



**PWGSC PROJECT #R.075061.002
MARINE SEDIMENT SAMPLING PROGRAM
ALMA DFO-SCH
ALMA, NEW BRUNSWICK

FINAL REPORT**

Submitted to:
Public Works and Government Services Canada
Saint John, New Brunswick

Submitted by:
Amec Foster Wheeler Environment & Infrastructure,
a Division of Amec Foster Wheeler Americas Limited
Saint John, New Brunswick

August 2015

TE131446.1000



5 August 2015

TE131446.1000

Mr. Jason Keys
Environmental Specialist
Environmental Services
Public Works and Government Services Canada
189 Prince William Street
Saint John, New Brunswick
E2L 2B9

Dear Mr. Keys:

Re: Marine Sediment Sampling Program at the Alma Fisheries and Oceans Small Craft Harbour, Alma, New Brunswick - Final Report

Amec Foster Wheeler Environment & Infrastructure, a Division of Amec Foster Wheeler Americas Limited (Amec Foster Wheeler), is pleased to provide Public Works and Government Services Canada the findings of a Marine Sediment Sampling Program undertaken at the Alma Fisheries and Oceans Canada - Small Craft Harbour in New Brunswick.

Amec Foster Wheeler appreciates the opportunity to provide services to your organization. Please do not hesitate to call if you have any questions regarding this, or any other matter.

Respectfully submitted,
**Amec Foster Wheeler Environment & Infrastructure,
a Division of Amec Foster Wheeler Americas Limited**

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EXECUTIVE SUMMARY

Seven (7) sediment samples were collected within the Alma Fisheries and Oceans Canada (DFO) - Small Craft Harbour (SCH) in New Brunswick on 13 July, 2015. The samples were submitted to AGAT Laboratories for detailed analyses. Results were compared to the *Canadian Environmental Protection Act* (CEPA) Disposal at Sea Lower Level Screening Criteria; Canadian Council of Ministers of the Environment (CCME) Soil Quality Guidelines (SQGs) for the Protection of Environment and Human Health (1999a) and Atlantic Risk-Based Corrective Action (RBCA) Tier 1 Version 3.0 Risk-Based Screening Levels (RBSLs) and Sediment Ecological Screening Levels (SESLs) for the Protection of Freshwater and Marine Life (2012). Table ES1, below, reports the summarized guideline exceedance results of the sediment analysis for the field program. Figure ES1 (below) depicts the summarized substrate composition for the samples collected from the Alma DFO-SCH.

Table ES1 Sediment Analysis Guideline Exceedance Table

Guideline / Parameter	Sample ID						
	A-5	A-14	A-17	A-26	A-28	A-30	A-38
CEPA Disposal at Sea – Lower Level Screening Criteria							
PAHs ¹	-	-	-	-	-	-	-
Metals	-	-	-	-	-	-	-
PCBs ²	-	-	-	-	-	-	-
CCME Soil Quality Guidelines							
PAHs (IACR ³)	-	-	-	-	-	-	-
Metals	-	-	-	-	-	-	-
PCBs	-	-	-	-	-	-	-
DDT ⁴	-	-	-	-	-	-	-
Atlantic RBCA Tier 1 Version 3.0 RBSLs and SESLs							
BTEX ⁵	-	-	-	-	-	-	-
TPH ⁶	-	-	-	-	-	-	-

Notes:

"-" indicates no exceedance

1 – PAH - polycyclic aromatic hydrocarbon

2 – PCB - polychlorinated biphenyl

3 – IACR - Index of Additive Cancer Risk

4 – DDT - dichloro-diphenyl-trichloroethane

5 – BTEX - benzene, toluene, ethylbenzene, and xylene

6 – TPH - total petroleum hydrocarbons

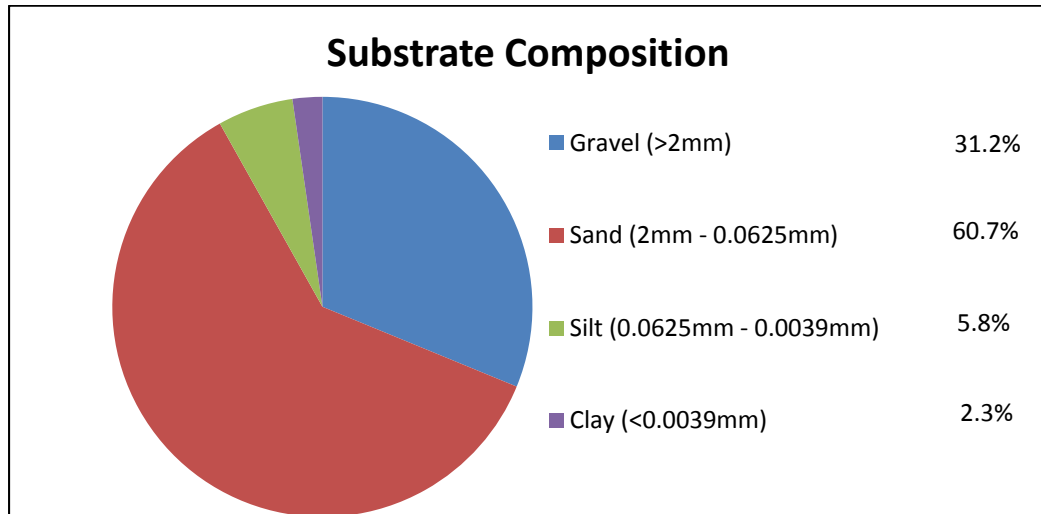


Figure ES1 Substrate Composition Averaged from Sampling Locations at the Alma DFO-SCH, New Brunswick

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1.0 INTRODUCTION

At the request of Public Works and Government Services Canada (PWGSC), seven (7) stations were sampled within the footprint of the proposed dredging area at the Alma Fisheries and Oceans (DFO) - Small Craft Harbour (SCH), Albert County, New Brunswick on 13 July, 2015. The Marine Sediment Sampling Program (MSSP) was required to determine disposal options for the sediment intended to be dredged from this location.

2.0 SCOPE AND METHODOLOGY

2.1 Site Plan

The selection of sample stations followed guidance provided in the Environmental Protection Series: *Users Guide to the Application Form for Ocean Disposal* (Environment Canada, 1995), whereby a random approach was implemented for the location of sampling stations in the proposed dredging area of the SCH. The unstratified area was divided into square blocks where at least five times as many blocks as the number of stations required was used (minimum of 30 blocks). A random number generator software program was used to derive the sampling locations within this dredge area (Figure 2.1).

A detailed program design was prepared by Amec Foster Wheeler Environment & Infrastructure, a Division of Amec Foster Wheeler Americas Limited (Amec Foster Wheeler) and submitted to PWGSC on 10 July, 2015 for review and approval prior to field program implementation. The field program was scheduled upon acceptance of the design.

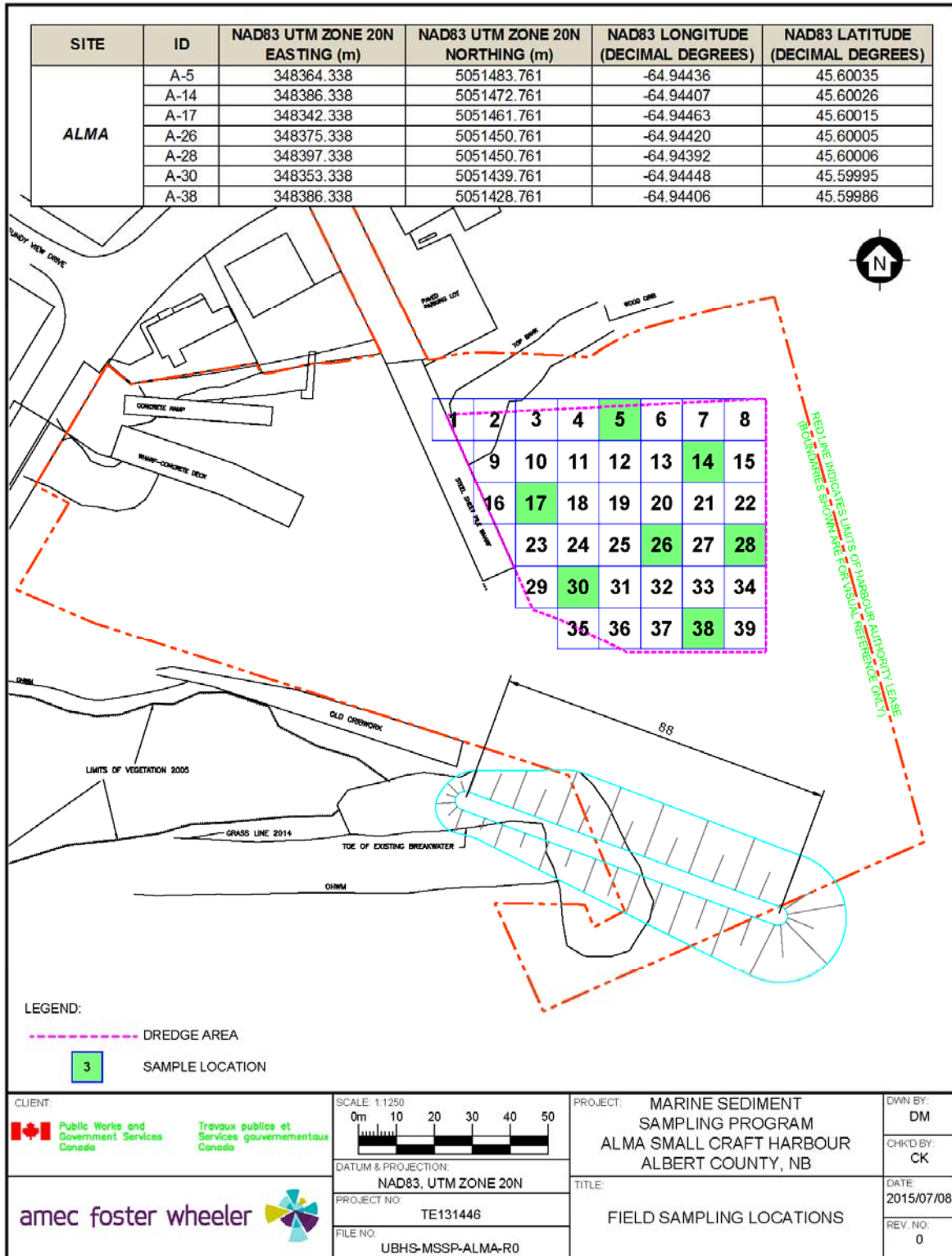
Sample collection, preparation, and analyses were conducted in accordance with Environment Canada's publication *Guidance Document on Collection and Preparation of Sediments for Physicochemical Characterization and Biological Testing* (1994). Diversified Divers Inc./Divers Quarters was retained to collect the sediment samples. The sample collection field program was completed in accordance with guidelines defined by provincial Occupational Health and Safety Standards.

2.2 Sample Collection and Analysis

The marine sediment samples were collected by divers at the selected sampling stations. A handheld Global Positioning System (GPS) was used to georeference the sampling location coordinates that were derived prior to field program initiation. Sample station coordinates are listed in Figure 2.1. Appendix A is comprised of a collection of photos taken of the sample locations during the field program.

Duplicate samples were collected from all stations to safeguard against loss or damage during transport. All samples were then stored in the laboratory-supplied jars and kept in a cooler on until the field program was completed. Upon completion of the field program, the samples were chilled and delivered to the laboratory for select chemical analyses. The duplicate sediment samples were refrigerated and stored at the Amec Foster Wheeler office in Saint John, New Brunswick.

Figure 2.1 Sampling Locations at the Alma DFO-SCH



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AGAT Laboratories (AGAT) in Dartmouth, Nova Scotia, an accredited laboratory with the Canadian Association for Laboratory Accreditation (CALA) and ISO/IEC 17025 certified for all of the analyses required for this Project, was engaged to conduct the laboratory analyses. At the request of PWGSC, the samples were submitted for the typical ocean and land disposal suite of parameters which includes ICP 23 metals scan plus mercury, hexavalent chromium, tin, and low-level selenium; low-level polycyclic aromatic hydrocarbons (PAHs); total inorganic and total organic carbon (TIC/TOC); total polychlorinated biphenyls (PCBs); total dichloro-diphenyl-trichloroethane (DDT); low-level benzene, toluene, ethylbenzene, and xylene (BTEX); total petroleum hydrocarbons (TPHs), including a qualitative assessment for presence/absence of creosote; and grain size. Silica gel cleanup was completed for all samples analyzed for petroleum hydrocarbons, and a return to baseline at C32 was verified.

3.0 ANALYTICAL RESULTS

The analytical results of the marine sediment samples collected and analyzed from the Alma DFO-SCH are summarized in Tables B.1 to B.5 (Appendix B) and discussed below. The complete set of analytical results, including laboratory Quality Assurance/Quality Control (QA/QC) and Certificates of Analyses for all parameters tested, are provided in Appendix C.

In order to facilitate the determination of all disposal options, the tabulated analytical sample results were compared to the following, where applicable:

- *Canadian Environmental Protection Act (CEPA) Disposal at Sea Regulations (formerly the Ocean Dumping Control Act) – Lower Level Screening Criteria.*
- *Canadian Council of Ministers of the Environment (CCME) Sediment Quality Guidelines - Interim Sediment Quality Guidelines (ISQGs) and Marine and Estuarine Probable Effects Levels (PELs) (1999b).*
- *CCME Soil Quality Guidelines (SQGs) for the Protection of Environment and Human Health in agricultural, residential/parkland, and commercial/industrial applications (1999a).*
- *Atlantic Risk-Based Corrective Action (RBCA) Tier 1 Version 3.0 Risk-Based Screening Levels (RBSLs) and Sediment Ecological Screening Levels (SESLs) for the Protection of Freshwater and Marine Aquatic Life (2012).*

Results as compared to the previously noted Guidelines, with the exception of the CCME Sediment Quality Guidelines (ISQGs and PELs), are discussed further in this Report.

3.1 PAH Concentrations

PAHs were not detected in any of the seven samples collected.

CEPA Disposal at Sea Screening Criteria - Lower Level

There were no exceedances of the CEPA Disposal at Sea Lower Level Screening Criteria for any of the seven samples collected (Table B.1).

CCME SQGs - Human Health (Potable Water) and (Direct Contact)

None of the seven samples collected exceeded the CCME SQGs for the Protection of Human Health (Potable Water) for any land use scenario (Table B.1).

Guidance provided in the CCME SQGs for the Protection of Environmental and Human Health (2008) indicates that for soil contaminated by coal tar or creosote mixtures, the calculated Benzo(a)pyrene total potency equivalent (TPE) concentration for soil samples should be multiplied by an uncertainty factor (UF) of 3 prior to comparison with the SQGs for the protection of human health (direct contact) to account for carcinogenic potential of alkylated and other PAHs present for which a Potency Equivalency Factors (PEF) does not currently exist, but which are likely to contribute to mixture carcinogenic potential.

Analytical review of the results by laboratory staff revealed that the presence of creosote was not observed in any of the seven samples analyzed. No exceedances of the CCME SQGs for the Protection of Human Health (Direct Contact) for all land use applications were noted in the seven samples collected (Table B.1).

CCME SQGs - Environmental Health (Soil Contact), (Soil and Food Ingestion), and (Freshwater Life)

None of the seven samples collected showed exceedances of the CCME SQGs for the Protection of Environmental Health (Soil Contact), (Soil and Food Ingestion) or (Freshwater Life) for any land use scenario (Table B.1).

3.2 Metal Concentrations

CEPA Disposal at Sea Screening Criteria - Lower Level

No exceedances of the CEPA Disposal at Sea Lower Level Screening Criteria were noted in any of the seven samples collected (Table B.2).

CCME SQGs

None of the seven samples collected exceeded the CCME SQGs for any land use application (Table B.2).

3.3 Petroleum Hydrocarbon Concentrations

Modified TPH values reflect the sum of the individual carbon fractions that resembles gasoline, diesel #2, and lube oil. BTEX was not detected in any of the seven samples collected at the Alma DFO-SCH. One sample, A-38, had showed a trace amount of TPH, but no resemblance was determined. All seven samples reached baseline at C₃₂ (Table B.3).

No exceedances of the Atlantic RBCA Tier 1 Version 3.0 RBSLs and SESLs for the Protection of Freshwater and Marine Aquatic Life, CCME SQGs were noted in any of the seven samples collected (Tables B.3).

3.4 PCBs Concentrations

PCBs were not detected in any of the seven samples collected at the Alma DFO-SCH and no exceedances of the CEPA Disposal at Sea Lower Level Screening Criteria or CCME SQGs for any land use applications were noted in any of the seven samples collected (Table B.4).

3.5 DDT Concentrations

Total DDT refers to the sum of dichlorodiphenyldichloroethylene (DDE), dichlorodiphenyldichloroethane (DDD), and DDT. Neither DDE, DDD, nor DDT were detected in any of the seven samples collected at the Alma DFO-SCH, and no exceedances of the CEPA Disposal at Sea Lower Level Screening Criteria, CCME SQGs for all land use applications were noted in any of the seven samples collected (Table B.4).

3.6 Carbon Content

Samples collected from the Alma DFO-SCH showed total carbon content ranging from 0.26 to 2.31% (Table B.5). TIC was the predominant type in all of the samples except A-17, ranging from 0.18 to 1.75%. TOC was not detected in samples A-5, A-14 and A26; where TOC was detected ranged from 0.56% (sample A-38) to 0.96% (sample A-17) (Table B.5).

3.7 Grain Size Distribution

Sediment composition is described in Figure 3.1 and Table 3.1 below. Figure 3.1 illustrates the overall sediment composition from the samples collected from within the SCH, expressed as percentages to show the average grain size distributions. Table 3.1 breaks down the sediment composition at each sampling location.

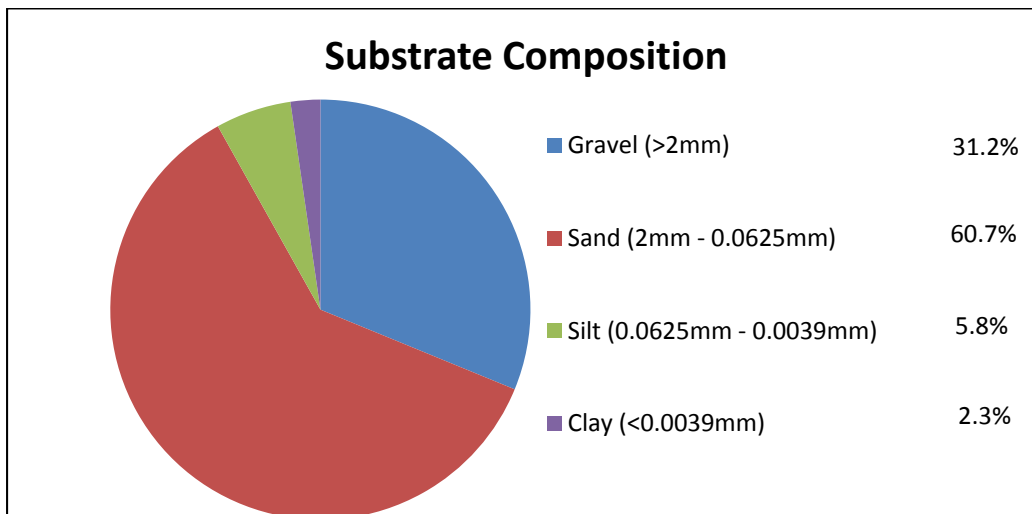


Figure 3.1 Substrate Composition Averaged from Sampling Locations at the Alma DFO-SCH, New Brunswick

Table 3.1 Dominant Sediment Types at Each Sample Location

Sample ID	Sediment Distribution			
	Primary Substrate	Secondary Substrate	Tertiary Substrate	Quaternary Substrate
A-5	Sand	Gravel	Silt	Clay
A-14	Sand	Gravel	Silt	Clay
A-17	Sand	Gravel	Silt	Clay
A-26	Sand	Gravel	Silt/Clay	-
A-28	Gravel	Sand	Silt	Clay
A-30	Sand	Gravel	Silt	Clay
A-38	Sand	Gravel	Silt	Clay

Notes:
 "-" indicates none detected.
 "/" indicates equal amounts of substrate.

4.0 BENTHIC PHOTOGRAPH DESCRIPTION

A series of underwater photographs were collected at each of the sampling locations that show the substrate and any flora and fauna at the site. Photographs are presented in Appendix A and characterization of the photographs collected at each of the sampling locations is provided below.

Sample Station A-5

The substrate at the surface and within the test pit was predominantly sand with lesser amounts of cobble and rock. The photos are devoid of flora or fauna.

Sample Station A-14

The surface of the substrate was a mix of cobble and sand with lesser amounts of gravel. Within the test pit the substrate had a higher percentage of sand with lesser amounts of cobble and gravel. The photos are devoid of flora or fauna.

Sample Station A-17

The surface of the substrate was a mix of cobble and sand with lesser amounts of rock and gravel. Within the test pit the substrate was predominantly sand with lesser amounts of cobble, rock, and gravel. The photos are devoid of flora or fauna; however, macrofloral debris was noted.

Sample Station A-26

The surface of the substrate was a mix of cobble and gravel with lesser amounts of sand. Within the test pit the substrate was predominantly sand with lesser amounts of cobble, rock, and gravel. The photos show the green alga *Spongomorpha sp.* and bladderwrack (*Fucus vesiculosus*). No macrofauna was noted.

Sample Station A-28

The surface of the substrate was a mix of sand and silt with lesser amounts of cobble. Within the test pit the substrate was predominantly sand with lesser amounts of silt, cobble, and gravel. The photos are devoid of flora or fauna; however, macrofloral debris was noted.

Sample Station A-30

The surface of the substrate was a mix of sand and cobble with lesser amounts of gravel and rock. Within the test pit the substrate was predominantly sand with lesser amounts of silt, cobble, and gravel. Bladderwrack (*Fucus vesiculosus*) is present in the photos, but no macrofauna was noted.

Sample Station A-38

The surface of the substrate was a mix of sand and silt with lesser amounts of gravel and rock. Within the test pit the substrate was predominantly sand with lesser amounts of silt, cobble, and gravel. The photos are devoid of flora or fauna; however, macrofloral debris was noted.

5.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

All samples collected were labelled on site using a waterproof marker with the date, sample site identifier, and sample number. The samples were placed upright on ice inside a cooler for safe storage and transport, and were delivered to the laboratory following program completion. A copy of the Chain of Custody (COC) that accompanied the samples is provided in Appendix C. Additional samples were collected to safeguard against loss or damage during transport, and will be stored and refrigerated until the PWGSC Project Manager provides approval to dispose/destroy the samples.

Sample collection, preparation, and analyses followed guidance provided in the previously referenced Environment Canada document. Samples were analyzed by an accredited laboratory with CALA and/or ISO/IEC 17025 and are certified by the Standards Council of Canada (SCC) for each selected chemical analyses of this program. The complete set of analytical results, including laboratory QA/QC and Certificates of Analyses for all parameters tested, are provided in Appendix C.

The laboratory undertakes internal duplicate analyses for QA/QC purposes. Laboratory duplicate analyses were performed on all of the parameters analyzed for this program to meet internal QA/QC objectives for the Alma samples submitted. No discrepancies were noted by the laboratory for the analyses performed.

To assess the quality of the analytical data, a review of the internal laboratory QA/QC results was completed and included a review of laboratory duplicate analyses, method blanks, surrogates, spike samples, and QA/QC standards. This review did not reveal any information or discrepancies that may affect the analytical results of the Alma samples.

A Senior Amec Foster Wheeler Reviewer has reviewed this Report prior to its release. The limitations of this document are provided in Appendix D.

6.0 CONCLUSION

The analytical results of the seven samples collected and analyzed from the Alma DFO-SCH indicate that there were no exceedances of CEPA, CCME SQGs, RBCA Tier 1 Version 3.0 RBSLs or SESLs.

7.0 CLOSING

This document has been prepared and reviewed by the following people:

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Intermediate Project Professional

Reviewed by:



Kerry Higgins, B.Sc., EP
Senior Project Professional

8.0 REFERENCES

- Atlantic Risk-Based Corrective Action (RBCA). 2012. Atlantic RBCA (Risk-Based Corrective Action), for Petroleum Impacted Sites in Atlantic Canada Tier I Version 3, User Guidance. Issued on, July 2012. Available online at: http://www.atlanticrbc.com/data_eng/ATLANTIC_RBCA_User_Guidance_v3_July_2012doc_final.pdf.
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- Canadian Council of Ministers of the Environment (CCME). 2008. Canadian Soil Quality Guidelines Carcinogenic and other Polycyclic Aromatic Hydrocarbons (PAHS) (Environmental and Human Health Effects) Scientific Supporting Document, PN 1401, ISBN 978-1-896997-79-7 PDF. Available on-line at: www.ccme.ca.
- Environment Canada. 1994. Guidance document on collection and preparation of sediments for physicochemical characterization and biological testing. Environmental Protection Series. Report EPS 1/RM/29, December 1994.
- Environment Canada. 1995. User's Guide to the Application Form for Ocean Disposal. Report EPS 1/MA/1, December 1995.



APPENDIX A
Photo Log

Sample Station A-5



Typical depth of penetration of core tubes ~12 cm

Sample Station A-5



Area around A-5



Testpit at A-5, 80 cm deep

Sample Station A-14



Area around A-14



Testpit at A-14, 45 cm deep

Sample Station A-17



Area around A-17



Test Pit at A-17, 80 cm deep

Sample Station A-26



Area around A-26



Test Pit at A-26, 68 cm deep

Sample Station A-28



Area around A-28



Test Pit at A-28, 65 cm deep

Sample Station A-30



Area around A-30



Test Pit at A-30, 65 cm deep

Sample Station A-38



Area around A-38



Test Pit at A-38, 55 cm deep



APPENDIX B
Analytical Summary Tables

Table B.1 PAH Results for Marine Sediments as Compared to Federal Criteria - Alma DFO-SCH, Albert County, New Brunswick

Parameter	RDL	Units	Sample Identification and Date							CEPA Disposal at Sea Screening Criteria - Lower Level	CCME Sediment Quality Guidelines				CCME Soil Quality Guidelines					
			A-5	A-14	A-17	A-26	A-28	A-30	A-38		Interim Sediment Quality Guidelines		Probable Effects Levels		Human Health		Environmental Health			
			13-Jul-15								Freshwater	Marine	Freshwater	Marine	Potable Water	Direct Contact	Soil Contact		Soil and Food Ingestion	Freshwater Life
			13-Jul-15								Freshwater	Marine	Freshwater	Marine	Agricultural, Residential/ Parkland, Commercial and Industrial Land Uses	Agricultural, Residential/ Parkland, Commercial and Industrial Land Uses	Agricultural and Residential/ Parkland Land Uses	Commercial and Industrial Land Uses	Agricultural and Residential/ Parkland Land Uses	Agricultural, Residential/ Parkland, Commercial/ Industrial Land Uses
Polycyclic Aromatic Hydrocarbon (PAH) Results																				
1-Methylnaphthalene	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05											
2-Methylnaphthalene	0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		0.0202	0.0202	0.201	0.201						
Acenaphthene	0.00671		<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671		0.00671	0.00671	0.0889	0.0889					21.5	0.28
Acenaphthylene	0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		0.00587	0.00587	0.128	0.128						320
Anthracene	0.04		<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04		0.0469	0.0469	0.245	0.245		2.5	3.2	61.5		
Benz(a)anthracene	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		0.0371	0.0748	0.385	0.693	0.33			6.2		
Benzo(a)pyrene	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		0.0319	0.0888	0.782	0.763	0.37	20	72	0.6	8800	
Benzo(b)fluoranthene	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05									6.2		
Benzo(b+j)fluoranthene	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1						0.16					
Benzo(g,h,i)perylene	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01						6.8					
Benzo(k)fluoranthene	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01						0.034			6.2		
Chrysene	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		0.0571	0.108	0.862	0.846	2.1			6.2		
Dibenz(a,h)anthracene	0.006		<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006		0.00622	0.00622	0.135	0.135	0.23					
Fluoranthene	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		0.111	0.113	2.355	1.494		50	180	15.4		
Fluorene	0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		0.0212	0.0212	0.144	0.144				15.4	0.25	
Indeno(1,2,3-cd)pyrene	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01						2.7					
Naphthalene	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		0.0346	0.0346	0.391	0.391				8.8	0.013	
Perylene	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05											
Phenanthrene	0.04		<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04		0.0419	0.0867	0.515	0.544				43	0.046	
Pyrene	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		0.053	0.153	0.875	1.398				7.7		
Total PAH	0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	2.5											
Index of Additive Cancer Risk (IACR)	Calculation	None	0.5062354	0.5062354	0.5062354	0.5062354	0.5062354	0.5062354	0.5062354					1						
Benzo(a)pyrene TPE (10 ⁻⁵)	Calculation	mg/kg	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146									5.3		
Creosote or Coal Tar source suspected/known?	yes/no		No	No	No	No	No	No	No											
Uncertainty Factor (UF) Applied	yes/no		No	No	No	No	No	No	No											
Benzo(a)pyrene TPE (10 ⁻⁵) with UF	Calculation	mg/kg	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable									5.3		

NOTE(S):

All results below the laboratory detection limit were divided by 2 prior to further calculations.

Total PAH calculation based on the sum of 16 individual PAH compounds (acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluorene, fluoranthene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene) as per guidance from Environment Canada, 2009.

Additive Cancer Risk (IACR) = ([Benz(a)anthracene]/0.33mg/kg) + ([Benzo(a)pyrene]/0.37mg/kg) + ([Benzo(b+j)fluoranthene]/0.16mg/kg) + ([Benzo(g,h,i)perylene]/6.8mg/kg) + ([Benzo(k)fluoranthene]/0.034mg/kg) + ([Chrysene]/2.1mg/kg) + ([Dibenz(a,h)anthracene]/0.23mg/kg) + ([Indeno(1,2,3-c,d)pyrene]/2.7mg/kg).

Total Potency Equivalent (TPE) based on an incremental lifetime cancer risk (ILCR) of 1 in 100,000 (10⁻⁵).

Benzo(a)pyrene TPE (10⁻⁵) = Sum of PAH concentration multiplied by their respective Benzo(a)pyrene Potency Equivalency Factors: ([Benz(a)anthracene]*0.1) + ([Benzo(a)pyrene]*1) + ([Benzo(b+j)fluoranthene]*0.1) + ([Benzo(k)fluoranthene]*0.1) + ([Benzo(g,h,i)perylene]*0.01) + ([Chrysene]*0.01) + ([Dibenz(a,h)anthracene]*1) + ([Indeno(1,2,3-c,d)pyrene]*0.1).

Benzo(a)pyrene TPE Uncertainty Factor = 3.

Light values indicate results below detection limit.

Table B.2 Metal Results for Marine Sediments as Compared to Federal Criteria - Alma DFO-SCH, Albert County, New Brunswick

Parameter	RDL	Units	Sample Identification and Date							CEPA Disposal at Sea Screening Criteria - Lower Level	CCME Sediment Quality Guidelines				CCME Soil Quality Guidelines				
			A-5	A-14	A-17	A-26	A-28	A-30	A-38		Interim Sediment Quality Guidelines		Probable Effects Levels		Agricultural Land Use	Residential/Parkland Land Use	Commercial Land Use	Industrial Land Use	
			13-Jul-15								Freshwater	Marine	Freshwater	Marine					
Aluminum	10	mg/kg	6980	7620	7460	7410	7550	7760	6820										
Antimony	1		<1	<1	<1	<1	<1	<1	<1	<1					20	20	40	40	
Arsenic	1		4	4	4	4	4	4	4	3		5.9	7.24	17.0	41.6	12	12	12	12
Barium	5		13	11	19	15	15	18	49							750	500	2000	2000
Beryllium	2		<2	<2	<2	<2	<2	<2	<2	<2						4	4	8	8
Boron (Total)	2		5	4	7	5	7	7	14										
Cadmium	0.3		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.6	0.6	0.7	3.5	4.2	1.4	10	22	22
Chromium (Hexavalent)	0.4		< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4						0.4	0.4	1.4	1.4
Chromium (Total)	2		11	10	12	11	11	11	11			37.3	52.3	90.0	160	64	64	87	87
Cobalt	1		6	6	6	6	7	6	6							40	50	300	300
Copper	2		11	14	13	14	17	14	10		81*	35.7	18.7	197	108	63	63	91	91
Iron	50		12700	13600	13300	13100	13400	13700	11500										
Lead	0.5		6.4	8.6	7	7	10.1	8.7	7.3		66*	35.0	30.2	91.3	112	70	140	260	600
Manganese	2		273	329	274	322	373	321	234										
Mercury (Total)	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		0.75	0.17	0.13	0.486	0.7	6.6	6.6	24	50
Molybdenum	2		<2	<2	<2	<2	<2	<2	<2							5	10	40	40
Nickel	2		11	11	12	11	12	11	11							50	50	50	50
Selenium	1		<1	<1	<1	<1	<1	<1	<1							1	1	2.9	2.9
Silver	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5							20	20	40	40
Strontium	5		12	13	14	13	14	15	18										
Thallium	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1							1	1	1	1
Tin	2		3	3	4	3	3	4	3							5	50	300	300
Uranium	0.1		0.4	0.5	0.6	0.5	0.6	1.1	0.7							23	23	33	300
Vanadium	2		18	18	18	18	23	20	18							130	130	130	130
Zinc	5		42	49	46	44	45	50	39		160*	123	124	315	271	200	200	360	360

NOTE(S):

*Former Interim Rejection Limits (1991) which are not currently used to screen for ocean based disposal permitting but may be considered in terms of further investigation prior to issuance of an Ocean Disposal Permit (Victor Li, Environment Canada, pers. comm., June 2002).

Light values indicate results below detection limit.

Table B.3 BTEX/TPH Results for Marine Sediments as Compared to Federal Criteria - Alma DFO-SCH, Albert County, New Brunswick

Sample Identification	Date	Units	BTEX Concentrations				Petroleum Hydrocarbon Fraction Concentrations				MTBE	Reached Baseline at C32	Resemblance	FOC
			Benzene	Toluene	Ethylbenzene	Xylene	C ₆ -C ₁₀	C ₁₀ -C ₂₁	C ₂₁ -C ₃₂	Modified TPH (Less BTEX)				
A-5	13-Jul-15	mg/kg	< 0.005	< 0.04	< 0.01	< 0.05	< 3	< 15	< 15	< 20	< 0.050	Y	NR	0.000075
A-14			< 0.005	< 0.04	< 0.01	< 0.05	< 3	< 15	< 15	< 20	< 0.050	Y	NR	0.000075
A-17			< 0.005	< 0.04	< 0.01	< 0.05	< 3	< 15	< 15	< 20	< 0.050	Y	NR	0.0096
A-26			< 0.005	< 0.04	< 0.01	< 0.05	< 3	< 15	< 15	< 20	< 0.050	Y	NR	0.000075
A-28			< 0.005	< 0.04	< 0.01	< 0.05	< 3	< 15	< 15	< 20	< 0.050	Y	NR	0.0083
A-30			< 0.005	< 0.04	< 0.01	< 0.05	< 3	< 15	< 15	< 20	< 0.050	Y	NR	0.0057
A-38			< 0.005	< 0.04	< 0.01	< 0.05	< 3	< 15	16	< 20	< 0.050	Y	NR	0.0056
RDL			0.005	0.04	0.01	0.05	3	15	15	20	0.050			
Guidelines			Benzene	Toluene	Ethylbenzene	Xylene	Gasoline	Diesel / No. 2 Fuel Oil	No. 6 Oil/ Lube Oil	Modified TPH (Less BTEX)	MTBE			
Atlantic RBCA Tier I Version 3.0														
Risk-Based Screening Levels for Soil														
Agricultural/ Residential Land Use	Potable	Coarse-Grained Soil	0.042	0.35	0.065	8.8	74	270	1100					
		Fine-Grained Soil	0.094	0.74	0.13	22	1900	4700	10000					
	Non-Potable	Coarse-Grained Soil	0.099	77	30	8.8	74	270	1100					
		Fine-Grained Soil	2.3	10000	9300	210	2100	8600	10000					
Commercial/ Industrial Land Use	Potable	Coarse-Grained Soil	0.042	0.35	0.065	11	870	1800	10000					
		Fine-Grained Soil	0.094	0.74	0.13	22	1900	4700	10000					
	Non-Potable	Coarse-Grained Soil	2.5	10000	10000	110	870	4000	10000					
		Fine-Grained Soil	33	10000	10000	10000	10000	10000	10000					
Residential Saturation		Coarse-Grained Soil	890	450	240	340	TBD	TBD	TBD					
		Fine-Grained Soil	1000	480	250	360	TBD	TBD	TBD					
Sediment Ecological Screening Levels for the Protection of Freshwater and Marine Aquatic Life														
Sediment Type		Typical	1.2	1.4	1.2	1.3	15	25	43					
(based on standard FOC =		Other	5.4	6.1	5	5.5	67	110	190					
CCME Soil Quality Guidelines														
Agricultural, Residential/ Parkland, Commercial, and Industrial Land Uses	Surface	Coarse-Grained Soil	0.03	0.37	0.082	11.0								
		Fine-Grained Soil	0.0068	0.08	0.018	2.4								
	Subsoil	Coarse-Grained Soil	0.03	0.37	0.082	11.0								
		Fine-Grained Soil	0.0068	0.08	0.018	2.4								

NOTE(S):

NR - No Resemblance

Fraction of Organic Content (FOC) = g-carbon/g-soil

CCME Soil Quality Guidelines for benzene based on an incremental lifetime cancer risk (ILCR) of 1 in 100,000 (10⁻⁵).

Light values indicate results below detection limit.

Table B.4 PCB and DDT Results for Marine Sediments as Compared to Federal Criteria - Alma DFO-SCH, Albert County, New Brunswick

Parameter	RDL	Units	Sample Identification and Date						CEPA Disposal at Sea Screening Criteria - Lower Level	CCME Sediment Quality Guidelines				CCME Soil Quality Guidelines			
			A-5	A-14	A-17	A-26	A-28	A-30		A-38	Interim Sediment Quality Guidelines		Marine and Estuarine Probable Effects Levels		Agricultural Land Use	Residential/Parkland Land Use	Commercial/Industrial Land Use
			13-Jul-15							Freshwater	Marine	Freshwater	Marine				
Polychlorinated Biphenyl (PCB) Results																	
Aroclor 1016	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1								
Aroclor 1221	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1								
Aroclor 1232	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1								
Aroclor 1242	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1								
Aroclor 1248	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1								
Aroclor 1254	0.0633		<0.0633	<0.0633	<0.0633	<0.0633	<0.0633	<0.0633	<0.0633	0.060	0.0633	0.340	0.709				
Aroclor 1260	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1								
Aroclor 1262	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1								
Aroclor 1268	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1								
Dieldrin	0.0007		< 0.0007	< 0.0007	< 0.0007	< 0.0007	< 0.0007	< 0.0007	< 0.0007	0.00285	0.00071	0.00667	0.0043				
Total PCB Concentration	0.0215	<0.0215	<0.0215	<0.0215	<0.0215	<0.0215	<0.0215	<0.0215	0.1	0.0341	0.0215	0.277	0.189	0.5	1.3	33	
Dichloro-Diphenyl-Trichloroethane (DDT) Results																	
o,p-DDE	0.001	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001								
p,p-DDE	0.001		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001								
o,p-DDD	0.001		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001								
p,p-DDD	0.001		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001								
o,p-DDT	0.001		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001								
p,p-DDT	0.001		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001								
o,p-DDT + p,p-DDT	0.001		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.00119	0.00119	0.00477	0.00477				
o,p-DDD + p,p-DDD	0.001		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.00354	0.00122	0.00851	0.00781				
o,p-DDE + p,p-DDE	0.001		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.00142	0.00207	0.00675	0.37400				
Total DDT (calculated)	0.001		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001					0.7	0.7	12	

NOTE(S):
Light values indicate results below detection limit.

Table B.5 Grain Size and Carbon Content Results for Marine Sediments -Alma DFO-SCH, Albert County, New Brunswick

Parameter	RDL	Units	Sample Identification and Date						
			A-5	A-14	A-17	A-26	A-28	A-30	A-38
			13-Jul-15						
Grain Size Results									
< PHI -4 (12.5 mm)	0.1	%	100	100	100	80.3	75.9	100	66.9
< PHI -3 (9.5 mm)	0.1		100	94.1	100	78	63.9	94.8	66.9
< PHI -2 (4.75 mm)	0.1		93.5	78.7	97.9	69.8	57.6	86.7	64.9
< PHI -1 (2 mm)	0.1		87.9	62	93.8	59.2	39.1	77.5	62.5
< PHI 0 (1 mm)	0.1		83.7	50.7	89.3	51.2	26.2	69.3	59.3
< PHI +1 (1/2 mm)	0.1		76.4	38.9	80.5	45	18	58.9	56.5
< PHI +2 (1/4 mm)	0.1		29.8	13	37.4	28.2	12.6	31	49.8
< PHI +3 (1/8 mm)	0.1		5.2	4.8	12.2	5.9	9.1	17	33.4
< PHI +4 (1/16 mm)	0.1		3.1	3.6	8.2	3.9	7.3	10.8	20
< PHI +5 (1/32 mm)	0.1		2.5	2.6	6.4	2.7	5.8	6.1	9.3
< PHI +6 (1/64 mm)	0.1		1.9	1.9	4.9	2.5	4.9	3.9	5.1
< PHI +7 (1/128 mm)	0.1		1.6	1.5	3.5	1.8	3.2	2.9	4.2
< PHI +8 (1/256 mm)	0.1		1.4	1.2	2.9	1.7	2.5	2.4	3.5
< PHI +9 (1/512 mm)	0.1		1.3	1.1	2.2	1.2	2	1.9	2.5
Gravel	1			12	38	6	41	61	23
Sand	1		85	58	86	55	32	67	43
Silt	1		2	2	5	2	5	8	17
Clay	1		1	1	3	2	3	2	4
Other									
Total Organic Carbon (TOC)	0.15	%	<0.15	<0.15	0.96	<0.15	0.83	0.57	0.56
Total Inorganic Carbon (TIC)	0.15	%	0.18	0.32	0.64	0.25	1.11	0.92	1.75
Total Carbon (TC)		%	0.26	0.40	1.60	0.33	1.94	1.49	2.31

NOTE(S):

All results below the laboratory detection limit were divided by 2 prior to further calculations.

Light values indicate results below detection limit.



APPENDIX C
QA/QC, COC, and Laboratory Certificates of Analyses



**CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL
580 MAIN STREET, SUITE 105
SAINT JOHN, NB E2K1J5
(506) 652-9497**

ATTENTION TO: Chyann Kirby

PROJECT: TE131446.1000

AGAT WORK ORDER: 15X995728

SOIL ANALYSIS REVIEWED BY: Jason Coughtrey, Inorganics Supervisor

TRACE ORGANICS REVIEWED BY: Jennifer Patterson, Organics Supervisor

DATE REPORTED: Jul 28, 2015

PAGES (INCLUDING COVER): 21

VERSION*: 2

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

***NOTES**

VERSION 2: Final report, issued, July 28, 2015.

VERSION 1: Leachable parameters only, issued, July 24, 2015.

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.



Certificate of Analysis

AGAT WORK ORDER: 15X995728

PROJECT: TE131446.1000

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Dartmouth, Nova Scotia
CANADA B3B 1M2
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CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: Chyann Kirby

SAMPLING SITE:

SAMPLED BY:

AMEC - NB - Available Metals in Soil

DATE RECEIVED: 2015-07-15

DATE REPORTED: 2015-07-28

Parameter	Unit	SAMPLE DESCRIPTION:		A-5	A-14	A-17	A-26	A-28	A-30	A-38
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015
		G / S	RDL	6738028	6738260	6738264	6738268	6738273	6738277	6738281
Aluminum	mg/kg	10	6980	7620	7460	7410	7550	7760	6820	
Antimony	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	
Arsenic	mg/kg	1	4	4	4	4	4	4	3	
Barium	mg/kg	5	13	11	19	15	15	18	49	
Beryllium	mg/kg	2	<2	<2	<2	<2	<2	<2	<2	
Boron	mg/kg	2	5	4	7	5	7	7	14	
Cadmium	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
Chromium	mg/kg	2	11	10	12	11	11	11	11	
Cobalt	mg/kg	1	6	6	6	6	7	6	6	
Copper	mg/kg	2	11	14	13	14	17	14	10	
Iron	mg/kg	50	12700	13600	13300	13100	13400	13700	11500	
Lead	mg/kg	0.5	6.4	8.6	7.0	7.0	10.1	8.7	7.3	
Lithium	mg/kg	5	15	16	17	17	17	17	17	
Manganese	mg/kg	2	273	329	274	322	373	321	234	
Molybdenum	mg/kg	2	<2	<2	<2	<2	<2	<2	<2	
Nickel	mg/kg	2	11	11	12	11	12	11	11	
Selenium	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	
Silver	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Strontium	mg/kg	5	12	13	14	13	14	15	18	
Thallium	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Tin	mg/kg	2	3	3	4	3	3	4	3	
Uranium	mg/kg	0.1	0.4	0.5	0.6	0.5	0.6	1.1	0.7	
Vanadium	mg/kg	2	18	18	18	18	23	20	18	
Zinc	mg/kg	5	42	49	46	44	45	50	39	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

6738028-6738281 Results are based on the dry weight of the sample.

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 15X995728

PROJECT: TE131446.1000

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CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: Chyann Kirby

SAMPLING SITE:

SAMPLED BY:

AMEC - NB - Hexavalent Chromium in Soil

DATE RECEIVED: 2015-07-15

DATE REPORTED: 2015-07-28

Parameter	Unit	SAMPLE DESCRIPTION:		A-5	A-14	A-17	A-26	A-28	A-30	A-38
		G / S	RDL	Soil	Soil	Soil	Soil	Soil	Soil	Soil
DATE SAMPLED:		7/13/2015		7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015
Chromium, Hexavalent	mg/kg	0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 15X995728

PROJECT: TE131446.1000

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CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: Chyann Kirby

SAMPLING SITE:

SAMPLED BY:

AMEC - NB - TOC/TIC

DATE RECEIVED: 2015-07-15

DATE REPORTED: 2015-07-28

Parameter	Unit	SAMPLE DESCRIPTION:		A-5	A-14	A-17	A-26	A-28	A-30	A-38
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015
		G / S	RDL	6738028	6738260	6738264	6738268	6738273	6738277	6738281
Total Organic Carbon by Walkley Black	%		0.15	<0.15	<0.15	0.96	<0.15	0.83	0.57	0.56
Total Inorganic Carbon, Calculated	%		0.15	0.18	0.32	0.64	0.25	1.11	0.92	1.75

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard
 6738028-6738281 * Total Carbon analysis performed at AGAT Laboratories Burnaby.

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 15X995728

PROJECT: TE131446.1000

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CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: Chyann Kirby

SAMPLING SITE:

SAMPLED BY:

Grain Size Analysis (Sieve & Pipette)

DATE RECEIVED: 2015-07-15

DATE REPORTED: 2015-07-28

Parameter	Unit	SAMPLE DESCRIPTION:		A-5	A-14	A-17	A-26	A-28	A-30	A-38
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015
		G / S	RDL	6738028	6738260	6738264	6738268	6738273	6738277	6738281
Particle Size Distribution (<12.5mm, -4 PHI)	%		0.1	100	100	100	80.3	75.9	100	66.9
Particle Size Distribution (<9.5mm, -3 PHI)	%		0.1	100	94.1	100	78.0	63.9	94.8	66.9
Particle Size Distribution (<4.75mm, -2 PHI)	%		0.1	93.5	78.7	97.9	69.8	57.6	86.7	64.9
Particle Size Distribution (<2mm, -1 PHI)	%		0.1	87.9	62.0	93.8	59.2	39.1	77.5	62.5
Particle Size Distribution (<1mm, 0 PHI)	%		0.1	83.7	50.7	89.3	51.2	26.2	69.3	59.3
Particle Size Distribution (<1/2mm, 1 PHI)	%		0.1	76.4	38.9	80.5	45.0	18.0	58.9	56.5
Particle Size Distribution (<1/4mm, 2 PHI)	%		0.1	29.8	13.0	37.4	28.2	12.6	31.0	49.8
Particle Size Distribution (<1/8mm, 3 PHI)	%		0.1	5.2	4.8	12.2	5.9	9.1	17.0	33.4
Particle Size Distribution (<1/16mm, 4 PHI)	%		0.1	3.1	3.6	8.2	3.9	7.3	10.8	20.0
Particle Size Distribution (<1/32mm, 5 PHI)	%		0.1	2.5	2.6	6.4	2.7	5.8	6.1	9.3
Particle Size Distribution (<1/64mm, 6 PHI)	%		0.1	1.9	1.9	4.9	2.5	4.9	3.9	5.1
Particle Size Distribution (<1/128mm, 7 PHI)	%		0.1	1.6	1.5	3.5	1.8	3.2	2.9	4.2
Particle Size Distribution (<1/256mm, 8 PHI)	%		0.1	1.4	1.2	2.9	1.7	2.5	2.4	3.5
Particle Size Distribution (<1/512mm, 9 PHI)	%		0.1	1.3	1.1	2.2	1.2	2.0	1.9	2.5
Particle Size Distribution (Gravel)	%		1	12	38	6	41	61	23	38
Particle Size Distribution (Sand)	%		1	85	58	86	55	32	67	43
Particle Size Distribution (Silt)	%		1	2	2	5	2	5	8	17
Particle Size Distribution (Clay)	%		1	1	1	3	2	3	2	4
Particles >75um	%		1	96	96	91	96	92	88	77
Classification	Coarse/Fine			Coarse	Coarse	Coarse	Coarse	Coarse	Coarse	Coarse

Certified By:



AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 15X995728

PROJECT: TE131446.1000

11 Morris Drive, Unit 122
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<http://www.agatlabs.com>

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: Chyann Kirby

SAMPLING SITE:

SAMPLED BY:

Grain Size Analysis (Sieve & Pipette)

DATE RECEIVED: 2015-07-15

DATE REPORTED: 2015-07-28

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 15X995728

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CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: Chyann Kirby

SAMPLING SITE:

SAMPLED BY:

Mercury Analysis in Soil

DATE RECEIVED: 2015-07-15

DATE REPORTED: 2015-07-28

Parameter	Unit	SAMPLE DESCRIPTION:		A-5	A-14	A-17	A-26	A-28	A-30	A-38
		G / S	RDL	Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015
				6738028	6738260	6738264	6738268	6738273	6738277	6738281
Mercury	mg/kg			0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

6738028-6738281 Results are based on the dry weight of the soil.

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 15X995728

PROJECT: TE131446.1000

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CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: Chyann Kirby

SAMPLING SITE:

SAMPLED BY:

AMEC - NB - Atlantic RBCA Tier 1 Hydrocarbons in Soil + Silica Gel + Creosote

DATE RECEIVED: 2015-07-15

DATE REPORTED: 2015-07-28

Parameter	Unit	SAMPLE DESCRIPTION:		A-5	A-14	A-17	A-26	A-28	A-30	A-38
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015
		G / S	RDL	6738028	6738260	6738264	6738268	6738273	6738277	6738281
Methyl-t-Butyl-Ether (MTBE)	mg/Kg		0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzene	mg/kg		0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	mg/kg		0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Ethylbenzene	mg/kg		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Xylene (Total)	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
C6-C10 (less BTEX)	mg/kg		3	<3	<3	<3	<3	<3	<3	<3
>C10-C21 Hydrocarbons	mg/kg		15	<15	<15	<15	<15	<15	<15	<15
>C21-C32 Hydrocarbons	mg/kg		15	<15	<15	<15	<15	<15	<15	16
Modified TPH (Tier 1)	mg/kg		20	<20	<20	<20	<20	<20	<20	<20
Resemblance Comment				NR	NR	NR	NR	NR	NR	NR
Creosote Comment				NR	NR	NR	NR	NR	NR	NR
Return to Baseline at C32				Y	Y	Y	Y	Y	Y	Y
% Moisture	%		1	22	8	24	11	8	23	44
Silica Gel Cleanup				Y	Y	Y	Y	Y	Y	Y
Surrogate	Unit	Acceptable Limits								
Isobutylbenzene - EPH	%	60-140		105	111	105	107	101	105	106
Isobutylbenzene - VPH	%	60-140		80	75	71	65	69	75	73
n-Dotriacontane - EPH	%	60-140		97	105	95	98	93	100	102

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

6738028-6738281 Results are based on the dry weight of the soil.

Resemblance Comment Key:
 GF - Gasoline Fraction
 WGF - Weathered Gasoline Fraction
 GR - Product in Gasoline Range
 FOF - Fuel Oil Fraction
 WFOF - Weathered Fuel Oil Fraction
 FR - Product in Fuel Oil Range
 LOF - Lube Oil Fraction
 UC - Unidentified Compounds
 NR - No Resemblance
 NA - Not Applicable

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CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: Chyann Kirby

SAMPLING SITE:

SAMPLED BY:

AMEC - NB - DDT in Soil

DATE RECEIVED: 2015-07-15

DATE REPORTED: 2015-07-28

Parameter	Unit	SAMPLE DESCRIPTION:		A-5	A-14	A-17	A-26	A-28	A-30	A-38
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015
		G / S	RDL	6738028	6738260	6738264	6738268	6738273	6738277	6738281
Dieldrin (Hfx 2012-03)	µg/kg		0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7
o,p'-DDD (Hfx 2012-03)	µg/kg		1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
o,p'-DDE (Hfx 2012-03)	µg/kg		1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
o,p'-DDT (Hfx 2012-03)	µg/kg		1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
p,p'-DDD (Hfx 2012-03)	µg/kg		1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
p,p'-DDE (Hfx 2012-03)	µg/kg		1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
p,p'-DDT (Hfx 2012-03)	µg/kg		1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
o,p'-DDT + p,p'-DDT	µg/kg		1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
o,p'-DDD + p,p'-DDD	ug/kg		1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
o,p'-DDE + p,p'-DDE	µg/kg		1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total DDT	µg/kg		1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

J. Patterson



Certificate of Analysis

AGAT WORK ORDER: 15X995728

PROJECT: TE131446.1000

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CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: Chyann Kirby

SAMPLING SITE:

SAMPLED BY:

AMEC - NB - PCB Arochlor

DATE RECEIVED: 2015-07-15

DATE REPORTED: 2015-07-28

Parameter	Unit	SAMPLE DESCRIPTION:		A-5	A-14	A-17	A-26	A-28	A-30	A-38
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015
		G / S	RDL	6738028	6738260	6738264	6738268	6738273	6738277	6738281
Aroclor 1242	mg/kg		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg		0.0633	<0.0633	<0.0633	<0.0633	<0.0633	<0.0633	<0.0633	<0.0633
Aroclor 1260	mg/kg		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1016	mg/kg		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1262	mg/kg		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1268	mg/kg		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

6738028-6738281 Results are based on the dry weight of the soil.

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 15X995728

PROJECT: TE131446.1000

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CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: Chyann Kirby

SAMPLING SITE:

SAMPLED BY:

AMEC - NB - Polycyclic Aromatic Hydrocarbons in Soil

DATE RECEIVED: 2015-07-15

DATE REPORTED: 2015-07-28

Parameter	Unit	SAMPLE DESCRIPTION:		A-5	A-14	A-17	A-26	A-28	A-30	A-38
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015
		G / S	RDL	6738028	6738260	6738264	6738268	6738273	6738277	6738281
1-Methylnaphthalene	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
2-Methylnaphthalene	mg/kg		0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Acenaphthene	mg/kg		0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671
Acenaphthylene	mg/kg		0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Acridine	mg/Kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Anthracene	mg/kg		0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Benzo(a)anthracene	mg/kg		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	mg/kg		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(b+j)fluoranthene	mg/kg		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(e)pyrene	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(ghi)perylene	mg/kg		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	mg/kg		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	mg/kg		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenzo(a,h)anthracene	mg/kg		0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Fluoranthene	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Fluorene	mg/kg		0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Indeno(1,2,3)pyrene	mg/kg		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Naphthalene	mg/kg		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perylene	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Phenanthrene	mg/kg		0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Pyrene	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Quinoline	mg/Kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total PAH	mg/Kg		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
% Moisture	%			22	8	24	11	8	23	44
Surrogate	Unit	Acceptable Limits								
Nitrobenzene-d5	%	50-140		80	77	75	77	83	72	70
2-Fluorobiphenyl	%	50-140		86	84	83	85	84	79	81
Terphenyl-d14	%	50-140		59	56	54	55	56	50	55

Certified By:

J. Patterson



AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 15X995728

PROJECT: TE131446.1000

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CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: Chyann Kirby

SAMPLING SITE:

SAMPLED BY:

AMEC - NB - Polycyclic Aromatic Hydrocarbons in Soil

DATE RECEIVED: 2015-07-15

DATE REPORTED: 2015-07-28

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

6738028-6738281 Results are based on the dry weight of the soil.

Certified By:

J. Patterson



Certificate of Analysis

AGAT WORK ORDER: 15X995728

PROJECT: TE131446.1000

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CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: Chyann Kirby

SAMPLING SITE:

SAMPLED BY:

AMEC - NB - Total Polychlorinated Biphenyls

DATE RECEIVED: 2015-07-15

DATE REPORTED: 2015-07-28

Parameter	Unit	SAMPLE DESCRIPTION:		A-5	A-14	A-17	A-26	A-28	A-30	A-38
		G / S	RDL	Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015
		G / S		6738028	6738260	6738264	6738268	6738273	6738277	6738281
Total Polychlorinated Biphenyls	mg/kg	0.0215	<0.0215	<0.0215	<0.0215	<0.0215	<0.0215	<0.0215	<0.0215	<0.0215

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

6738028-6738281 Results are based on the dry weight of the soil.

Certified By:

Quality Assurance

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL
AGAT WORK ORDER: 15X995728
PROJECT: TE131446.1000
ATTENTION TO: Chyann Kirby
SAMPLING SITE:
SAMPLED BY:

Soil Analysis																
RPT Date: Jul 28, 2015			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits		
								Lower	Upper		Lower	Upper		Lower	Upper	

AMEC - NB - TOC/TIC

Total Organic Carbon by Walkley Black	986	4706	0.30	0.25	18.2%	< 0.15	96%	80%	120%	NA	80%	120%	98%	80%	120%
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AMEC - NB - Available Metals in Soil

Aluminum	7162015		4260	4400	3.2%	< 10	120%	80%	120%	119%	80%	120%	NA	70%	130%
Antimony	7162015		< 1	< 1	0.0%	< 1	93%	80%	120%	103%	80%	120%	75%	70%	130%
Arsenic	7162015		2	2	0.0%	< 1	96%	80%	120%	98%	80%	120%	91%	70%	130%
Barium	7162015		12	12	0.0%	< 5	99%	80%	120%	100%	80%	120%	120%	70%	130%
Beryllium	7162015		< 2	< 2	0.0%	< 2	111%	80%	120%	108%	80%	120%	101%	70%	130%
Boron	7162015		2	2	0.0%	< 2	109%	80%	120%	106%	80%	120%	90%	70%	130%
Cadmium	7162015		< 0.3	< 0.3	0.0%	< 0.3	98%	80%	120%	98%	80%	120%	87%	70%	130%
Chromium	7162015		6	5	18.2%	< 2	114%	80%	120%	97%	80%	120%	90%	70%	130%
Cobalt	7162015		3	4	NA	< 1	114%	80%	120%	114%	80%	120%	84%	70%	130%
Copper	7162015		5	5	0.0%	< 2	119%	80%	120%	117%	80%	120%	87%	70%	130%
Iron	7162015		6800	6560	3.6%	< 50	117%	80%	120%	115%	80%	120%	106%	70%	130%
Lead	7162015		3.6	3.6	0.0%	< 0.5	110%	80%	120%	106%	80%	120%	96%	70%	130%
Lithium	7162015		10	10	0.0%	< 5	111%	70%	130%	112%	70%	130%	109%	70%	130%
Manganese	7162015		363	359	1.1%	< 2	116%	80%	120%	113%	80%	120%	98%	70%	130%
Molybdenum	7162015		< 2	< 2	0.0%	< 2	99%	80%	120%	97%	80%	120%	81%	70%	130%
Nickel	7162015		7	7	0.0%	< 2	117%	80%	120%	113%	80%	120%	88%	70%	130%
Selenium	7162015		< 1	< 1	0.0%	< 1	103%	80%	120%	102%	80%	120%	77%	70%	130%
Silver	7162015		< 0.5	< 0.5	0.0%	< 0.5	103%	80%	120%	102%	80%	120%	86%	70%	130%
Strontium	7162015		< 5	< 5	0.0%	< 5	98%	80%	120%	97%	80%	120%	91%	70%	130%
Thallium	7162015		< 0.1	< 0.1	0.0%	< 0.1	107%	80%	120%	103%	80%	120%	NA	70%	130%
Tin	7162015		4	3	NA	< 2	101%	80%	120%	99%	80%	120%	91%	70%	130%
Uranium	7162015		0.3	0.3	0.0%	< 0.1	101%	80%	120%	99%	80%	120%	91%	70%	130%
Vanadium	7162015		5	4	NA	< 2	110%	80%	120%	111%	80%	120%	105%	70%	130%
Zinc	7162015		13	16	NA	< 5	120%	80%	120%	109%	80%	120%	88%	70%	130%

Mercury Analysis in Soil

Mercury	1	6747204	< 0.05	< 0.05	0.0%	< 0.05	98%	70%	130%		70%	130%	106%	70%	130%
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Certified By:


Quality Assurance

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL
AGAT WORK ORDER: 15X995728
PROJECT: TE131446.1000
ATTENTION TO: Chyann Kirby
SAMPLING SITE:
SAMPLED BY:

Trace Organics Analysis															
RPT Date: Jul 28, 2015			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE		MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

AMEC - NB - Polycyclic Aromatic Hydrocarbons in Soil

1-Methylnaphthalene	1	6738264	< 0.05	< 0.05	0.0%	< 0.05	50%	50%	140%	106%	50%	140%	94%	50%	140%
2-Methylnaphthalene	1	6738264	< 0.02	< 0.02	0.0%	< 0.02	116%	50%	140%	125%	50%	140%	63%	50%	140%
Acenaphthene	1	6738264	< 0.00671	< 0.00671	0.0%	< 0.00671	108%	50%	140%	96%	50%	140%	88%	50%	140%
Acenaphthylene	1	6738264	< 0.005	< 0.005	0.0%	< 0.005	105%	50%	140%	94%	50%	140%	79%	50%	140%
Acridine	1	6738264	< 0.05	< 0.05	0.0%	< 0.05	57%	50%	140%	71%	50%	140%	56%	50%	140%
Anthracene	1	6738264	< 0.04	< 0.04	0.0%	< 0.04	88%	50%	140%	83%	50%	140%	74%	50%	140%
Benzo(a)anthracene	1	6738264	< 0.01	< 0.01	0.0%	< 0.01	68%	50%	140%	58%	50%	140%	58%	50%	140%
Benzo(a)pyrene	1	6738264	< 0.01	< 0.01	0.0%	< 0.01	57%	50%	140%	59%	50%	140%	67%	50%	140%
Benzo(b)fluoranthene	1	6738264	< 0.05	< 0.05	0.0%	< 0.05	59%	50%	140%	63%	50%	140%	63%	50%	140%
Benzo(b+j)fluoranthene	1	6738264	< 0.1	< 0.1	0.0%	< 0.1	76%	50%	140%	71%	50%	140%	88%	50%	140%
Benzo(e)pyrene	1	6738264	< 0.05	< 0.05	0.0%	< 0.05	85%	50%	140%	86%	50%	140%	89%	50%	140%
Benzo(ghi)perylene	1	6738264	< 0.01	< 0.01	0.0%	< 0.01	67%	50%	140%	68%	50%	140%	57%	50%	140%
Benzo(k)fluoranthene	1	6738264	< 0.01	< 0.01	0.0%	< 0.01	76%	50%	140%	79%	50%	140%	77%	50%	140%
Chrysene	1	6738264	< 0.01	< 0.01	0.0%	< 0.01	90%	50%	140%	89%	50%	140%	93%	50%	140%
Dibenzo(a,h)anthracene	1	6738264	< 0.006	< 0.006	0.0%	< 0.006	64%	50%	140%	75%	50%	140%	53%	50%	140%
Fluoranthene	1	6738264	< 0.05	< 0.05	0.0%	< 0.05	87%	50%	140%	81%	50%	140%	129%	50%	140%
Fluorene	1	6738264	< 0.02	< 0.02	0.0%	< 0.02	113%	50%	140%	79%	50%	140%	71%	50%	140%
Indeno(1,2,3)pyrene	1	6738264	< 0.01	< 0.01	0.0%	< 0.01	68%	50%	140%	63%	50%	140%	53%	50%	140%
Naphthalene	1	6738264	< 0.01	< 0.01	0.0%	< 0.01	105%	50%	140%	98%	50%	140%	86%	50%	140%
Perylene	1	6738264	< 0.05	< 0.05	0.0%	< 0.05	96%	50%	140%	100%	50%	140%	116%	50%	140%
Phenanthrene	1	6738264	< 0.04	< 0.04	0.0%	< 0.04	106%	50%	140%	101%	50%	140%	112%	50%	140%
Pyrene	1	6738264	< 0.05	< 0.05	0.0%	< 0.05	89%	50%	140%	85%	50%	140%	114%	50%	140%
Quinoline	1	6738264	< 0.05	< 0.05	0.0%	< 0.05	111%	50%	140%	104%	50%	140%	91%	50%	140%

AMEC - NB - Total Polychlorinated Biphenyls

Total Polychlorinated Biphenyls	1	6738064	< 0.0215	< 0.0215	0.0%	< 0.0215	100%	70%	130%	99%	60%	130%	NA	60%	130%
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Comments: If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

AMEC - NB - DDT in Soil

Dieldrin (Hfx 2012-03)	1	6738064	< 0.7	< 0.7	0.0%	< 0.7	99%	60%	130%	105%	70%	130%	117%	60%	130%
o,p'-DDD (Hfx 2012-03)	1	6738064	< 1.0	< 1.0	0.0%	< 1.0	106%	60%	130%	106%	70%	130%	130%	60%	130%
o,p'-DDE (Hfx 2012-03)	1	6738064	< 1.0	< 1.0	0.0%	< 1.0	105%	60%	130%	98%	70%	130%	100%	60%	130%
o,p'-DDT (Hfx 2012-03)	1	6738064	< 1.0	< 1.0	0.0%	< 1.0	103%	60%	130%	106%	70%	130%	92%	60%	130%
p,p'-DDD (Hfx 2012-03)	1	6738064	< 1.0	< 1.0	0.0%	< 1.0	101%	60%	130%	108%	70%	130%	124%	60%	130%
p,p'-DDE (Hfx 2012-03)	1	6738064	< 1.0	< 1.0	0.0%	< 1.0	99%	60%	130%	105%	70%	130%	117%	60%	130%
p,p'-DDT (Hfx 2012-03)	1	6738064	< 1.0	< 1.0	0.0%	< 1.0	106%	60%	130%	108%	70%	130%	117%	60%	130%

AMEC - NB - Atlantic RBCA Tier 1 Hydrocarbons in Soil + Silica Gel + Creosote

Methyl-t-Butyl-Ether (MTBE)	1	6738028	< 0.050	< 0.050	0.0%	< 0.050	76%	60%	140%	73%	60%	140%	74%	60%	140%
Benzene	1	6738028	< 0.005	< 0.005	0.0%	< 0.005	82%	60%	140%	82%	60%	140%	75%	30%	130%

Quality Assurance

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AGAT WORK ORDER: 15X995728
PROJECT: TE131446.1000
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SAMPLING SITE:
SAMPLED BY:

Trace Organics Analysis (Continued)

RPT Date: Jul 28, 2015			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits		
								Lower	Upper		Lower	Upper		Lower	Upper	
Toluene	1	6738028	< 0.04	< 0.04	0.0%	< 0.04	81%	60%	140%	80%	60%	140%	72%	30%	130%	
Ethylbenzene	1	6738028	< 0.01	< 0.01	0.0%	< 0.01	81%	60%	140%	80%	60%	140%	73%	30%	130%	
Xylene (Total)	1	6738028	< 0.05	< 0.05	0.0%	< 0.05	93%	60%	140%	93%	60%	140%	85%	30%	130%	
C6-C10 (less BTEX)	1	6738028	< 3	< 3	0.0%	< 3	91%	60%	140%	113%	60%	140%	111%	30%	130%	
>C10-C21 Hydrocarbons	1	6738028	<15	<15	0.0%	< 15		60%	140%		60%	140%		30%	130%	
>C21-C32 Hydrocarbons	1	6738260	<15	<15	0.0%	< 15	93%	60%	140%	93%	60%	140%	114%	30%	130%	
AMEC - NB - PCB Arochlor																
Aroclor 1242	93	6738260	< 0.1	< 0.1	NA	< 0.1	121%	70%	130%	85%	70%	130%	92%	60%	140%	
Aroclor 1254	93	6738260	< 0.0633	< 0.0633	NA	< 0.0633	102%	70%	130%	73%	70%	130%	87%	60%	140%	
Aroclor 1260	93	6738260	< 0.1	< 0.1	NA	< 0.1		70%	130%		70%	130%		60%	140%	

Comments: If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

Certified By:





Method Summary

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

AGAT WORK ORDER: 15X995728

PROJECT: TE131446.1000

ATTENTION TO: Chyann Kirby

SAMPLING SITE:

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PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Aluminum	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Antimony	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Arsenic	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Barium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Beryllium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Boron	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Cadmium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Chromium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Cobalt	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Copper	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Iron	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Lead	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP-MS
Lithium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP-MS
Manganese	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Molybdenum	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Nickel	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Selenium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Silver	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Strontium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Thallium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Tin	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Uranium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Vanadium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Zinc	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Chromium, Hexavalent	INOR-121-6029	SSSA 5;25 p. 683	SPECTROPHOTOMETER
Total Organic Carbon by Walkley Black	SOIL 0480; SOIL 0110; SOIL 0120	NELSON 1996; SHEPPARD 2007	SPECTROPHOTOMETER
Total Inorganic Carbon, Calculated			CALCULATION
Particle Size Distribution (<12.5mm, -4 PHI)	INOR-121-6034	ASTM D-422-63	SIEVE & PIPETTE
Particle Size Distribution (<9.5mm, -3 PHI)	INOR-121-6034	ASTM D-422-63	SIEVE & PIPETTE
Particle Size Distribution (<4.75mm, -2 PHI)	INOR-121-6034	ASTM D-422-63	SIEVE & PIPETTE



Method Summary

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

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PROJECT: TE131446.1000

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SAMPLING SITE:

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PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Particle Size Distribution (<2mm, -1 PHI)	INOR-121-6034	ASTM D-422-63	SIEVE & PIPETTE
Particle Size Distribution (<1mm, 0 PHI)	INOR-121-6034	ASTM D-422-63	SIEVE & PIPETTE
Particle Size Distribution (<1/2mm, 1 PHI)	INOR-121-6034	ASTM D-422-63	SIEVE & PIPETTE
Particle Size Distribution (<1/4mm, 2 PHI)	INOR-121-6034	ASTM D-422-63	SIEVE & PIPETTE
Particle Size Distribution (<1/8mm, 3 PHI)	INOR-121-6034	ASTM D-422-63	SIEVE & PIPETTE
Particle Size Distribution (<1/16mm, 4 PHI)	INOR-121-6034	ASTM D-422-63	SIEVE & PIPETTE
Particle Size Distribution (<1/32mm, 5 PHI)	INOR-121-6034	ASTM D-422-63	SIEVE & PIPETTE
Particle Size Distribution (<1/64mm, 6 PHI)	INOR-121-6034	ASTM D-422-63	SIEVE & PIPETTE
Particle Size Distribution (<1/128mm, 7 PHI)	INOR-121-6034	ASTM D-422-63	SIEVE & PIPETTE
Particle Size Distribution (<1/256mm, 8 PHI)	INOR-121-6034	ASTM D-422-63	SIEVE & PIPETTE
Particle Size Distribution (<1/512mm, 9 PHI)	INOR-121-6034	ASTM D-422-63	SIEVE & PIPETTE
Particle Size Distribution (Gravel)	INOR-121-6031	ASTM D-422-63	SIEVE & PIPETTE
Particle Size Distribution (Sand)	INOR-121-6031	ASTM D-422-63	SIEVE & PIPETTE
Particle Size Distribution (Silt)	INOR-121-6031	ASTM D-422-63	SIEVE & PIPETTE
Particle Size Distribution (Clay)	INOR-121-6031	ASTM D-422-63	SIEVE & PIPETTE
Particles >75um	INOR-121-6031, INOR-121-6034	ASTM D-422-63	CALCULATED
Classification	INOR-121-6031, INOR-121-6031	Atlantic RBCA	CALCULATED
Mercury	INOR-121-6101 & INOR-121-6107	Based on EPA 245.5 & SM 3112B	CV/AA

Method Summary

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PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Methyl-t-Butyl-Ether (MTBE)	VOL-120-5013	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/MS
Benzene	VOL-120-5013	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/MS
Toluene	VOL-120-5013	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/MS
Ethylbenzene	VOL-120-5013	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/MS
Xylene (Total)	VOL-120-5013	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/MS
C6-C10 (less BTEX)	VOL-120-5013	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/MS/FID
>C10-C21 Hydrocarbons	ORG-120-5007	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/MS/FID
>C21-C32 Hydrocarbons	VOL-120-5007	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/FID
Modified TPH (Tier 1)	ORG-120-5007	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/MS/FID
Resemblance Comment	ORG-120-5007	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/MS/FID
Creosote Comment			GC/FID
Return to Baseline at C32	ORG-120-5007	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/FID
% Moisture	LAB-131-4024	Topp, G.C. 1993. Soil Water Content. CSSS	GRAVIMETRIC
Silica Gel Cleanup			GC/FID
Isobutylbenzene - EPH	VOL-120-5007	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/FID
Isobutylbenzene - VPH	VOL-120-5013	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/MS
n-Dotriacontane - EPH	VOL-120-5007	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/FID
Dieldrin (Hfx 2012-03)	ORG-120-5108		GC/ECD
o,p'-DDD (Hfx 2012-03)	ORG-120-5108		GC/ECD
o,p'-DDE (Hfx 2012-03)	ORG-120-5108		GC/ECD
o,p'-DDT (Hfx 2012-03)	ORG-120-5108		GC/ECD
p,p'-DDD (Hfx 2012-03)	ORG-120-5108		GC/ECD
p,p'-DDE (Hfx 2012-03)	ORG-120-5108		GC/ECD
p,p'-DDT (Hfx 2012-03)	ORG-120-5108		GC/ECD
o,p'-DDT + p,p'-DDT	ORG-120-5108	Based on EPA SW-846/6510 C-8080-8081 A	GC/ECD
o,p'-DDD + p,p'-DDD	ORG-120-5108	Based on EPA SW-846/6510 C-8080-8081 A	GC/ECD
o,p'-DDE + p,p'-DDE	ORG-120-5108	Based on EPA SW-846/6510 C-8080-8081 A	GC/ECD
Total DDT	Calculation	Calculation	GC/FID
Aroclor 1242	TO 0400	EPA 8082	GC/ECD
Aroclor 1248	TO 0400	EPA 8082	GC/ECD
Aroclor 1254	TO 0400	EPA 8082	GC/ECD
Aroclor 1260	TO 0400	EPA 8082	GC/ECD
Aroclor 1016	TO 0400	EPA 8082	GC/ECD
Aroclor 1221	TO 0400	EPA 8082	GC/ECD
Aroclor 1232	TO 0400	EPA 8082	GC/ECD

Method Summary

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PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Aroclor 1262	TO 0400	EPA 8082	GC/ECD
Aroclor 1268	TO 0400	EPA 8082	GC/ECD
1-Methylnaphthalene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
2-Methylnaphthalene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Acenaphthene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Acenaphthylene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Acridine	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Anthracene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Benzo(a)anthracene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Benzo(a)pyrene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Benzo(b)fluoranthene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Benzo(b+j)fluoranthene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Benzo(e)pyrene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Benzo(ghi)perylene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Benzo(k)fluoranthene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Chrysene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Dibenzo(a,h)anthracene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Fluoranthene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Fluorene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Indeno(1,2,3)pyrene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Naphthalene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Perylene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Phenanthrene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Pyrene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Quinoline	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Total PAH			
% Moisture			GRAVIMETRIC
Nitrobenzene-d5	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
2-Fluorobiphenyl	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Terphenyl-d14	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Total Polychlorinated Biphenyls	ORG-120-5106	EPA SW846/8081/8080	GC/ECD



Unit 122 - 11 Morris Dr.
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B3B 1M2
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www.agatlabs.com

Laboratory use Only
 Arrival Condition: Good Poor (complete 'notes')
 Arrival Temperature: 6° AGAT Job Number: 15X995728
 Notes: _____

Drinking Water Sample (y/n): N Reg. No. _____
 Waterworks Number: _____

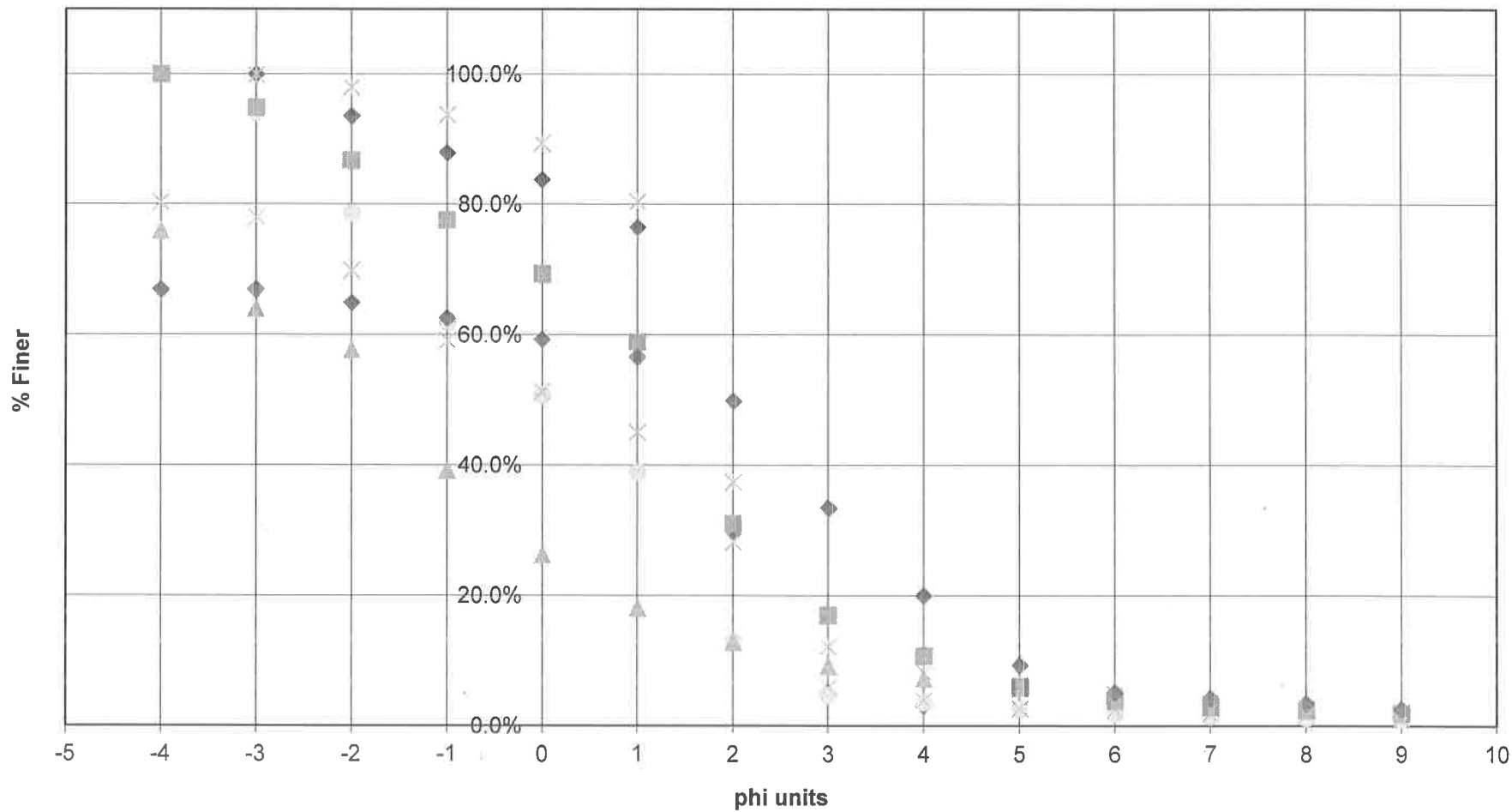
Report To: Company: Amec Foster Wheeler Contact: Chyann Kirby Address: 580 Main Street, Suite 105, Hilyard Place, Building B, Saint John, New Brunswick, E2K 1J5 Phone: <u>506-652-4530</u> FAX: <u>506-652-9517</u> PO #: _____ AGAT Quotation: <u>15-1771</u> Client Project #: <u>TE131446.1000</u> Invoice to: Same (Y/N) - Circle Company: _____ Contact: _____ Address: _____ Phone: _____ Fax: _____ PO#/Credit Card #: _____		Report Information 1. Name: <u>Chyann Kirby</u> Email: <u>chyann.kirby@amecfw.com</u> 2. Name: <u>Christa Dubreuil</u> Email: <u>christa.dubreuil@amectw.com</u> Regulatory Requirements (Check): <input type="checkbox"/> List Guidelines on Report <input checked="" type="checkbox"/> Do Not List Guidelines on Report <input type="checkbox"/> PIRI Site Info (check all that apply): <input type="checkbox"/> Tier 1 <input type="checkbox"/> Res. <input type="checkbox"/> Pot. <input type="checkbox"/> Coarse <input type="checkbox"/> Tier 2 <input type="checkbox"/> Com <input type="checkbox"/> N/Pot. <input type="checkbox"/> Fine <input type="checkbox"/> Gas <input type="checkbox"/> Fuel <input type="checkbox"/> Lube <input type="checkbox"/> CCME <input type="checkbox"/> CDWQ <input type="checkbox"/> Ind <input type="checkbox"/> NSDFOSP <input type="checkbox"/> Com <input type="checkbox"/> HRM 101 <input type="checkbox"/> Res/P Storm Water <input type="checkbox"/> Ag <input type="checkbox"/> HRM 101 <input type="checkbox"/> FWAL Waste Water <input type="checkbox"/> Sediment <input type="checkbox"/> Other _____		Report Format <input type="checkbox"/> Single PDF sample per page <input type="checkbox"/> Multiple PDF samples per page <input type="checkbox"/> Excel Format Included Turnaround Time (TAT) Business Days Regular TAT: <input checked="" type="checkbox"/> 5 - 7 days Rush TAT: <input type="checkbox"/> 1 day <input type="checkbox"/> 2 days <input type="checkbox"/> 3 - 4 days Date Required: _____ Time Required: _____	
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SAMPLE IDENTIFICATION	DATE / TIME SAMPLED	SAMPLE MATRIX	# OF CONTAINERS	COMMENTS - Site/sample info, Sample Containment	Field Filtered/ Preserved	Standard Water Analysis +MS	Available Metals (w Sn, Se-LL)	Hexavalent Chromium	Mercury	PSA - Sieve & Pipette	TOC	TIC	DDT	Silica Gel Cleanup	TPH/BTEX (PIRI) Tier 1	Total PAH	Total PCB's (Calculation)	PCB Arochlors-1242,1248,1254,1260 (Miss)	PCB Arochlors-1016,1221,1232,1262,1268 (Call)	Lab Sample #
A-5	13-Jul-15	sed./soi	4 x 500 ml	Sediment		X	X	X	X	X	X	X	X	X	X	X	X	X	X	
A-14	13-Jul-15	sed./soi	4 x 500 ml	Sediment		X	X	X	X	X	X	X	X	X	X	X	X	X	X	
A-17	13-Jul-15	sed./soi	4 x 500 ml	Sediment		X	X	X	X	X	X	X	X	X	X	X	X	X	X	
A-26	13-Jul-15	sed./soi	4 x 500 ml	Sediment		X	X	X	X	X	X	X	X	X	X	X	X	X	X	
A-28	13-Jul-15	sed./soi	4 x 500 ml	Sediment		X	X	X	X	X	X	X	X	X	X	X	X	X	X	
A-30	13-Jul-15	sed./soi	4 x 500 ml	Sediment		X	X	X	X	X	X	X	X	X	X	X	X	X	X	
A-38	13-Jul-15	sed./soi	4 x 500 ml	Sediment		X	X	X	X	X	X	X	X	X	X	X	X	X	X	

Sample Relinquished By (print name & sign) Chyann Kirby (Amec Foster Wheeler)	Date/Time 14-Jul-15 1:00pm	Samples Received By (print name and sign) <i>Samantha Baker</i>	Date/Time July 15/15 9:00	Special Instructions Please include a qualitative comment regarding the presence of creosote in samples as well as provide the results in GIS-ready format.
Sample Relinquished By (print name & sign) <i>Chyann Kirby</i>	Date/Time 14-Jul-15 1:00pm	Samples Received By (print name and sign)	Date/Time	Page 1 of 1

Particle Size Distribution 15x995728

◆ 6738028 ● 6738260 ✖ 6738264 ✖ 6738268 ▲ 6738273 ■ 6738277 ◆ 6738281





APPENDIX D

Limitations

LIMITATIONS

1. The work performed in the preparation of this report and the conclusions presented are subject to the following:
 1. The Standard Terms and Conditions which form a part of our Professional Services Contract.
 2. The Scope of Services.
 3. Time and Budgetary limitations as described in our Contract.
 4. The Limitations stated herein.
2. No other warranties or representations, either expressed or implied, are made as to the professional services provided under the terms of our Contract, or the conclusions presented.
3. The information presented in this report is based on sampling techniques which are considered industry-standard for this type of assessment (i.e., samples collected by divers using standard procedures commonly accepted by PWGSC).
4. The sediment characteristics at the Site were assessed, within the limitations set out above, having due regard for applicable environmental regulations as of the date of the analytical reporting.
5. No request for information about the site history or operating practices within the site boundaries has been included in the scope of work for this project.
6. Sample collection and testing was carried out in accordance with the terms of our contract. Other substances, or different quantities of substances testing for, may be present on Site and may be revealed by different or other testing not provided for in our contract.
7. This report is for the sole use of the party to whom it is addressed unless expressly stated otherwise in the report or contract. Any use which any third party makes of the report, in whole or the part, or any reliance thereon or decisions made based on any information or conclusions in the report is the sole responsibility of such third party. Amec Foster Wheeler accepts no responsibility whatsoever for damages or loss of any nature or kind suffered by any such third party as a result of actions taken or not taken or decisions made in reliance on the report or anything set out therein.