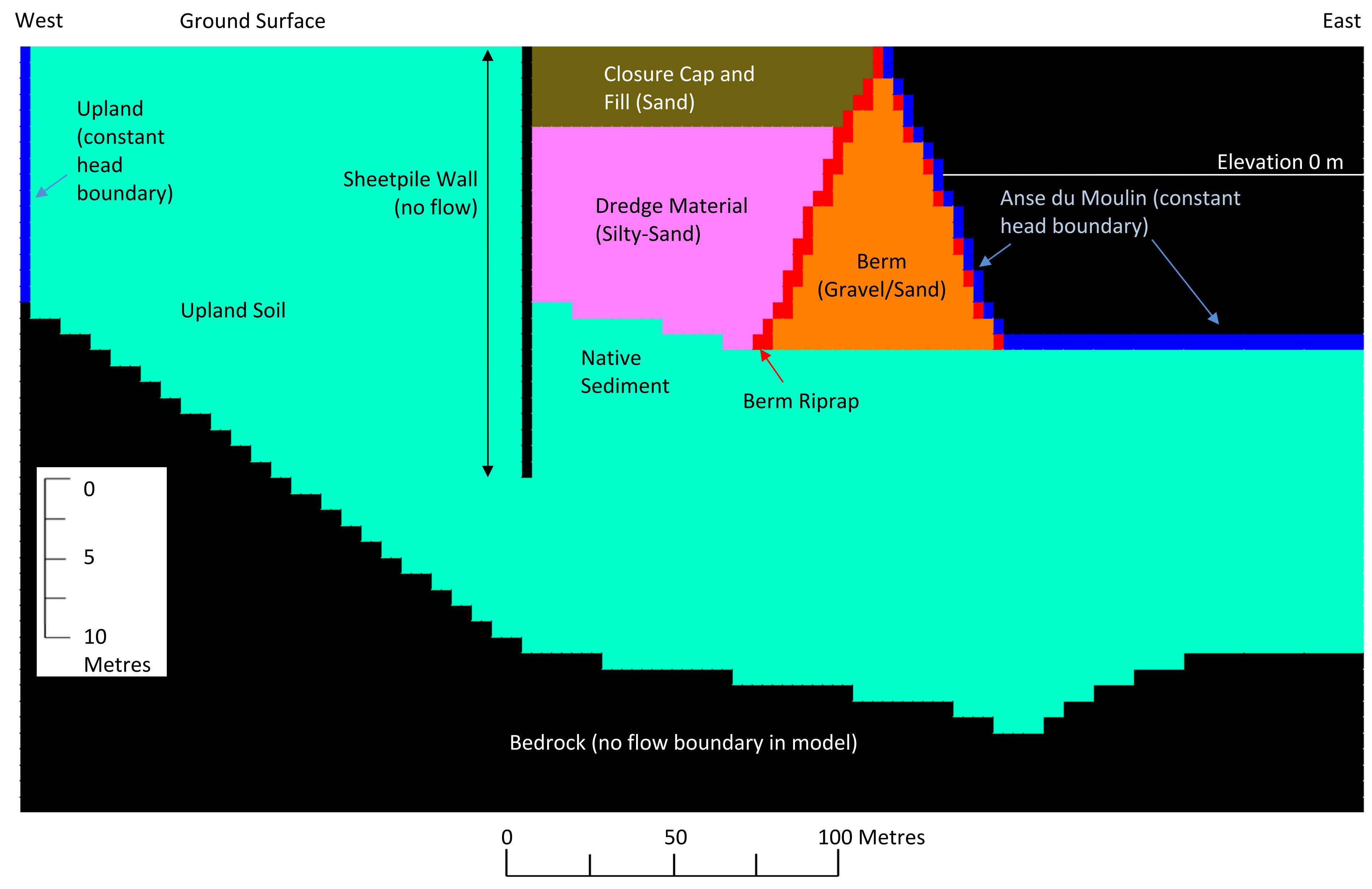


Figure E-5
Hydrogeological Units and Boundary Conditions Used in the CDF Model
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

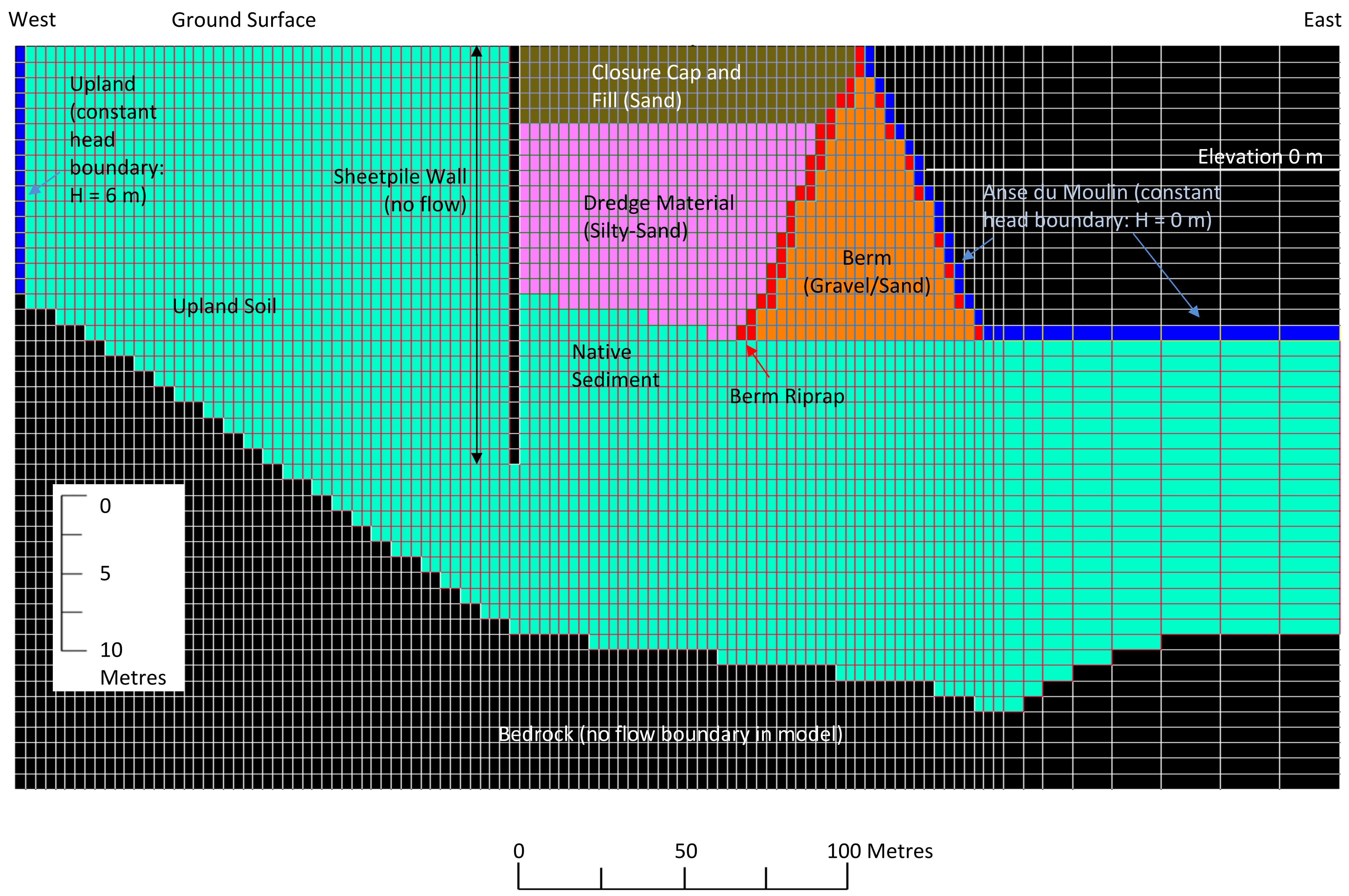
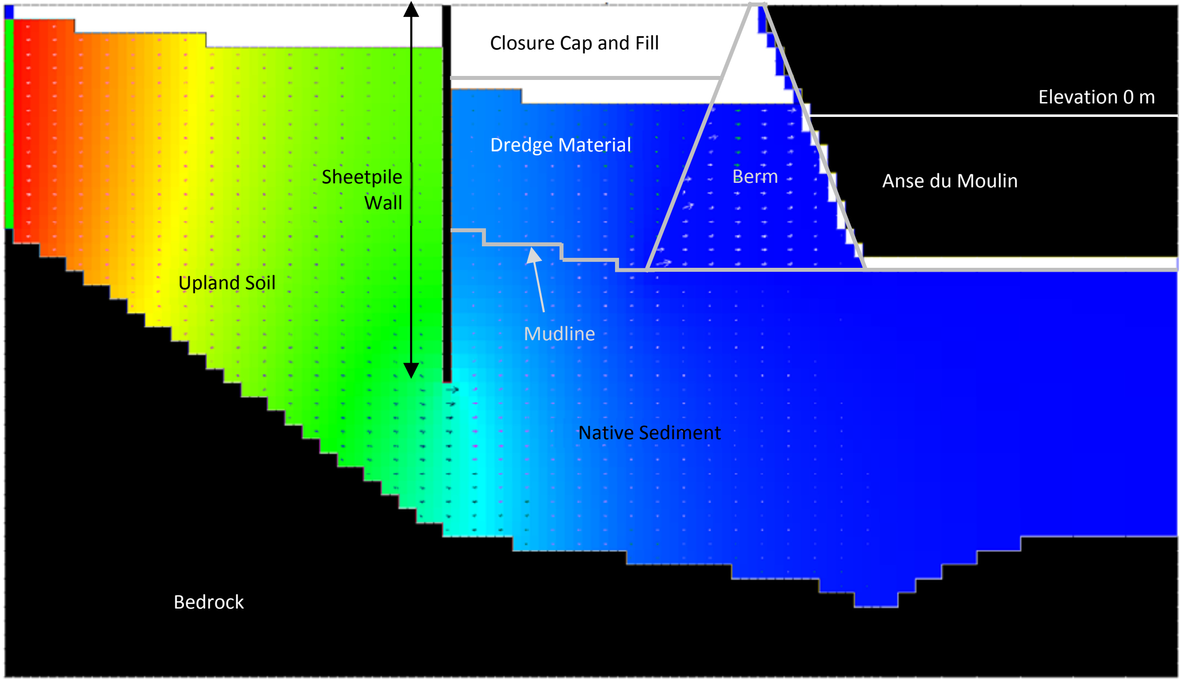
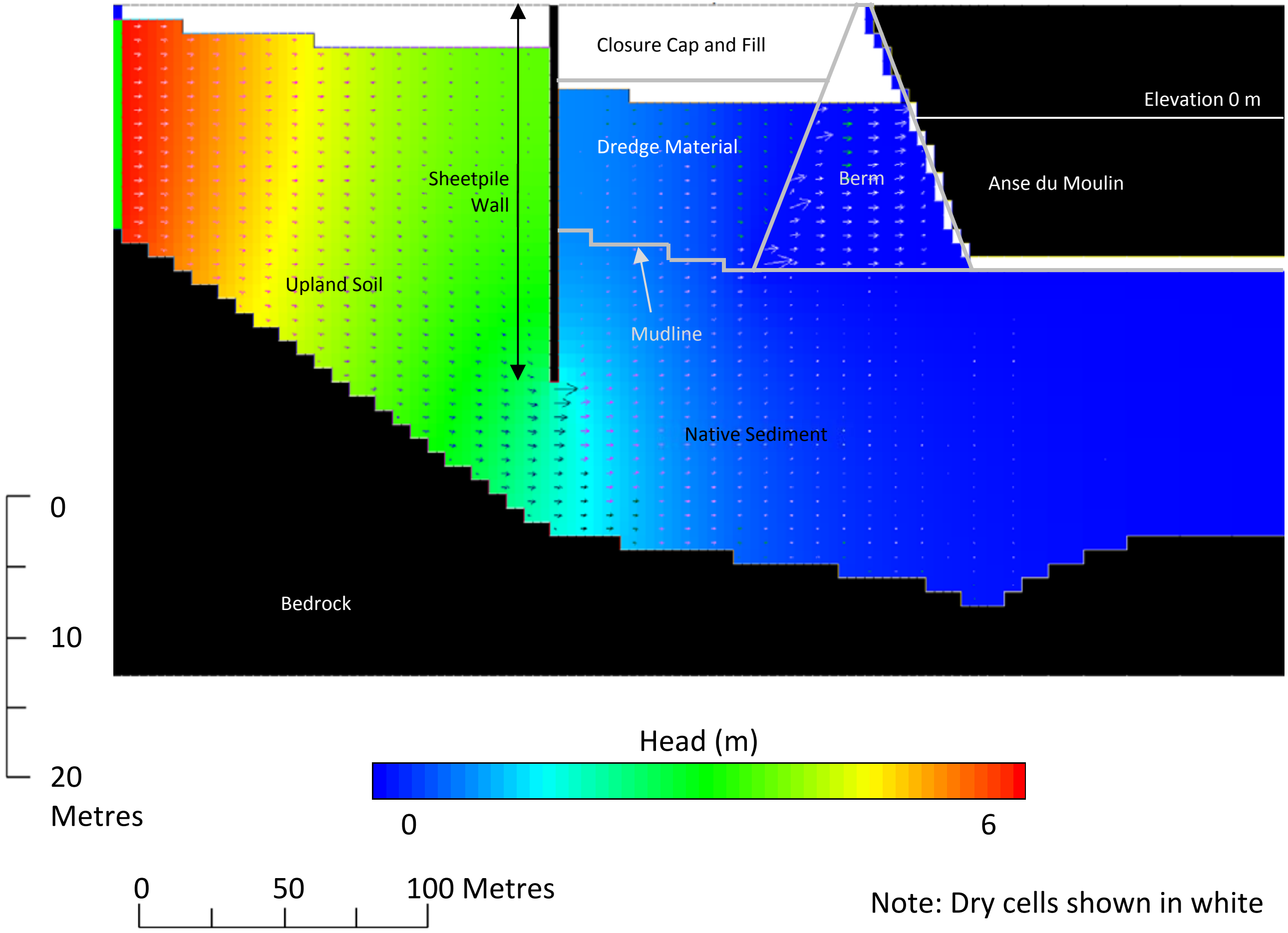


Figure E-6
Numerical Grid Used for the CDF Model
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

(a) Velocity Vectors Showing Actual Magnitude



(b) Velocity Vectors Shown Exaggerated



Note: Dry cells shown in white

Figure E-7
Steady State Head and Flow Simulated by the CDF Model
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

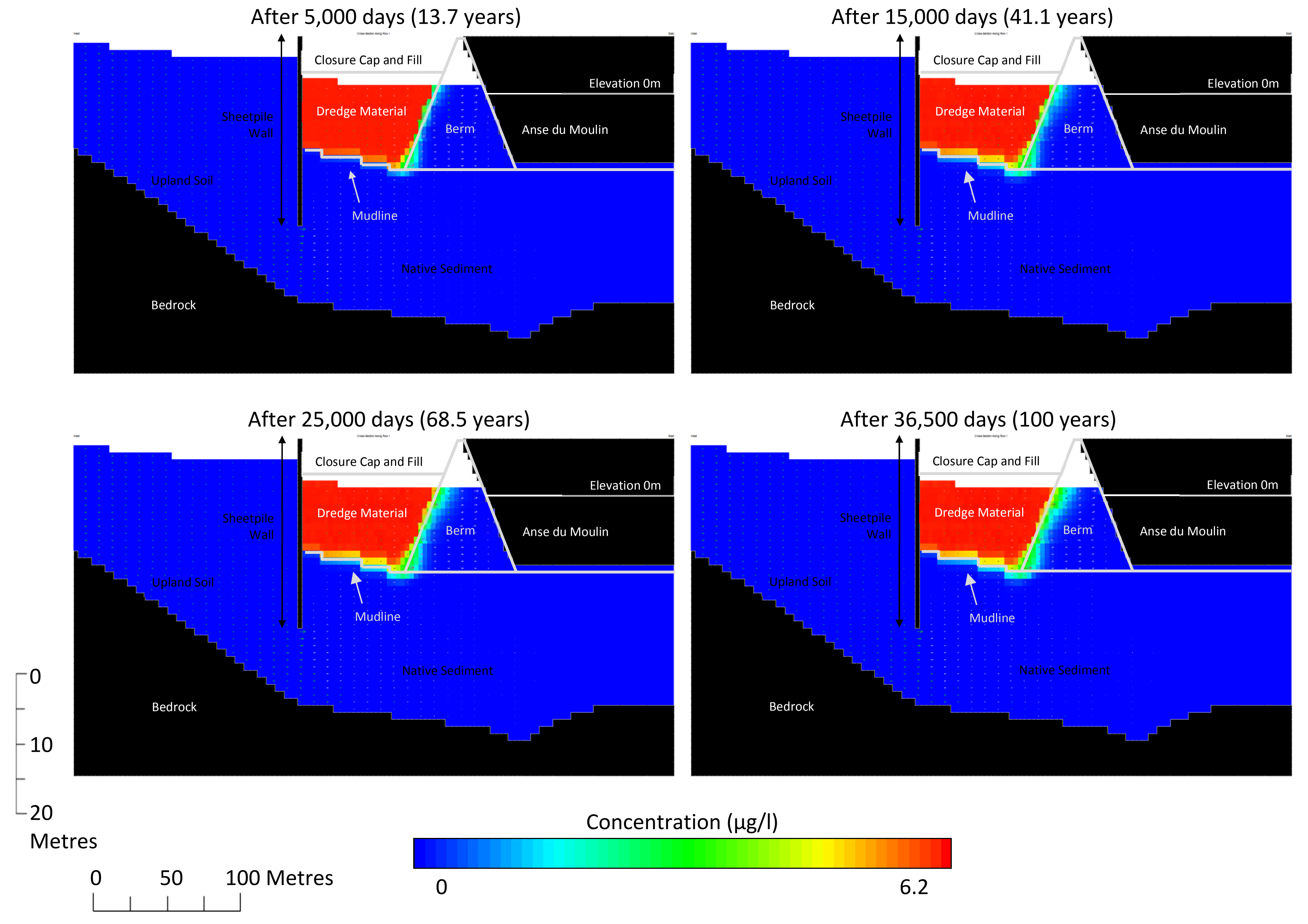


Figure E-8a
Simulated Spatial Distribution of Chrysene Porewater Concentration at Select Snapshots Over 50 Years
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

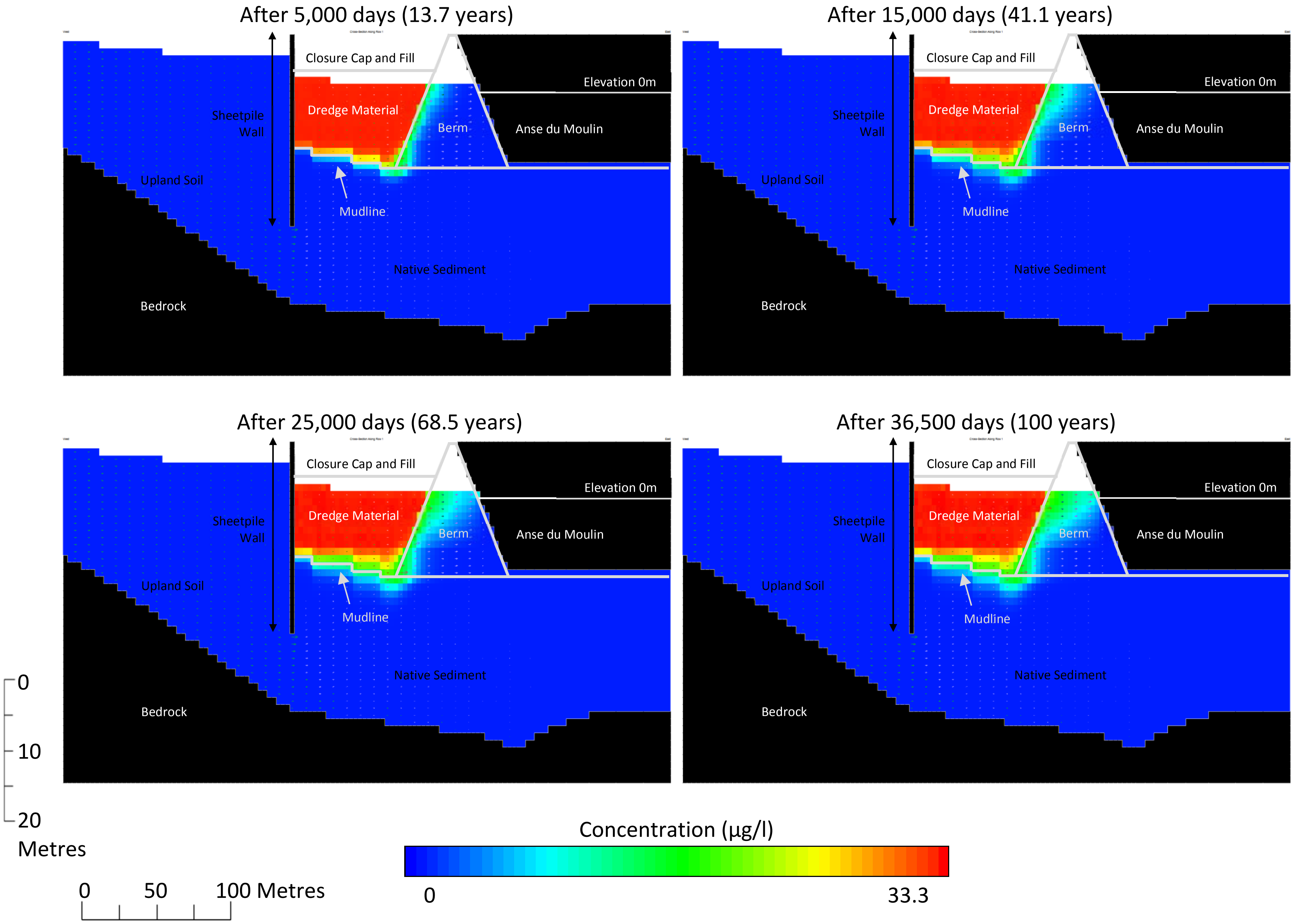


Figure E-8b

Simulated Spatial Distribution of Fluoranthene Porewater Concentration at Select Snapshots Over 50 Years
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

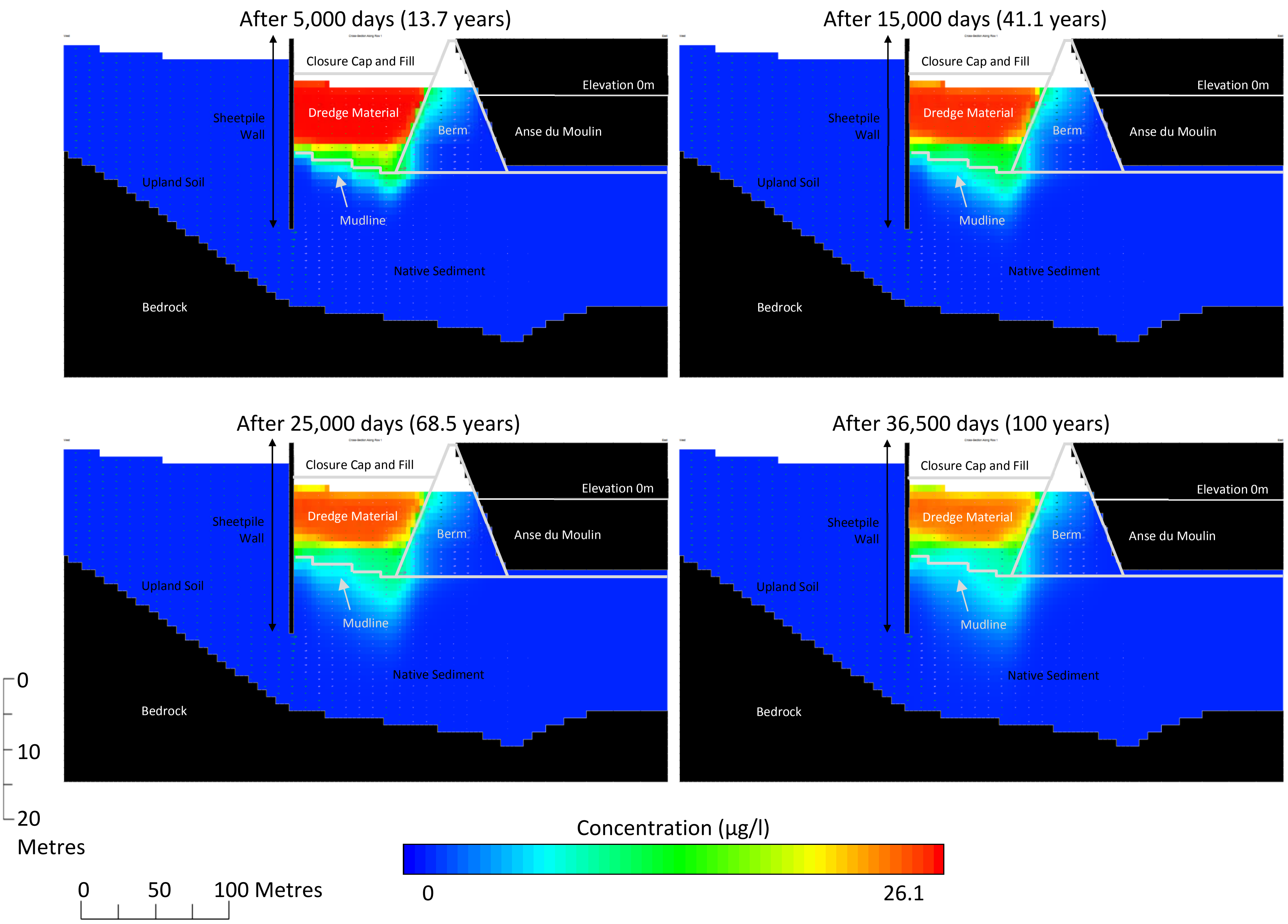


Figure E-8c

Simulated Spatial Distribution of Acenaphthene Porewater Concentration at Select Snapshots Over 50 Years
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

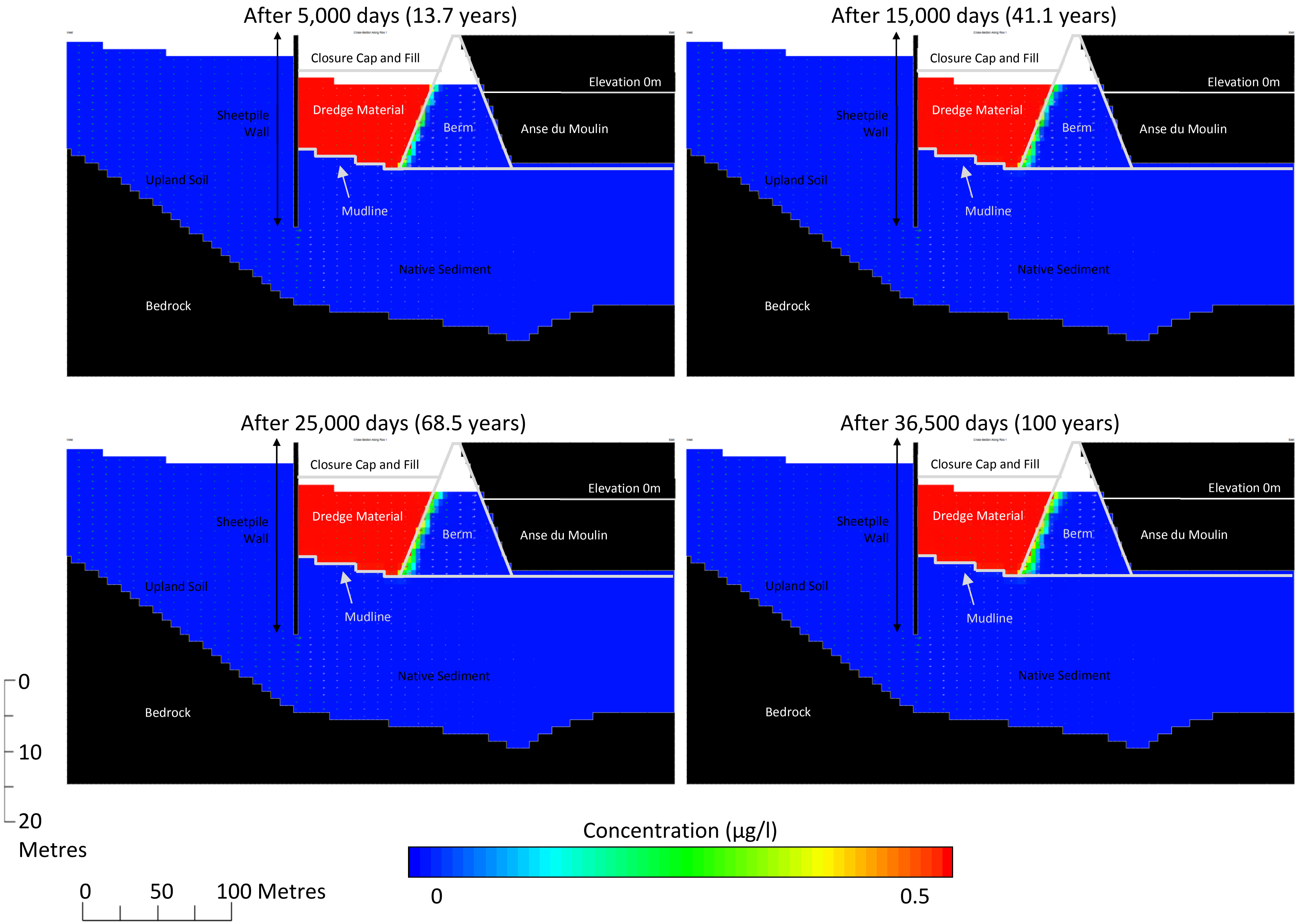


Figure E-8d

Simulated Spatial Distribution of Total PCBs Porewater Concentration at Select Snapshots Over 50 Years
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

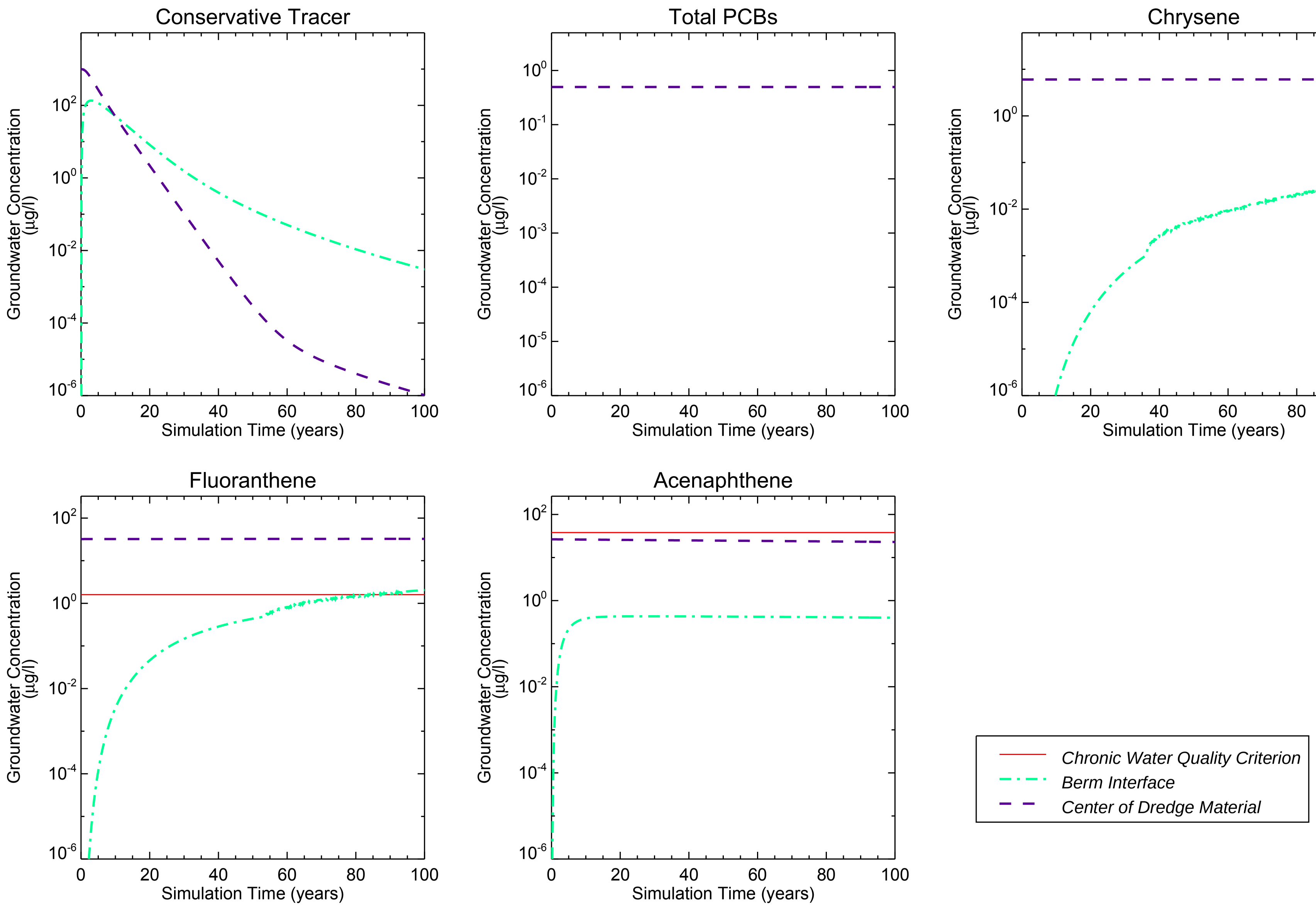


Figure E-9

Temporal Profiles of Simulated Contaminant Concentrations at the Berm/Anse Interface and Within the CDF With First Order Decay
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

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Model results represent the average simulated concentrations at the Berm/Anse interface. For total PCBs, the simulated concentrations were lower than the lower bound of the y-axis over the entire simulation period. Run ID: \\norcal1\sf\projects\ALCOA\BaieComeau\Model\Runs\Run037

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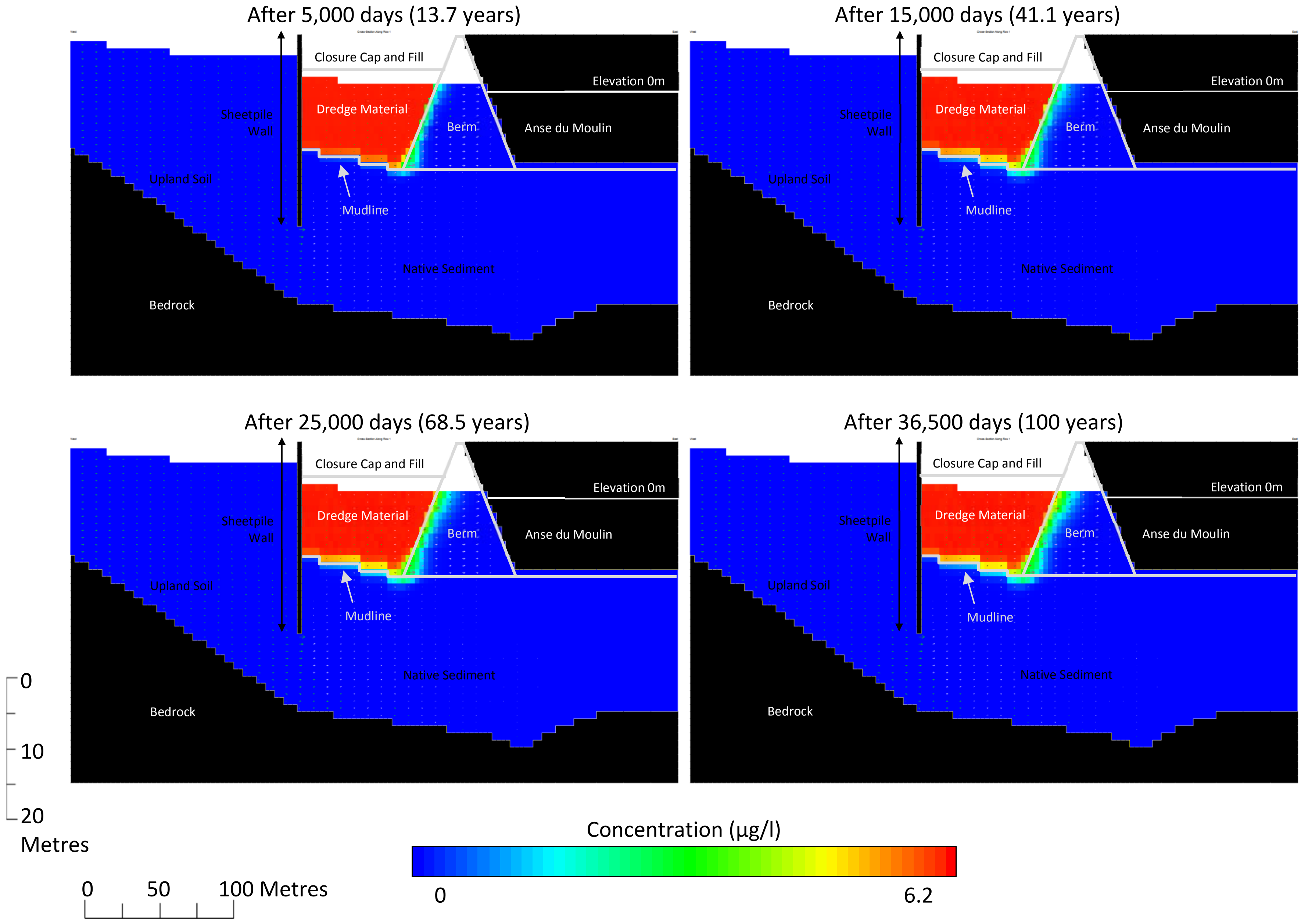

Figure E-10a
Simulated Spatial Distribution of Chrysene Porewater Concentration at Select Snapshots Over 50 Years
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

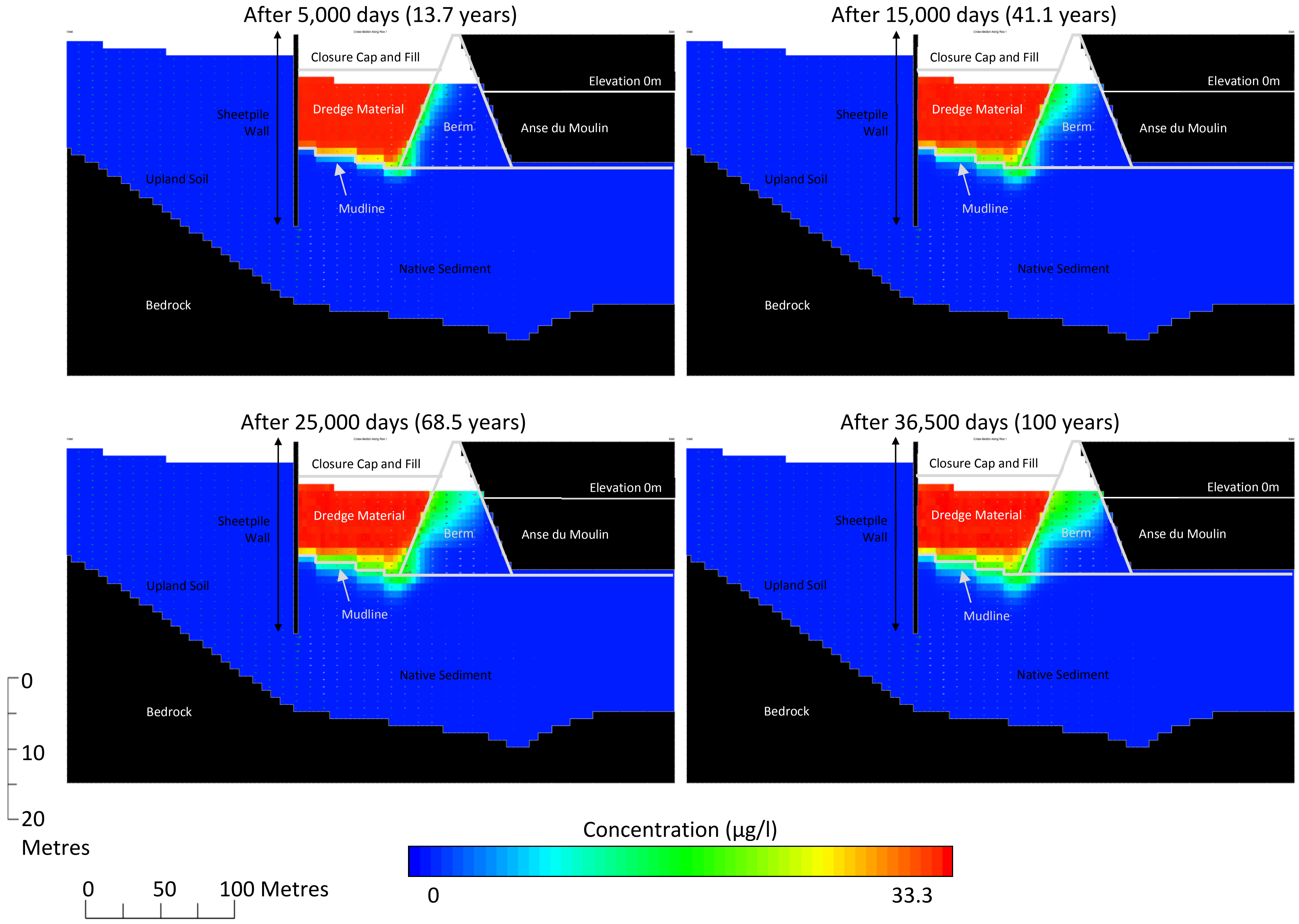

Figure E-10b

Simulated Spatial Distribution of Fluoranthene Porewater Concentration at Select Snapshots Over 50 Years
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

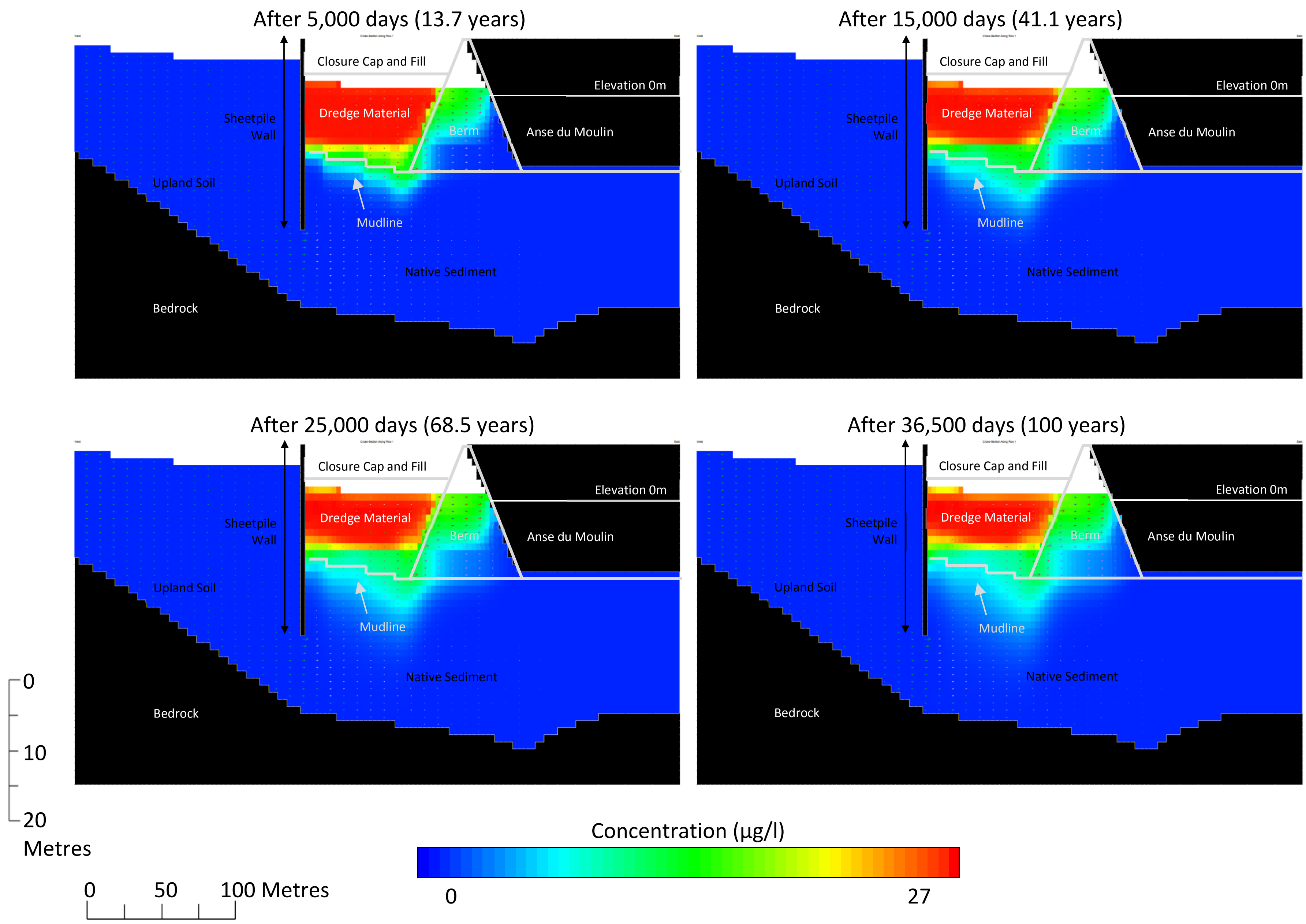

Figure E-10c

Simulated Spatial Distribution of Acenaphthene Porewater Concentration at Select Snapshots Over 50 Years
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

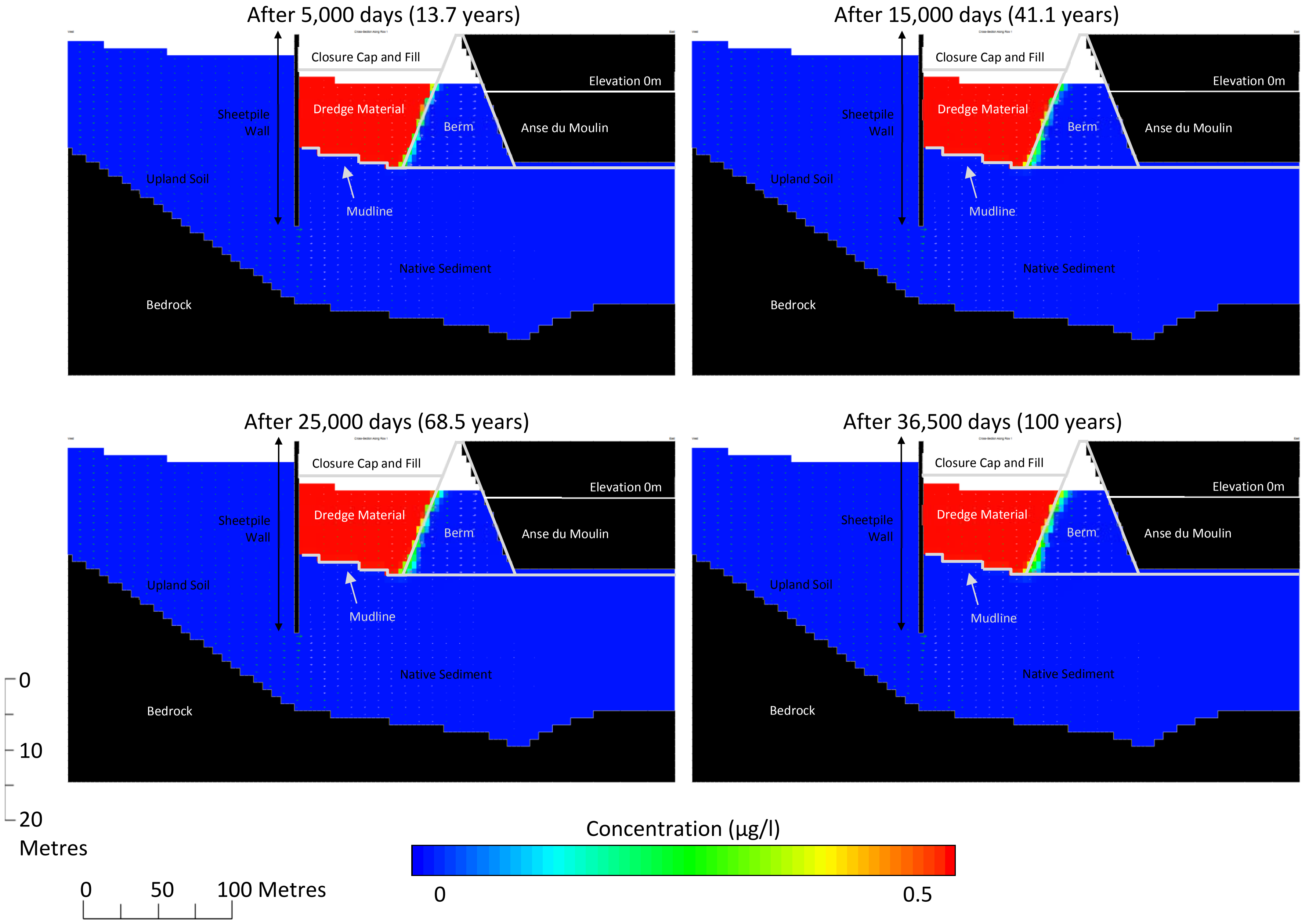

Figure E-10d

Simulated Spatial Distribution of Total PCBs Porewater Concentration at Select Snapshots Over 50 Years

Analysis of Rehabilitation Alternatives

Alcoa, Baie-Comeau, Quebec

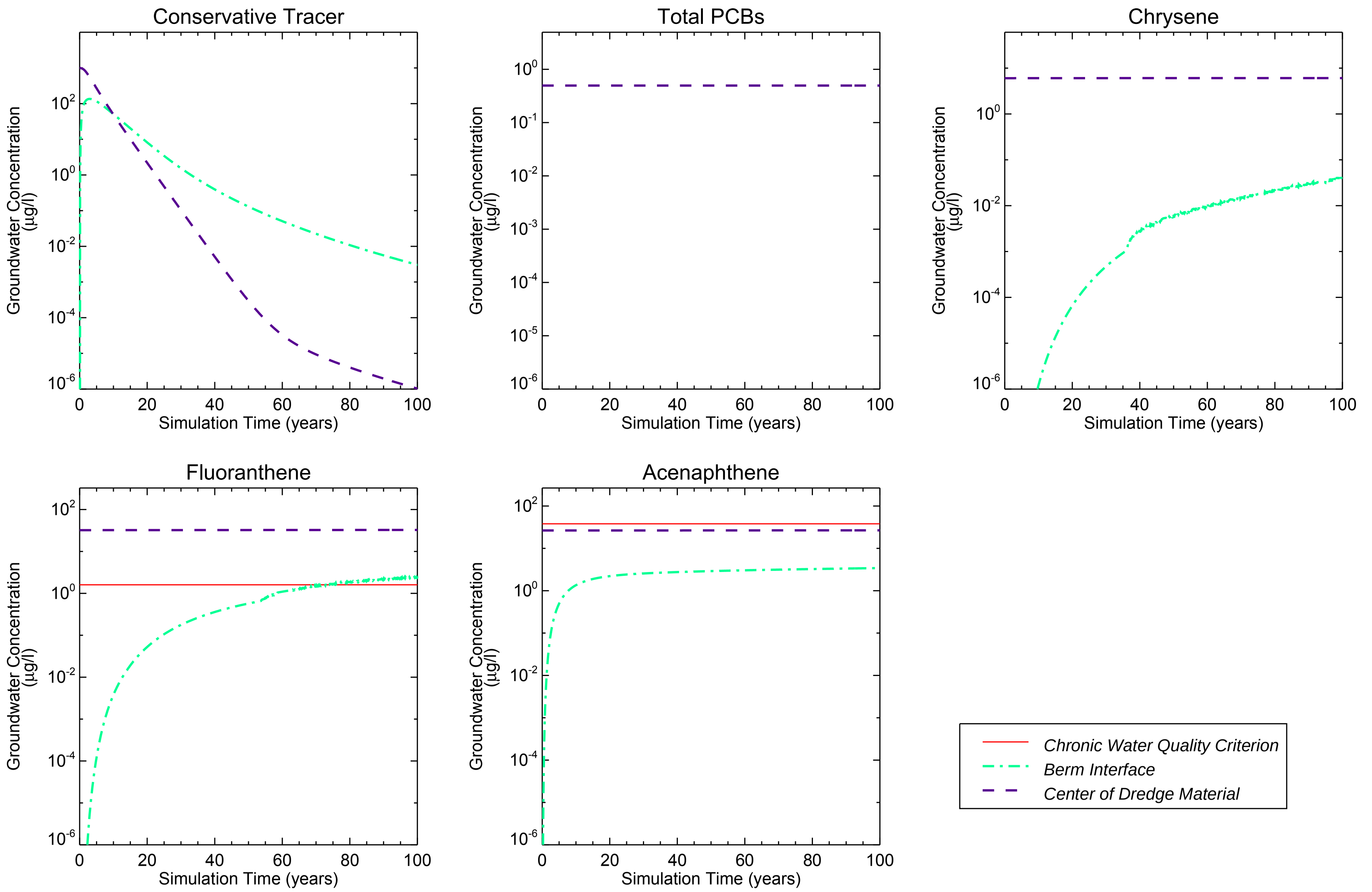

Figure E-11

Temporal Profiles of Simulated Contaminant Concentrations at the Berm/Anse Interface and Within the CDF Without First Order Decay
Analysis of Rehabilitation Alternatives
Alcoa, Baie-Comeau, Quebec

Model results represent the average simulated concentrations at the Berm/Anse interface. For total PCBs, the simulated concentrations were lower than the lower bound of the y-axis over the entire simulation period. Run ID: \\norcal1\sf\projects\ALCOA\BaieComeau\Model\Runs\Run036

APPENDIX F
SUMMARY OF COST ESTIMATES FOR REHABILITATION ALTERNATIVES

Table F-1
Sediment Rehabilitation Cost Estimate Summary - Alternatives RA 1 through RA 4

Description		In Situ Dredge Volume (m^3)	CDF Disposal Volume (m^3)	Off-site Disposal Volume (m^3)	Backfill/Cap Placement Volume (m^3)	CDF Berm Fill Volume (m^3)	CDF Closure Cap Volume (m^3)	Duration (years)	Cost ($) (-15%)	Cost ($)	Cost ($) (+30%)
Alternative 1	No Action	0	0	0	0	0	0	0	0	0	0
Alternative 2	Limited Dredging, CDF, MNR	5,700	6,300	0	900	2,000	5,775	1	$ 6,789,800	**$ 7,988,000**	$ 10,384,400
Alternative 3	Dredging/CDF/Armored Capping	53,800	59,200	0	15,130	42,631	15,753	1	$ 23,035,850	**$ 27,101,000**	$ 35,231,300
Alternative 4	Dredging/CDF/Off-site Landfill Disposal	88,300	64,300	32,800	12,700	42,744	10,436	2	$ 51,425,000	**$ 60,500,000**	$ 78,650,000

Notes:

1. All costs should be considered preliminary and subject to revision in the future. **An additional 20% location specific factor is included in the cost estimate**.
2. This cost estimate has been developed based on a conceptual level design at an accuracy of -15% to +30%, in accordance with standard engineering practice for feasibility studies and USEPA guidance.
3. Costs and volumes are rounded off as appropriate.
4. Costs include taxes assumed to be based on 15 percent of total construction cost.
5. All cost estimates include material and labor unless otherwise noted. Unit Costs are estimated using standard estimating guides (e.g., Means Site Work and Landscape Cost Data), vendors, professional judgment, and experience from other projects.
6. The estimates presented are developed using current and generally accepted engineering cost estimation methods. Note that these estimates are based on assumptions concerning future events and actual costs may be affected by known and unknown risks including, but not limited to, changes in general economic and business conditions, site conditions that were unknown to Anchor QEA, LLC at the time the estimates were performed, future changes in site conditions, regulatory or enforcement policy changes, and delays in performance. Actual costs may vary from these estimates and such variations may be material.
7. Costs do not include property costs (where applicable), access costs, legal fees, Agency oversight, or public relations efforts.
8. This estimate is based on our current understanding of the site and the resulting conceptual development of the design. Subsequent site specific investigations may further refine this estimate. These estimates should therefore be considered preliminary and will be subject to revision as additional data and information becomes available as part of design related investigations. The concepts shown in these estimates will also be likely optimized as part of future design.

Table F-2
Preliminary Cost Estimate for Sediment Rehabilitation Alternative 2: Limited Dredging, CDF, MNR

Item Number	Description	Unit	Number of Units	Unit Cost	Estimated Cost ($)
Mobilization/Demobilization					
1	Mobilization/Demobilization (Year 1)	LS	1	---	$ 260,100
Site Preparation					
2	Access/Staging/Laydown Areas Development/Restoration	LS	1	$ 150,000	$ 150,000
Confined Disposal Facility (CDF) Containment Berm Construction					
3	Pre-Design Investigation	LS	1	$ 500,000	$ 500,000
4	CDF Berm Training Terrace Construction	m^3	771	$ 101	$ 77,710
5	CDF Berm Structural Fill Construction	m^3	1,061	$ 90	$ 95,496
6	CDF Berm Outer Face Armoring (D_{50} = 0.4 m)	m^3	168	$ 110	$ 18,562
7	Allowance for Water Quality Management	LS	1	-	$ 8,800
Dredging and Transport					
8	Debris Removal	In situ m^3	140	$ 232	$ 32,500
9	Environmental Dredging	In situ m^3	5,700	$ 114	$ 649,800
10	Allowance for Water Quality Management	LS	1	-	$ 30,500
Offload and On-Site Disposal					
11	Transportation and Disposal of Sediments in on-site CDF (Bulked Volume)	m^3	6,300	$ 24	$ 151,200
Capping					
Dredging Backfill					
12	Backfilling	m^3	900	$ 103	$ 92,880
13	Disposal of Project Related Materials	metric tons	490	$ 93	$ 45,325
CDF Closure					
14	Debris Removal (*prior to DM placement*)	In situ m^3	100	-	$ 31,800
15	Geogrid	m^2	3,292	$ 17	$ 54,430
16	CDF Closure Sand Cap Layer	m^3	3,800	$ 128	$ 487,920
17	CDF Closure Cap Armor Layer (D_{50} = .0.4 m)	m^3	1,975	$ 149	$ 293,875
Monitored Natural Recovery (MNR)					
18	MNR	LS	1	$ 924,300	$ 924,300
Construction Monitoring/Oversight					
19	Construction Monitoring/Oversight	Month	8	$ 50,000	$ 400,000
20	Construction Total:				$ 4,305,198
21	Routine Engineering Design (8%):				$ 344,416
22	Taxes (15%):				$ 645,780
23	Overhead and Profit (12%)				$ 516,624
24	Long-Term Monitoring/OM&M Program (Present Worth):				$ 2,176,200
25	Grand Total ($):				$ 7,988,218
26	**Rounded Grand Total ($):**				**$ 7,988,000**
27	**Grand Total (-15%)**				**$ 6,789,800**
28	**Grand Total (+30%)**				**$ 10,384,400**

See Notes and Assumptions on next page.

Table F-2
Preliminary Cost Estimate for Sediment Rehabilitation Alternative 2: Limited Dredging, CDF, MNR

General Notes:

1. All costs should be considered preliminary and subject to revision in the future. **An additional 20% location specific factor is included in the cost estimate**.
2. This cost estimate has been developed based on a conceptual level design at an accuracy of -15% to +30%, in accordance with standard engineering practice for feasibility studies and USEPA guidance.
3. Costs and volumes are rounded off as appropriate.
4. Costs include taxes assumed to be based on 15 percent of total construction cost.
5. All cost estimates include material and labor unless otherwise noted. Unit Costs are estimated using standard estimating guides (e.g. Means Site Work and Landscape Cost Data), vendors, professional judgment, and experience from other projects.
6. The estimates presented are developed using current and generally accepted engineering cost estimation methods. Note that these estimates are based on assumptions concerning future events and actual costs may be affected by known and unknown risks including, but not limited to, changes in general economic and business conditions, site conditions that were unknown to Anchor QEA, LLC at the time the estimates were performed, future changes in site conditions, regulatory or enforcement policy changes, and delays in performance. Actual costs may vary from these estimates and such variations may be material.
7. Costs do not include property costs (where applicable), access costs, legal fees, Agency oversight, or public relations efforts.
8. This estimate is based on our current understanding of the site and the resulting conceptual development of the design. Subsequent site specific investigations may further refine this estimate. These estimates should therefore be considered preliminary and will be subject to revision as additional data and information becomes available as part of design related investigations. The concepts shown in these estimates will also be likely optimized as part of future design.

Alternative Notes and Assumptions:

1. This estimate is only for the sediment rehabilitation work (i.e., dredging, capping, backfilling, Monitored Natural Recovery (MNR), and CDF construction and closure) to be conducted at the site.
2. This estimate includes mobilization and demobilization of labor, equipment, and materials necessary to implement the rehabilitation option as described above. The mobilization/demobilization cost has been estimated at 10% of the rehabilitation construction costs. It is assumed that work for this rehabilitation option will be conducted 12 hours per day, 6 days per week, 30 weeks per year.
3. CDF construction will include construction of a nearshore CDF berm, positioned between Wharves 2 & 3 for the placement of dredged sediments. The containment berm will be constructed to an elevation of -6.35 m below the Chart Datum.
4. Debris removal volume is estimated to be 2.5% of the total volume of in-situ material removed. Removal costs are assumed to be 5% of the total dredging cost. Debris removal production is assumed to occur concurrently with dredging. The production rates for dredging consider the average rates for debris removal with typical dredging based on previous experience. The depicted unit cost has been back-calculated for informational purposes.
5. Environmental dredging will be conducted to the depth of the Occasional Effect Level (OEL) or to a depth of 0.60 m, whichever occurs at a deeper depth. Dredge volumes based on Thiessen polygons developed for cores with tPCB and/or tPAH analyses. The OEL depth was determined using sediment tPAH or tPCB values, whichever was found at a lower elevation, referenced to the MDDEP sediment chemistry regulations. An overdredge allowance of .30 m (1 foot) was assumed. Dredging is assumed to be conducted using mechanical methods.
6. The nearshore CDF will be filled with dredged material using a high-solids pump. A 0.25 m high solids pump will be used to transfer dredged material from barges into the CDF. The pump will operate at a maximum discharge rate of 8,300 liters/minute, transferring material at an average rate of 150 meters3/hour and will be powered by a hydraulic power unit. A pipeline will run from the barge over the center of the CDF containment structure, while the discharge point will be attached to a flexi-float to facilitate re-positioning of the discharge point ensuring placement of even material lifts. A water recirculation pipeline will be used to induce slurrying of the dredge material within the barge. The water will be drawn from the CDF and pumped back to the barge.
7. Sediment to be disposed of in the CDF is assumed to have a bulking factor of 10%, based on the in-situ sediment grain size, which is on average ~80% sand as determined by sediment sampling activities in the Anse du Moulin between 2007 and 2009.
8. Backfill assumes that a .15 m clean sand cover will be placed over the dredged area. A .15 m overplacement allowance was assumed. It is assumed that the sand will be purchased from an offsite source.
9. CDF construction assumptions include: CDF Training terraces assumed to be 1.25 m in height, having 2:1 sideslopes. Based on current berm alignment and size, 4 training terraces have been calculated. Each training terrace is assumed to be 55 m wide, with a height of 1.25 m and a base of 2.5 m. The calculated volume for each training terrace is 86 m3. Training terraces assumed to act as filter layer between structural fill and outer berm armoring. The remainder of the CDF berm will be comprised of clean structural fill. In addition, the outer face of the berm will be armored with an armor layer cap.
10. It is assumed that the on-site nearshore CDF will be filled to the elevation necessary to accommodate placement of the dredged material.
11. The CDF will be closed with 1 m sand cap (assumes 0.15 m overplacement), overlain by a geogrid, then covered with an armor layer cap (D50 = 0.4 m), armoring is assumed to be 0.6 m thick (1.5 times the D50).

Table F-2

Preliminary Cost Estimate for Sediment Rehabilitation Alternative 2: Limited Dredging, CDF, MNR

12. Disposal of additional project materials including debris, PPE, etc. would be disposed of in a appropriate disposal facility via truck. It is assumed that the additional project materials and debris will be treated as non-contaminated materials, and subject to applicable costs at the approved disposal facility.
13. Monitored Natural Recovery cost includes: Water, and fish sampling, with applicable reporting (Years 1, 3, 5, 7, 10, 12, 15) at a Year 0 cost of $180,000; Sediment grabs and analysis (Years 1, 3, 5, 7, 10, 12, 15) at a Year 0 cost of $30,000. A Net Present Value (NPV) analysis was completed using a discount rate of 7% as outlined by the USEPA (USEPA, July 2000).
14. Construction monitoring/oversight includes daily oversight of construction activities and is assumed to be conducted during all activities. It is envisioned that the construction monitoring/oversight would include water column monitoring and cap thickness monitoring. Best management practices will be employed to control turbidity during all construction activities. For this cost estimate, a monthly cost of $50,000 was used, and was multiplied by the projected duration to calculate the value used in the estimate. This estimate assumes that construction monitoring and oversight will be conducted for the 6 months of in-water construction time, plus one additional month prior to, and following the construction season.
15. Engineering fees typically range between 7 to 15 percent of construction costs as recommended by the U.S. Environmental Protection Agency (USEPA) in A Guide to Developing and Documenting Cost Estimates During the Feasibility Study, EPA 540-R-00-002 (USEPA 2000). A fee of 8% was used for this cost estimate due to the conceptual nature of this estimate.
16. Long Term Monitoring for the CDF includes: Settlement measurement (Years 1, 3, 10, 15) at a Year 0 cost of $10,000; Installation of monitoring wells (Years 1 to 15) at a Year 0 cost of $60,000 (Includes labor, travel, analytical costs for installation of 4 groundwater wells with annual monitoring); and Regulatory reporting (Years 1 to 15) at a Year 0 cost of $15,000 (one report per year). Maintenance of the CDF includes repair of the closure cap (Years 1-15) at a Year 0 cost of $40,000. A Net Present Value (NPV) analysis was completed using a discount rate of 7% as outlined by the USEPA (USEPA, July 2000).
17. Long Term Monitoring for Dredging includes: Bathymetric surveying (Year 1) at a Year 0 cost of $30,000. A Net Present Value (NPV) analysis was completed using a discount rate of 7% as outlined by the USEPA (USEPA, July 2000).
18. Long Term Monitoring for CDF closure Caps/Backfilling includes: Bathymetric surveying (Years 0, 1, 3, 5, 7, 10, 12, 15) at a Year 0 cost of $30,000; Armor stone placement verification (Year 0) at a cost of $15,000; Diver inspection (Years 0, 1, 3, 5, 7, 10, 12, 15) at a Year 0 cost of $20,000.
19. Dredge area backfill maintenance assumes a repair of 5% of the backfill volume every 5 years (Years 5, 10, 15).The assumed cost for repair is the current $/m3 cost for backfilling. A Net Present Value (NPV) analysis was completed using a discount rate of 7% as outlined by the USEPA (USEPA, July 2000).
20. A contingency allowance has been included to account for unforeseen circumstances or variability in the material types, volumes, labor, and/or material costs. The contingency typically ranges from 15 to 25 percent of the construction costs as recommended by the USEPA (USEPA 1987 and USEPA 2000). For the purposes of this estimate, values of -15 / +30 percent have been used due to the conceptual nature of this estimate.

Acronyms

CDF	Confined Disposal Facility
CM	Construction Management
D_{50}	50% Diameter (Particle Size)
EC	Environment Canada
ERDC/EL	Engineer Research and Development Center/Environmental Laboratory
LS	List Price
LTM	Long Term Monitoring
M	meters
MO	Month
MDDEP	Ministère du Développement durable, de l'Environnement et des Parcs
MNR	Monitored Natural Recovery
NPV	Net Present Value
OEL	Occasional Effect Level
OMM	Operations, Monitoring, and Maintenance
PAH	Polyaromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency

Table F-3
Rehabilitation Alternative 2 - Volumes and Areas

Dredging Volumes

Rehabilitation Action	Design Volume (m^3)	Expected Volume (m^3)	Expected Rounded Volume (m^3)	Bulked Volume (m^3)	Bulked Rounded Volume (m^3)	Total Area (m^2)
Limited Environmental Dredging	4,426	5,696	**5,700**	6,266	**6,300**	4,167

Dredging Notes:

1. Assumed method of dredging is mechanical clamshell-type dredge.
2. Dredge volume based on Thiessen polygons for cores that had tPAH and tPCB (congeners) analyzed. Depth to OEL or 0.60 m, whichever occurs deeper.
3. Assumed overdredge allowance is 0.30 m (1 foot).
4. Expected dredge volume calculated by assuming a 1.5x increase factor per USACE Environmental Dredging Guidance (ERDC/EL TR 08-29). The factor includes consideration for overdredge and sideslopes.
5. Bulking factor of 10% applied to dredge volume for CDF Disposal volumes. Based on sediment characteristics (80% Sand, shallow dredge cut) and Bray, 1997 (Dredging: A Handbook for Engineers).

Capping Volumes/Areas

Rehabilitation Action	Area (m^2)	Sand Cap Volume (m^3)	Armor Layer Cap Volume (m^3)	Backfill Volume (m^3)
Dredging Backfill (Env. Dredge Area Only)	4,167	--	--	900
CDF Armor Layer Cap	3,292	--	1,975	

Capping Notes:

1. The CDF will be closed using a typical near shore cap, plus a geogrid layer that will be placed on top of the dredged material layer. A 1 meter sand cap will be placed on top of the geogrid (with 0.15 m overplacement allowance), then covered with off shore cap armoring. Near shore cap armoring is assumed to be 0.6 m thick (1.5 times the D50 of 0.4 m).

2. Dredging Backfill is assumed to be a 0.15 m sand cover with a 0.15 m overplacement allowance, and is assumed for the environmental dredge area only.

CDF Capacity

Fill Elevation	Capacity	Surface Area
-8.1 m	6,722	3,292
Rounded Capacity	**6,700**	

CDF Capacity Notes:

1. CDF fill assumes 1.9 m thick layer of dredged material for placement.
2. CDF Capacity based on AutoCAD surface-to-surface comparison.

Additional CDF Metrics

Total Fill Volume (m^3)	Structure Fill (m^3)	Training Terraces (m^3)	Outer Berm Face Area (m^2)	Outer Berm Cap Armor Layer (m^3)	Geogrid (m^2)	CDF Closure Cap (m^3)
1,832	1,061	771	280	168	3,292	3,800

Additional CDF Notes:

1. CDF containment berm assumes 2H:1V side slopes, a 2.5 m wide crest, and a crest elevation of -6.35 m located between the proposed Wharf 2 and 3 rock stabilization (assumed to be 2:1 slopes, commencing at -10 m, and sloping towards the center.
2. CDF Total fill volume based on AutoCAD surface-to-surface comparison of berm to assumed rock stabilization fill surface. Assumes no dredging will be conducted prior to berm construction.
3. CDF Training terraces assumed to be 2 m in height, having 2:1 sideslopes. Based on current berm alignment and size, 5 training terraces have been calculated, including 1 "cap" terrace at the berm crest. Due to the wedge shaped area formed between the wharves rock fill stabilization, the width of the terraces varies. The volume for each set of parallel terraces was calculated numerically and summed for a total.
4. CDF Outer Berm Amoring thickness assumed to be the same as the Near Shore Cap armoring (D50 = 0.4 m), over the surface area of the outer face of the berm.
5. The CDF will be closed using an armor layer cap, plus a geogrid layer that will be placed on top of the dredged material layer. A 1 metre sand cap will be placed on top of the geogrid (with 0.15 m overplacement allowance), then covered with an armor layer cap (D50 = 0.4 m). Ar assumed to be 0.6 m thick 1.5 times the D50).

OD = overdredge allowance
CY = cubic yards
m = meters
m2 = square meters
m3 = cubic meters

Table F-4
Sediment Rehabilitation Duration - Alternative 2

Description	Unit	Number of Units	Average Production Rate	Estimated Duration (Days)
Dredging				
Environmental Dredging	In situ m^3	5,700	850	6.7
Capping				
Dredge Area Backfilling	m^3	900	1,100	0.8
CDF Construction				
Training Terrace Construction	m^3	771	550	1.4
Structural Fill Construction	m^3	1,061	550	1.9
CDF Berm Outer Face Armoring (D50 = 0.4 m)	m^3	168	275	0.6
CDF Closure				
Geogrid	m^2	3,292	280	11.8
CDF Closure Sand Cap Layer	m^3	3,800	1,350	2.8
CDF Closure Cap Armor Layer (D50 = .0.4 m)	m^3	1,975	450	4.4

Estimated Total Project Duration (days)	29.6
Weeks (6 days per)	4.9
Years (30 weeks per)	0.164
Rounded Total Project Duration (years)	**1**

Notes:

1. Production rates do not include access area/staging/laydown area development or restoration.
2. Capping is assumed to occur concurrently with CDF construction/dredging/and CDF closure. **Estimated Total Project Duration based on maximum duration of capping activities or dredging and CDF construction/closure activities.**
3. Debris removal is assumed to occur concurrently with dredging/capping.
4. CDF disposal is assumed to occur concurrently with dredging, with no impacts on the dredging schedule.
5. Work is assumed to occur 12 hours/day, 6 days/week, 30 weeks/construction season, 1 construction season/year.

Table F-5
Preliminary Cost Estimate for Sediment Rehabilitation Alternative 3: Dredging/CDF/Armored Capping

Item No.	Description	Unit	Number of Units	Unit Cost	Estimated Cost ($)
Mobilization/Demobilization					
1	Mobilization/Demobilization (Year 1)	LS	1	---	$ 1,550,000
Site Preparation					
2	Access/Staging/Laydown Areas Development/Restoration	LS	1	$ 150,000	$ 150,000
Confined Disposal Facility (CDF) Containment Berm Construction					
3	Pre-Design Investigation	LS	1	$ 500,000	$ 500,000
4	CDF Berm Training Terrace Construction	m^3	10,077	$ 101	$ 1,015,762
5	CDF Berm Structural Fill Construction	m^3	31,293	$ 90	$ 2,816,370
6	CDF Berm Outer Face Armoring (D_{50} = 0.4 m)	m^3	1,261	$ 110	$ 139,236
7	Allowance for Water Quality Management	LS	1	-	$ 96,600
Dredging & Transport					
8	Debris Removal	In-situ m^3	1,350	$ 228	$ 307,800
9	Environmental Dredging	In-situ m^3	53,800	$ 114	$ 6,133,200
10	Allowance for Water Quality Management	LS	1	-	$ 502,300
Offload and On-Site Disposal					
11	Transportation and Disposal of Sediments in on-site CDF (Bulked Volume)	m^3	59,200	$ 24	$ 1,420,800
Dredging Backfill and Environmental Capping					
Dredging Backfill					
12	Backfilling	m^3	9,000	$ 103	$ 928,800
13	Armor Layer Cap (Sand and Gravel Layer)	m^3	0	$ 128	$ -
14	Armor Layer Cap (Armor Layer D50 = 0.4 m)	m^3	6,130	$ 164	$ 1,007,805
Disposal of Project Related Materials					
15	Disposal of Project Related Materials	metric tons	2,710	$ 93	$ 250,675
CDF Closure					
16	Geogrid	m^2	5,404	$ 17	$ 89,361
17	CDF Closure Sand Cap Layer	m^3	15,753	$ 62	$ 982,987
18	CDF Asphalt	m^2	5,404	$ 25	$ 136,829
Construction Monitoring/Oversight					
19	Construction Monitoring/Oversight	Month	8	$ 50,000	$ 400,000
20	Construction Total:				$ 18,428,525
21	Routine Engineering Design (8%):				$ 1,474,282
22	Taxes (15%):				$ 2,764,279
23	Overhead and Profit (12%)				$ 2,211,423
24	Long-Term Monitoring/OM&M Program (Present Worth):				$ 2,222,400
25	Grand Total ($):				$ 27,100,909
26	**Rounded Grand Total ($):**				**$ 27,101,000**
27	**Grand Total (-15%)**				**$ 23,035,850**
28	**Grand Total (+30%)**				**$ 35,231,300**

See Notes and Assumptions on next page

Table F-5
Preliminary Cost Estimate for Sediment Rehabilitation Alternative 3:
Dredging/CDF/Armored Capping

General Notes:

1. All costs should be considered preliminary and subject to revision in the future. **An additional 20% location specific factor is included in**
2. This cost estimate has been developed based on a conceptual level design at an accuracy of -15% to +30%, in accordance with standard engineering practice for feasibility studies and USEPA guidance.
3. Costs and volumes are rounded off as appropriate.
4. Costs include taxes assumed to be based on 15 percent of total construction cost.
5. All cost estimates include material and labor unless otherwise noted. Unit Costs are estimated using standard estimating guides (e.g. Means Site Work and Landscape Cost Data), vendors, professional judgment, and experience from other projects.
6. The estimates presented are developed using current and generally accepted engineering cost estimation methods. Note that these estimates are based on assumptions concerning future events and actual costs may be affected by known and unknown risks including, but not limited to, changes in general economic and business conditions, site conditions that were unknown to Anchor QEA, LLC at the time the estimates were performed, future changes in site conditions, regulatory or enforcement policy changes, and delays in performance. Actual costs may vary from these estimates and such variations may be material.
7. Costs do not include property costs (where applicable), access costs, legal fees, Agency oversight, or public relations efforts.
8. This estimate is based on our current understanding of the site and the resulting conceptual development of the design. Subsequent site

Alternative Notes and Assumptions:

1. This estimate is only for the sediment rehabilitation work (i.e., dredging, backfilling, Monitored Natural Recovery (MNR), and CDF construction and closure) to be conducted at the site.
2. This estimate includes mobilization and demobilization of labor, equipment, and materials necessary to implement the rehabilitation option as described above. The mobilization/demobilization cost has been estimated at 10% of the rehabilitation construction costs. It is assumed that work for this rehabilitation option will be conducted 12 hours per day, 6 days per week, 30 weeks per year.
3. CDF construction will include construction of a nearshore CDF berm, positioned between Wharves 2 & 3 for the placement of dredged sediments. The containment berm will be constructed to an elevation of 7.4 m above the Chart Datum, to match the elevation of the adjacent wharves.
4. Debris removal volume is estimated to be 2.5% of the total volume of in-situ material removed. Removal costs are assumed to be 5% of the total dredging cost. Debris removal production is assumed to occur concurrently with dredging. The production rates for dredging consider the average rates for debris removal with typical dredging based on previous experience. The depicted unit cost has been back-calculated for informational purposes.
5. Environmental dredging will be conducted to the depth of the Occasional Effect Level (OEL) or to a depth of 0.60 m, whichever occurs at a deeper depth. Dredge volumes based on risk-based Thiessen polygons developed for cores with tPCB and/or tPAH analyses. The OEL depth was determined using sediment tPAH or tPCB values, whichever was found at a lower elevation, referenced to the MDDEP sediment chemistry regulations. An overdredge allowance of .30 m (1 foot) was assumed. Dredging is assumed to be conducted using mechanical
6. The nearshore CDF will be filled with dredged material using a high-solids pump. A 0.25 m high solids pump will be used to transfer dredged material from barges into the CDF. The pump will operate at a maximum discharge rate of 8,300 liters/minute, transferring material at an average rate of 150 meters3/hour and will be powered by a hydraulic power unit. A pipeline will run from the barge over the center of the CDF containment structure, while the discharge point will be attached to a flexi-float to facilitate re-positioning of the discharge point ensuring placement of even material lifts. A water recirculation pipeline will be used to induce slurrying of the dredge material within the
7. Sediment to be disposed of in the CDF is assumed to have a bulking factor of 10%, based on the in-situ sediment grain size, which is on average ~80% sand as determined by sediment sampling activities in the Anse du Moulin between 2007 and 2009.
8. Backfill assumes that a .15 m clean sand cover will be placed over the dredged area. A .15 m overplacement allowance was assumed. It is assumed that the sand will be purchased from an offsite source.
9. The environmental sediment cap is assumed to be comprised of an armor layer only. The environmental cap armor layer assumes a median stone (D_{50}) size of of 0.4 m. The thickness of the armor layer is assumed to be 1.5x times the median stone size for estimated thickness of 0.6 m. Future design stages may indicate the need for a filter layer of intermediate particle size and a chemical isolation layer.
10. Assumed CDF construction includes: CDF Training terraces assumed to be 2.5 m in height, having 2:1 sideslopes. Based on current berm alignment and size, 14 training terraces have been calculated. Each training terrace is assumed to be 57.6 m wide (avg, width of embayment at berm location), with a height of 2.5 m and a base of 10 m. The calculated volume for each training terrace is approximately 720 m3. Training terraces assumed to act as filter layer between structural fill and outer berm armoring. The remainder of the CDF berm will be comprised of clean structural fill. In addition, the outer face of the berm will be armored with an armor layer cap.
11. It is assumed that the on-site nearshore CDF will be filled to the elevation necessary to accommodate placement of the dredged material.
12. The CDF will be closed with 1 m sand cap (assumes 0.15 m overplacement), overlain by a geogrid, then covered with an armor layer cap (D50 = 0.4 m), armoring is assumed to be 0.6 m thick (1.5 times the D50).
13. Disposal of additional project materials including debris, PPE, etc. would be disposed of in a appropriate disposal facility via truck. It is assumed that the additional project materials and debris will be treated as non-contaminated materials, and subject to applicable costs at the approved disposal facility.
14. Construction monitoring/oversight includes daily oversight of construction activities and is assumed to be conducted during all activities. It is envisioned that the construction monitoring/oversight would include water column monitoring and cap thickness monitoring. Best management practices will be employed to control turbidity during all construction activities. For this cost estimate, a monthly cost of $50,000 was used, and was multiplied by the projected duration to calculate the value used in the estimate. This estimate assumes that construction monitoring and oversight will be conducted for the 6 months of in-water construction time, plus one additional month prior to,
15. Engineering fees typically range between 7 to 15 percent of construction costs as recommended by the U.S. Environmental Protection Agency (USEPA) in A Guide to Developing and Documenting Cost Estimates During the Feasibility Study, EPA 540-R-00-002 (USEPA 2000). A fee of 8% was used for this cost estimate due to the conceptual nature of this estimate.
16. Long Term Monitoring for the CDF includes: Settlement measurement (Years 1, 3, 10, 15) at a Year 0 cost of $10,000; Installation of monitoring wells (Years 1 to 15) at a Year 0 cost of $60,000 (Includes labor, travel, analytical costs for installation of 4 groundwater wells with annual monitoring); and Regulatory reporting (Years 1 to 15) at a Year 0 cost of $15,000 (one report per year). Maintenance of the CDF includes repair of the closure cap (Years 1-15) at a Year 0 cost of $40,000. A Net Present Value (NPV) analysis was completed using a discount
17. Long Term Monitoring for Dredging includes: Bathymetric surveying (Year 1) at a Year 0 cost of $30,000. A Net Present Value (NPV) analysis was completed using a discount rate of 7% as outlined by the USEPA (USEPA, July 2000).

Table F-5

Preliminary Cost Estimate for Sediment Rehabilitation Alternative 3: Dredging/CDF/Armored Capping

18. Long Term Monitoring for Environmental and CDF closure Caps/Backfilling includes: Bathymetric surveying (Years 0, 1, 3, 5, 7, 10, 12, 15) at a Year 0 cost of $30,000; Armor stone placement verification (Year 0) at a cost of $15,000; Diver inspection (Years 0, 1, 3, 5, 7, 10, 12, 15) at a Year 0 cost of $20,000.
19. Environmental cap and dredge area backfill maintenance assumes a repair of 5% of the backfill volume every 5 years (Years 5, 10, 15).The assumed cost for repair is the current $/m3 cost for backfilling. A Net Present Value (NPV) analysis was completed using a discount rate of 7% as outlined by the USEPA (USEPA, July 2000).
20. A contingency allowance has been included to account for unforeseen circumstances or variability in the material types, volumes, labor, and/or material costs. The contingency typically ranges from 15 to 25 percent of the construction costs as recommended by the USEPA (USEPA 1987 and USEPA 2000). For the purposes of this estimate, values of -15 / +30 percent have been used due to the conceptual nature

Acronyms

CDF	Confined Disposal Facility
CM	Construction Management
D_{50}	50% Diameter (Particle Size)
EC	Environment Canada
ERDC/EL	Engineer Research and Development Center / Environmental Laboratory
LS	List Price
LTM	Long Term Monitoring
M	meters
MO	Month
MDDEP	Ministère du Développement durable, de l'Environnement et des Parcs
MNR	Monitored Natural Recovery
NPV	Net Present Value
OEL	Occasional Effect Level
OMM	Operations, Monitoring, and Maintenance
PAH	Polyaromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency

Table F-6
Rehabilitation Alternative 3 - Volumes and Areas

Dredging Volumes

Rehabilitation Action	Design Volume (m^3)	Expected Volume (m^3)	Expected Rounded Volume (m^3)	Bulked Volume (m^3)	Bulked Rounded Volume (m^3)	Total Area (m^2)
Environmental Dredging	35,892	53,838	**53,800**	59,222	**59,200**	30,046

Dredging Notes:

1. Assumed method of dredging is mechanical clamshell-type dredge.
2. Dredge volume based on Thiessen polygons for cores that had tPAH and tPCB (congeners) analyzed. Depth to OEL or 0.60 m (for navigational purposes), whichever occurs deeper.
3. Assumed overdredge allowance is 0.30 m (1 foot).
4. Expected dredge volume calculated by assuming a 1.5x increase factor per USACE Environmental Dredging Guidance (ERDC/EL TR 08-29). The factor includes consideration for overdredge and sideslopes.
5. Bulking factor of 10% applied to dredge volume for CDF Disposal volumes. Based on sediment characteristics (80% Sand, shallow dredge cut) and Bray, 1997 (Dredging: A Handbook for Engineers).

Capping Volumes/Areas

Rehabilitation Action	Area (m^2)	Sand Cap Volume (m^3)	Armor Layer Cap Volume (m^3)	Backfill Volume (m^3)
Armor Layer Cap	10,217	--	6,130	--
Dredging Backfill (Env. Dredge Area Only)	30,046	--	--	9,000
Wharf 3-North Rock Fill	2,058	--	2,800	--

Capping Notes:

1. Armor layer cap is located in nearshore areas subject to wave energy and includes 0.6 m thick armor layer based on 0.4 m D50 stone x 1.5. Subsequent design analysis may indicate the need for a filter layer between native sediment and the armor layer.
2. Dredging Backfill is assumed to be a 0.15 m sand cover with a 0.15 m overplacement allowance, and is assumed for the environmental dredge area only.
3. Thickness of Near Shore Cap armor is 0.6 m, with no assumed overplacement.

CDF Capacity

Fill Elevation	Capacity	Surface Area
4.5 m	60,503	5,404
Rounded Capacity	**60,500**	

CDF Capcity Notes:

1. CDF fill assumes flat surface.
2. CDF Capacity based on AutoCAD surface-to-surface comparison.

Additional CDF Metrics

Total Fill Volume (m^3)	Structure Fill (m^3)	Training Terraces (m^3)	Outer Berm Face Area (m^2)	Outer Berm Armoring (m^3)	Geogrid (m^2)	CDF Closure Cap (m^3)	Asphalt Cover (m^2)
41,370	31,293	10,077	2,102	1,261	5,404	15,753	5,404

Additional CDF Notes:

1. CDF containment berm assumes 2H:1V side slopes, a 5 m wide crest, and a crest elevation of 7.4 m.
2. CDF Total fill volume based on AutoCAD surface-to-surface comparison of berm to existing bathymetry. Assumes no dredging will be conducted prior to berm construction.
3. CDF Training terraces assumed to be 2.5 m in height, having 2:1 sideslopes. Based on current berm alignment and size, 6 training terraces have been calculated. Each training terrace is assumed to be 57.6 m wide (avg, width of embayment at berm location), with a height of 2.5 m and a base of 10 m. The calculated volume for each training terrace is approximately 720 m^3. Training terraces assumed to act as filter layer between structural fill and outer berm armoring.
4. CDF Outer Berm Amoring thickness assumed to be the same as the Near Shore Cap armoring (D50 = 0.4 m), over the surface area of the outer face of the berm.
5. The nearshore CDF will be closed using a low permeability cap system. A geogrid layer will placed on top of the dredged material layer. A low permeability cap, with volume to match the remaining capacity will be placed on top of the geogrid, then covered with asphalt to bring the CDF area to grade with the surrounding wharves.

OD = Overdredge allowance
CY = cubic yards
m = meters
m^2 = square meters
m^3 = cubic meters

Table F-7
Sediment rehabilitation Duration - Alternative 3

Description	Unit	Number of Units	Average Production Rate	Estimated Duration (Days)
Dredging				
Environmental Dredging	In situ m^3	53,800	850	63.3
Capping				
Dredge Area Backfilling	m^3	9,000	1,100	8.2
Environmental Capping (Armor Layer)	m^3	6,130	450	13.6
CDF Construction				
Training Terrace Construction	m^3	10,077	550	18.3
Structural Fill Construction	m^3	31,293	550	56.9
CDF Berm Outer Face Armoring (D50 = 0.4 m)	m^3	1,261	275	4.6
CDF Closure				
Geogrid	m^2	5,404	280	19.3
CDF Closure Sand Cap Layer	m^3	15,753	3,300	4.8
CDF Asphalt	m^2	5,404	1,255	4.3

Estimated Total Project Duration (days)	171.5
Weeks (6 days per)	28.6
Years (30 weeks per)	1.0
Rounded Total Project Duration (years)	**1**

Notes:

1. Production rates do not include access area/staging/laydown area development or restoration.
2. Capping is assumed to occur concurrently with CDF construction/dredging/and CDF closure. **Estimated Total Project Duration based on maximum duration of capping activities or dredging and CDF construction/closure activities.**
3. Debris removal is assumed to occur concurrently with dredging/capping.
4. CDF disposal is assumed to occur concurrently with dredging, with no impacts on the dredging schedule.
5. Work is assumed to occur 12 hours/day, 6 days/week, 30 weeks/construction season, 1 construction season/year.

Table F-8
Preliminary Cost Estimate for Sediment Rehabilitation Alternative 4: Dredging, CDF, Offsite Disposal

Item Number	Description	Unit	Number of Units	Unit Cost	Estimated Cost ($)
Mobilization/Demobilization					
1	Mobilization/Demobilization (Year 1)	LS	2	---	$ 3,761,300
Site Preparation					
2	Access/Staging/Laydown Areas Development/Restoration	LS	1	$ 150,000	$ 150,000
Confined Disposal Facility (CDF) Containment Berm Construction					
3	Pre-Design Investigation	LS	1	$ 500,000	$ 500,000
4	CDF Berm Training Terrace Construction	m^3	9,625	$ 101	$ 970,200
5	CDF Berm Structural Fill Construction	m^3	31,867	$ 90	$ 2,868,030
6	CDF Berm Outer Face Armoring (D_{50} = 0.4 m)	m^3	1,252	$ 110	$ 138,166
7	Allowance for Water Quality Management	LS	1	-	$ 8,800
Dredging and Transport					
8	Debris Removal	In situ m^3	2,210	$ 228	$ 503,300
9	Environmental Dredging	In situ m^3	88,300	$ 114	$ 10,066,200
10	Allowance for Water Quality Management	LS	1	-	$ 45,750
Offload and On-site Disposal					
11	Transportation and Disposal of Sediments in on-site CDF (Bulked Volume)	m^3	64,300	$ 24	$ 1,543,200
Dewatering, Sediment Treatment, Transport, and Off-site Disposal					
12	Dewatering and Stabilization of Dredged Material (Bulked Volume)	m^3	32,800	$ 150	$ 4,920,000
13	Transportation and Disposal of Sediments at off-site Disposal Facility (Bulked Volume)	m^3	32,800	$ 400	$ 13,120,000
Dredging Backfill					
14	Backfilling	m^3	12,700	$ 103	$ 1,310,640
15	Disposal of Project Related Materials	metric tons	4,430	$ 93	$ 409,775
CDF Closure					
16	Geogrid	m^2	5,404	$ 17	$ 89,366
17	CDF Cap	m^3	10,436	$ 62	$ 651,206
18	CDF Asphalt	m^2	5,404	$ 25	$ 136,837
Construction Monitoring/Oversight					
19	Construction Monitoring/Oversight	Month	16	$ 50,000	$ 800,000
20				Construction Total	$ 41,992,770
21				Routine Engineering Design (8%)	$ 3,359,422
22				Taxes (15%)	$ 6,298,915
23				Overhead and Profit (12%)	$ 5,039,132
24				Long-Term Monitoring/OM&M Program (Present Worth)	$ 2,126,400
25				Grand Total ($)	$ 58,816,639
26				**Rounded Grand Total ($)**	**$ 60,500,000**
27				**Grand Total (-15%)**	**$ 51,425,000**
28				**Grand Total (+30%)**	**$ 78,650,000**

See Notes and Assumptions on next page.

Table F-8

Preliminary Cost Estimate for Sediment Rehabilitation Alternative 4: Dredging, CDF, Offsite Disposal

General Notes:

1. All costs should be considered preliminary and subject to revision in the future. **An additional 20% location specific factor is included in the cost estimate**.

2. This cost estimate has been developed based on a conceptual level design at an accuracy of -15% to +30%, in accordance with standard engineering practice for feasibility studies and USEPA guidance.

3. Costs and volumes are rounded off as appropriate.

4. Costs include taxes assumed to be based on 15 percent of total construction cost.

5. All cost estimates include material and labor unless otherwise noted. Unit Costs are estimated using standard estimating guides (e.g. Means Site Work and Landscape Cost Data), vendors, professional judgment, and experience from other projects.

6. The estimates presented are developed using current and generally accepted engineering cost estimation methods. Note that these estimates are based on assumptions concerning future events and actual costs may be affected by known and unknown risks including, but not limited to, changes in general economic and business conditions, site conditions that were unknown to Anchor QEA. LLC at the time the estimates were performed, future changes in site conditions, regulatory or enforcement policy changes, and delays in performance. Actual costs may vary from these estimates and such variations may be material.

7. Costs do not include property costs (where applicable), access costs, legal fees, Agency oversight, or public relations efforts.

8. This estimate is based on our current understanding of the site and the resulting conceptual development of the design. Subsequent site specific investigations may further refine this estimate. These estimates should therefore be considered preliminary and will be subject to revision as additional data and information becomes available as part of design related investigations. The concepts shown in these estimates will also be likely optimized as part of future design.

Alternative Notes and Assumptions:

1. This estimate is only for the sediment rehabilitation work (i.e., dredging, backfilling, CDF construction and closure), onsite dredged material management, offsite transport and landfill disposal.

2. This estimate includes mobilization and demobilization of labor, equipment, and materials necessary to implement the rehabilitation option as described above. The mobilization/demobilization cost has been estimated at 10% of the rehabilitation construction costs. It is assumed that work will be conducted for this rehabilitation option 12 hours per day, 6 days per week, 30 weeks per year.

3. CDF construction will include construction of a nearshore CDF berm, positioned between Wharves 2 & 3 for the placement of dredged sediments. The containment berm will be constructed to an elevation of 7.4m above the Chart Datum, to match the elevation of the adjacent wharves.

4. Debris removal volume is estimated to be 2.5% of the total volume of in-situ material removed. Removal costs are assumed to be 5% of the total dredging cost. Debris removal production is assumed to occur concurrently with dredging. The production rates for dredging consider the average rates for debris removal with typical dredging based on previous experience. The depicted unit cost has been back-calculated for informational purposes.

5. Environmental dredging will be conducted to the depth of the Occasional Effect Level (OEL) or to a depth of 0.60 m, whichever occurs at a deeper depth. Dredge volumes based on Thiessen polygons developed for cores with tPCB and/or tPAH analyses. The OEL depth was determined using sediment tPAH or tPCB values, whichever was found at a lower elevation, referenced to the MDDEP sediment chemistry regulations. An overdredge allowance of .30 m (1 foot) was assumed. Dredging is assumed to be conducted using mechanical methods.

6. The nearshore CDF will be filled with dredged material using a high-solids pump. A 0.25 m high solids pump will be used to transfer dredged material from barges into the CDF. The pump will operate at a maximum discharge rate of 8,300 liters/minute, transferring material at an average rate of 150 meters3/hour and will be powered by a hydraulic power unit. A pipeline will run from the barge over the center of the CDF containment structure, while the discharge point will be attached to a flexi-float to facilitate re-positioning of the discharge point ensuring placement of even material lifts. A water recirculation pipeline will be used to induce slurrying of the dredge material within the barge. The water will be drawn from the CDF and pumped back to the barge.

7. Sediment to be disposed of in the CDF is assumed to have a bulking factor of 10%, based on the in-situ sediment grain size, which is on average ~80% sand as determined by sediment sampling activities in the Anse du Moulin between 2007 and 2009.

8. Backfill assumes that a .15 m clean sand cover will be placed over the dredged area. A .15 m overplacement allowance was assumed. It is assumed that the sand will be purchased from an offsite source.

9. CDF construction assumptions include: CDF Training terraces assumed to be 2.5 m in height, having 2:1 sideslopes. Based on current berm alignment and size, 14 training terraces have been calculated. Each training terrace is assumed to be 55 m wide, with a height of 2.5 m and a base of 10 m. The calculated volume for each training terrace is 687.5 m3. Training terraces assumed to act as filter layer between structural fill and outer berm armoring. The remainder of the CDF berm will be comprised of clean structural fill. In addition, the outer face of the berm will be armored with an armor layer cap, described in Assumption 11.

10. It is assumed that the on-site nearshore CDF will be filled to capacity.

Table F-8
Preliminary Cost Estimate for Sediment Rehabilitation Alternative 4: Dredging, CDF, Offsite Disposal

11. Dredged material removed beyond the capacity of the on-site CDF will be dewatered and stabilized on-site. It is assumed that the bulked volume will be stabilized. The off-site disposal cost included in the cost estimate accounts for loading of trucks, truck transportation costs, disposal costs at the AES landfill and includes a contingency of 100% to account for unknown costs associated with the landfill operation, transportation costs, and in the event that sediments exceeding the D criteria are not allowed to be placed into the CDF due to regulations.

12. The CDF will be closed with 1 m sand cap (assumes 0.15 m overplacement), overlain by a geogrid, then covered with an armor layer cap (D50 = 0.4 m), armoring is assumed to be 0.6 m thick (1.5 times the D50).

13. Disposal of additional project materials including debris, PPE, etc. would be disposed of in a appropriate disposal facility via truck. It is assumed that the additional project materials and debris will be treated as non-contaminated materials, and subject to applicable costs at the approved disposal facility.

14. Construction monitoring/oversight includes daily oversight of construction activities and is assumed to be conducted during all activities. It is envisioned that the construction monitoring/oversight would include water column monitoring and cap thickness monitoring. Best management practices will be employed to control turbidity during all construction activities. For this cost estimate, a monthly cost of $50,000 was used, and was multiplied by the projected duration to calculate the value used in the estimate. This estimate assumes that construction monitoring and oversight will be conducted for the 6 months of in-water construction time, plus one additional month prior to, and following the construction season.

15. Engineering fees typically range between 7 to 15 percent of construction costs as recommended by the U.S. Environmental Protection Agency (USEPA) in A Guide to Developing and Documenting Cost Estimates During the Feasibility Study, EPA 540-R-00-002 (USEPA 2000). A fee of 8% was used for this cost estimate due to the conceptual nature of this estimate.

16. Long Term Monitoring for the CDF includes: Settlement measurement (Years 1, 3, 10, 15) at a Year 0 cost of $10,000; Installation of monitoring wells (Years 1 to 15) at a Year 0 cost of $60,000 (Includes labor, travel, analytical costs for installation of 4 groundwater wells with annual monitoring); and Regulatory reporting (Years 1 to 15) at a Year 0 cost of $15,000 (one report per year). Maintenance of the CDF includes repair of the closure cap (Years 1-15) at a Year 0 cost of $40,000. A Net Present Value (NPV) analysis was completed using a discount rate of 7% as outlined by the USEPA (USEPA, July 2000).

17. Long Term Monitoring for Dredging includes: Bathymetric surveying (Year 1) at a Year 0 cost of $30,000. A Net Present Value (NPV) analysis was completed using a discount rate of 7% as outlined by the USEPA (USEPA, July 2000).

18. Long Term Monitoring for CDF closure Caps/Backfilling includes: Bathymetric surveying (Years 0, 1, 3, 5, 7, 10, 12, 15) at a Year 0 cost of $30,000; Armor stone placement verification (Year 0) at a cost of $15,000; Diver inspection (Years 0, 1, 3, 5, 7, 10, 12, 15) at a

19. Dredge area backfill maintenance assumes a repair of 5% of the backfill volume every 5 years (Years 5, 10, 15).The assumed cost for repair is the current $/m3 cost for backfilling. A Net Present Value (NPV) analysis was completed using a discount rate of 7% as outlined by the USEPA (USEPA, July 2000).

20. A contingency allowance has been included to account for unforeseen circumstances or variability in the material types, volumes, labor, and/or material costs. The contingency typically ranges from 15 to 25 percent of the construction costs as recommended by the USEPA (USEPA 1987 and USEPA 2000). For the purposes of this estimate, values of -15 / +30 percent have been used due to the conceptual nature of this estimate.

Acronyms

CDF	Confined Disposal Facility
CM	Construction Management
D_{50}	50% Diameter (Particle Size)
EC	Environment Canada
ERDC/EL	Engineer Research and Development Center / Environmental Laboratory
LS	List Price
LTM	Long Term Monitoring
M	meters
MO	Month
MDDEP	Ministère du Développement durable, de l'Environnement et des Parcs
MNR	Monitored Natural Recovery
NPV	Net Present Value
OEL	Occasional Effect Level
OMM	Operations, Monitoring, and Maintenance
PAH	Polyaromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency

Table F-9
Rehabilitation Alternative 3 - Volumes and Areas

Dredging Volumes

Rehabilitation Action	Design Volume (m^3)	Expected Volume (m^3)	Expected Rounded Volume (m^3)	Bulked Volume (m^3)	Bulked Rounded Volume (m^3)	Total Area (m^2)
Environmental Dredging	46,489	58,487	**58,500**	64,336	**64,300**	35,688

Dredging Notes:

1. Assumed method of dredging is mechanical clamshell-type dredge.
2. Dredge volume based on Thiessen polygons for cores that had tPAH and tPCB (congeners) analyzed. Depth to OEL or 0.60 m, whichever occurs deeper.
3. Assumed overdredge allowance is 0.30 m (1 foot).
4. Expected dredge volume calculated by assuming a 1.5x increase factor per USACE Environmental Dredging Guidance (ERDC/EL TR 08-29). The factor includes consideration for overdredge and sideslopes.
5. Bulking factor of 10% applied to dredge volume for CDF Disposal volumes. Based on sediment characteristics (80% Sand, shallow dredge cut) and Bray, 1997 (Dredging: A Handbook for Engineers).

Additional Dredge Volume Beyond CDF Capacity

Design Volume (m^3)	Rounded Expected Volume (m^3)	Rounded Bulked Volume (m^3)	Additional Backfill Area (m^2)
23,693	29,800	32,800	20,130

Capping Volumes/Areas

Rehabilitation Action	Area (m^2)	Sand Cap Volume (m^3)	Armor Layer Cap Volume (m^3)	Backfill Volume (m^3)
Armor Layer Cap	--	--	--	--
Dredging Backfill (Env. Dredge Area Only)	57,862	--	--	12,700
Wharf 3-North Rock Fill	2,058	--	2,800	--

Capping Notes:

1. Armor layer cap is located in nearshore areas subject to wave energy and includes 0.6 m thick armor layer based on 0.4 m D50 stone x 1.5. Subsequent design analysis may indicate the need for a filter layer between native sediment and the armor layer.
2. Dredging Backfill is assumed to be a 0.15 m sand cover with a 0.15 m overplacement allowance, and is assumed for the environmental dredge area only.

CDF Capacity

Fill Elevation	Capacity	Surface Area
5.4	64,430	5,404
Rounded Capacity	**64,400**	

CDF Capacity Notes:

1. CDF fill assumes flat surface.
2. CDF Capacity based on AutoCAD surface-to-surface comparison.

Additional CDF Metrics

Total Fill Volume (m^3)	Structure Fill (m^3)	Training Terraces (m^3)	Outer Berm Face Area (m^2)	Outer Berm Armoring (m^3)	Geogrid (m^2)	CDF Closure Cap (m^3)	Asphalt Cover (m^2)
41,492	31,867	9,625	2,086	1,252	5,404	10,436	5,404

Additional CDF Notes:

1. CDF containment berm assumes 2H:1V side slopes, a 5 m wide crest, and a crest elevation of 7.4 m.
2. CDF Total fill volume based on AutoCAD surface-to-surface comparison of berm to existing bathymetry. Assumes no dredging will be conducted prior to berm construction.
3. CDF Training terraces assumed to be 2.5 m in height, having 2:1 sideslopes. Based on current berm alignment and size, 6 training terraces have been calculated. Each training terrace is assumed to be 57.6 m wide (avg, width of embayment at berm location), with a height of 2.5 m and a base of 10 m. The calculated volume for each training terrace is approximately 720 m3. Training terraces assumed to act as filter layer between structural fill and outer berm armoring.
4. CDF Outer Berm Amoring thickness assumed to be the same as the Near Shore Cap armoring (D50 = 0.4 m), over the surface area of the outer face of the berm. Thickness of armor layer assumed to be 0.6 m (D50 x 1.5)
5. The nearshore CDF will be closed using a low permeability cap system. A geogrid layer will placed on top of the dredged material layer. A low permeability cap, with volume to match the remaining capacity will be placed on top of the geogrid, then covered with asphalt to bring the CDF area to grade with the surrounding wharves.

OD = Overdredge allowance
CY = cubic yards
m = meters
m^2 = square meters
m^3 = cubic meters

Table F-10
Sediment rehabilitation Duration - Alternative 4

Description	Unit	Number of Units	Average Production Rate	Estimated Duration (Days)
Dredging				
Environmental Dredging	In situ m^3	88,300	850	103.9
Capping				
Dredge Area Backfilling	m^3	12,700	1,100	11.5
CDF Construction				
Training Terrace Construction	m^3	9,625	550	17.5
Structural Fill Construction	m^3	31,867	550	57.9
CDF Berm Outer Face Armoring (D50 = 0.4 m)	m^3	1,252	275	4.6
CDF Closure				
Geogrid	m^2	5,404	280	19.3
CDF Closure Sand Cap Layer	m^3	10,436	3,300	3.2
CDF Asphalt	m^2	5,404	1,255	4.3

Estimated Total Project Duration (days)	210.6
Weeks (6 days per)	35.1
Years (30 weeks per)	1.2
Rounded Total Project Duration (years)	**2**

Notes:

1. Production rates do not include access area/staging/laydown area development or restoration.
2. Capping is assumed to occur concurrently with CDF construction/dredging/and CDF closure. **Estimated Total Project Duration based on maximum duration of capping activities or dredging and CDF construction/closure activities.**
3. Debris removal is assumed to occur concurrently with dredging/capping.
4. CDF disposal is assumed to occur concurrently with dredging, with no impacts on the dredging schedule.
5. Work is assumed to occur 12 hours/day, 6 days/week, 30 weeks/construction season, 1 construction season/year.