Case No. 16-1871-EL-BGN

Icebreaker Windpower Inc.

Application-Part 10 of 13

Part 10 includes:

- Exhibit X. Substation Geotechnical Report
- Exhibit Y. Inadvertent Return Contingency Plan
- Exhibit Z. LimnoTech EMF Memorandum

Date Filed: February 1, 2017

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Case No. 16-1871-EL-BGN

Icebreaker Windpower Inc.

Application-Part 10 of 13

- Exhibit X. Substation Geotechnical Report

December 22, 2016

Dave Karpinski
Lake Erie Energy Development Corporation (LEEDCo)
1938 Euclid Avenue, Suite 200
Cleveland, Ohio 44115

RE: Geotechnical and Subsurface Exploration Report for the Proposed Electrical Substation for the Icebreaker Offshore Wind Demonstration Project, Cleveland, Ohio; LAE001.600.0005.

Dear Mr. Karpinski:

Hull & Associates, Inc. (Hull) is pleased to present the attached Geotechnical and Subsurface Exploration Report (Report) for the proposed electrical substation for the Icebreaker Offshore Wind Demonstration Project located at the Cleveland Public Power Facility on North Marginal Road in Cleveland, Ohio (Site). The work was performed by Hull as requested by LEEDCo in accordance with Hull's revised proposal (Hull document #LAE001.100.0002) dated September 17, 2016 and the subsequent authorization to proceed. This Report summarizes our understanding of the proposed construction, describes the drilling and testing procedures, discusses our observations of subsurface conditions, and presents the findings and recommendations as it relates to foundation design and earthwork construction for the planned project. The Report also incorporates the information shared during a design review meeting with Middough Inc. on December 8, 2016. Attached is the Report as a PDF electronic file being provided via email for your distribution.

Soil samples collected during this exploration will be stored at our material testing laboratory for 90 days from the date of this Report, unless directed otherwise by you.

Please do not hesitate to contact Shawn McGee with any questions or comments you may have regarding the Report at (440) 232-9945.

Sincerely,

Daniel R. Pratt
Engineer II

Shawn D. McGee, P.E.
Geotechnical Practice Leader

Attachment

cc: Tom McNeilan, McNeilan & Associates, LLC (w/Attachments)
Yacoub Kordahi, P.E., Middough Inc. (w/Attachments)

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GEOTECHNICAL AND SUBSURFACE EXPLORATION REPORT

FOR THE:
PROPOSED ELECTRICAL SUBSTATION FOR THE ICEBREAKER OFFSHORE WIND DEMONSTRATION

LOCATED AT:
CLEVELAND PUBLIC POWER SITE
NORTH MARGINAL ROAD
CLEVELAND, CUYAHOGA COUNTY, OHIO

PREPARED FOR:
LAKE ERIE ENERGY DEVELOPMENT CORPORATION
1938 EUCLID AVENUE, SUITE 200
CLEVELAND, OHIO 44115

PREPARED BY:
HULL & ASSOCIATES, INC.
4 HEMISPHWERE WAY
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DECEMBER 22, 2016

HULL

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1.0 INTRODUCTION

An exploration and evaluation of the geotechnical and geoenvironmental conditions have been made for the proposed electrical substation for the Icebreaker Offshore Wind Demonstration Project located at the Cleveland Public Power (CPP) Facility on North Marginal Road in Cleveland, Ohio (Site). This proposed development will consist of equipment, power poles, and lightly loaded buildings to support operations of the electrical substation during the project. The exploration presented in this Report has been performed as requested by the Lake Erie Energy Development Corporation (LEEDCo) in accordance with Hull's revised proposal (Hull document #LAE001.100.0002) dated September 17, 2016 and the subsequent authorization to proceed.

The project includes the installation of six 3-Megawatt wind turbine generators (WTGs) offshore from the former CPP and beyond the breakwaters. Energy generated from the WTGs will be transmitted through cables, which will be installed beneath the harbor with horizontal directional drilling (HDD) techniques, to a new substation to be located at the CPP facility. The substation will include the construction of a 138 kV Interconnect facilities and switchyard area, both approximately 120 feet by 60 feet in size. The project will also include a HDD entry pit. We understand that LEEDCo is currently considering two locations and HDD orientations.

The purpose of this exploration was to: 1) determine the subsurface conditions to the depths of the borings, 2) evaluate the engineering characteristics of the subsurface materials, 3) provide information to assist in designing the foundations of the anticipated structures (by others), 4) provide stratigraphic information of the lacustrine deposits for planning of HDD, and 5) present general earthwork recommendations for construction. A geotechnical engineer has planned and supervised the performance of the geotechnical engineering services, has considered the findings, and has prepared this Report in accordance with generally accepted geotechnical engineering practices. This Report was prepared solely for the use of LEEDCo and their assigns for the specific purposes mentioned above. No other warranties, either expressed or implied, are made as to the professional advice included in this Report.

It is understood that previous borings completed at the Site in the mid 2000s encountered coal ash and soil fill that extended 12 to 14 feet BGS with groundwater recorded at 12 feet BGS, similar to lake levels. The borings completed by Hull will obtain a better understanding of the previous filling activities (e.g., type of fill, approximate vertical/lateral extents, consistency/density, etc.) in the development areas and provide basic information relative to potential construction and development constraints, including their suitability for initiating a HDD bore from the Site and the possible presence of rubble or other obstructions. In addition, Hull advanced borings on the nearby Cleveland Confined Disposal Facility (CDF12) in proximity to the

proposed HDD alignment for the purpose of providing stratigraphic information within the lacustrine deposits underlying the CDF for HDD planning purposes.

During this phase of the project, Hull also completed a limited (Geoenvironmental) Environmental Review (ER) and also coordinated a non-intrusive geophysical exploration using Electromagnetic (EM) Induction profiling and targeted Ground-penetrating Radar (GPR) technology at the Site. The Geoenvironmental ER consisted of a desktop study for the purpose of obtaining information related to potential environmental and/or geotechnical concerns as a result of previous operations or activities at the Site. Hull subcontracted a firm specializing in Geophysical Surveys to conduct an EM/GPR survey over targeted areas based on the proposed layout at the Site to locate interpreted conductive/metallic targets or other anomalous responses.

A conceptual Site layout map showing the location of the proposed equipment layout and general structural loads was available for our use (see site plans in Attachment A). A 90% Design Review Plan Set, which included a site grading plan and general construction specifications were available to Hull to finalize this Report. It is understood that minimal cut/fills, other than excavations needed to remove existing foundation systems or for the new equipment footings, will be required to achieve planned final grades.

Any revision in the plans for the proposed structures from those enumerated in this Report should be brought to the attention of Hull so it may be determined if changes in the foundation or earthwork recommendations are required. If additional data are needed for design purposes or deviations from the noted subsurface conditions are encountered during construction, they should also be brought immediately to the attention of Hull. It is recommended that Hull be provided the opportunity to review the final design and specifications prior to construction so the earthwork and foundation recommendations may be properly interpreted and implemented. At that time, it may be necessary to submit supplementary recommendations.

2.0 DESCRIPTION OF SITE

2.1 Site Location

The Site is located at the Cleveland Public Power Site on North Marginal Road in the City of Cleveland, Cuyahoga County, Ohio. The Site is bounded to the north and east by Lake Erie, to the west by a private yacht club, and to the south by North Marginal Road. Figure 1 is a USGS site location map.

2.2 Site Topography, Drainage, and Surface Features

The Site, including the existing electrical substation area, consists of an approximate 3-acre gravel lot that is uniformly flat with no discernable geomorphic features. Established vegetation is absent with the exception of trees and brush along the water's edge. There are no drainage structures, such as catch basins and storm sewers, present at the Site. Based on a review of available topography for the Site, storm water runoff appears to generally flow north towards the Lake.

It should be noted that the CPP site is a former submerged area of Lake Erie where manmade fill was placed to create land along the former shoreline and to achieve current grades. The City does not have records of the source or origin of the fill, or how/if the fill was placed and compacted. This Report does give a description of the material type in later sections.

2.3 General Area Geology

Geological references report that the Site is currently relatively flat terrain located within the physiographic region of the Erie Lake Plain, and is comprised of lacustrine deposits and glacial drift. The Wisconsin glacier passed over the region. Glacial drift consists of varying amounts of gravel, sand, silt and clay. The Lake Plains region and the Cuyahoga River valley, lacustrine (lake bottom) silt and clay deposits overlie the glacial till. Where erosion stripped away the till, the lacustrine deposits may rest directly on bedrock. Lacustrine deposits were formed when surface water runoff washed fine grained sediments into lakes that covered parts of Cuyahoga County during or immediately after the last period of glaciation. Over time, the silt and clay settled to the bottom of the lakes and accumulated into thick layers. Bedrock underlying the unconsolidated material beneath the Site is Devonian Age Ohio Shale and is reported to be several hundred feet below ground surface (BGS) based on a review of Glacial and Surficial Geology of Cuyahoga County, Ohio maps prepared by the Division of Geological Survey for the project area.

2.4 Electromagnetic (EM) Induction Profiling and Ground-penetrating Radar (GPR) Survey

Grumman Exploration, Inc. conducted Electromagnetic (EM) induction profiling and Ground-penetrating radar (GPR) surveys within the Icebreaker Substation and the CPP 138 kV Ring Bus Extension Areas on October 7, 2014. The approach to the EM profiling and GPR survey was as follows:

- The EM Induction Profiling survey was performed using a GSSI GEM-300 multi-frequency EM induction profiling system. This EM technique is commonly used for effectively locating large subsurface metallic targets (e.g., USTs, barrels, foundations, metallic objects, conductive buried waste and fill limits, some utility lines, geologic features, and occasionally groundwater containment plumes) in situations where GPR is ineffective. Vertical dipole quadrature phase (proportional to inductionconductivity) and in-phase (metal-sensitive) measurements using a single coil alignment at three frequencies (15,030Hz and 9,810 Hz and 4,410 Hz) were recorded electronically at each grid location. The gridded EM survey was limited to the open, accessible portions of the southern, eastern and western regions of the Site. The transect spacing was 5-ft and the in-line measurement interval was ~2.2-ft. A "continuous survey" mode was used. In this survey mode, data are acquired at a fixed time interval while the operator walks along a survey line at a steady pace. Regularly spaced reference marks were incorporated into the data during acquisition to "fix" the measurement locations. Subsequently, a computer program was used to adjust the station positions with respect to the coordinate system being used.
- GPR scans were also performed in targeted areas of the site, and mainly over anomalous EM targets and in the northern sector of the east parcel. The GPR system used was a GSSI SIR-3000 in conjunction with a 270 MHz dipole antenna. This antenna was selected for its greater depth penetration compared to that of the 400 MHz antenna. The first field task involved equipment setup and the completion of several test scans to observe the GPR response and to adjust the data acquisition parameters. A survey wheel was used to acquire distance-based data at the density of approximately 10.0 GPR traces per foot. GPR scans were performed along 5-ft spaced east-west and north-south transects in both investigation areas as access and ground surface conditions allowed. The time window used was 80 nanoseconds (ns) and band-pass filters were applied to reduce extraneous interference. Preliminary interpretations regarding the possible presence of excavations and anomalous buried structures and objects were made as the GPR data were acquired. The data was recorded electronically on an internal hard disk in the field and later transferred to a desktop PC computer and computer workstation for subsequent processing, display and analysis

The investigation areas were located within an active public utility service yard area covered with gravel at the ground surface. An approximate 202-ft by 43-ft concrete containment slab is located in the center of the yard. There were many obstructions and sources of electrical interference within both investigation areas, including: electrical transformers, utility boxes, debris piles, concrete vaults, a dumpster, soil and fill piles, various stored equipment, debris piles, steel superstructure and foundations related to an overhead coal loading chute and conveyors, a brick electrical building and loading dock, and areas with dense vegetation. Additionally, trial directional borings were conducted in the Icebreaker Substation area at the same time as the geophysical investigation.

In summary, anomalous strong EM responses were observed in a few locations within the investigation areas. These responses are believed to indicate buried metallic structures, demolition debris and/or possibly industrial fill, such as slag. The GPR results show strong reflective targets in the switchgear area what may

indicate reinforced concrete structures. This information was used to target areas and zones during the drilling. Specific targets or conditions of interest in the two investigation areas are summarized below:

CPP 138 kV Ring Bus Extension

Anomalous EM in-phase and GPR responses were noted in three general locations within the CPP 138 kV Ring Bus Extension area, including:

- 0-ft to 15-ft N/ 20-ft to 30-ft+ W: west of concrete pad (see Figure 2 in Appendix E) - Possible interpretations of this zone include a more deeply buried reinforced concrete pad, metal equipment or a concentration of metallic debris. There was no corresponding EM conductivity response over this target which may indicate that the target is metallic. GPR scans over the EM anomaly show no clear indication of a buried structure, although the cause of the EM response may be too deep to detect using GPR.

- 20-ft to 45-ft W/ 5-ft to 40-ft N: west-central end of the concrete containment pad - Erratic strong EM in-phase responses were observed between the obstructions on the pad. Some of the strong EM responses may be interference effects caused by nearby metallic obstructions. GPR scans over the southern portion of this area (see Figure 3 in Appendix E) show strong reflective objects or structures buried a few feet below the slab surface. It is not clear what the reflective objects are and the lateral extent of this area and outline of the targets could not be determined because of the limited working area. A possible explanation is that the targets are large fragments of reinforced concrete or stone (e.g. rip-rap). Deeper, chaotic GPR reflections were observed over the reflective targets which may indicate coarse demolition debris.

- 10-ft to 50-ft E/ 25-ft to 40-ft S: west of brick building - anomalous strong reflective surfaces were observed in the shallow subsurface region west of the brick building. No corresponding EM responses were noted over this region. The reflective targets appear to be on the order of 1-ft to 2-ft below the ground surface. These reflective surfaces may indicate large fragments of concrete debris, former foundations, former support structures/flooring, or large pieces of stone.

Icebreaker Substation

Relatively few anomalous EM or GPR responses were observed within the HDD & Interconnect areas, although large portions of this area were obstructed and could not be scanned. The significant observations from this area include:

- 140-ft to 175-ft E/10-ft to 20-ft S: Vicinity of dumpster, south of containment pad - An anomalous strong EM in-phase response was observed in the driveway area. No corresponding EM conductivity response was observed over this area. Possible explanations for this response include a more deeply buried reinforced concrete pad or other metallic structure. It is also considered possible that the response is an interference effect caused by the nearby dumpster and other metallic equipment. No indication of a reflective target was noted on GPR scans over this target (see Figure 4 in Appendix E).

- 180-ft to 250-ft E/35-ft to 90-ft N: far northeast (northern) corner of service yard - Strong EM conductivity and strong, negative EM in-phase responses were observed across the northeast corner of the HDD/Interconnect area. A strong negative EM in-phase response is often observed over

regions with deeper, highly conductive industrial fill such as slag, cinders, or fill material with elevated iron or salt content. These types of materials are commonly observed throughout the Cleveland metro area. The increasingly negative response moving to the northeast may indicate that the highly conductive fill increases in thickness or concentration moving toward Lake Erie. No anomalous GPR responses were noted over this area, however the possible highly conductive fill would tend to severely reduce the effective GPR exploration depth over this area.

Additional information and more detailed findings from the EM profile and GPR survey activities are provided in the Geophysical Survey Report (prepared by Grumman Exploration, Inc.) in Appendix E.

3.0 FIELD EXPLORATION AND LABORATORY TESTING PROGRAM

3.1 Field Exploration

The field exploration included a reconnaissance of the Site, drilling sixteen (16) standard sampled borings for the proposed project, advancing six (6) auger borings, performing Standard Penetration Tests (SPT), recovering split-spoon and Shelby tube samples for laboratory analysis, and performing visual-manual examination of the soil samples retained. Eight of the borings were drilled within the Icebreaker Substation area and where the HDD entry pit will be located, six were located within the CPP 138 kV Ring Bus Extension area, and two were located on the Port of Cleveland's Confined Disposal Facility 12 (CDF12) along the proposed HDD alignment. The six auger borings were located within the HDD pit location of the Icebreaker Substation area to determine if subsurface debris, oversized materials, or other obstructions are present within the HDD entry pit area along the proposed profiles. The borings were advanced via a Central Mine Equipment Company (CME) LC55 all-terrain track-mounted drill rig operated by HAD Inc. of Rittman, Ohio. Samples on the CPP site were generally obtained from within the borehole at intervals of 2 ½ feet within the upper 10 feet and then at 5 feet intervals to the borings' termination depth. The borings on CDF12 were straight augered (no sampling) to a depth of 40 feet below lake level (i.e., 60 to 75 feet BGS), at which time conventional split spoon sampling and Shelby tubes were alternated at 5- to 10-foot intervals to a depth of 90 feet below the lake water level (i.e., 120 feet BGS). Split-barrel samples were collected by the Standard Penetration Test Method (ASTM D1586).

The borings were completed between October 17 and 28, 2016 under the direction of a geologist from Hull at locations pre-determined by LEEDCo's project manager, McNeilan & Associates, LLC, and concurred with by Hull based on the proposed development conceptual layout. Hull had to field adjust some of the originally planned locations to avoid overhead electrical lines and potential underground obstructions. The boring locations were staked in the field by Hull using a hand-held GPS unit utilizing sub-foot accuracy as shown on the boring location site plan (see Appendix A). The location and ground surface elevation of the "as-drilled" borings were not surveyed, but available topographic information indicates that the CPP Site area is relatively flat and has an elevation difference across the Site of approximately 3 feet – the Icebreaker Substation area has the lowest elevation of approximately 581 feet (vertical datum NAVD 1988) with the higher elevation near CPP 138 kV Ring Bus Extension area of approximately 584 feet. The borings located within CDF12 (BH-14 and 16) were at approximate elevations of 585 and 579 feet, respectively.

Table 1 summarizes the coordinates, existing ground surface elevations, thickness of the fill, and termination depths at each boring location. The soil borings were immediately backfilled with drill cuttings and bentonite upon completion of drilling.

Table 1 – Summary of Borings

Boring Number	Boring Type	Boring Locations		Elevation of Existing Ground Surface[1]	Thickness of Fill (ft. BGS[2])	Termination Depth (ft. BGS[2])
		Latitude	Longitude			
BH-1	Switchyard Area and HDD Entry Pit	41.527152	-81.661831	581	33.5	100
BH-2	Switchyard Area and HDD Entry Pit	41.527080	-81.661755	581	≥24.2	24.2
BH-3	Switchyard Area and HDD Entry Pit	41.527091	-81.661869	581	33.5	60
BH-4	Switchyard Area and HDD Entry Pit	41.526981	-81.661705	582	≥30	30
BH-5	Switchyard Area and HDD Entry Pit	41.526988	-81.661845	582	≥30	30
BH-6	Switchyard Area and HDD Entry Pit	41.527040	-81.661939	582	≥28.5	28.5
BH-7	Switchyard Area and HDD Entry Pit	41.527024	-81.662058	582	≥30	30
BH-8	Switchyard Area and HDD Entry Pit	41.526915	-81.661903	582	33.5	40
BH-9	138 kV Interconnect Area	41.526649	-81.662217	582	28.5	45
BH-10	138 kV Interconnect Area	41.526479	-81.662153	584	33.5	35
BH-11	138 kV Interconnect Area	41.526532	-81.662336	582	29	45
BH-12	138 kV Interconnect Area	41.526476	-81.662534	583	33.5	45
BH-13	138 kV Interconnect Area	41.526332	-81.662405	584	33.5	35
BH-14	CDF12	41.530286	-81.664148	585	N/A	120
BH-15	138 kV Interconnect Area	41.526088	-81.662793	584	35	40
BH-16	CDF12	41.528959	-81.663189	579	N/A	1215
AB-1[3]	Auger Boring	41.527109	-81.661864	581	≥7	7
AB-2[3]	Auger Boring	41.527080	-81.661847	581	≥20	20
AB-3[3]	Auger Boring	41.527071	-81.661809	581	≥23	23
AB-4[3]	Auger Boring	41.527100	-81.661798	581	≥25	25
AB-5[3]	Auger Boring	41.527043	-81.661782	581	≥25	25
AB-6[3]	Auger Borings	41.527013	-81.661747	581	~35	35

1. Elevations for borings are approximate and were interpolated from the field topographic field survey performed by KS Associates in August 2016 – the elevations are rounded to the nearest foot. The vertical datum for the borings performed at the CPP Site are NAVD 1988. The vertical datum for the borings at CDF12 are IGLD 1985.
2. BGS = below existing ground surface
3. Borings not samples, consequently, fill depths are approximate based on observations from drill cuttings. Borings AR-1, AR-3, AR-4 and AR-5 achieved auger refusal/obstructions prior to reaching the planned depth.

Refer to the boring logs in Attachment B for more detailed descriptions of subsurface units, sample data, SPT results, groundwater conditions, pocket penetrometer test results, and other pertinent information. See the maps in Appendix A that illustrates the locations of the "as drilled" borings.

3.2 Geotechnical Laboratory Testing Program

All samples were examined by a geotechnical engineer from Hull and described based on the visual-manual examination (ASTM D 2488) soil classification system. In addition, select samples were sent to Resource International, Inc. geotechnical testing laboratory in Cleveland, Ohio and subjected to grain-size analyses (ASTM D422), moisture content determinations (ASTM D2216), and Atterberg limits tests (ASTM D4318). In addition, the relatively undisturbed samples procured with Shelby tubes were subject to Unconsolidated Undrained Triaxial Compression (ASTM D2850) and One-Dimensional Consolidation (ASTM D2435) tests to determine shear strength and settlement/compression properties for the HDD design and planning (by others).

Laboratory testing indicated that the split spoon samples tested on the fill material at the CPP Facility was classified as silty sand with gravel (SM), poorly graded sand with gravel (SP), and well graded gravel with sand (GW) under the Unified Soil Classification System (USCS). Atterberg limit testing indicated that split spoon samples tested were non-plastic, expect for one sample in boring BH-9 (8.5-10 feet BGS) which had a liquid limit of 35 and plasticity index of 14 – suggesting that localized zones of clayey soil may be present within the fill. Moisture contents as received by the laboratory were also completed for select samples from within the fill and ranged from 9.0 to 41.7 percent. Similarly, laboratory testing indicated that the split spoon and Shelby tube samples tested on the underlying lacustrine deposit at the CPP Facility and beneath the CDF12 were relatively consistent, and was classified as lean clay (CL), lean clay with sand (CL), and well graded sand with silt (SW-WM) under the USCS. Atterberg limit testing indicated that clayey samples had liquid limits that ranged from 27 to 47, and plasticity indices that ranged from 8 to 24. Moisture contents as received by the laboratory were also completed for select lacustrine samples and ranged from 11.4 to 57.0 percent.

Ten (10) unconsolidated undrained (UU) triaxial compression tests (ASTM D2850) were performed on relatively undisturbed (Shelby tube) samples collected within several of the soil borings within the lacustrine deposit to determine the "undrained" shear strengths of the material. The tests were performed at specific effective confining stresses (cell pressures) ranging from27.8 to 104.2 pounds per square inch (psi), which represent the approximate stresses at the sample depth. The shear stresses ranged from 131 to 1,302 pounds per square feet (psf). There does not seem to be a trend with the shear strength of the lacustrine material with depth. Table 2 provides the shear strength results.

Table 2 – Unconsolidated Undrained Triaxial Test Summary

Boring Number	Sample Number	Depth	Sample Description	USCS[1]	LL[2]	PL[2]	PI[2]	LI[2]	Moisture Content	Effective Confining Stress PSI (psf)	Shear Stress (psf)
BH-1	ST-2	50.9-51.4	Gray lean CLAY, tr. coarse to fine sand	CL	35	18	17	0.52	26.9%	45.2 (6,508)	1,162
BH-1	ST-3	71.1-71.6	Gray lean CLAY, tr. fine sand	CL	38	18	20	0.51	28.1	60.8 (8,755)	1,302
BH-3	ST-1	36.5-37.0	Gray lean CLAY, tr. coarse to fine sand	CL	27	19	8	1.78	33.2	27.8 (4,003)	131
BH-3	ST-2	41.3-41.8	Gray silty CLAY, tr. coarse to fine sand	CL-ML	---	---	---	N/A	29.2	31.3 (4,507)	174
BH-3	ST-4	55.8-56.3	Gray lean CLAY, tr. fine sand	CL	27	17	10	0.93	26.3	48.6 (6,998)	993
BH-14	ST-1	110.8-111.3	Gray lean CLAY, tr. coarse to fine sand	CL	41	21	20	0.41	29.2	93.8 (13,507)	1,055
BH-14	ST-2	119.0-119.6	Gray lean CLAY, tr. coarse to fine sand	CL	37	20	17	0.42	27.2	104.2 (15,004)	471
BH-16	ST-2	76.0-76.5	Gray lean CLAY, tr. coarse to fine sand	CL	35	17	18	0.76	30.6	62.5 (9,000)	382
BH-16	ST-4	96.0-96.5	Gray lean CLAY, tr. coarse to fine sand	CL	39	22	17	0.56	31.6	82.6 (11,894)	470
BH-16	ST-6	116.4-116.9	Gray lean CLAY, tr. coarse to fine sand	CL	38	19	19	0.36	25.8	100.7 (14,500)	379

1. Based on visual identification.
2. LL=liquid limit; PL=plastic limit; PI=plasticity index; LI=liquidity index

One-dimensional consolidation testing (ASTM D2435) was also performed on select Shelby tube samples collected within the underlying lacustrine deposits to determine settlement characteristics of the compressible material underlying the Site for use in HDD planning. Table 3 provides the results of the consolidation testing.

Table 3 - Consolidation Parameters

Settlement Parameters	BH-1 / ST-1 (40-42 ft BGS)	BH-3 / ST-3 (45-47 ft BGS)	BH-16 / ST-1 (65-67 ft BGS)	BH-16 / ST-5 (105-107 ft BGS)
Water Content (%) (w)	34.6	32.5	25.3	31.7
Dry Density (pcf) (γ_d)	85.8	94.1	93.8	90.4
Saturated Density (pcf) (γ_{sat})	117.7	123.0	121.3	119.3
Effective Overburden Pressure (psf) (σ_{vo}')	2,183	2,650	3,790	5,528
Specific Gravity	2.71	2.70	2.70	2.67
In-situ Void Ratio (e)	0.974	0.790	0.797	0.844
Pre-consolidation Pressure (psf) (σ_p')	2,409	4,425	6,322	3,346
Compression Index (C_c)	0.300	0.258	0.197	0.300
Recompression Index (C_r)	0.081	0.059	0.039	0.059
Over Consolidation Ratio (OCR)	1.10	1.67	1.67	0.61

The consolidation parameters appear to be consistent with lacustrine deposits within the Cleveland area. The soils appear to be over consolidated with OCR ranging between 1.1 to 1.67. Sample BH-16/ST-5 (105-107 feet BGS) had an OCR of 0.61, however, based on our experience, it is anticipated that the pre-consolidation pressure of 3,346 psf for a soil specimen at this depth is probably low. There does not appear to be a correlation with the settlement properties with depth.

All phases of the laboratory-testing program were conducted in general accordance with applicable American Society for Testing and Materials (ASTM) specifications. Copies of the laboratory results are provided in Appendix C. Soil samples will be stored at the laboratory for 90 days from the date of this Report unless otherwise directed by the Client.

3.3 Geoenvironmental Sampling and Testing

In order to characterize the fill material in the sub-surface at the Site, four soil samples were collected (i.e., 2 from the Icebreaker Substation/HDD entry pit area and the CPP 138 kV Ring Bus Extension area) for laboratory analysis for semi-volatile organic compounds (SVOCs) by U.S. EPA method 8270 and Resource Conservation and Recovery Act (RCRA) 8 metals by U.S. EPA method 6010B. A representative portion of the soil samples were placed in a clean plastic bag for volatile organic compound (VOC) headspace

screening using a photoionization detector (PID) in order to field screen for the presence of VOCs. Rationale for the soil sample selection for analysis were based on the anticipated release mechanism of historical operations, or field observations including PID headspace screening results, staining, discoloration, or odors.

Soil samples from four borings (BH-5, BH-7, BH-9, and BH-13) were sent to the laboratory of analysis of VOCs, SVOCs, RCRA 8 Metals, and PCBs as previously discussed. Multiple chemicals of concerns (COCs) were detected in soils. A total of 4 VOCs, 1 SVOC, and 7 metals were detected above laboratory practical quantitation limits (PQLs).

Detected metals in soil consisted of the following:

Arsenic	Cadmium	Lead	Mercury
Barium	Chromium	Selenium	

Detected VOCs in soil consisted of the following:

Benzene	Toluene
Methylene Chloride	Xylenes

Detected SVOCs in soil consisted of the following:

2-Methylnaphthalene

The laboratory analytical data and a summary table are provided in Appendix D.

4.0 EXPLORATION FINDINGS

The following sections present the generalized subsurface conditions observed during the field exploration. During the field activities, our geologist also made observations of existing soil cover/topsoil thicknesses, groundwater conditions, surface features, PID readings, and other site observations deemed important to the planned site development. Refer to the boring logs in Appendix B for more detailed descriptions of the subsurface conditions.

4.1 General Subsurface Conditions

The Site's upper surface consists of a gravel base and asphalt at some locations. In general, fill material was encountered at the CPP site from ground surface to a depth of approximately 29 to 35 feet BGS at the boring locations. The fill material consisted of non-plastic silt and sand with varying amounts of wood, gravel, brick, slag, and coal fragments, with occasional zones of lean clay. The amount of coal and slag appears to be higher in the upper 10 feet of the fill as compared to the lower portions of the fill. Similarly, the amount of brick appears to be higher between 15 to 30 feet BGS within the fill. As previously discussed, the CPP Site was formerly submerged within Lake Erie; based on a review of historic USGS topographic maps, it appears the fill was placed directly on the lacustrine deposits to create developable land. The City does not have specific documentation that describes in detail the origin, method of placement, or the extent of moisture and compaction control during placement, other than the USGS maps that suggests the fill was placed prior to construction of the power plant in the 1920s. It appears that the fill is uncontrolled fill placed randomly and varies in density and moisture contents based on the inconsistent SPT results and moisture contents that vary with depth. Therefore, the engineering characteristics of the fill material, such as composition, strength, and compressibility are considered to be variable. As such, without records of fill placement, monitoring, and testing, the possibility exists that the fill may contain other deleterious materials not identified in recovered soil samples. Consequently, there is a greater than typical risk of unacceptable settlement of the structures when bearing directly on the fill material and if the subgrade is not properly prepared. The blow counts seem to be lower between 10 to 20 feet BGS as compared to other SPT data above and below this zone, probably a result of the fluctuating and presence of the groundwater table at this depth. There does not appear to be a correlation of material type, grain-size of the soil, moisture contents, etc. of the fill vertically or horizontally (between the Icebreaker Substation and CPP 138 kV Ring Bus Extension areas).

Six auger borings were located within the HDD pit location of the Icebreaker Substation area to determine if subsurface debris, oversized materials, or other obstructions are present within the HDD entry pit area along the proposed profiles. Borings AR-1, AR-3, AR-4 and AR-5 encountered an obstruction (i.e., auger refusal) prior to reaching the planned depth – refusal was achieved at 7, 23, 25, and 25 feet BGS,

respectively (see Table 1). Based on the standard sample borings, the fill appears to have larger (diameter) pieces of fill material (i.e., larger than 6 inches) within the Icebreaker Substation area as compared to the CPP 138 kV Ring Bus Extension area – as corroborated by the auger borings; so the contractor should be prepared to manage and encounter these materials during HDD pit excavation.

Below the fill was soft to medium stiff lacustrine clay that extended to the termination depth of the borings. Similar soft lacustrine clay deposits were also observed in the CDF12 borings. In general, the first 5 to 15 feet of the lacustrine deposits directly below the fill (approximately 35 to 50 feet BGS), was described as a non-plastic silt or silt sand and typically have lower blow counts as this is probably the former lakebed within the harbor. The blow counts generally increased with depth. There did not appear to be a strong trend with changes in moisture content with depth within the lacustrine deposits. Bedrock was not encountered in any of the borings as it is anticipated to be over 150 feet BGS in this region.

4.2 Groundwater Observations

Water levels in each soil boring were measured immediately upon the completion of drilling, and were at an average depth of approximately 10 feet BGS, which is likely hydraulically connected to the lake water level. The water levels are summarized on Table 4 below. The boreholes were subsequently backfilled with soil cuttings on the same day.

Table 4 – Measured Groundwater Levels

Boring Number	Groundwater Level (ft. BGS)	Approximate Elevation of Groundwater
BH-1	12	569
BH-2	Dry	---
BH-3	Dry	---
BH-4	10	572
BH-5	Dry	---
BH-6	6.5	575.5
BH-7	6.4	575.6
BH-8	7.3	574.7
BH-9	11.4	570.7
BH-10	10.9	573.1
BH-11	9.3	572.7
BH-12	11.2	571.8

BH-13	7.3	576.7
BH-14	N/A	---
BH-15	11.4	572.6
BH-16	N/A	---
AB-1	9	572
AB-2	8.9	572.1
AB-3	8.9	572.1
AB-4	8.9	572.1
AB-5	9.2	571.8
AB-6	8.8	572.0

Hydrostatic groundwater levels and upper (perched) saturation zones should be expected to fluctuate seasonally due to variations in rainfall, runoff, evapotranspiration, and other factors. Consequently, the measured groundwater levels shown on the boring logs only represent conditions at the time the readings were collected and may thus be different at the time of construction. Furthermore, the actual groundwater levels, seepage, and localized saturated conditions may be observed at shallower depths during periods of heavy precipitation.

5.0 FOUNDATION DISCUSSION AND RECOMMENDATIONS

5.1 Project Description

This Report provides design recommendations relative to foundation type and Site preparation considerations for the installation of electrical substation equipment and structures for the CPP 138 kV Ring Bus Extension (Interconnect facilities) and Icebreaker Substation (switchyard) area and HDD entry pit. It is assumed that minimal amounts of cut/fill (+/- one foot), with the exception of the excavation needed to remove the existing foundations and demolition of the existing structures within the CPP 138 kV Ring Bus Extension area, will be needed to achieve planned final grade. The CPP 138 kV Ring Bus Extension area will be at a final elevation from 582 to 585 feet. The final grade within the Icebreaker Substation area will be at an elevation between 581 to 582 feet. Based on the proposed grading plans prepared by Middough, the final surface will generally be in a south to north grade at a 1.15 to 2.92% slope, with storm water runoff directed towards the northeast corner of the Site to the Lake. The following sizes and structural loads were provided by Middough:

- Transformer = 14 feet by 14 feet pad; weighs 128 kips
- Typical High Pole = vertical load at about 20 kips, ground moment between 670 to 1,150 kips-ft, and shear about 18 kips
- Typical Low to Medium Pole = vertical load at about 6.0 kips, ground moment between 20 to 35 kips-ft, and shear at about 2.0 kips
- SWGR Metal Building = floor live load is at a minimum of 250 psf, and roof live load at a minimum of 50 psf
- Settlement tolerances = ½ to 1-inch (total)

5.2 Foundation Recommendations

5.2.1 Transformer and SWGR Metal Building

Based on the field observations and laboratory test results; slab on grade foundations that bear directly on prepared subgrade surface are considered suitable to support the proposed transformers and lightly-loaded buildings. Foundation supporting systems could be designed for a maximum allowable bearing pressure of 2,500 pounds per square foot (psf) when the site is prepared and the subgrade passes the inspection as outlined in this Report. This allowable bearing pressure is higher than the transformer (14 ft x 14 ft; weight of 128 kips = 650 psf) and SWGR Metal Building (floor live load of 250 psf and roof live load of 50 psf) structural bearing loadings. Extending a footing deeper within this area will not provide a significant benefit as groundwater is relatively shallow (approximately 10 feet BGS) and that would extend the footing closer to the very soft lacustrine deposits, which would both reduce bearing capacity. Although the fill is considered uncontrolled as previously discussed, the fill material is still considered a more suitable material to support the lightly loaded structures than the very soft and wet lacustrine deposits.

If exterior footings are used, they should be placed at a minimum depth of 42 inches below the finished grade in order to protect them from frost per City of Cleveland Building Codes. Interior footings in heated

areas, if present, may be placed at a convenient depth below building floor slab level, provided they bear on suitable material.

All footing excavations should be cut to vertical side walls and flat bottoms with the bottoms comprised of firm soil undisturbed by the method of excavation or softened by standing water. It is anticipated that the fill material has enough fines and moisture that should facilitate temporary vertical side walls during footing excavation, if not the side walls should be sloped as needed. Conventional backhoe type equipment may be used, except in the last few inches when hand excavation methods may be required. Before the backfill or concrete is placed, all water and loose debris should be removed from the excavations. Concrete placement should follow excavation and bearing surface examination as rapidly as practical.

The geotechnical engineer, or a designated representative, should examine footing excavation bottoms, prior to placement of reinforcing steel and concrete in order to determine suitability of the supporting soils. If suitable bearing is not encountered at the proposed bottom of the excavation, the following should be performed as approved by the geotechnical engineer and concurred with by the structural engineer: 1) footings should be redesigned for the lower allowable bearing capacity encountered, 2) undercut the soft soils and replaced with AASHTO #1and 2 and/or ODOT 304 aggregate and geogrid to further distribute the loads (depth of undercut and geogrid type to be determined in the field by the Geotechnical Engineer based on site conditions), or 3) the underlying unsuitable soils should be removed and replaced with acceptable engineered fill.

Relative to excavation and replacement, the following is recommended:

1. The excavation should be performed using conventional backhoe type equipment to minimize disturbance to the soils at the bottom of the excavation.

2. The bottom of the excavation should be examined and approved for fill placement by the geotechnical engineer.

3. All engineered fill should be placed in lifts not exceeding 8 inches loose thickness and compacted to a density of not less than 98 percent of maximum dry density and +/- 3% of optimum moisture content as established by Standard Proctor (ASTM D698). However, additional compactive effort may be necessary to achieve the bearing pressure noted above. The type of material considered satisfactory for use as engineered fill is provided in Section 6.1. The structural engineer may also specify a lean mix concrete or footing concrete to backfill the overexcavation.

4. The material excavated, with the exception of any topsoil or other deleterious material, is considered suitable for re-use in the engineered fill. These soils will, however require some moisture adjustment in order to achieve the specified densities.

5. All fill should be placed and compacted under the continuous observation and testing by a technician under the general guidance of the geotechnical engineer.

Provided the equipment pad subgrade is properly prepared as previously discussed, if the equipment pad bears on a granular base course of approved granular material it should be of adequate thickness to help distribute concentrated loads, to provide more uniform subgrade support, and to act as a capillary moisture break. For the native subgrade soils observed, a subgrade modulus (k) of 110 pounds per cubic inch (pci) may be used for the base course pad design, if needed.

5.2.2 Poles

Although several pile types are suitable for use on the Site, only drilled piers have been analyzed at this time for the poles located in the CPP 138 kV Ring Bus Extension area . Pile capacity analyses have been performed for the high pole (vertical load of 20 kips, ground moment of 670 kip-ft, and shear of 18 kips) and low to medium pole (vertical load of 6 kips, ground moment of 20 kip-ft, and shear of 2 kips). Based on these loads, the subsurface conditions observed within the borings in the CCP 138 kV Ring Bus Extension area (borings BH-9 to BH-13), and the anticipation that spread footings will not be able to support the poles at these loads within the fill, we have estimated a minimum 3-foot diameter caisson (with 2% steel) that extends 35 feet BGS and an 24-inch diameter caisson that is 15 feet BGS for the high and low to medium poles, respectively, for lateral displacements less than 2 inches. The designer should perform vertical and laterally loaded pile calculations using the final loading conditions to determine the final size and depth of piles needed to support the poles. Table 5 presents a generalized subsurface soil profile observed during the field exploration (based on soil boring BH-1) and recommended geotechnical values for design of the drilled piers within the Icebreaker Substation and CPP 138 kV Ring Bus Extension areas.

These values were based on our experience and conservatively estimated based on material type and results from the SPT and laboratory results. Due to the variability of the fill material, it is recommended that a minimum factor of safety of 2.0 be used during the design. Due to the presence of the uncontrolled fill (e.g., bricks, slag, gravel, wood, etc.) and the obstructions observed at relatively shallow depths in the Icebreaker Substation borings (i.e., borings AR-1, AR-3, AR-4 and AR-5 encountered obstructions at 7, 23, 25, and 25 feet BGS, respectively), care should be taken when advancing the caissons within the fill to maintain quality of the installation and to avoid equipment damage.

Table 5 – Generalized Soil Profile

Material	Depth BGS (feet)[1]	Wet Unit Weight (pcf)	Shear Strength (degrees or psf)	Ultimate Skin Friction (psf)	Ultimate End Bearing (psf)	Lateral Modulus (k, pci)	Strain Factor (E_{50})	Lateral Earth Pressure Coefficient (K_o)	Poisson's Ratio (μ)
FILL-Medium Dense Silty Sand	0 -10	115	ϕ=28	800	---	90	---	0.53	0.30
FILL-Loose Sand	10 - 25	115	ϕ=23	650	5,000	90	---	0.61	0.25
FILL – Medium Dense to Dense Silty Sand	25 - 35	120	ϕ=30	1,200	10,000	90	---	0.50	0.35
Loose to Medium Dense Silty Sand with Gravel	35 - 40	122.5	ϕ=23	650	5,000	90	---	0.61	0.25
Soft to Medium Stiff Lean Clay	40 - 60	125	750	650	5,000	100	0.02	0.80	0.40
Medium Stiff to Stiff Lean Clay	60 - 100	125	1,000	800	9,000	100	0.01	0.75	0.45

An alternative to a deep foundation system would be to modify the existing soils with rammed aggregate pier systems (RAPs). RAPs are patented intermediate foundation technology systems that are generally constructed by applying direct vertical ramming energy to densely compact successive thin lifts of high-quality crushed rock to form high stiffness engineered elements. The vertical ramming action also increases the lateral stress and improves the soils surrounding the cavity, which results in foundation settlement control and greater bearing pressures. RAPs may also have difficulty achieving desired depth due to the potential obstructions located at the Site. RAPs are typically proprietary products and the companies will need to be contacted for pricing and structural design support. Hull can assist with the design and provide site-specific geotechnical information to a structural engineer to support the design of extended type foundation systems.

5.3 Comparison of COCs to Applicable Standards

The COCs detected in soil as previously discussed were compared to Ohio Voluntary Action Program (VAP) generic numerical standards (GNS) for direct contact with soil for commercial/industrial land use and construction/excavation activities, pursuant to OAC 3745-300-08, effective May 16, 2016. These comparisons are shown in the Table provided in Appendix D, and are summarized below.

Arsenic was detected in two soil samples (BH-7 from 3.5 to 5.5 feet and BH-9 from 3.5 to 5.5 feet) above the direct contact soil standard for commercial/industrial activities. All other COCs reported in soil samples collected at the Property were below their respective single-chemical direct contact soil standards for commercial/industrial land use and construction/excavation activities.

6.0 CONSTRUCTION CONSIDERATIONS

6.1 Site Preparation and Compaction Requirements

As previously discussed, it is assumed that minimal amounts of cut/fill (+/- one foot), with the exception of the excavation needed to remove the existing foundations and demolition of the existing structures within the CPP 138 kV Ring Bus Extension area, will be needed to achieve planned final grade. The CPP 138 kV Ring Bus Extension area will be at a final elevation from 582 to 585 feet. The final grade within the Icebreaker Substation area will be at an elevation between 581 to 582 feet.

The on-site material and imported soils can be used for general fill activities and to backfill the excavations from the existing foundation removal, provided that the following is met:

- **On-site material**, with the exception of any topsoil, organic contaminated soil or other deleterious materials, are satisfactory for use as engineered fill for support of lightly loaded buildings/sheds, equipment, and gravel pads, subject to compactive effort applied and possible adjustment of moisture as may be required to achieve specified density requirements. Brick larger than 3 inches in any direction shall be removed.

- **Imported material** can be considered satisfactory for use as engineered fill includes clean clayey soil (USCS CL, SC, or GC), bank run sand and gravel, or ODOT 304 aggregate. The fill material should be free from contamination with topsoil, organic matter, rocks having a major dimension greater than 3-inches, and frozen soil. Fat clays (CH) and reclaimed asphalt concrete pavement is not considered a suitable fill material. Soils described as silt (USCS ML or MH) is also not considered a suitable fill material at the subgrade surface because the stability of these materials is very sensitive to increases in moisture, therefore, these soils should not be placed within three feet of the top of the subgrade. Materials with an ASTM D698 maximum dry density of less than 100 pounds per cubic foot are not considered satisfactory for use as fill.

Do not place frozen fill material or place fill material on frozen ground/subgrade. Insulation blankets, straw, a sacrificial soil layer, or other means may be used to protect the ground surface or subgrade when freezing temperatures are expected. Remove and discard frozen materials within undercut areas or other areas requiring excavation prior to use as engineered fill.

If the moisture content of the fill being placed or the native subgrade is too high (i.e., greater than 3% above optimum moisture content per ASTM D698), appropriate adjustment entails spreading and exposing to the sun and wind for drying and using equipment such as a disc and/or a grader. This may not be feasible during wet seasonal conditions. Wet soils will pump and may cause excessive rutting under heavy equipment traffic. Therefore, improvements to the subgrade may be achieved by undercutting and replacing with suitable fill (possibly in combination with a non-woven geotextile or biaxial geogrid) or stabilization with lime or cement. The most appropriate subgrade improvement technique should be determined at the time of construction. If the moisture content of the fill is too low, a water truck with a sprinkler bar may be

required. After sprinkling, the soil should be thoroughly mixed with a disc and/or a grader.

All suitable fill as required to establish planned grade, should be uniformly compacted in lifts not exceeding 8 inches loose thickness to a density of not less than:

1) 98% of the maximum dry density and +/- 3% of optimum moisture content (OMC) as established by ASTM procedure D 698 (Standard Proctor), in areas of building/shed and equipment support, and for the backfill of the existing foundation areas; and

2) 100% of the maximum dry density and +/- 3% of OMC as established by ASTM procedure D 698 in all areas subject to vehicular traffic loads.

6.2 Proof Rolling

Upon achieving final subgrade elevation; completion of stripping, clearing, and grubbing activities; and prior to controlled fill placement, it is recommended that the soil subgrade be compacted, proof rolled, examined, and approved by the geotechnical engineer, or a designated representative. The proof roll should be performed directly on the subgrade surface over the entire work areas to identify any soft, weak, loose, or excessively wet subgrade conditions. The proof rolling should be completed with a minimum 20-ton fully-loaded tandem-axle dump truck (or equivalent). The vehicle should pass in each of two perpendicular directions covering the proposed work area, if feasible.

Any identified unstable zones should be stabilized as determined in the field based on observed visible conditions of the proof roll. Stabilization methods may include, but are not limited to, disking the subgrade surface to allow for drying (if wet conditions are encountered), additional compaction, or undercutting to a firm, stable depth and replacing the soft/weak zones with controlled fill, as directed by the geotechnical engineer. Backfilling the undercuts with well graded aggregate and AASHTO #1 and #2 stone, and installing geogrid (such as Tensar Biaxial Geogrid BX1200), or equivalent, at the base of the undercut will improve stability and overall performance of the subgrade. Once the subgrade is stable, filling activities may begin. It is anticipated that the fill material will consist of material generated during excavation activities. Suitable controlled fill material should consist of soils where moisture is controlled and rocks are appropriately sized to allow for placement of a uniform lift as described herein.

6.3 Removal of Existing Foundations

It is understood that the Demolition Plan developed by Middough indicate that the existing foundations designated for demolition are to be removed completely within the areas of the Icebreaker Substation and the CPP 138 kV Ring Bus Extension Areas where new structure and equipment is to be located, and a minimum of 5 feet below existing ground surface for the other areas within the project limits. In areas where existing foundations are closely spaced, a general excavation of the entire area may be more efficient than removal and backfill of the excavation for individual structures - this is considered a means and methods and should

be at the discretion of the contractor provided that the excavations are properly backfilled as discussed herein. In addition, a general removal and replacement approach may provide an opportunity to prepare the subgrade where various equipment may be supported on mats or slab on grade systems. Section 6.1 provides recommendations related to the material types that are considered suitable for backfilling of the excavations and also compaction requirements.

It is also understood that the Contractor is responsible to investigate the location and condition of the existing circulating water intake/discharge tunnels which are reported to be located directly beneath the CPP 138 kV Ring Bus Extension area. It is recommended that these tunnels be located and completely removed or abandoned in place (e.g.., grouted, etc.), or the new tower foundation systems be redesigned or relocated to avoid the effects of the tunnels.

6.4 Pavement Considerations

Based on the results of the soil testing, either a Portland cement concrete or asphalt concrete pavement design may be employed by the proposed development if needed. Most of the borings located within the proposed paved areas encountered gravel at the surface. Subgrade soil with a CBR of 7 and a subgrade modulus of 110 pci may be used for the design of flexible (asphalt) and rigid (concrete) pavements, respectively. This is valid if the fill is compacted and the subgrade is prepared as outlined above.

6.5 Drainage

Adequate drainage should be established at the Site to minimize any increase in the moisture content of the subgrade material. Positive drainage of the Site should be created by gently sloping the surface away from the site and into drainage swales. Surface water runoff should be properly controlled and drained away from the Site. It should be noted that the subgrade soils are subject to shrinking and swelling whenever their seasonal moisture contents vary.

6.6 Groundwater Control

The contractors should be prepared to deal with any seepage or surface water that may accumulate in excavations. Based on the fact that ground water was encountered at approximately 10 feet at the site, dewatering may be required during construction of the HDD entry pits because it is anticipated the excavations will extend below the water table. Fluctuations in the ground water may occur seasonally and due to variations in rainfall, construction activity, surface runoff, and other factors. Since such variations are anticipated, we recommend that design drawings and specifications accommodate such possibilities and that construction planning be based on the assumption that such variations can occur.

6.7 Excavations

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. All excavations should comply with applicable local, state, and federal safety regulations including the current Occupational Safety and Health Administration (OSHA) Excavation and Trench Safety Standards (29 CFR Part 1926). The information in this report is being provided solely as a service to our client. Under no circumstance should the information provided be interpreted to mean Hull is assuming responsibility for construction Site safety.

6.8 Geotechnical Related Construction Observation and Testing

The recommendations presented in this Report are based on information disclosed by the limited number of borings. The boring information must be extrapolated to determine the subsurface conditions occurring over the entire site. This extrapolation is based on the knowledge of soil forming geological processes and on past experience. Therefore, the recommendations presented in this report are based in part on the assumption that certain natural conditions will actually be encountered and not be altered during construction. Consequently, it is recommended that Hull perform the construction observation and testing. The recommendations in this Report are considered final only if we observe the foundation excavation to determine if actual subsurface conditions differ from those encountered during this exploration.

7.0 STANDARD OF CARE AND LIMITATIONS

The conclusions and recommendations presented herein are based on the level of effort and investigative techniques using that degree of care and skill ordinarily exercised under similar conditions by reputable members of the profession practicing in the same or similar locality at the time of service. No other warranties, expressed or implied, is made or intended by this report. An evaluation of past or present compliance with federal, state, or local environmental or land use laws or regulations has not been conducted. Conclusions presented by Hull regarding the Site are consistent with the Scope of Work, level of effort specified, and investigative techniques employed. Reports, opinions, letters and other documents do not evaluate the presence or absence of any compound or parameter not specifically analyzed and reported. Hull makes no guarantees regarding the completeness or accuracy of any information obtained from public or private files. In addition, Hull makes no guarantees on the condition of the Site or changes in Site records after the date reviewed as indicated in the Report.

Furthermore, this Report is prepared for, and made available for the sole use of Lake Erie Energy Development Corporation and their assigns. The contents thereof may not be used or relied upon by any other person or entity, without the express written consent and authorization of Lake Erie Energy Development Corporation and Hull.

FIGURES

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0 500 1,000 2,000 Feet

1:24,000

Quad: Cleveland North

Source: The topographic map was acquired through the USGS Topographic Map web service.

The aerial photo in the inset was acquired through the ESRI Imagery web service. Aerial photography dated 2015.

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Lake Erie Energy Development Corporation
Icebreaker Offshore Wind Demonstration Project

Site Location Map

North Marginal Road
Cleveland, Cuyahoga County, Ohio

Date:

December 2016

File Name:
LAE001_03_Fig01_SLM.mxd

Edited: 12/6/2016 By: mopel

Figure

1

Produced using ArcGIS 10.3

APPENDIX A

Site Plan and Boring Location Maps

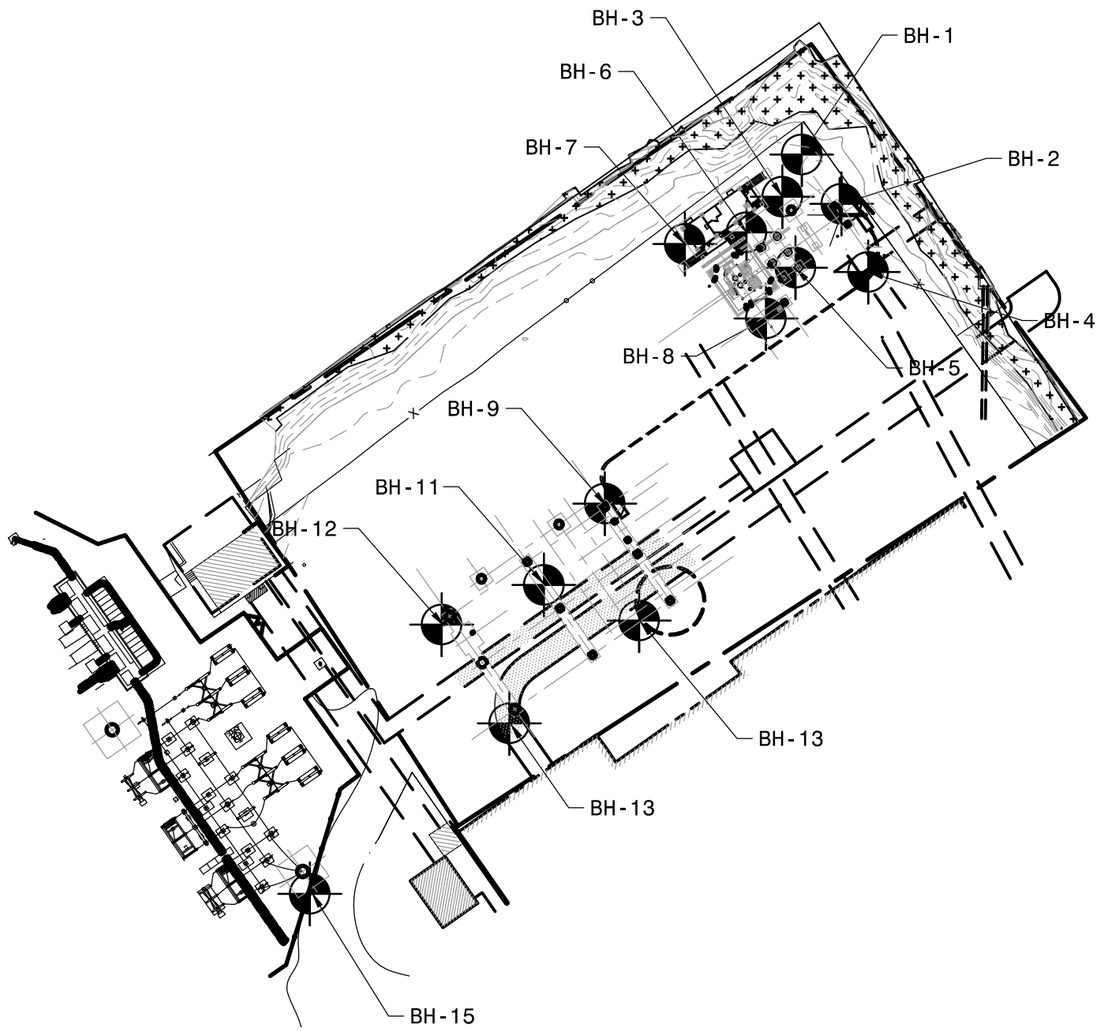
NOTES

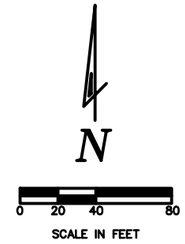
1. BASE MAP AND EQUIPMENT LAYOUT BASED ON MIDDOUGH'S 90% REVIEW DRAWINGS DATED 12-/9/2016

2. TOPOGRAPHY BASED ON KS ASSOCIATES FIELD SURVEY (DATE OF SURVEY: 8/18-23-2016).

3. THE BASIS OF BEARINGS FOR THE SURVEY IS OHIO STATE PLANE, NORTH ZONE NAD83(2011) GRID NORTH. VERTICAL DATUM IS NAVD 1988

4. THE PROJECT BOUNDARY SHOWN IS AN APPROXIMATE LIMIT OF THE PROJECT WORK LIMITS AND DOES NOT REPRESENT A COMPLETE BOUNDARY SURVEY.





LEGEND

PROJECT BOUNDARY

BH-8 BORING LOCATIONS

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BROWNFIELDS
SHALE OIL & GAS
WASTE MANAGEMENT
ENVIRONMENTAL
ALTERNATIVE ENERGY

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LAKE ERIE ENERGY DEVELOPMENT CORPORATION
ICEBREAKER OFFSHORE WIND DEMONSTRATION PROJECT

FIGURE 1
BORING LOCATION MAP

NORTH MARGINAL ROAD
CLEVELAND, CUYAHOGA COUNTY, OHIO

PROJECT NO.: LAE001	SUBMITTAL DATE: DECEMBER 2016
CAD DWG FILE: LAE001.100.0001 SAH	PLOT DATE: 12/22/16

NOTES

1. BASE MAP AND EQUIPMENT LAYOUT BASED ON MIDDOUGH'S 90% REVIEW DRAWINGS DATED 12-/9/2016
2. TOPOGRAPHY BASED ON KS ASSOCIATES FIELD SURVEY (DATE OF SURVEY: 8/18-23-2016).
3. THE BASIS OF BEARINGS FOR THE SURVEY IS OHIO STATE PLANE, NORTH ZONE NAD83(2011) GRID NORTH. VERTICAL DATUM IS NAVD 1988
4. THE PROJECT BOUNDARY SHOWN IS AN APPROXIMATE LIMIT OF THE PROJECT WORK LIMITS AND DOES NOT REPRESENT A COMPLETE BOUNDARY SURVEY.

LEGEND

PROJECT BOUNDARY

BH-8 BORING LOCATIONS

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ICEBREAKER OFFSHORE WIND DEMONSTRATION PROJECT

FIGURE 2
BORING LOCATION MAP

NORTH MARGINAL ROAD
CLEVELAND, CUYAHOGA COUNTY, OHIO

PROJECT NO.: LAE001	SUBMITTAL DATE: DECEMBER 2016
CAD DWG FILE: LAE001.100.0001 SAH	PLOT DATE: 12/22/16

NOTES

1. BASE MAP AND EQUIPMENT LAYOUT BASED ON MIDDOUGH'S 90% REVIEW DRAWINGS DATED 12-/9/2016

2. TOPOGRAPHY BASED ON KS ASSOCIATES FIELD SURVEY (DATE OF SURVEY: 8/18-23-2016).

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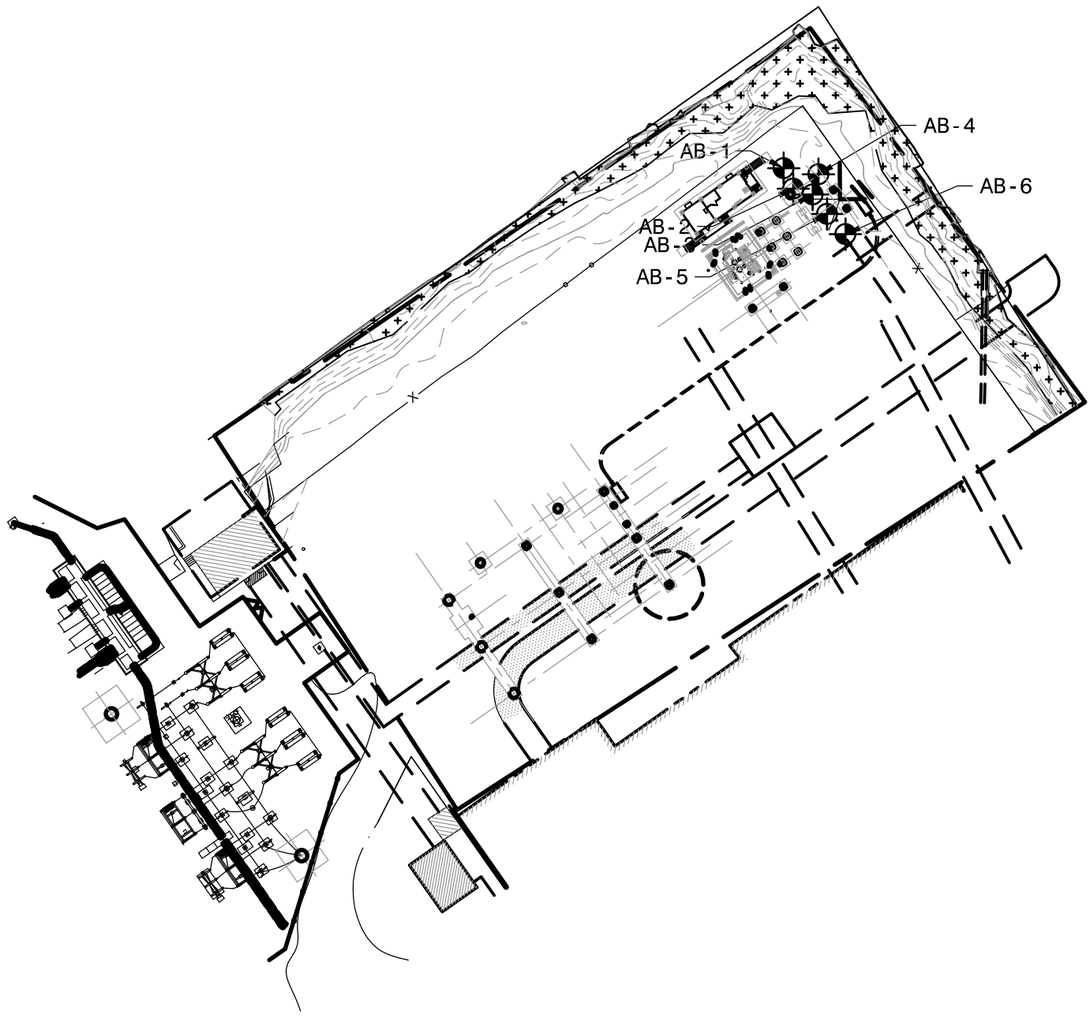
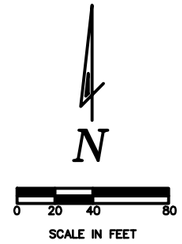
4. THE PROJECT BOUNDARY SHOWN IS AN APPROXIMATE LIMIT OF THE PROJECT WORK LIMITS AND DOES NOT REPRESENT A COMPLETE BOUNDARY SURVEY.





LEGEND

PROJECT BOUNDARY

AB-4 BORING LOCATIONS

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SHALE OIL & GAS
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LAKE ERIE ENERGY DEVELOPMENT CORPORATION
ICEBREAKER OFFSHORE WIND DEMONSTRATION PROJECT

FIGURE 3
AUGER BORING LOCATIONS

NORTH MARGINAL ROAD
CLEVELAND, CUYAHOGA COUNTY, OHIO

PROJECT NO.: LAE001	SUBMITTAL DATE: DECEMBER 2016
CAD DWG FILE: LAE001.100.0001 SAH	PLOT DATE: 12/22/16

APPENDIX B

General Information, Drilling Procedures, and Logs of Borings
Definition of Terms Used to Describe Subsurface Materials on Boring Logs
(16 Sample Borings and 6 Auger Borings)

GENERAL INFORMATION, DRILLING PROCEDURES AND LOGS OF BORINGS

Drilling and sampling were conducted in accordance with procedures generally recognized and accepted as standardized methods of investigation of subsurface conditions concerning geotechnical engineering considerations. Borings were drilled with either a truck-mounted or ATV-mounted drill rig.

Drive split-barrel sampling was performed in 1.5-foot increments at intervals not exceeding 5 feet. In the event the sampler encountered resistance to penetration of 6 inches or less after 50 blows of the drop more representative samples were preserved from each sampling increment.

In borings where rock was cored, NXM or NQ sized diamond coring tools were used.

Depth of water recorded in the boring is measured from the top of existing ground surface to the top of water level. Initial water level measurement indicates the water level observed during the drilling activities and the static water level indicates the water level observed immediately after drilling. In relatively pervious soils, such as sandy soils, the indicated depth is considered a reliable groundwater level for that date. Seasonal variations, temperature and recent rainfall conditions may influence the levels of the groundwater table and volumes of water will depend on the permeability of the soils. In fine-grained soils, such as clay and silt, such readings are less reliable.

In the laboratory, all samples were described based on the visual-manual examination soil classification system in accordance with ASTM D2488. Moisture contents of representative fine-grained soil samples were determined. A limited number of samples, considered representative of foundation materials present, were selected for performance of grain-size analyses and plasticity characteristics test.

The boring logs included in the Attachment have been prepared on the basis of the field record of drilling and sampling, and the results of the laboratory examination and testing of samples. Stratification lines on the boring logs indicating changes in soil stratigraphy represent depths of changes approximated by the driller, by sampling effort and recovery, and by laboratory test results. Actual depths to changes may differ somewhat from the estimated depths, or transitions may occur gradually and not be sharply defined. The boring logs presented in this report therefore contain both factual and interpretative information and are not an exact copy of the field log.

Although it is considered that the borings have disclosed information generally representative of actual site conditions, it should be expected that between borings conditions may occur which are not precisely represented by any one of the borings. Soil deposition processes and natural geologic forces are such that soil and rock types and conditions may change in short vertical intervals and horizontal distances.

Soil/rock samples will be stored at Hull & Associates Inc.'s laboratory for a period of 90 days. After this period of time, they will be discarded, unless notified to the contrary by the client.

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DEFINITION OF TERMS USED TO DESCRIBE SUBSURFACE MATERIALS ON BORING LOGS

DESCRIPTION OF SOILS

The soil descriptions on the boring logs are based on visual-manual examination (ASTM D 2488) of soil samples, Standard Penetration Test (ASTM D 1586) results, and the results of laboratory testing on selected soil samples. Soils are described as to density or consistency, color, grain size distribution, moisture condition, and other pertinent properties, in that order. SAA indicates material can be described as "Same As Above", with any differences noted. Soil descriptions are according to the following criteria, with the principal constituent, written in capital letters.

Standard Penetration Test (ASTM D 1586)

In the Standard Penetration Test, a 2.0-inch outside diameter, 1.375-inch inside diameter split-spoon sampler is driven 18 inches into soil by means of a 140-pound hammer falling freely through a vertical distance of 30 inches. The sampler is normally driven in three successive 6-inch increments. The total number of blows required to drive the split spoon sampler over 12 inches of penetration during the second and third successive increments is the Standard Penetration Test N-Value. If the blow count for any half foot increment exceeded 50, the SPT was stopped and the distance the sampler was driven was measured and recorded (e.g., 50/2 indicates 50 blows were recorded for a 2-inch penetration).

Sampling method abbreviations

Methods by which soil samples are collected for analysis are abbreviated as follows:

AS - Auger Sample - directly from auger flight
SP - Split Spoon Sample
ST - Shelby Tube Sample
RC - Rock Core
DP - Direct Push Sample

Density of cohesionless soils

Density of **cohesionless** soils is based upon results of Standard Penetration Tests as indicated below:

Density Term	N-Value (Blows per foot)
Very loose	0-4
Loose	5-10
Medium Dense	11-30
Dense	31-50
Very Dense	Over 50

Consistency of cohesive soils

Consistency of cohesive soils is based on Standard Penetration Test results and the unconfined compressive strength.

Consistency Term	N-Value (Blows per foot)	Unconfined Compressive Strength (tons per square foot)
Very soft	<2	<0.25
Soft	2-4	0.25-0.5
Medium stiff	5-8	0.5-1.0
Stiff	9-15	1.0-2.0
Very stiff	16-30	2.0-4.0
Hard	>30	>4.0

Color

Soil color is described in basic terms, such as brown, black, red, grey, and yellow. If the soil is a uniform color throughout, the term is single, modified by adjectives such as light and dark. If the predominant color is shaded by a secondary color, the secondary color precedes the primary color. If two major and distinct colors are swirled throughout the soil, the colors are modified by the term "mottled".

Component definitions by grain size (ASTM D 653)

Material	Definitions	Fractions	Sieve Limits	
			Upper	Lower
Boulders	Material too large to pass through an opening 12 in. square.			
Cobbles	Material passing through a 12 in. square opening and retained on the 3 inch sieve.			
Gravel	Material passing the 3 in. sieve and retained on 1/4 in. (No. 4) sieve.	Coarse Fine	3 in 3/4 in.	3/4 in No. 4 (1/4in.)
Sand	Material passing the No. 4 sieve and retained on the No. 200 Sieve.	Coarse Medium Fine	No. 4 (1/4") No. 10 (1/8") No. 40 (1/32")	No. 10 (1/8") No. 40 (1/32") No. 200
Silt	Material passing the No. 200 sieve, which is usually non-plastic or very slightly plastic in character and exhibits little or no strength when air dried.		No. 200	
Clay	Material passing the No. 200 sieve, which can also be made to exhibit plasticity within a certain range of moisture contents and which exhibits considerable strength when air dried.		No. 200	

Soil constituents may be stated in terms of percentages (by weight) of gravel, sand, and fines, as follows:

Trace - particles of a given size range present, but present at <5%
Few - 5 to 15%
Little - 15 to 25%
Some - 30 to 45%
Mostly - 50 to 100%

Moisture condition

Moisture contents may be written as dry, moist or wet as described below:

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible moisture
Wet	Visible free water, usually soil below the water table

DESCRIPTION OF ROCK

The following terms are used to describe the degree of weathering of the rock specimen relative to that of the comparable unweathered parent rock. (Do not confuse relative strength/hardness with weathering.):

Unweathered	No evidence of any chemical or mechanical alternation of the rock mass. Mineral crystals have a bright appearance with no discoloration. Fractures show little or no staining on surfaces.
Slightly Weathered	<10% of rock volume altered. Slight discoloration of the surface w/minor alterations along open fractures.
Moderately Weathered	Portions of the rock mass are discolored as evident by a dull appearance. Surfaces may have a pitted appearance. Isolated zones of varying rock strengths due to alteration may be present. 10 to 15 percent of the rock volume presents alterations.
Highly Weathered	Entire rock mass appears discolored and dull. Some pockets of slightly to moderately weathered rock may be present and some areas of severely weathered materials may be present.
Severely Weathered	Majority of the rock mass reduced to a soil-like state with visible relict rock texture. Zones of more resistant rock may be present, but the material can generally be molded and crumbled by hand pressures.

The following terms are used to describe the relative strength/hardness of the bedrock:

Very Weak	Can be easily scratched by fingernail or knife. Pieces 1 inch (25 mm) or more in thickness can be broken by finger pressure.
Weak	Can be grooved or gouged readily by a knife or pick. Can be excavated in small fragments by moderate blows of a pick point. Small, thin pieces can be broken by finger pressure.
Moderately Strong	Can be scratched with a knife or pick. Grooves or gouges to ¼" (6mm) deep can be excavated by hand blows of a geologist's pick. Requires moderate hammer blows to detach specimen.
Strong	Can be scratched with a knife or pick only with difficulty. Requires hard hammer blows to detach specimen.
Very Strong	Cannot be scratched by a knife or sharp pick. Breaking of hand specimens requires hard repeated blows of the geologist hammer.

Rock Quality Designation, RQD – This value is expressed in percent and is an indirect measure of rock soundness. It is obtained by summing the total length of all core pieces which are at least four inches long, and then dividing this sum by the total length of the core recovered.

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BORING NUMBER AB-1

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio
DATE STARTED 10/21/16 **COMPLETED** 10/21/16
GROUND ELEVATION 581 ft
DRILLING CONTRACTOR HAD
GROUND WATER LEVELS:
RIG TYPE Mobile EQ002 **DRILLING METHOD** 3.25" Hollow Stem Auger ▽ **AT TIME OF DRILLING** 9.01 ft / Elev 571.99 ft
LOGGED BY J. Mielecki **CHECKED BY** S. McGee **AT END OF DRILLING** ---
COORDINATES 41.527109, -81.661864 **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		GRAVEL surface, existing.										
		Black silty SAND, with coal.										
5		CONCRETE.										

Auger refusal at 7 feet.
Bottom of borehole at 7 feet.

▽

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BORING NUMBER AB-2

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio
DATE STARTED 10/21/16 **COMPLETED** 10/21/16
GROUND ELEVATION 581 ft
DRILLING CONTRACTOR HAD
GROUND WATER LEVELS:
RIG TYPE Mobile EQ002 **DRILLING METHOD** 3.25" Hollow Stem Auger
AT TIME OF DRILLING 8.90 ft / Elev 572.10 ft
LOGGED BY J. Mielecki **CHECKED BY** S. McGee
AT END OF DRILLING ---
COORDINATES 41.527080, -81.661847
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Black SAND.										
5												
		Black SAND, some cobble.										
		Black SAND.										
10												
		Black silty SAND, with gravel.										
15												
20												

Bottom of borehole at 20 feet.

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BORING NUMBER AB-3

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio
DATE STARTED 10/21/16 **COMPLETED** 10/21/16
GROUND ELEVATION 581 ft
DRILLING CONTRACTOR HAD
GROUND WATER LEVELS:
RIG TYPE Mobile EQ002 **DRILLING METHOD** 3.25" Hollow Stem Auger ▽ **AT TIME OF DRILLING** 8.93 ft / Elev 572.07 ft
LOGGED BY J. Mielecki **CHECKED BY** S. McGee **AT END OF DRILLING** ---
COORDINATES 41.527071, -81.661809 **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Black gravelly SAND.										
5												
10		▽										
15		COBBLE.										
		Black silty SAND.										
20												
		Auger refusal at 23 feet. Bottom of borehole at 23 feet.										

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BORING NUMBER AB-4

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio
DATE STARTED 10/21/16 **COMPLETED** 10/21/16
GROUND ELEVATION 581 ft
DRILLING CONTRACTOR HAD
GROUND WATER LEVELS:
RIG TYPE Mobile EQ002 **DRILLING METHOD** 3.25" Hollow Stem Auger ▽ **AT TIME OF DRILLING** 8.93 ft / Elev 572.07 ft
LOGGED BY J. Mielecki **CHECKED BY** S. McGee **AT END OF DRILLING** ---
COORDINATES 41.527100, -81.661798 **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Black sandy SILT.										
5		COBBLE.										
		Black gravelly SAND, with clay. ▽										
10												
15												
20		COBBLE.										
25		Auger refusal at 25 feet. Bottom of borehole at 25 feet.										

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BORING NUMBER AB-5

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio
DATE STARTED 10/21/16 **COMPLETED** 10/21/16
GROUND ELEVATION 581 ft
DRILLING CONTRACTOR HAD
GROUND WATER LEVELS:
RIG TYPE Mobile EQ002 **DRILLING METHOD** 3.25" Hollow Stem Auger ▽ **AT TIME OF DRILLING** 9.21 ft / Elev 571.79 ft
LOGGED BY J. Mielecki **CHECKED BY** S. McGee **AT END OF DRILLING** ---
COORDINATES 41.527043, -81.661782 **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		GRAVEL surface, existing.										
		Black gravelly SAND, some clay, some clay tile fragments.										
5		Soft, black silty SAND, with gravel, wet.										
10		▽										
15		COBBLE.										
20												
25		Auger refusal at 25 feet. Bottom of borehole at 25 feet.										

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BORING NUMBER AB-6

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio
DATE STARTED 10/21/16 **COMPLETED** 10/21/16
GROUND ELEVATION 581 ft
DRILLING CONTRACTOR HAD
GROUND WATER LEVELS:
RIG TYPE Mobile EQ002 **DRILLING METHOD** 3.25" Hollow Stem Auger ▽ **AT TIME OF DRILLING** 8.97 ft / Elev 572.03 ft
LOGGED BY J. Mielecki **CHECKED BY** S. McGee **AT END OF DRILLING** ---
COORDINATES 41.527013, -81.661747 **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		GRAVEL surface, existing.										
		Black silty SAND.										
5												
		▽										
10												
15												
20		COBBLE.										
25												
30												
35												

Bottom of borehole at 35 feet

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BORING NUMBER BH-1

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio
DATE STARTED 10/24/16 **COMPLETED** 10/25/16
GROUND ELEVATION 581 ft
DRILLING CONTRACTOR HAD
GROUND WATER LEVELS:
RIG TYPE Mobile EQ002 **DRILLING METHOD** 3.25" Hollow Stem Auger ▽ **AT TIME OF DRILLING** 12.00 ft / Elev 569.00 ft
LOGGED BY A. Prvanovic **CHECKED BY** S. McGee **AT END OF DRILLING** ---
COORDINATES 41.527152,-81.661831 **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		FILL: Medium dense, dark brown silty SAND, few gravel, coal and slag fragments, moist.	SS 1	100	8-6-7	0.75		12.0				
5		FILL: Medium stiff, dark brown SILT, some sand, few gravel, coal and slag fragments.	SS 2	87	3-4-2	0.5		24.9				
		FILL: Medium stiff, dark brown SILT, some sand, few gravel, coal and slag fragments, wet.										
		FILL: Medium dense, dark brown silty SAND, few organics, wet.	SS 3	87	5-2-22			26.0				
10		FILL: Loose, brown SAND, few silt and gravel, wet.	SS 4	47	3-1-6			14.0				
		▽ FILL: Very loose, brown SAND, few silt and gravel, wet.	SS 5	0	1-1-1							
15		FILL: Very loose, dark brown to black SAND, trace silt and fine gravel, wet.	SS 6	13	WOH-1			34.5				
20			SS 7	53	2-2-1	0		17.5				
25		FILL: Very dense, black gravelly SAND, sandstone fragments, wet.	SS 8	100	50/3.6			26.5				
30		FILL: Very dense, dark brown sandy GRAVEL, wet.	SS 9	67	5-2-50/6			15.8				
		FILL: SANDSTONE fragments.										
		FILL: Very dense, dark brown sandy GRAVEL, wet.										
35		Medium dense, black SAND, some fine gravel, wet.	SS 10	100	7-7-7			22.8				
		Medium dense, gray silty SAND, wet.										

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BORING NUMBER BH-1

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
35		Medium dense, gray silty SAND, wet. *(continued)*										
40		Medium stiff, gray-brown lean CLAY, wet.	SS 11	67	4-3-4	0.5		31.6	27	19	8	
			ST 1	100								
45		Soft, gray-brown lean CLAY, wet. (CL)	SS 12	100	1-1-1	0.25		37.4	40	22	18	
50		Medium stiff, gray-brpwn silty CLAY, wet.	SS 13	100	2-3-3	0.25		25.4				
			ST 2	100					35	18	17	
55		Stiff, gray-brown lean CLAY, wet.	SS 14	100	3-4-6	0.25		28.4	38	23	15	
60		Medium stiff, gray-brown lean CLAY, wet.	SS 15	100	4-4-3	0.25		26.0				
65		Stiff, gray-brown lean CLAY, wet.	SS 16	100	3-7-7	0.25		28.4				
70		Medium stiff to stiff, gray-brown lean CLAY, wet.	SS 17	100	5-3-3	0.25		27.5				
			ST 3	100					38	18	20	
75		Loose, gray-brown clayey SAND, wet.	SS 18	100	4-5-5	0.25		27.5				

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BORING NUMBER BH-1

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
75		Loose, gray-brown clayey SAND, wet. *(continued)*										
80		Stiff, gray-brown sandy SILT, some clay, wet.	SS 19	100	4-6-7	0.25		28.3				
85		Medium stiff, gray-brown lean CLAY, wet.	SS 20	100	4-4-4	0.25		28.8				
90		Stiff, gray-brown sandy lean CLAY, wet.	SS 21	100	4-5-5	0.25		26.3				
95			SS 22	100	3-4-5	0.25		27.7				
100			SS 23	100	5-5-5	0.25		25.8				

Bottom of borehole at 100 feet.

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BORING NUMBER BH-2

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio
DATE STARTED 10/20/16 **COMPLETED** 10/20/16
GROUND ELEVATION 581 ft
DRILLING CONTRACTOR HAD
GROUND WATER LEVELS:
RIG TYPE Mobile EQ002 **DRILLING METHOD** 3.25" Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY J. Mielecki **CHECKED BY** S. McGee
AT END OF DRILLING ---
COORDINATES 41.527080,-81.661755
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		FILL: Medium dense, brown and black SAND, some gravel, clay and silt, few coal fragments, moist.	SS 1	100	10-9-8-5			13.4				
5		FILL: Loose, black, silty SAND, some coal and cinder fragments, moist.	SS 2	55	4-3-3-2			29.9				
		FILL: Medium dense, black, silty SAND, moist.	SS 3	45	32-12-3-2			14.9				
		FILL: Medium dense CONCRETE fragments.										
10		FILL: Medium stiff, brown, sandy lean CLAY, some gravel, trace brick fragments, moist.	SS 4	67	4-3-50/6			19.1				
		FILL: Very dense, brown SANDSTONE fragments, moist. (possible gravel dike wall)										
15		FILL: Very dense, gray LIMESTONE fragments, some clay and sand, wet. (possible gravel dike wall)	SS 5	60	23-25-26-4			12.9				
20		FILL: Medium dense, brown SAND, some gravel, fine grained, wet. (possible gravel dike wall)	SS 6	46	1-3-25-50/3			17.4				
		FILL: Medium dense, tan LIMESTONE fragments, wet. (possible gravel dike wall)										
		FILL: Very dense, gray LIMESTONE fragments, wet. (possible gravel dike wall)	SS 7	45	45-50/2			11.6				
		Auger refusal at 24.2 feet. Bottom of borehole at 24.2 feet.										

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Hull & Associates, Inc.
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Bedford, Ohio 44146
Telephone (440) 232-9945
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BORING NUMBER BH-3

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio
DATE STARTED 10/20/16 **COMPLETED** 10/20/16
GROUND ELEVATION 581 ft
DRILLING CONTRACTOR HAD
GROUND WATER LEVELS:
RIG TYPE Mobile EQ002 **DRILLING METHOD** 3.25" Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY J. Mielecki **CHECKED BY** S. McGee
AT END OF DRILLING ---
COORDINATES 41.527091,-81.661869
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		FILL: GRAVEL surface, existing.										
		FILL: Dense, brown, silty SAND, some gravel, few brick and coal fragments, moist.	SS 1	100	7-17-20-20			9.0				
5		FILL: Stiff, gray, lean SILT, moist.	SS 2	75	5-3-11-14			36.7				
		FILL: Medium dense, gray to tan, GRAVEL consisting of limestone fragments, moist.	SS 3	85	2-11-14-13			30.5				
		FILL: Medium dense, red-brown, SAND, some slag, moist.										
10		FILL: Very stiff, gray to black, lean SILT, trace angular gravel, moist.	SS 4	90	1-10-15-13			26.5				
15		FILL: Very loose, black, silty SAND, some gravel, moist, poor recovery.	SS 5	7	1-2-2			12.6				
		FILL: Very dense, black, SAND, coarse, angular, wet.	SS 6	45	24-50/2			14.1				
20		FILL: Very dense, white, GRAVEL comprised of weathered limestone fragments, wet.										
		FILL: Medium dense, black SAND, fine grained, wet.	SS 7	67	4-16-10			15.6				
25		FILL: Medium dense, white SAND, fine grained, wet.										
		FILL: Medium dense GRAVEL comprised of limestone fragments, wet.										
		NO RECOVERY.	SS 8	0	50/3							
30												
		Very stiff, gray, lean SILT, non-plastic, moist.	SS 9	67	9-9-9			24.1	NP	NP	NP	
35												

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BORING NUMBER BH-3

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
35		Very stiff, gray, lean CLAY, moist. (CL)	ST 1	100					27	19	8	
		Stiff, gray, lean CLAY, trace gravel, moist.	SS 10	100	2-4-7			27.8				
40			ST 2	75								
		Very soft, gray, lean CLAY, moist.	SS 11	100	0-0-0			35.8				
45			ST 3	100					45	24	21	
		Soft, gray, lean CLAY, moist.	SS 12	100	2-2-2			28.4				
50												
		Medium stiff, gray, lean CLAY, moist.	SS 13	100	2-3-3			27.9				
55			ST 4	100					27	17	10	
60			SS 14	100	2-4-4			28.7	37	22	15	

Bottom of borehole at 60 feet.

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BORING NUMBER BH-4

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio
DATE STARTED 10/20/16 **COMPLETED** 10/20/16
GROUND ELEVATION 582 ft
DRILLING CONTRACTOR HAD
GROUND WATER LEVELS:
RIG TYPE Mobile EQ002 **DRILLING METHOD** 3.25" Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY J. Mielecki **CHECKED BY** S. McGee
AT END OF DRILLING ---
COORDINATES 41.526981,-81.661705
AFTER DRILLING 10.04 ft / Elev 570.96 ft

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		FILL: Hard, black, lean SILT, some sand, coal fragments, clay, and gravel, moist.	SS 1	90	15-17-17-15							
5		FILL: Medium dense, black and brown gravelly SAND, some silt and coal fragments, moist.	SS 2	75	1-3-11-40							
		FILL: Loose, black and brown gravelly SAND, some silt and coal fragments, moist.	SS 3	100	4-5-4-5							
		FILL: Stiff, gray, lean CLAY, few coal fragments, moist.										
		FILL: Stiff, gray, lean CLAY, few coal fragments, wet.										
10		FILL: Very stiff, black, lean, sandy SILT, moist.	SS 4	100	4-8-12-12							
15		FILL: Medium stiff, silty, sandy CLAY, few clay tile fragments, wet.	SS 5	50	3-3-4-4							
20		FILL: Very loose SAND, some gravel and brick fragments. trace wood fragments, wet [FILL].	SS 6	5	1-1-1-1							
		FILL: Very dense SAND, wet [FILL].	SS 7	100	50/5							
25		FILL: Very dense CONCRETE fragments [FILL].										
		FILL: Medium dense, black SAND, fine grained, wet.	SS 8	80	2-20-5							
30		FILL: Medium dense, gray-white SLAG, wet [FILL].										

Bottom of borehole at 30 feet.

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BORING NUMBER BH-5

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio
DATE STARTED 10/19/16 **COMPLETED** 10/19/16
GROUND ELEVATION 582 ft
DRILLING CONTRACTOR HAD
GROUND WATER LEVELS:
RIG TYPE Mobile EQ002 **DRILLING METHOD** 3.25" Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY J. Mielecki **CHECKED BY** S. McGee
AT END OF DRILLING ---
COORDINATES 41.526988,-81.661845
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		FILL: Dense, black SAND, some coal fragments, clay, and gravel, moist.	SS 1	75	17-15-27-27							
5		FILL: Hard, black SILT, some sand and coal fragments, moist.	SS 2	90	2-7-26-26							
		FILL: Loose, black, silty SAND, fine grained, moist.	SS 3	100	1-2-4-5							
10		FILL: Stiff, black SILT, trace fine sand and coal fragments, wet.	SS 4	90	2-2-10-15							
15		FILL: Very loose, black, gravelly SAND, poor recovery.	SS 5	5	0-0-0-1							
20		FILL: Medium dense, black, silty SAND, fine grained, some coarse sand, wet.	SS 6	85	3-2-9-30							
25		FILL: Very dense, gray and black, gravelly SAND, wet.	SS 7	73	14-40-26							
30		FILL: Loose, gray to brown, SAND, fine grained, wet.	SS 8	100	5-4-5							

Bottom of borehole at 30 feet.

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BORING NUMBER BH-6

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio
DATE STARTED 10/19/16 **COMPLETED** 10/19/16
GROUND ELEVATION 582 ft
DRILLING CONTRACTOR HAD
GROUND WATER LEVELS:
RIG TYPE Mobile EQ002 **DRILLING METHOD** 3.25" Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY J. Mielecki **CHECKED BY** S. McGee
AT END OF DRILLING ---
COORDINATES 41.527040,-81.661939
AFTER DRILLING 6.50 ft / Elev 575.50 ft

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		FILL: Stiff, black and brown, sandy lean CLAY, some cinders and coal fragments, moist.	SS 1	100	11-7-8-7			18.2				
5		FILL: Hard, black SILT, moist.	SS 2	95	14-23-15-17			36.5				
		FILL: Very stiff, black SILT, moist.	SS 3	75	2-16-12-3			41.7				
		FILL: Very stiff, black sandy SILT, wet.										
		FILL: Medium dense, gray CONCRETE fragments.										
10		FILL: Soft, black, sandy SILT, wet.	SS 4	80	2-2-2-2			35.0				
15		FILL: Loose, gray, gravelly SAND, some silt, wet.	SS 5	75	2-4-4-3			31.1				
20		FILL: Very loose, black, gravelly SAND, wet.	SS 6	15	0-0-0-1			20.7				
		FILL: Very dense, black, silty SAND, wet.	SS 7	71	23-22-50/5			21.3				
25		FILL: Very dense SANDSTONE fragments, wet.										
		FILL: Very dense COBBLES, wet.										

Bottom of borehole at 28.5 feet.

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BORING NUMBER BH-7

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio
DATE STARTED 10/19/16 **COMPLETED** 10/19/16
GROUND ELEVATION 582 ft
DRILLING CONTRACTOR HAD
GROUND WATER LEVELS:
RIG TYPE Mobile EQ002 **DRILLING METHOD** 3.25" Hollow Stem Auger
AT TIME OF DRILLING 6.38 ft / Elev 575.62 ft
LOGGED BY J. Mielecki **CHECKED BY** S. McGee
AT END OF DRILLING ---
COORDINATES 41.527024,-81.662058
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		FILL: Hard, black clayey SAND, with gravel and coal fragments, moist.	SS 1	100	9-16-16-20			13.8				
5		FILL: Stiff, black SILT, moist.	SS 2	90	7-7-6-5			33.0				
		FILL: Very loose, black silty SAND, with gravel, wet.	SS 3	98	1-1-1-50/4							
		FILL: LIMESTONE, gray, wet.	SS 4	100	50/3							
10		FILL: LIMESTONE, gray.										
15		FILL: Soft, gray lean CLAY, with gravel, wet.	SS 5	15	0-0-0-2			19.2				
20		FILL: Very loose, black SAND, some wood, wet.	SS 6	5	1-1-1-1			32.1				
25		FILL: Medium dense, black SAND, some gravel, wet.	SS 7	33	10-8-7							
30		FILL: Very Loose, black silty SAND, with wood, wet.	SS 8	80	2-2-2							

Bottom of borehole at 30 feet.

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BORING NUMBER BH-8

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio
DATE STARTED 10/19/16 **COMPLETED** 10/19/16
GROUND ELEVATION 582 ft
DRILLING CONTRACTOR HAD
GROUND WATER LEVELS:
RIG TYPE Mobile EQ002 **DRILLING METHOD** 3.25" Hollow Stem Auger
AT TIME OF DRILLING 7.30 ft / Elev 574.70 ft
LOGGED BY J. Mielecki **CHECKED BY** S. McGee
AT END OF DRILLING ---
COORDINATES 41.526915,-81.661903
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		FILL: Very dense, black silty SAND, with cinder and coal fragments, moist.	SS 1	90	20-26-28-24			14.8				
5		FILL: Very dense, black and brown clayey SAND, coal fragments.	SS 2	100	5-33-23-15							
		▽										
10		FILL: COAL fragments.	SS 3	90	3-3-8-17							
		FILL: Stiff, dark gray SILT, moist.										
		FILL: Medium dense, black sandy GRAVEL, coal fragments, wet.										
15		FILL: Stiff, black SILT, moist.	SS 4	50	6-4-8-3			27.7				
		FILL: Medium dense, black gravelly SAND, with wood, wet.										
20		FILL: Very loose, black sand, some gravel, wet.	SS 5	5	0-0-0-0			46.9				
25		FILL: Very soft, black SILT, wet.	SS 6	100	0-0-0							
30		FILL: Very soft, black SILT, trace sand, wet.	SS 7	100	0-0-1							
35		Very loose, black silty SAND, wet.	SS 8	47	0-1-1							

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BORING NUMBER BH-8

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
35		Very loose, black silty SAND, wet. *(continued)*										
40		Medium stiff, gray lean CLAY, moist.	SS 9	33	3-2-3							

Bottom of borehole at 40 feet.

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BORING NUMBER BH-9

CLIENT Lake Erie Energy Development Corporation (LEEDCo) **PROJECT NAME** Icebreaker Offshore Wind Project

PROJECT NUMBER LAE001 **PROJECT LOCATION** Former CPP Facility and CDF 12, Cleveland, Ohio

DATE STARTED 10/18/16 **COMPLETED** 10/18/16 **GROUND ELEVATION** 582 ft

DRILLING CONTRACTOR HAD **GROUND WATER LEVELS:**

RIG TYPE Mobile EQ002 **DRILLING METHOD** 3.25" Hollow Stem Auger **AT TIME OF DRILLING** 11.35 ft / Elev 570.65 ft

LOGGED BY J. Mielecki **CHECKED BY** S. McGee **AT END OF DRILLING** ---

COORDINATES 41.526649,-81.662217 **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		ASPHALT surface, existing.										
		FILL: Stiff, black sandy SILT, with coal fragments, moist.	SS 1	100	10-5-4-6			22.0				
5		FILL: Medium dense, red-brown clayey SAND, with gravel and brick fragments, moist.	SS 2	75	2-3-12-15			14.4				
		FILL: Medium stiff, gray sandy CLAY, with gravel, moist.	SS 3	90	12-3-5-7			21.9				
10		FILL: Medium stiff, gray lean CLAY, moist.	SS 4	100	2-3-3-4			26.2	35	21	14	
		▽										
15		FILL: Loose, black, well-graded GRAVEL with sand, some brick fragments, wet. (GW)	SS 5	90	2-2-5-5							
20			SS 6	10	1-2-1-1			39.0				
25		FILL: Very loose, black sandy GRAVEL, with brick fragments.	SS 7	47	1-1-1							
30		Soft, gray lean CLAY, moist.	SS 8	33	1-1-1			28.4	32	20	12	
35		Medium stiff, gray lean CLAY, moist.	SS 9	47	2-3-4							

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BORING NUMBER BH-9

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
35		Medium stiff, gray lean CLAY, moist. *(continued)*										
40		Soft, gray lean CLAY, moist.	SS 10	100	1-1-1							
45		Soft, gray silty lean CLAY, moist.	SS 11	100	1-1-3							

Bottom of borehole at 45 feet.

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BORING NUMBER BH-10

CLIENT Lake Erie Energy Development Corporation (LEEDCo) **PROJECT NAME** Icebreaker Offshore Wind Project

PROJECT NUMBER LAE001 **PROJECT LOCATION** Former CPP Facility and CDF 12, Cleveland, Ohio

DATE STARTED 10/18/16 **COMPLETED** 10/18/16 **GROUND ELEVATION** 584 ft

DRILLING CONTRACTOR HAD **GROUND WATER LEVELS:**

RIG TYPE Mobile EQ002 **DRILLING METHOD** 3.25" Hollow Stem Auger ▽ **AT TIME OF DRILLING** 10.93 ft / Elev 573.07 ft

LOGGED BY J. Mielecki **CHECKED BY** S. McGee **AT END OF DRILLING** ---

COORDINATES 41.526479,-81.662153 **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		FILL: Medium stiff, black SILT, with gravel, coal fragments, moist.	SS 1	75	8-5-3-5			14.3				
5		FILL: Loose, brown, well graded SAND with silt, some gravel, coal fragments, moist. (SW-SM)	SS 2	50	3-3-3-3			14.1	NP	NP	NP	
		FILL: Medium dense, brown silty SAND, some gravel, coal fragments, moist.	SS 3	90	3-10-13-13							
10		FILL: Dense, brown clayey SAND, with glass and coal fragments, moist. ▽	SS 4	100	6-9-23-20							
15		FILL: Loose, black-to-brown silty SAND, with gravel, wet.	SS 5	90	6-5-4-6							
20		FILL: Very loose, black silty SAND, with gravel, wet.	SS 6	100	1-1-1-1							
25		FILL: Very loose, GRAVEL, with sand, wet.	SS 7	27	2-2-2			17.1				
30		FILL: Medium dense, black SAND, with gravel, brick fragments, wet.	SS 8	80	3-6-8							
35		Soft, gray silty CLAY, moist.	SS 9	67	0-2-3							

Bottom of borehole at 35 feet

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4 Hemishpere Way
Bedford, Ohio 44146
Telephone (440) 232-9945
Fax (440) 232-9946

BORING NUMBER BH-11

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio
DATE STARTED 10/18/16 **COMPLETED** 10/18/16
GROUND ELEVATION 582 ft
DRILLING CONTRACTOR HAD
GROUND WATER LEVELS:
RIG TYPE Mobile EQ002 **DRILLING METHOD** 3.25" Hollow Stem Auger
AT TIME OF DRILLING 9.27 ft / Elev 572.73 ft
LOGGED BY J. Mielecki **CHECKED BY** S. McGee
AT END OF DRILLING ---
COORDINATES 41.526532,-81.662336
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		FILL: Medium dense, clayey SAND, with gravel.										
		FILL: Black COAL and cinders.	SS 1	100	17-9-13-7							
5		FILL: Stiff, black SILT, with cinders and coal, some gravel, moist.	SS 2	60	7-4-10-7			11.4				
		FILL: Loose, red-brown gravelly SAND, some clay, moist.	SS 3	85	2-3-4-6							
10		▽ FILL: Medium dense, brown-black clayey SAND, with gravel, moist.	SS 4	75	4-7-7-5							
		FILL: Medium dense, brown-black clayey SAND, with gravel, wet.										
15		FILL: Medium dense, black silty SAND, with gravel, moist.	SS 5	85	2-4-7-4			20.2				
20		FILL: Very loose, black gravelly SAND, with brick fragments, wet.	SS 6	60	2-1-3-1			34.8				
25		FILL: Very loose, black SAND, some brick fragments, wet.	SS 7	13	1-1-1			57.0				
30		Soft, dark gray CLAY, moist.	SS 8	93	1-1-1							
35		Soft, gray, lean CLAY, moist.	SS 9	67	2-2-2							

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BORING NUMBER BH-11

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
35		Soft, gray, lean CLAY, moist. *(continued)*										
40		Very soft, gray, lean CLAY, moist.	SS 10	100	0-0-1							
45		Medium stiff, gray, lean CLAY, moist.	SS 11	100	0-2-3			31.6	27	19	8	

Bottom of borehole at 45 feet.

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BORING NUMBER BH-12

CLIENT Lake Erie Energy Development Corporation (LEEDCo) **PROJECT NAME** Icebreaker Offshore Wind Project

PROJECT NUMBER LAE001 **PROJECT LOCATION** Former CPP Facility and CDF 12, Cleveland, Ohio

DATE STARTED 10/17/16 **COMPLETED** 10/17/16 **GROUND ELEVATION** 583 ft

DRILLING CONTRACTOR HAD **GROUND WATER LEVELS:**

RIG TYPE Mobile EQ002 **DRILLING METHOD** 3.25" Hollow Stem Auger ▽ **AT TIME OF DRILLING** 11.23 ft / Elev 571.77 ft

LOGGED BY J. Mielecki **CHECKED BY** S. McGee **AT END OF DRILLING** ---

COORDINATES 41.526476,-81.662534 **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		FILL: Medium dense, black COAL, with ash and cinders, moist.	SS 1	95	27-10-13-12							
5		FILL: Medium dense, black SAND, with coal, some brown clay with gravel, moist.	SS 2	65	3-5-9-12							
		FILL: Very stiff, red-brown CLAY, with sand and fine gravel, moist.	SS 3	90	2-8-11-10							
10		FILL: Stiff, gray lean CLAY, with gravel, moist. FILL: Medium dense, red-brown SAND, with gravel, moist. ▽	SS 4	100	2-6-8-6							
15		FILL: Medium dense to dense, brown SAND, with gravel, wet. FILL: Dense, black silty SAND, with gravel, moist. FILL: Dense, gray to green SAND, with concrete and brick fragments.	SS 5	75	4-16-34-12							
20		FILL: Very loose, brown to black fine SAND, wet.	SS 6	15	1-2-1-1							
25		FILL: Very loose, black SAND, with gravel, wet.	SS 7	13	2-2-2							
30			SS 8	33	1-2-1							
35		Soft, gray lean CLAY, moist.	SS 9	67	2-2-1							

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BORING NUMBER BH-12

CLIENT Lake Erie Energy Development Corporation (LEEDCo) **PROJECT NAME** Icebreaker Offshore Wind Project

PROJECT NUMBER LAE001 **PROJECT LOCATION** Former CPP Facility and CDF 12, Cleveland, Ohio

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
35		Soft, gray lean CLAY, moist. *(continued)*										
40			SS 10	100	2-1-2							
45			SS 11	100	1-1-1							

Bottom of borehole at 45 feet.

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BORING NUMBER BH-13

CLIENT Lake Erie Energy Development Corporation (LEEDCo) **PROJECT NAME** Icebreaker Offshore Wind Project

PROJECT NUMBER LAE001 **PROJECT LOCATION** Former CPP Facility and CDF 12, Cleveland, Ohio

DATE STARTED 10/18/16 **COMPLETED** 10/18/16 **GROUND ELEVATION** 584 ft

DRILLING CONTRACTOR HAD **GROUND WATER LEVELS:**

RIG TYPE Mobile EQ002 **DRILLING METHOD** 3.25" Hollow Stem Auger ▽ **AT TIME OF DRILLING** 7.32 ft / Elev 576.68 ft

LOGGED BY J. Mielecki **CHECKED BY** S. McGee **AT END OF DRILLING** ---

COORDINATES 41.526332,-81.662405 **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		FILL: Very stiff, brown to black sandy lean CLAY, some gravel, moist.	SS 1	100	12-12-9-9			14.1				
5		FILL: Stiff, black sandy lean CLAY, with gravel, some coal, moist.	SS 2	85	9-8-6-3							
		▽ FILL: Medium dense, brown to black silty SAND, with cinders, some clay, some brick and glass, moist.	SS 3	60	9-8-6-13							
10		FILL: Very loose, brown to black silty SAND, with cinders, some clay, some brick and glass, moist.	SS 4	55	2-2-2-2							
15		FILL: Very loose, black gravelly SAND, with brick fragments, wet.	SS 5	50	2-1-2-2							
20			SS 6	10	1-1-1-1							
25		FILL: Medium dense, black gravelly SAND, some brick fragments, wet.	SS 7	87	2-6-6							
30		FILL: Loose, black fine SAND, with brick fragments, wet.	SS 8	67	3-3-3							
35		FILL: Very loose, black fine SAND, with gravel, wet. Soft, gray lean CLAY, moist.	SS 9	67	0-0-2							

Bottom of borehole at 35 feet

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BORING NUMBER BH-14

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio
DATE STARTED 10/28/16 **COMPLETED** 10/28/16
GROUND ELEVATION 577 ft
DRILLING CONTRACTOR HAD
GROUND WATER LEVELS:
RIG TYPE Mobile EQ002 **DRILLING METHOD** 3.25" Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY D. Pratt **CHECKED BY** S. McGee
AT END OF DRILLING ---
COORDINATES 41.530286,-81.664148
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown-black clayey SILT, trace gravel, few sand, moist.										
5		Black clayey SILT, trace gravel, few sand, moist.										
10		Black, lean CLAY, trace gravel, few sand, moist.										
15		Black, lean CLAY, trace gravel, few sand, wet.										
20		Black, lean CLAY, some sand, trace gravel, moist.										
25												
30		Black SILT, few sand, plastic, wet.										
35												

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BORING NUMBER BH-14

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
35		Black SILT, few sand, plastic, wet. *(continued)*										
40		Black SILT, some sand, trace gravel, wet.										
45												
50												
55												
60		Dark brown-black SILT, trace sand and fine gravel, wet.										
65												
70												
75												

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BORING NUMBER BH-14

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
75		Medium stiff, gray-brown, lean CLAY, trace gravel, wet. (CL)	SS 1	89	1-2-4			27.7	28	19	9	
80												
85			ST	13								
90												
95		Medium stiff, gray, lean CLAY, wet. (CL)	SS 2	100	2-2-3			29.9	45	21	24	
100												
105												
110			ST 1	100					41	21	20	
115												

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BORING NUMBER BH-14

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
115		Medium stiff, gray, lean CLAY, wet. (CL) *(continued)*										
120			ST 2	0					37	20	17	

Bottom of borehole at 120 feet.

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BORING NUMBER BH-15

CLIENT Lake Erie Energy Development Corporation (LEEDCo) **PROJECT NAME** Icebreaker Offshore Wind Project

PROJECT NUMBER LAE001 **PROJECT LOCATION** Former CPP Facility and CDF 12, Cleveland, Ohio

DATE STARTED 10/17/16 **COMPLETED** 10/17/16 **GROUND ELEVATION** 584 ft

DRILLING CONTRACTOR HAD **GROUND WATER LEVELS:**

RIG TYPE Mobile EQ002 **DRILLING METHOD** 3.25" Hollow Stem Auger **AT TIME OF DRILLING** 11.37 ft / Elev 572.63 ft

LOGGED BY J. Mielecki **CHECKED BY** S. McGee **AT END OF DRILLING** ---

COORDINATES 41.526088,-81.662793 **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		FILL: Medium dense, silty SAND, with ash, moist.	SS 1	75	20-6-7-7			13.2				
5		FILL: Very dense, gravelly SAND, with cinders and ash, moist.	SS 2	90	8-24-30-28							
		FILL: Very stiff, SILT, with cinders.	SS 3	5	8-10-10-10							
10		FILL: Loose, red clayey SAND, with gravel, moist. ▽	SS 4	50	2-3-2-2							
15		FILL: Very loose, red-brown gravelly SAND, wet.	SS 5	50	2-2-2-2							
20		FILL: Very loose, brown to black, poorly graded SAND with gravel, with glass fragments, wet. (SP)	SS 6	40	2-1-1-2			38.3				
25		FILL: Very loose, gravelly SAND, wet.	SS 7	27	1-1-2							
30		FILL: Loose, black gravelly SAND, wet.	SS 8	67	3-2-3							
35												

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BORING NUMBER BH-15

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
35												
		Soft, gray silty lean CLAY, moist.	SS 9	80	1-2-1							
40		Soft, gray lean CLAY, moist.	SS 10	27	1-1-1							

Bottom of borehole at 40 feet.

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BORING NUMBER BH-16

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio
DATE STARTED 10/26/16 **COMPLETED** 10/27/16
GROUND ELEVATION 577 ft
DRILLING CONTRACTOR HAD
GROUND WATER LEVELS:
RIG TYPE Mobile EQ002 **DRILLING METHOD** 3.25" Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY A. Prvanovic **CHECKED BY** S. McGee
AT END OF DRILLING ---
COORDINATES 41.528959,-81.663189
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Brown silty SAND, with fine gravel.										
5												
10		Black clayey SAND.										
		Loose, black clayey SAND, wet.										
15												
20												
25												
		Soft, black lean CLAY, wet.										
30												
35												

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BORING NUMBER BH-16

CLIENT Lake Erie Energy Development Corporation (LEEDCo) **PROJECT NAME** Icebreaker Offshore Wind Project

PROJECT NUMBER LAE001 **PROJECT LOCATION** Former CPP Facility and CDF 12, Cleveland, Ohio

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
35		Soft, black lean CLAY, wet. *(continued)*										
40												
45												
50												
55												
60		Loose, brown SAND, some gravel, trace clay, wet.	SS 1	67	3-3-3	0.25		19.8				
		Medium stiff, gray-brown, lean CLAY, wet. (CL)										
65			ST 1	100					35	19	16	
70		Soft, gray-brown, lean CLAY, little sand, wet.	SS 2	100	2-2-2			28.4				
75												

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CLIENT Lake Erie Energy Development Corporation (LEEDCo) **PROJECT NAME** Icebreaker Offshore Wind Project

PROJECT NUMBER LAE001 **PROJECT LOCATION** Former CPP Facility and CDF 12, Cleveland, Ohio

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
75		Soft, gray-brown, lean CLAY, little sand, wet. *(continued)*	ST 2	100					35	17	18	
80		Loose, gray-brown clayey SAND, wet.	SS 3	100	3-2-3	0.25		33.0				
85			ST 3	100								
90		Medium stiff, gray-brown, lean CLAY, wet. (CL)	SS 4	100	2-3-3	0.25		30.7				
95			ST 4	100					39	22	17	
100			SS 5	100	4-3-3	0.25		30.5				
105			ST 5	100					37	20	17	
110		Stiff, gray-brown, lean CLAY, wet.	SS 6	100	4-5-5	0.25		28.5				
115												

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BORING NUMBER BH-16

CLIENT Lake Erie Energy Development Corporation (LEEDCo)
PROJECT NAME Icebreaker Offshore Wind Project
PROJECT NUMBER LAE001
PROJECT LOCATION Former CPP Facility and CDF 12, Cleveland, Ohio

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
115		Stiff, gray-brown, lean CLAY, wet. *(continued)*	ST 6	100								
120			SS 7	100	6-6-6			19.6				

Bottom of borehole at 121.5 feet.

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APPENDIX C

Geotechnical Laboratory Testing Results

APPENDIX C-1

Index Testing (Grain Size Analysis and Plasticity Characteristics)

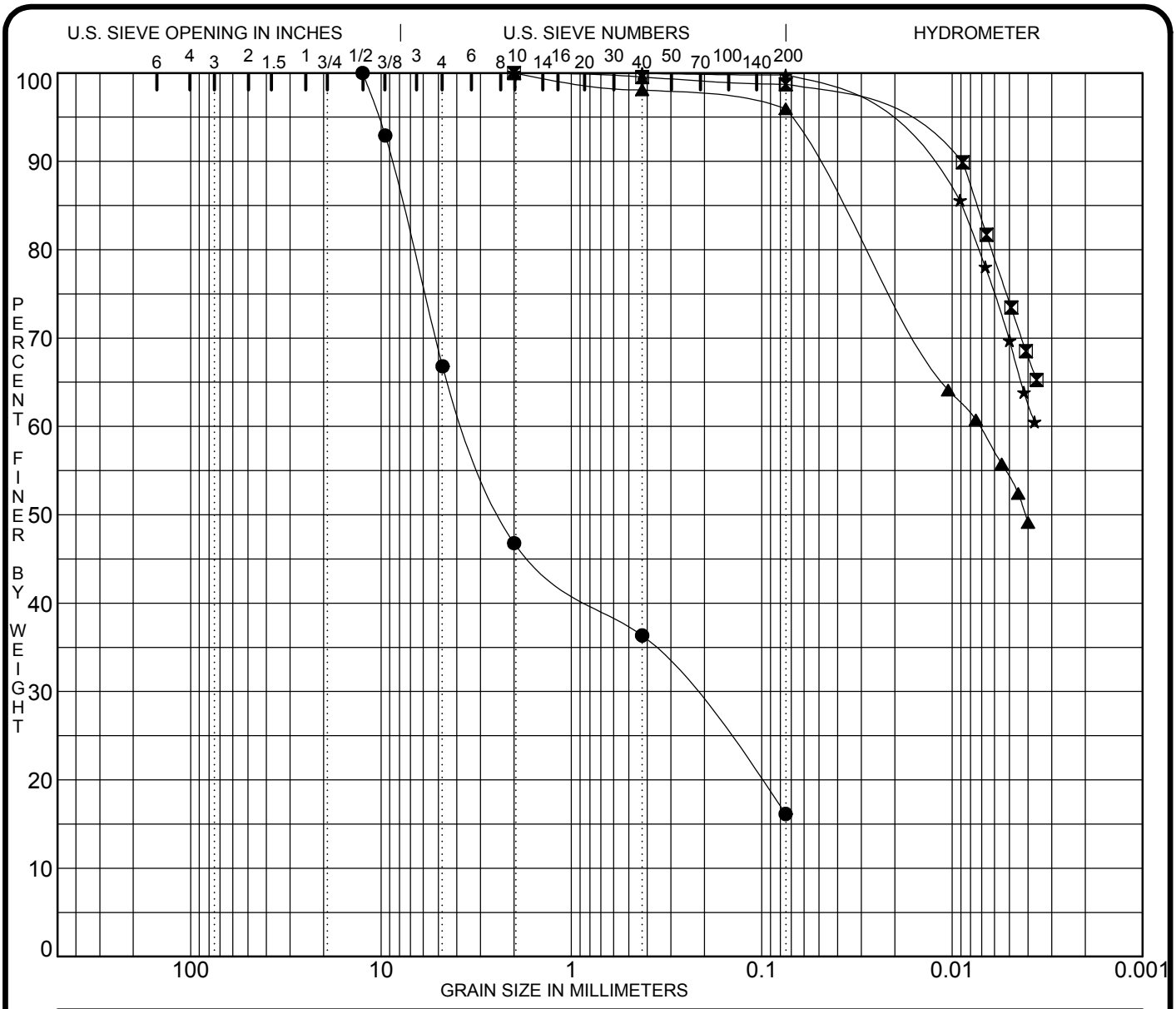
Resource International, Inc.

SUMMARY OF LABORATORY RESULTS

PROJECT CPP FACILITY/CDF 12 - ICEBREAKER **RII PROJECT NO.:** N-16-034-6

Borehole	Sample	Depth	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	%<#200 Sieve	Classification	LOI
BH-1	SS-7	18.5	23.6				16		
BH-1	SS-11	38.5	31.6	27	19	8			
BH-1	ST-1	40.0		47	23	24	99	LEAN CLAY CL	
BH-1	SS-12	43.5	37.4	40	22	18	96	LEAN CLAY CL	
BH-1	ST-2	50.0		35	18	17			
BH-1	SS-14	53.5	28.4	38	23	15			
BH-1	ST-3	70.0		38	18	20	100	LEAN CLAY CL	
BH-10	SS-3	6.0	17.6	NP	NP	NP	18	SILTY SAND with GRAVEL SM	
BH-10	SS-10	38.5	27.3	33	20	13	79	LEAN CLAY with SAND CL	
BH-11	SS-3	6.0	19.2	NP	NP	NP			
BH-13	SS-1	3.5	14.1				7		
BH-14	SS-1	75.0	27.7	28	19	9	100	LEAN CLAY CL	
BH-14	SS-2	95.0	29.9	35	21	14	99	LEAN CLAY CL	
BH-14	ST-1	110.0		41	21	20	94	LEAN CLAY CL	
BH-14	ST-2	118.0		37	20	17	91	LEAN CLAY CL	
BH-15	SS-6	20.0	38.3				4	POORLY GRADED SAND with GRAVEL SP	
BH-16	ST-1	65.0		35	19	16	94	LEAN CLAY CL	
BH-16	ST-2	75.0		35	17	18			
BH-16	ST-4	95.0		39	22	17	100	LEAN CLAY CL	
BH-16	ST-5	105.0		37	20	17			
BH-16	ST-6	115.0		38	19	19			
BH-3	SS-9	33.5	24.1	NP	NP	NP			
BH-3	ST-1	35.0		27	19	8	96	LEAN CLAY CL	
BH-3	ST-3	45.0		45	24	21			
BH-3	ST-4	55.0		27	17	10	99	LEAN CLAY CL	
BH-3	SS-14	58.5	28.7	37	22	15			
BH-6	SS-2	3.5	39.3				58		
BH-9	SS-4	8.5	26.2	35	21	14			
BH-9	SS-6	18.5	39.0				4	WELL-GRADED GRAVEL with SAND GW	
BH-9	SS-9	33.5	28.4	32	20	12			

LAB SUMMARY RII SS - OH DOT.GDT - 12/14/16 13:06 - U:\GI8\PROJECTS\2016\N-16-034-6.GPJ



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

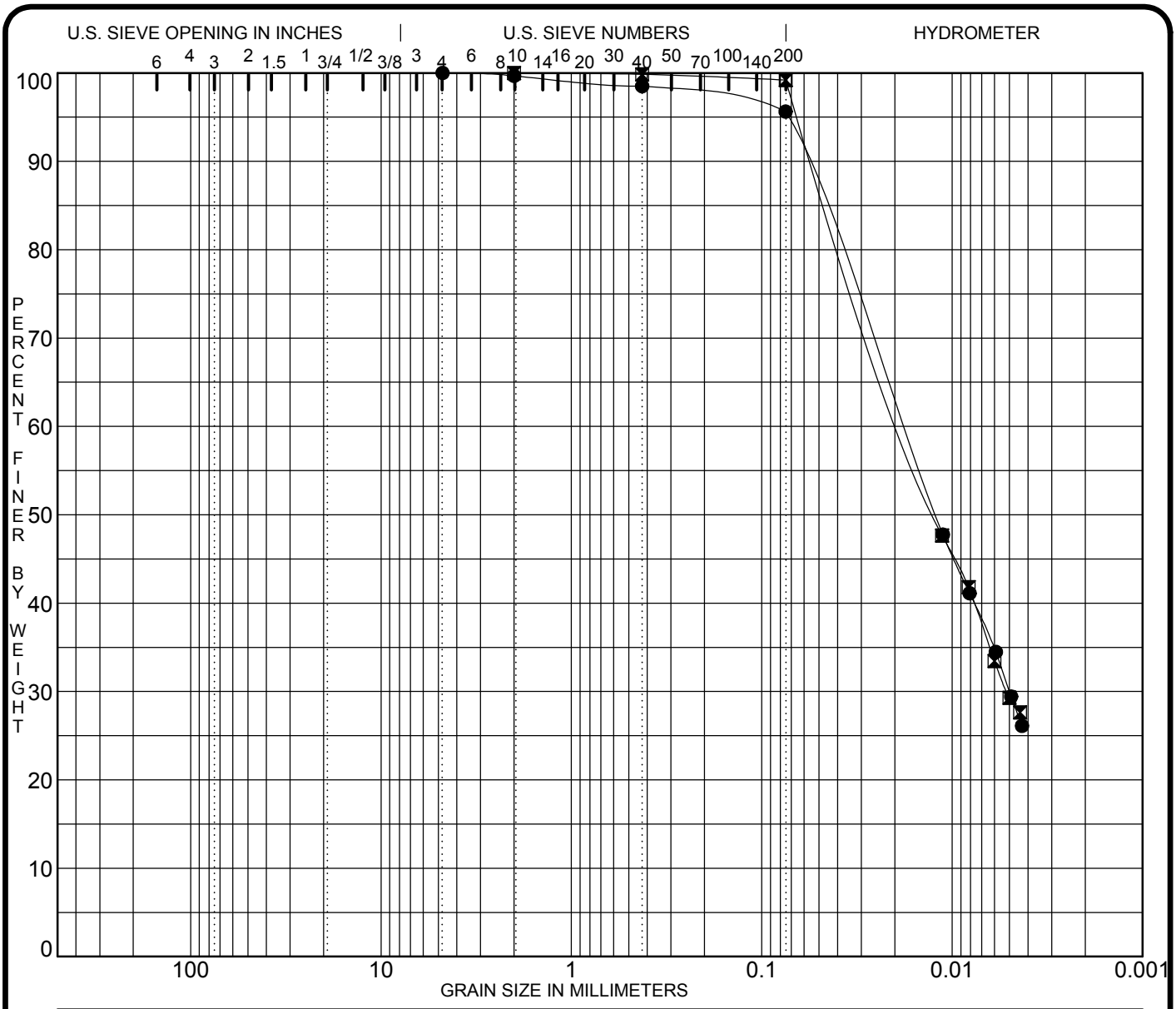
	Specimen ID	Depth	Classification	MC%	LL	PL	PI	Cc	Cu
●	BH-1	18.5		24					
⊠	BH-1	40.0	LEAN CLAY CL		47	23	24		
▲	BH-1	43.5	LEAN CLAY CL	37	40	22	18		
★	BH-1	70.0	LEAN CLAY CL		38	18	20		

	Specimen ID	Depth	D100	D60	D30	D10	%Gravel coarse	%Gravel fine	%Sand coarse	%Sand medium	%Sand fine	%Silt	%Clay
●	BH-1	18.5	12.50	3.54	0.247		0.0	33.2	20.0	10.4	20.2	16.1	
⊠	BH-1	40.0	2.00				0.0	0.0	0.0	0.5	0.8	24.7	74.0
▲	BH-1	43.5	2.00	0.01			0.0	0.0	0.0	1.9	2.1	41.8	54.2
★	BH-1	70.0	2.00				0.0	0.0	0.0	0.0	0.2	30.1	69.7

PROJECT **CPP Facility/CDF 12 - Icebreaker** PROJECT NO. **N-16-034-6**

GRADATION CURVES

RII



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

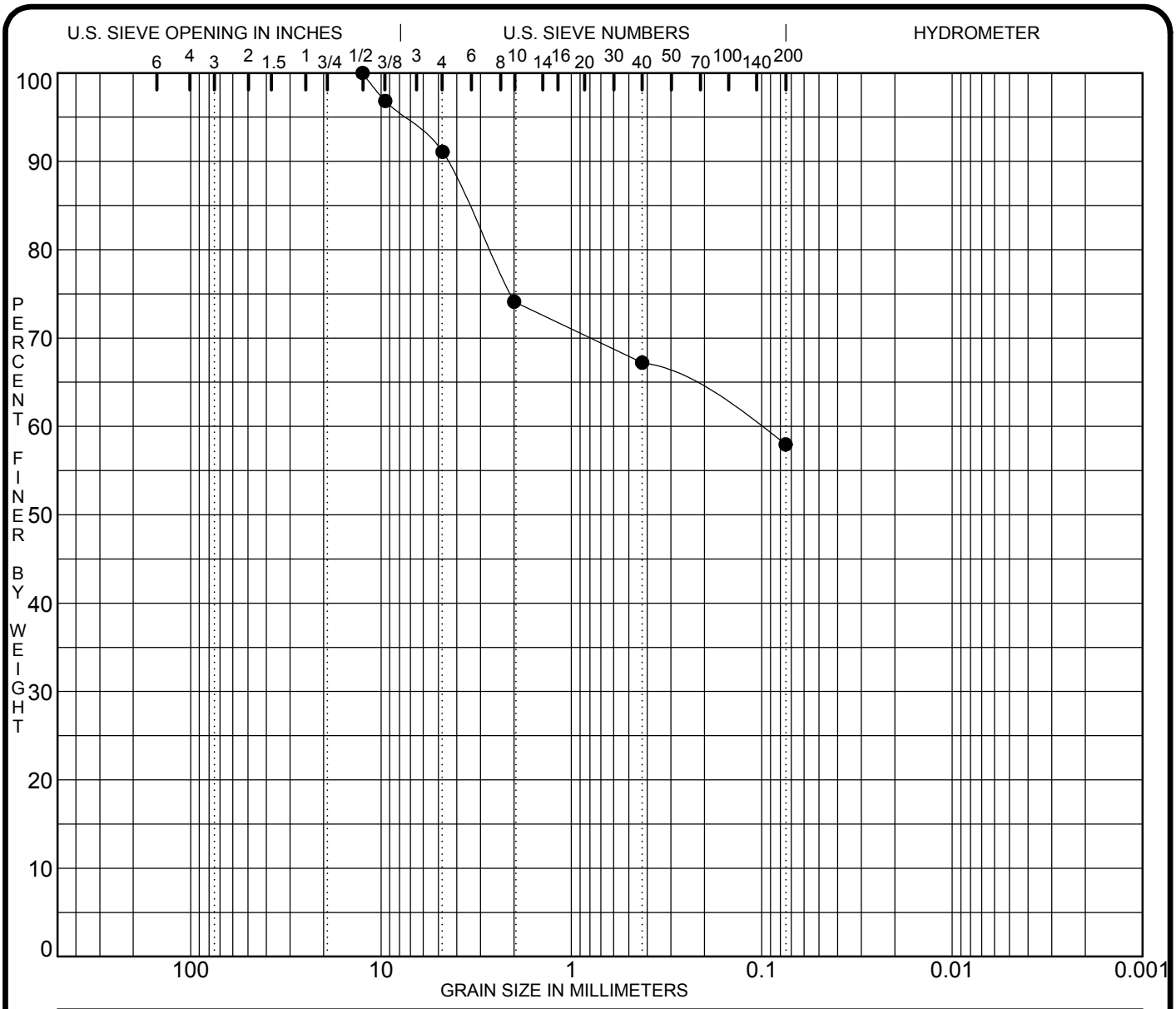
	Specimen ID	Depth	Classification	MC%	LL	PL	PI	Cc	Cu
●	**BH-3**	**35.0**	**LEAN CLAY CL**		**27**	**19**	**8**		
⊠	**BH-3**	**55.0**	**LEAN CLAY CL**		**27**	**17**	**10**		

	Specimen ID	Depth	D100	D60	D30	D10	%Gravel coarse	%Gravel fine	%Sand coarse	%Sand medium	%Sand fine	%Silt	%Clay
●	**BH-3**	**35.0**	**4.75**	**0.02**	**0.005**		**0.0**	**0.0**	**0.3**	**1.2**	**2.9**	**65.7**	**30.0**
⊠	**BH-3**	**55.0**	**2.00**	**0.02**	**0.005**		**0.0**	**0.0**	**0.0**	**0.1**	**0.6**	**69.9**	**29.3**

PROJECT **CPP Facility/CDF 12 - Icebreaker** PROJECT NO. **N-16-034-6**

GRADATION CURVES

RII



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

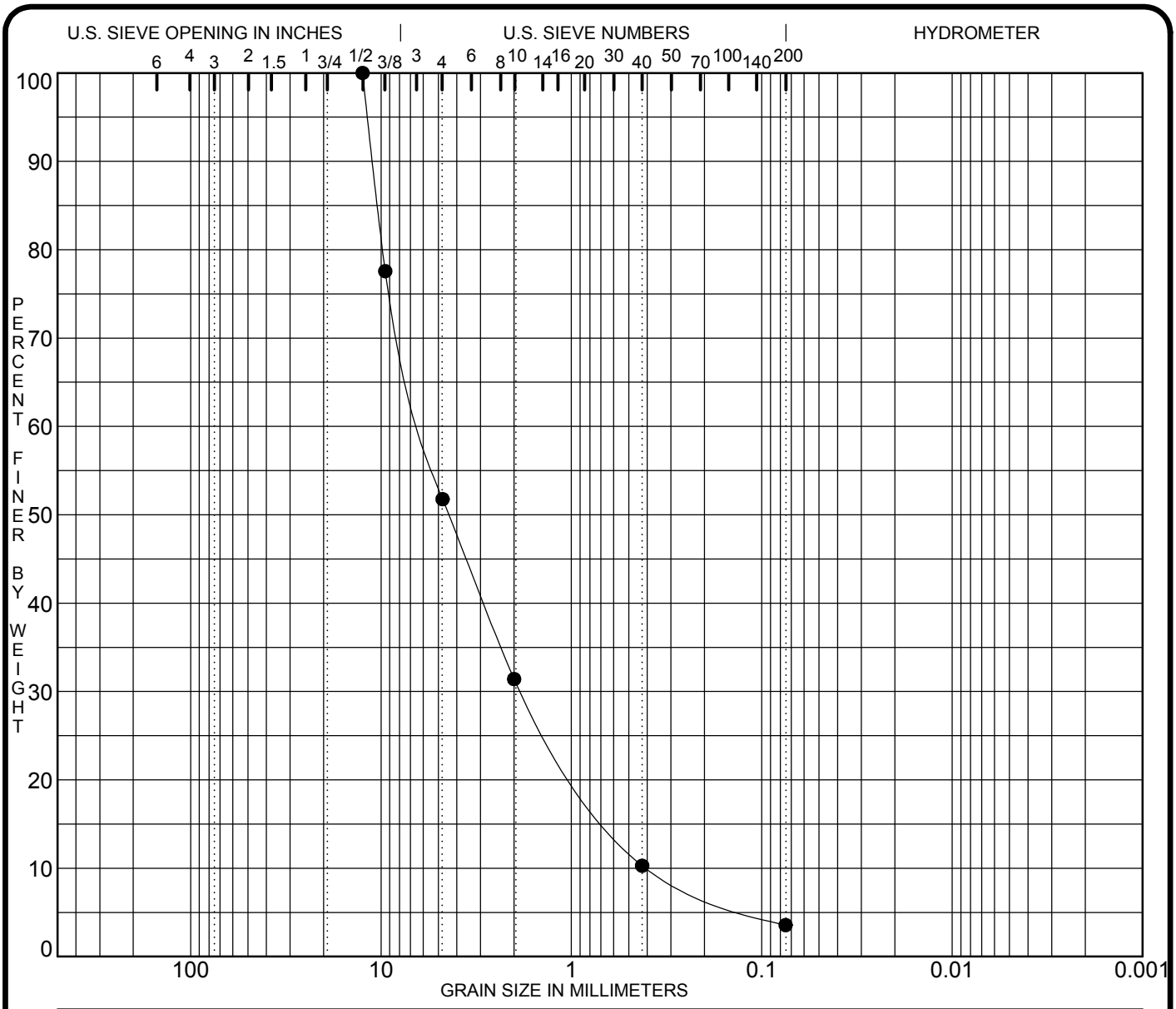
	Specimen ID	Depth	Classification	MC%	LL	PL	PI	Cc	Cu
●	**BH-6**	**3.5**		**39**					

	Specimen ID	Depth	D100	D60	D30	D10	%Gravel coarse	%Gravel fine	%Sand coarse	%Sand medium	%Sand fine	%Silt	%Clay
●	**BH-6**	**3.5**	**12.50**	**0.11**			**0.0**	**8.9**	**17.0**	**6.9**	**9.3**	**58.0**	

PROJECT **CPP Facility/CDF 12 - Icebreaker** PROJECT NO. **N-16-034-6**

GRADATION CURVES

RII



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

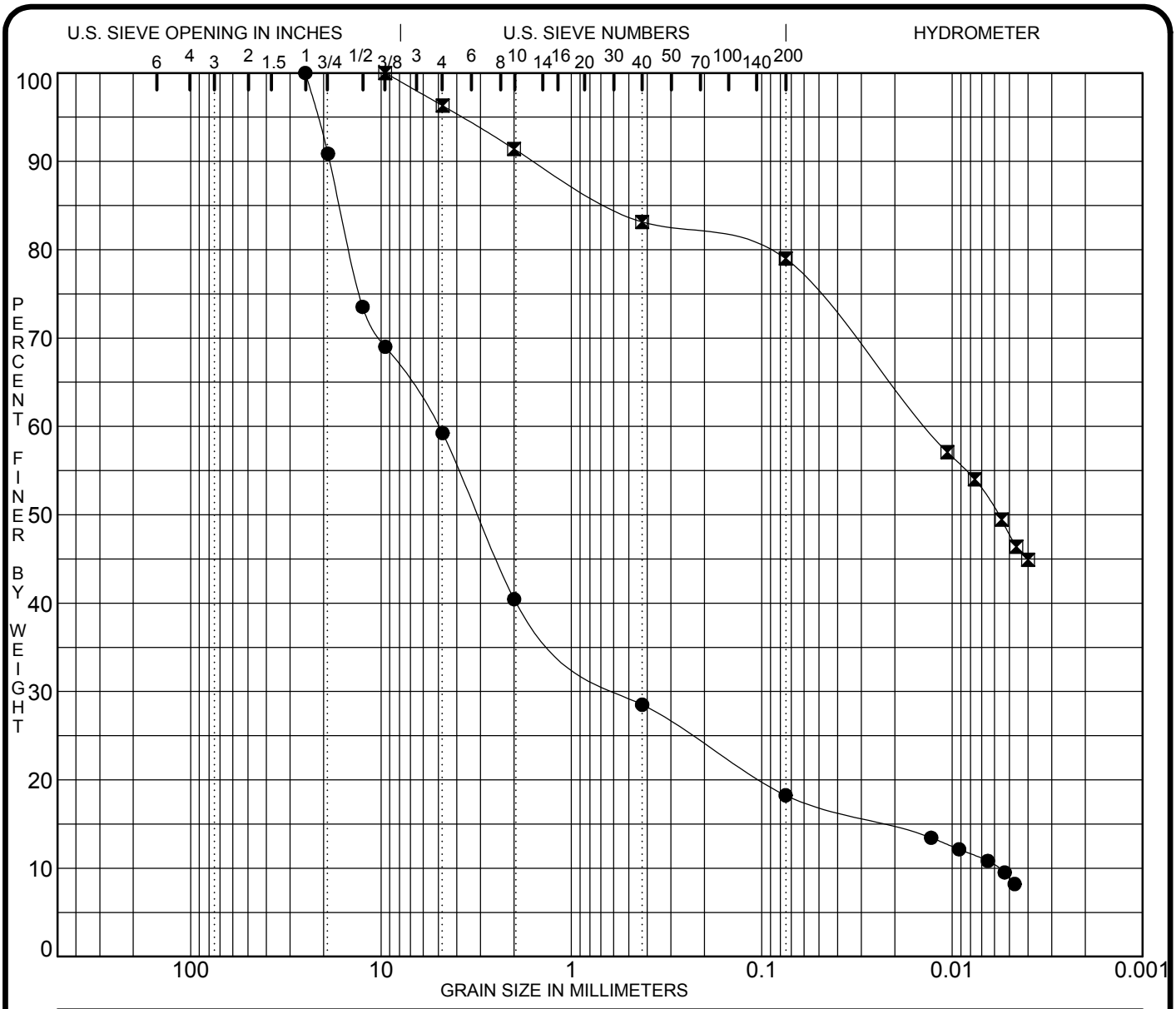
	Specimen ID	Depth	Classification	MC%	LL	PL	PI	Cc	Cu
●	**BH-9**	**18.5**	**WELL-GRADED GRAVEL with SAND GW**	**39**				**1.39**	**15.0**

	Specimen ID	Depth	D100	D60	D30	D10	%Gravel coarse	%Gravel fine	%Sand coarse	%Sand medium	%Sand fine	%Silt	%Clay
●	**BH-9**	**18.5**	**12.50**	**5.93**	**1.804**	**0.3953**	**0.0**	**48.2**	**20.4**	**21.1**	**6.7**	**3.6**	

PROJECT **CPP Facility/CDF 12 - Icebreaker** PROJECT NO. **N-16-034-6**

GRADATION CURVES

RII



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

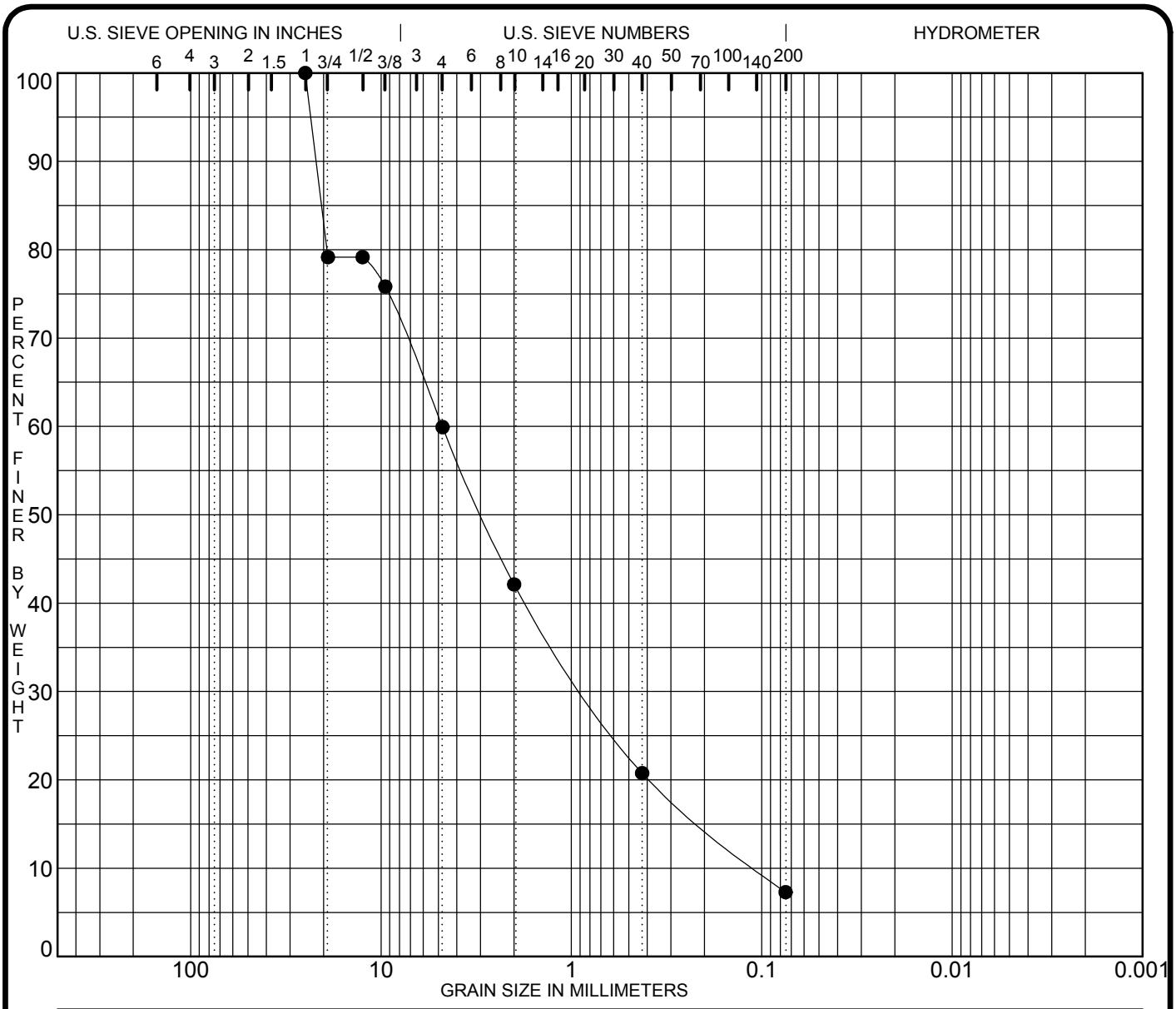
	Specimen ID	Depth	Classification	MC%	LL	PL	PI	Cc	Cu
●	BH-10	6.0	SILTY SAND with GRAVEL SM	18	NP	NP	NP	9.31	877.6
⊠	BH-10	38.5	LEAN CLAY with SAND CL	27	33	20	13		

	Specimen ID	Depth	D100	D60	D30	D10	%Gravel coarse	%Gravel fine	%Sand coarse	%Sand medium	%Sand fine	%Silt	%Clay
●	BH-10	6.0	25.00	5.01	0.516	0.0057	9.1	31.6	18.8	11.9	10.3	9.4	8.9
⊠	BH-10	38.5	9.50	0.01			0.0	3.7	4.9	8.3	4.1	31.2	47.8

PROJECT **CPP Facility/CDF 12 - Icebreaker** PROJECT NO. **N-16-034-6**

GRADATION CURVES

RII



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

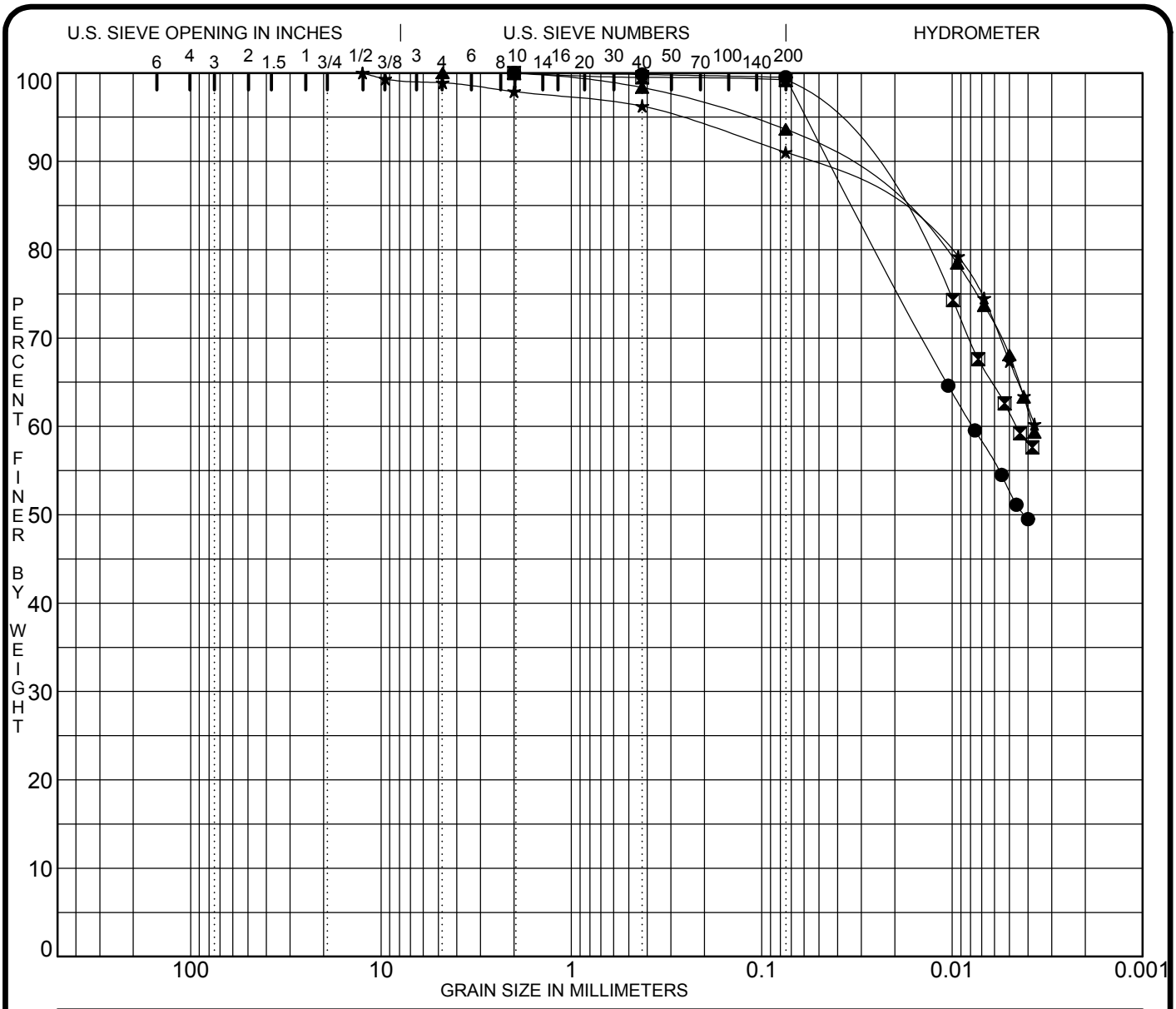
	Specimen ID	Depth	Classification	MC%	LL	PL	PI	Cc	Cu
●	**BH-13**	**3.5**		**14**				**1.36**	**44.8**

	Specimen ID	Depth	D100	D60	D30	D10	%Gravel coarse	%Gravel fine	%Sand coarse	%Sand medium	%Sand fine	%Silt	%Clay
●	**BH-13**	**3.5**	**25.00**	**4.77**	**0.831**	**0.1063**	**20.8**	**19.2**	**17.8**	**21.4**	**13.5**	**7.3**	

PROJECT **CPP Facility/CDF 12 - Icebreaker** PROJECT NO. **N-16-034-6**

GRADATION CURVES

RII



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

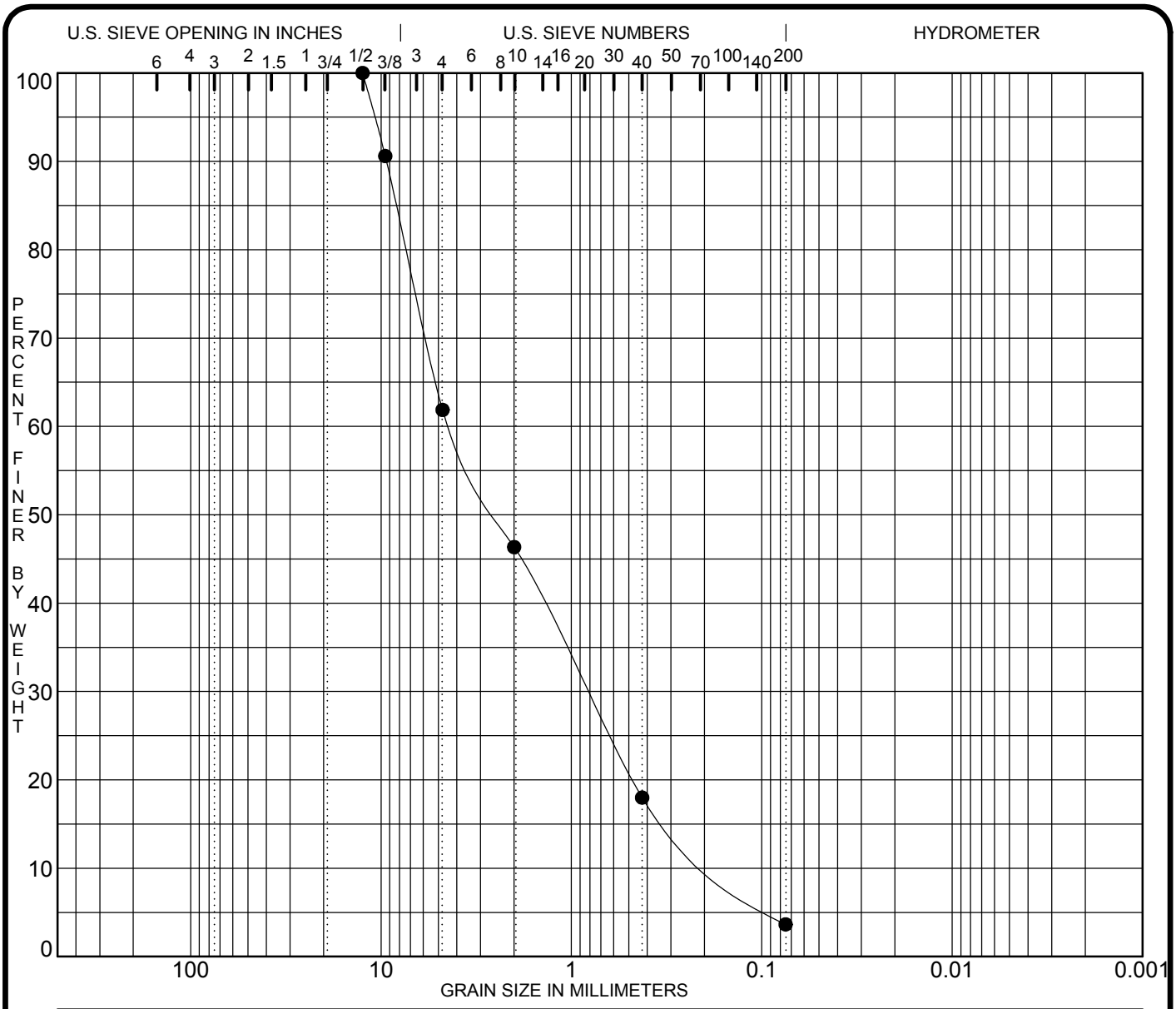
	Specimen ID	Depth	Classification	MC%	LL	PL	PI	Cc	Cu
●	BH-14	75.0	LEAN CLAY CL	28	28	19	9		
⊠	BH-14	95.0	LEAN CLAY CL	30	35	21	14		
▲	BH-14	110.0	LEAN CLAY CL		41	21	20		
★	BH-14	118.0	LEAN CLAY CL		37	20	17		

	Specimen ID	Depth	D100	D60	D30	D10	%Gravel coarse	%Gravel fine	%Sand coarse	%Sand medium	%Sand fine	%Silt	%Clay
●	BH-14	75.0	2.00	0.01			0.0	0.0	0.0	0.2	0.3	46.8	52.7
⊠	BH-14	95.0	2.00	0.00			0.0	0.0	0.0	0.5	0.3	37.7	61.5
▲	BH-14	110.0	4.75	0.00			0.0	0.0	0.1	1.6	4.7	25.5	68.1
★	BH-14	118.0	12.50				0.0	1.1	1.0	1.7	5.2	23.7	67.3

PROJECT **CPP Facility/CDF 12 - Icebreaker** PROJECT NO. **N-16-034-6**

GRADATION CURVES

RII



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

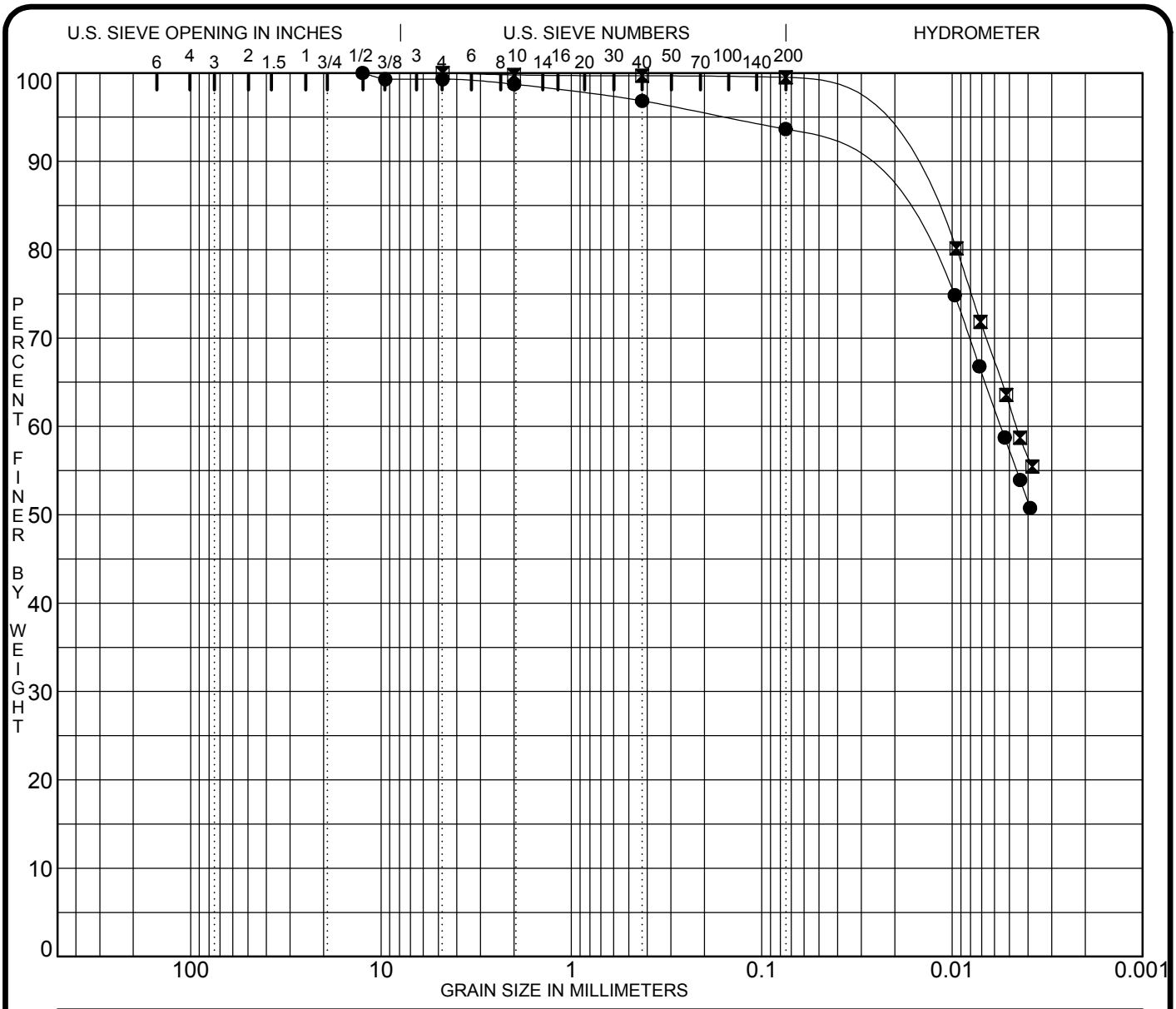
	Specimen ID	Depth	Classification	MC%	LL	PL	PI	Cc	Cu
●	**BH-15**	**20.0**	**POORLY GRADED SAND with GRAVEL SP**	**38**				**0.97**	**26.5**

	Specimen ID	Depth	D100	D60	D30	D10	%Gravel coarse	%Gravel fine	%Sand coarse	%Sand medium	%Sand fine	%Silt	%Clay
●	**BH-15**	**20.0**	**12.50**	**4.28**	**0.819**	**0.1618**	**0.0**	**38.1**	**15.5**	**28.4**	**14.3**	**3.6**	

PROJECT **CPP Facility/CDF 12 - Icebreaker** PROJECT NO. **N-16-034-6**

GRADATION CURVES

RII



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen ID	Depth	Classification	MC%	LL	PL	PI	Cc	Cu
●	**BH-16**	**65.0**	**LEAN CLAY CL**		**35**	**19**	**16**		
⊠	**BH-16**	**95.0**	**LEAN CLAY CL**		**39**	**22**	**17**		

	Specimen ID	Depth	D100	D60	D30	D10	%Gravel coarse	%Gravel fine	%Sand coarse	%Sand medium	%Sand fine	%Silt	%Clay
●	**BH-16**	**65.0**	**12.50**	**0.01**			**0.0**	**0.7**	**0.6**	**1.9**	**3.2**	**36.4**	**57.2**
⊠	**BH-16**	**95.0**	**4.75**	**0.00**			**0.0**	**0.0**	**0.2**	**0.1**	**0.2**	**37.1**	**62.4**

PROJECT **CPP Facility/CDF 12 - Icebreaker** PROJECT NO. **N-16-034-6**

GRADATION CURVES

RII

APPENDIX C-2

Unconsolidated Undrained Triaxial Compressive Strength Test Results

Unconsolidated, Undrained Triaxial Compression Test (ASTM D2850)

Project Number:	N-16-034	Boring Number:	BH-1
Project Name:	CPP /CDF 12 Icebreaker	Sample No. / Depth:	ST-2 / 50.9-51.4 ft.
Project Location:		Date of Testing:	11/25/2016
Client:	HULL	Technician:	JJH

Soil Description: Gray LEAN CLAY, trace coarse to fine sand.
Soil Classification: Visual USCS CL

Physical Characteristics	L.L.	P.L.	P.I.	Gravel %	C. Sand %	F. Sand %	Silt %	Clay %
	35	18	17					

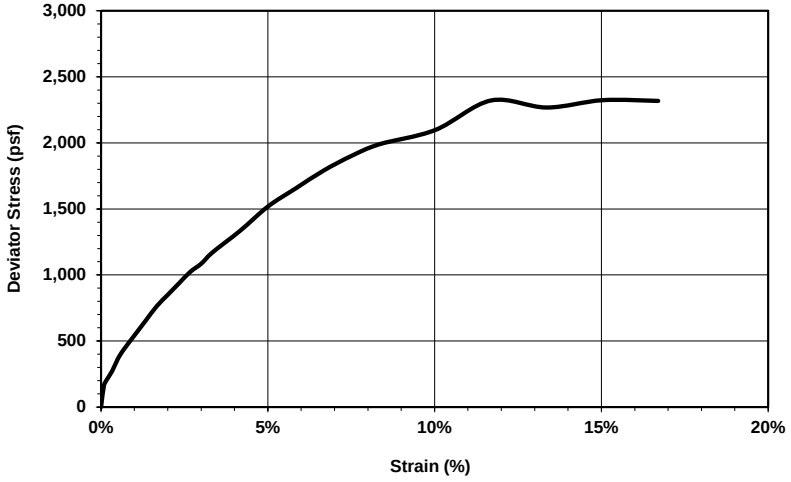
Natural S_o	Natural w_o	D_o (in)	H_o (in)	A_o (in^2)	V_o (in^3)	γ_d (pcf)	γ_{wet} (pcf)	S_G (Assumed)	e_o
106.8%	26.9%	2.832	5.987	6.30	37.72	99.7	126.5	2.67	0.672

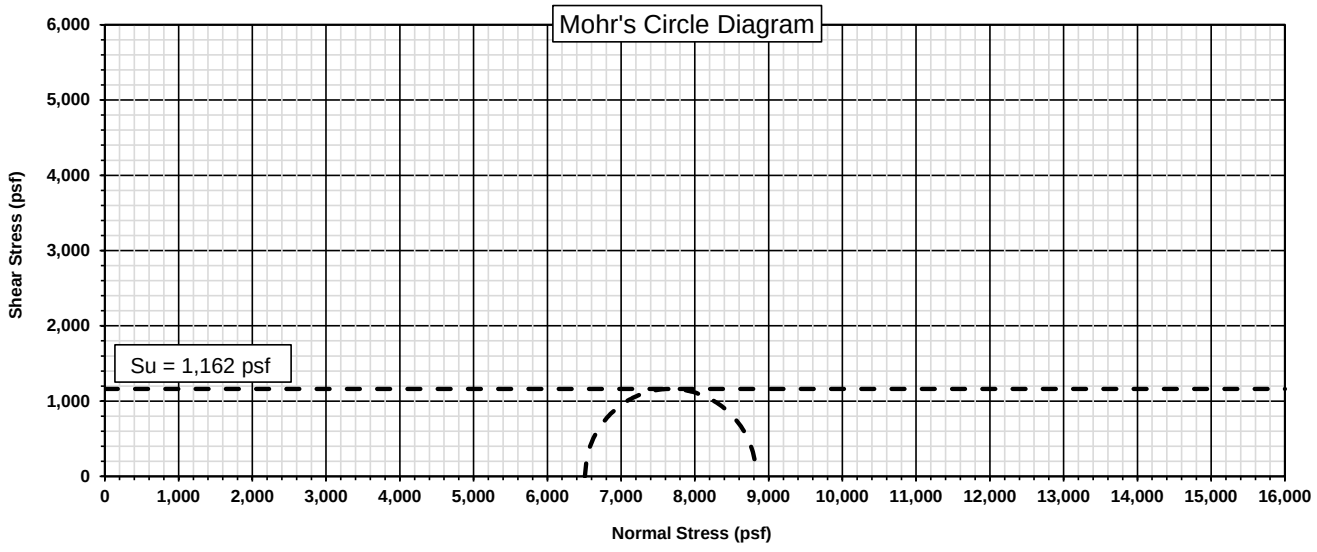
Effective Confining Stress, σ_3: 45.2 psi
6,509 psf
Strain Rate: 1.00 %/min

Deviator Stress @ Failure, $\Delta\sigma$: 2,323 psf
Axial Strain @ Failure: 15.03 %
Major Principal Stress @ Failure, σ_1: 8,832 psf

Failure Sketch

Unconsolidated-Undrained Compressive Strength





Notes:

Unconsolidated, Undrained Triaxial Compression Test (ASTM D2850)

Project Number:	N-16-034	Boring Number:	BH-1
Project Name:	CPP/CDF 12 Icebreaker	Sample No. / Depth:	ST-3 / 71.1-71.6 ft.
Project Location:		Date of Testing:	11/28/2016
Client:	HULL	Technician:	JJH

Soil Description: Gray LEAN CLAY, trace fine sand.
Soil Classification: USCS CL

Physical Characteristics	L.L.	P.L.	P.I.	Gravel %	C. Sand %	F. Sand %	Silt %	Clay %
	38	18	20	0	0	0.2	30.1	69.7

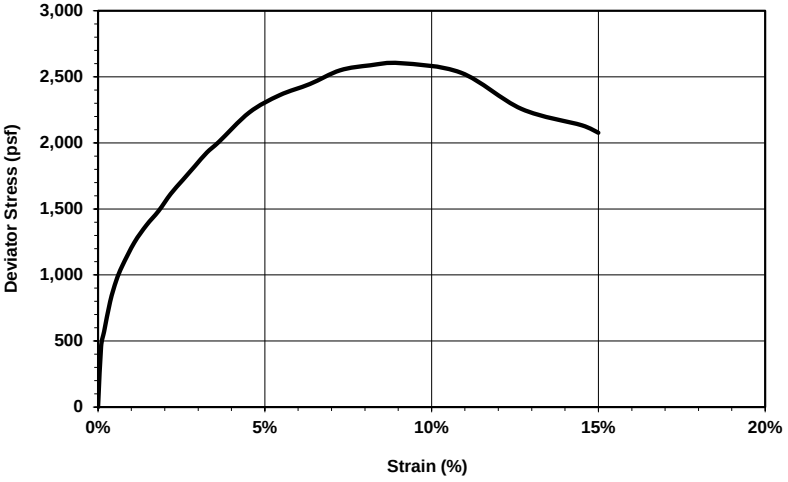
Natural		D_o	H_o	A_o	V_o	γ_d	γ_{wet}	S_G	e_o
S_o	w_o	(in)	(in)	(in^2)	(in^3)	(pcf)	(pcf)	(Assumed)	
105.7%	28.1%	2.829	5.514	6.29	34.67	97.5	124.9	2.67	0.710

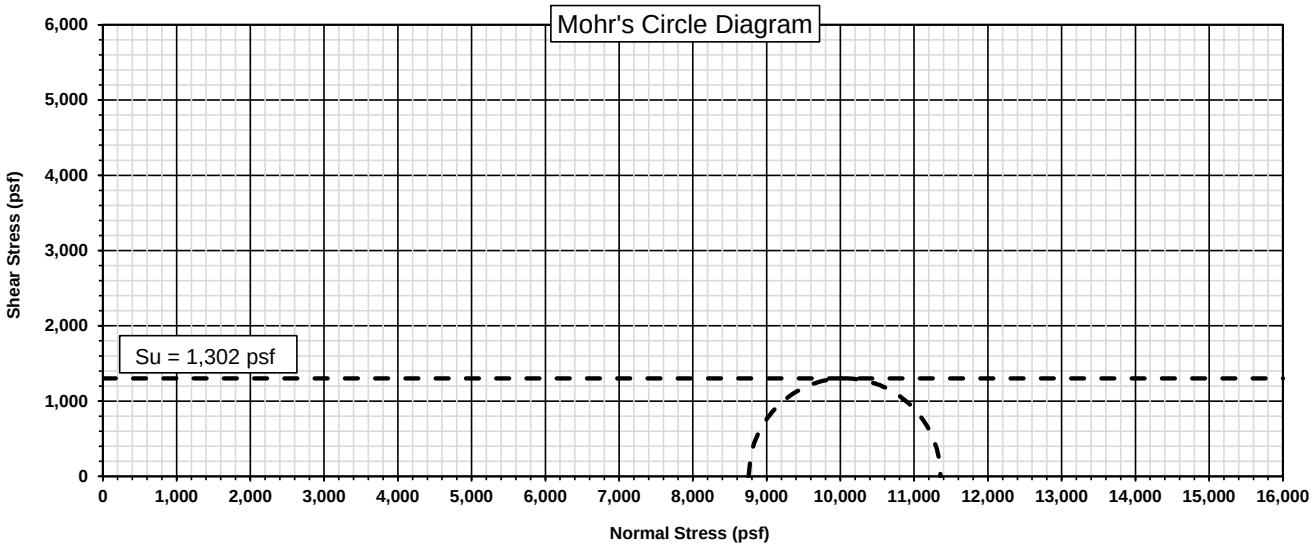
Effective Confining Stress, σ_3: 60.8 psi
8,755 psf
Strain Rate: 1.00 %/min

Deviator Stress @ Failure, $\Delta\sigma$: 2,603 psf
Axial Strain @ Failure: 9.07 %
Major Principal Stress @ Failure, σ_1: 11,359 psf

Failure Sketch

Unconsolidated-Undrained Compressive Strength





Notes:

Unconsolidated, Undrained Triaxial Compression Test (ASTM D2850)

Project Number:	N-16-034	Boring Number:	BH-3
Project Name:	CPP/CDF 12 Icebreaker	Sample No. / Depth:	ST-1 / 36.5-37.0 ft.
Project Location:		Date of Testing:	11/28/2016
Client:	HULL	Technician:	JJH

Soil Description: Gray LEAN CLAY, trace coarse to fine sand.
Soil Classification: USCS CL

Physical Characteristics	L.L.	P.L.	P.I.	Gravel %	C. Sand %	F. Sand %	Silt %	Clay %
	27	19	8	0	1.5	2.9	65.7	30.0

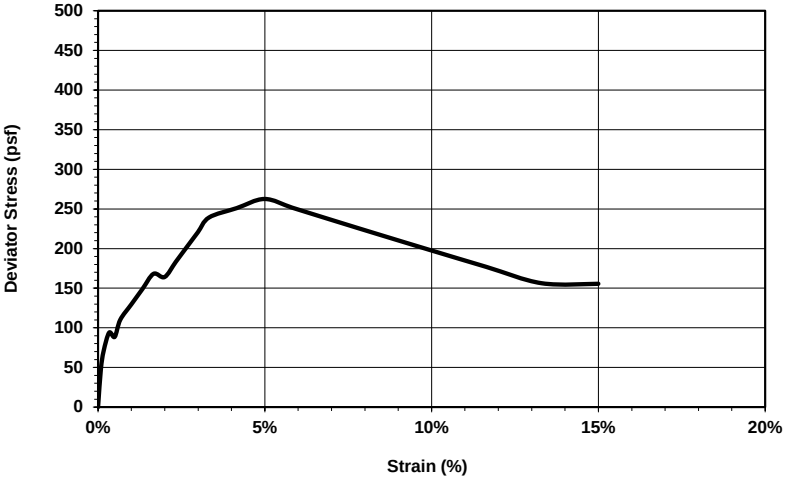
Natural		D_o	H_o	A_o	V_o	γ_d	γ_{wet}	S_G	e_o
S_o	w_o	(in)	(in)	(in^2)	(in^3)	(pcf)	(pcf)	(Assumed)	
107.2%	33.2%	2.789	6.014	6.11	36.74	91.2	121.5	2.67	0.828

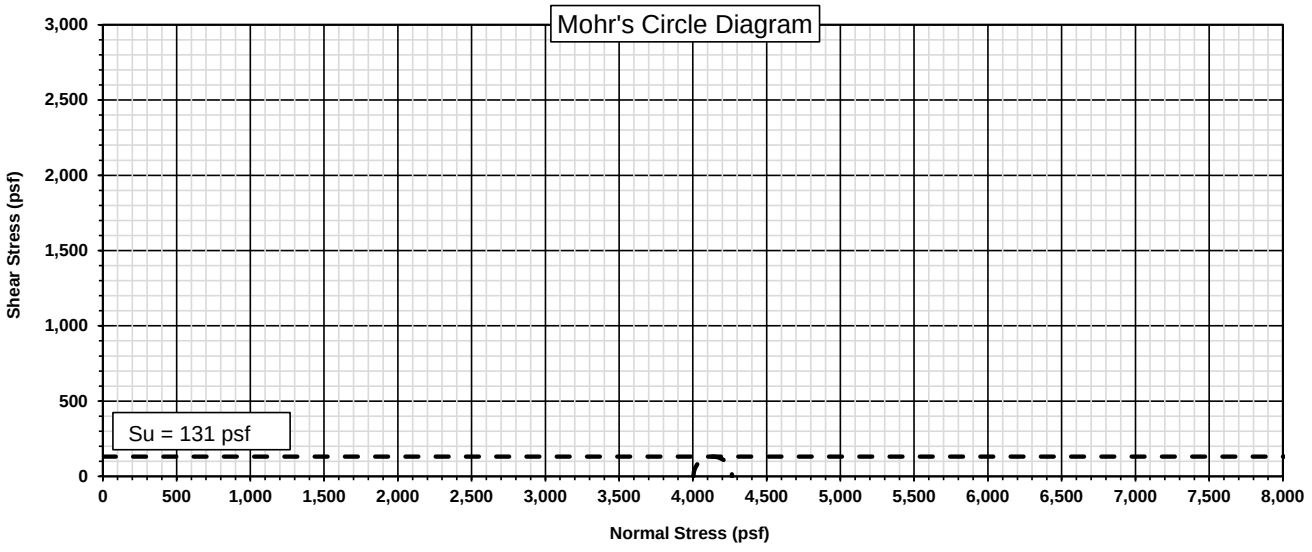
Effective Confining Stress, σ_3: 27.8 psi
4,003 psf
Strain Rate: 1.00 %/min

Deviator Stress @ Failure, $\Delta\sigma$: 263 psf
Axial Strain @ Failure: 4.99 %
Major Principal Stress @ Failure, σ_1: 4,266 psf

Failure Sketch

Unconsolidated-Undrained Compressive Strength





Notes:

Unconsolidated, Undrained Triaxial Compression Test (ASTM D2850)

Project Number:	N-16-034	Boring Number:	BH-3
Project Name:	CPP/CDF 12 Icebreaker	Sample No. / Depth:	ST-2 / 41.3-41.8 ft.
Project Location:		Date of Testing:	11/28/2016
Client:	HULL	Technician:	JJH

Soil Description: Gray SILTY CLAY, trace coarse to fine sand.
Soil Classification: USCS CL-ML

Physical Characteristics	L.L.	P.L.	P.I.	Gravel %	C. Sand %	F. Sand %	Silt %	Clay %

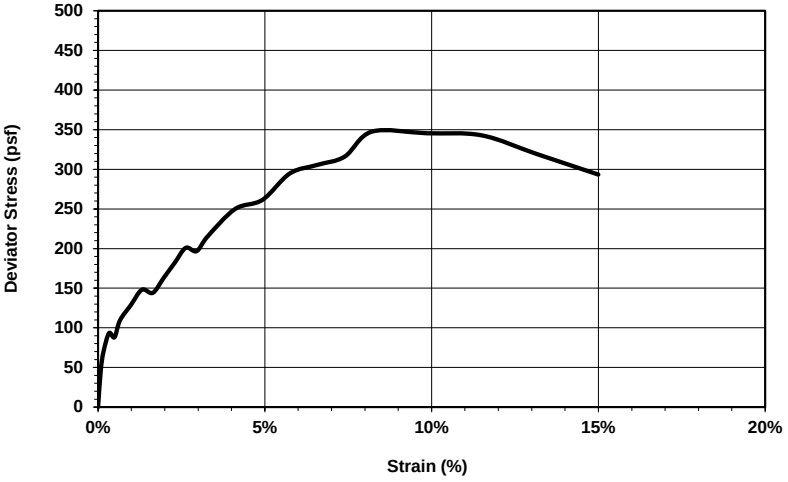
Natural S_o	Natural w_o	D_o (in)	H_o (in)	A_o (in^2)	V_o (in^3)	γ_d (pcf)	γ_{wet} (pcf)	S_G (Assumed)	e_o
94.5%	29.2%	2.798	6.088	6.15	37.44	91.3	118.0	2.67	0.825

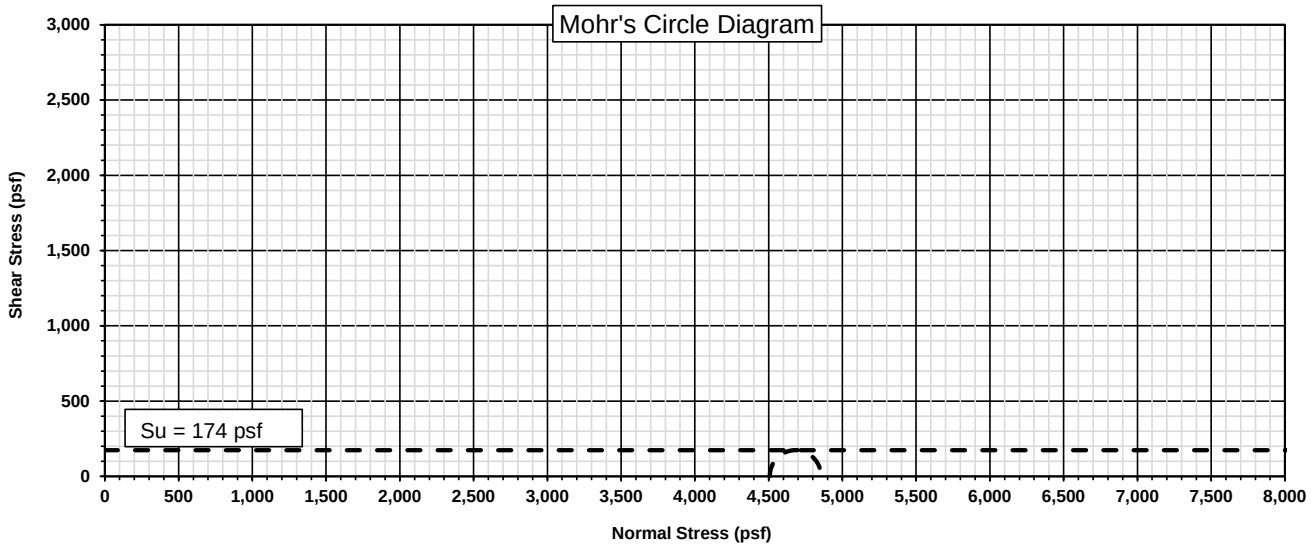
Effective Confining Stress, σ_3: 31.3 psi
4,507 psf
Strain Rate: 1.00 %/min

Deviator Stress @ Failure, $\Delta\sigma$: 348 psf
Axial Strain @ Failure: 8.21 %
Major Principal Stress @ Failure, σ_1: 4,855 psf

Failure Sketch

Unconsolidated-Undrained Compressive Strength





Notes:

Unconsolidated, Undrained Triaxial Compression Test (ASTM D2850)

Project Number:	N-16-034	Boring Number:	BH-3
Project Name:	CPP/CDF 12 Icebreaker	Sample No. / Depth:	ST-4 / 55.8-56.3 ft.
Project Location:		Date of Testing:	11/29/2016
Client:	HULL	Technician:	JJH

Soil Description: Gray LEAN CLAY, trace fine sand.
Soil Classification: USCS CL

Physical Characteristics	L.L.	P.L.	P.I.	Gravel %	C. Sand %	F. Sand %	Silt %	Clay %
	27	17	10	0	0	0.7	69.9	29.3

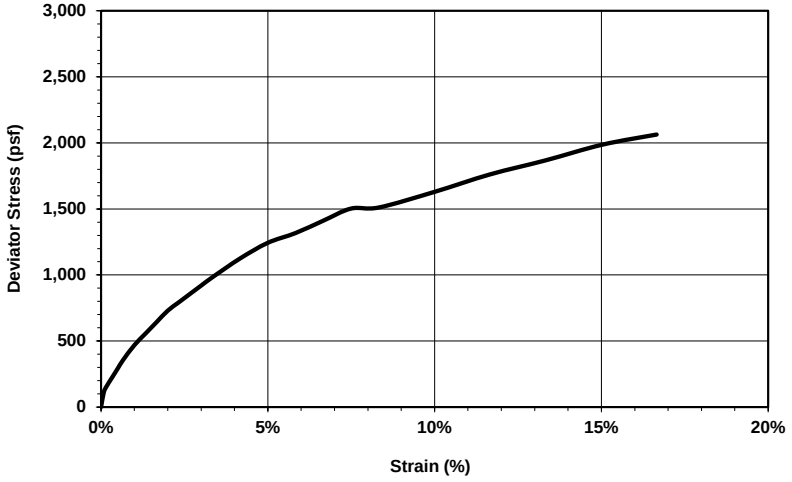
Natural S_o	Natural w_o	D_o (in)	H_o (in)	A_o (in^2)	V_o (in^3)	γ_d (pcf)	γ_{wet} (pcf)	S_G (Assumed)	e_o
104.6%	26.3%	2.851	6.004	6.38	38.32	99.7	126.0	2.67	0.671

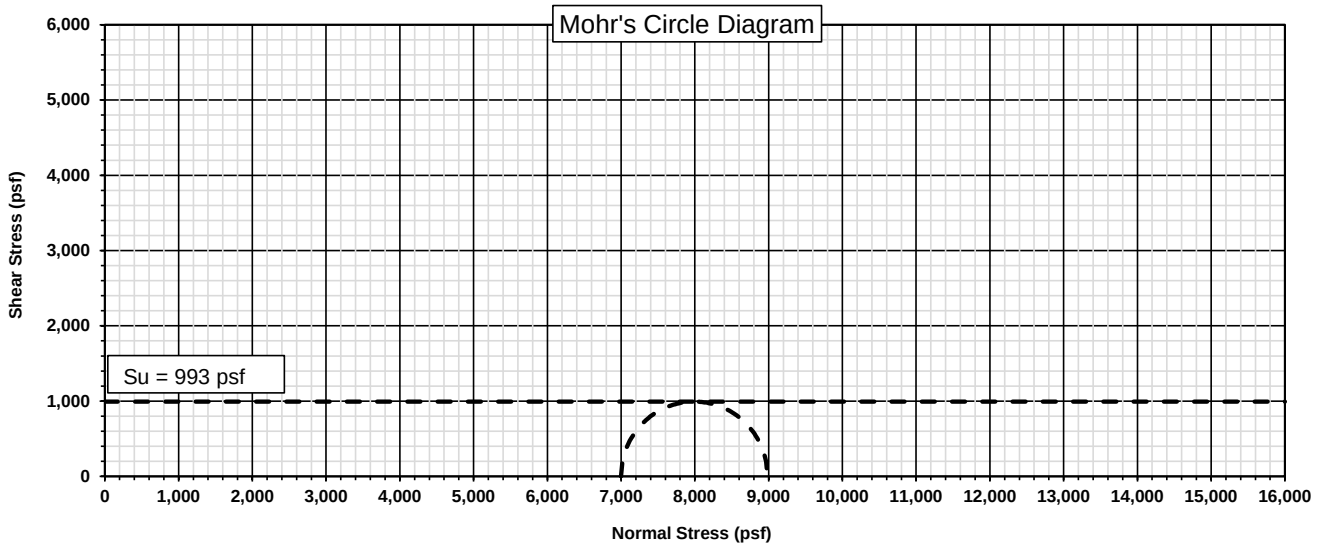
Effective Confining Stress, σ_3: 48.6 psi
6,998 psf
Strain Rate: 1.00 %/min

Deviator Stress @ Failure, $\Delta\sigma$: 1,986 psf
Axial Strain @ Failure: 15.02 %
Major Principal Stress @ Failure, σ_1: 8,985 psf

Failure Sketch

Unconsolidated-Undrained Compressive Strength





Notes:

Unconsolidated, Undrained Triaxial Compression Test (ASTM D2850)

Project Number:	N-16-034	Boring Number:	BH-14
Project Name:	CPP/CDF 12 Icebreaker	Sample No. / Depth:	ST-1 / 110.8-111.3 ft.
Project Location:		Date of Testing:	11/29/2016
Client:	HULL	Technician:	JJH

Soil Description: Gray LEAN CLAY, trace coarse to fine sand.
Soil Classification: USCS CL

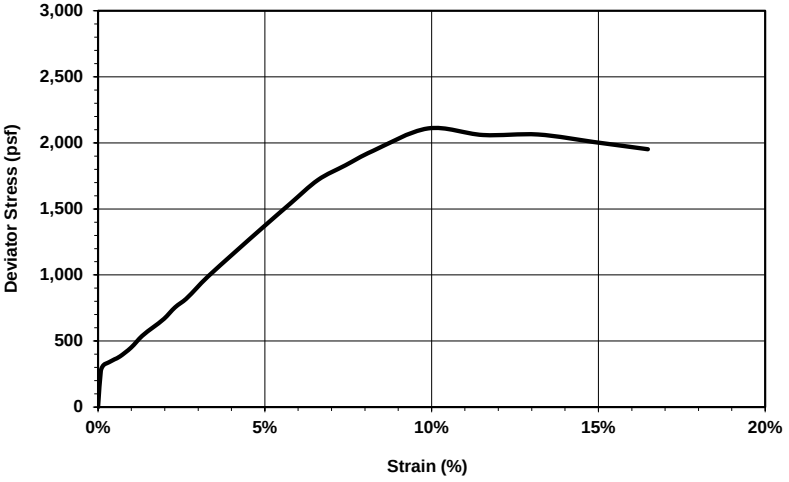
Physical Characteristics	L.L.	P.L.	P.I.	Gravel %	C. Sand %	F. Sand %	Silt %	Clay %
	41	21	20	0	1.7	4.7	25.5	68.1

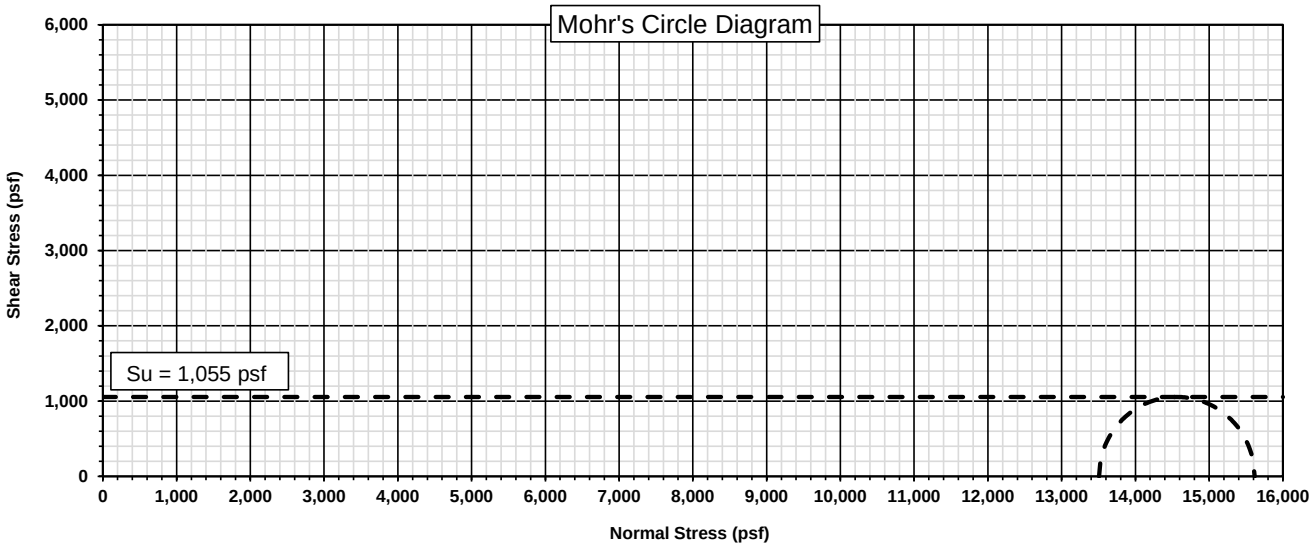
Natural		D_o	H_o	A_o	V_o	γ_d	γ_{wet}	S_G	e_o
S_o	w_o	(in)	(in)	(in^2)	(in^3)	(pcf)	(pcf)	(Assumed)	
110.8%	29.2%	2.840	6.067	6.34	38.44	97.9	126.4	2.67	0.703

Effective Confining Stress, σ_3:	93.8	psi	Deviator Stress @ Failure, $\Delta\sigma$:	2,109	psf
	13,507	psf	Axial Strain @ Failure:	9.89	%
Strain Rate:	1.00	%/min	Major Principal Stress @ Failure, σ_1:	15,617	psf

Failure Sketch

Unconsolidated-Undrained Compressive Strength





Notes:

Unconsolidated, Undrained Triaxial Compression Test (ASTM D2850)

Project Number:	N-16-034	Boring Number:	BH-14
Project Name:	CPP/CDF 12 Icebreaker	Sample No. / Depth:	ST-2 / 119.0-119.6 ft.
Project Location:		Date of Testing:	11/30/2016
Client:	HULL	Technician:	JJH

Soil Description: Gray LEAN CLAY, trace coarse to fine sand.
Soil Classification: USCS CL

Physical Characteristics	L.L.	P.L.	P.I.	Gravel %	C. Sand %	F. Sand %	Silt %	Clay %
	37	20	17	1.1	2.7	5.2	23.7	67.3

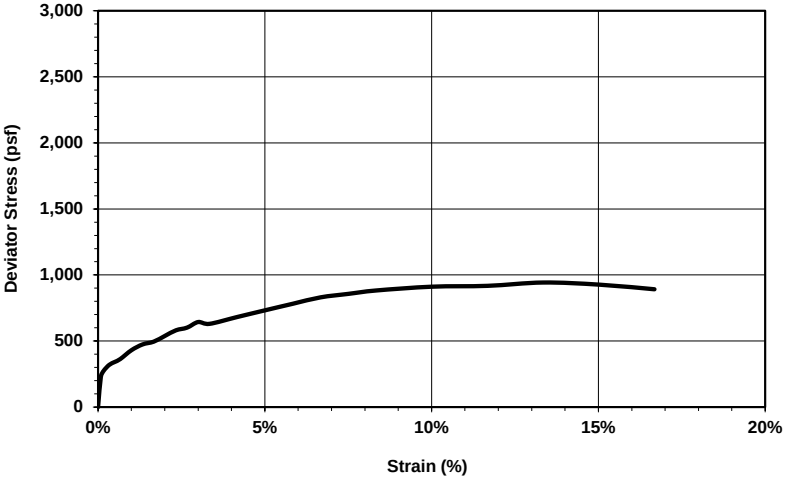
Natural		D_o	H_o	A_o	V_o	γ_d	γ_{wet}	S_G	e_o
S_o	w_o	(in)	(in)	(in^2)	(in^3)	(pcf)	(pcf)	(Assumed)	
115.6%	27.2%	2.830	5.995	6.29	37.71	102.4	130.2	2.67	0.628

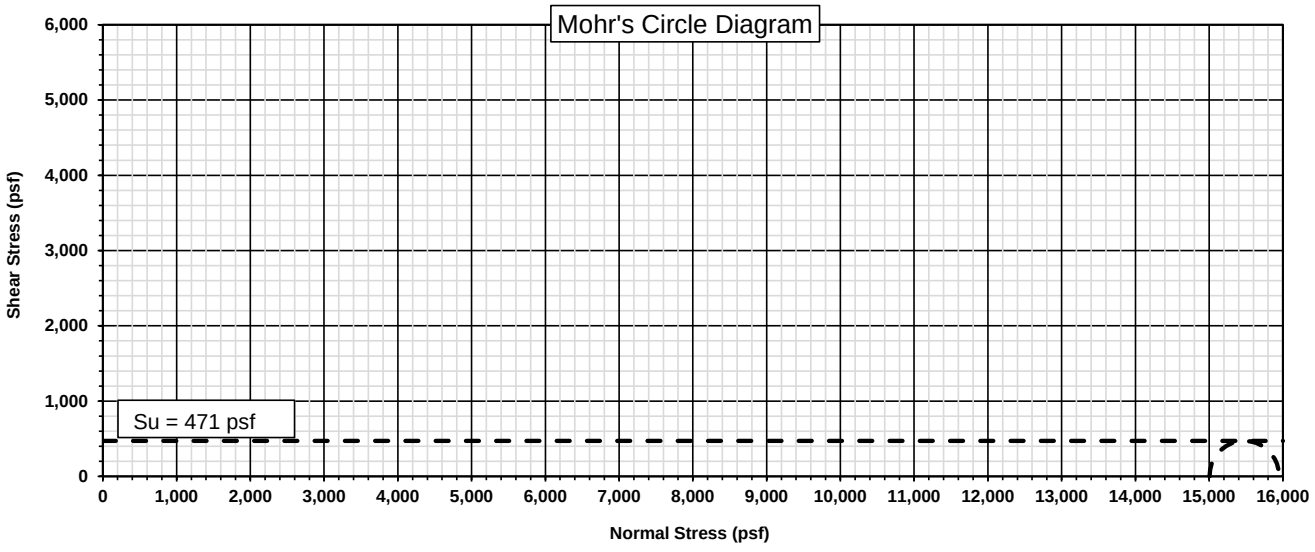
Effective Confining Stress, σ_3: 104.2 psi
15,005 psf
Strain Rate: 1.00 %/min

Deviator Stress @ Failure, $\Delta\sigma$: 943 psf
Axial Strain @ Failure: 13.34 %
Major Principal Stress @ Failure, σ_1: 15,948 psf

Failure Sketch

Unconsolidated-Undrained Compressive Strength





Notes:

Unconsolidated, Undrained Triaxial Compression Test (ASTM D2850)

Project Number:	N-16-034	Boring Number:	BH-16
Project Name:	CPP/CDF 12 Icebreaker	Sample No. / Depth:	ST-2 / 76.0-76.5 ft.
Project Location:		Date of Testing:	11/29/2016
Client:	HULL	Technician:	JJH

Soil Description: Gray LEAN CLAY, trace coarse to fine sand.
Soil Classification: USCS CL

Physical Characteristics	L.L.	P.L.	P.I.	Gravel %	C. Sand %	F. Sand %	Silt %	Clay %
	35	17	18					

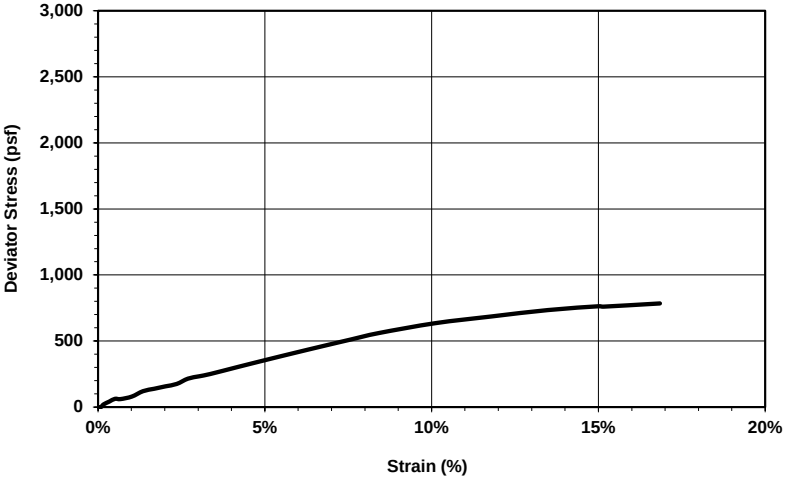
Natural S_o	Natural w_o	D_o (in)	H_o (in)	A_o (in^2)	V_o (in^3)	γ_d (pcf)	γ_{wet} (pcf)	S_G (Assumed)	e_o
121.8%	30.6%	2.844	5.937	6.35	37.72	99.8	130.3	2.67	0.671

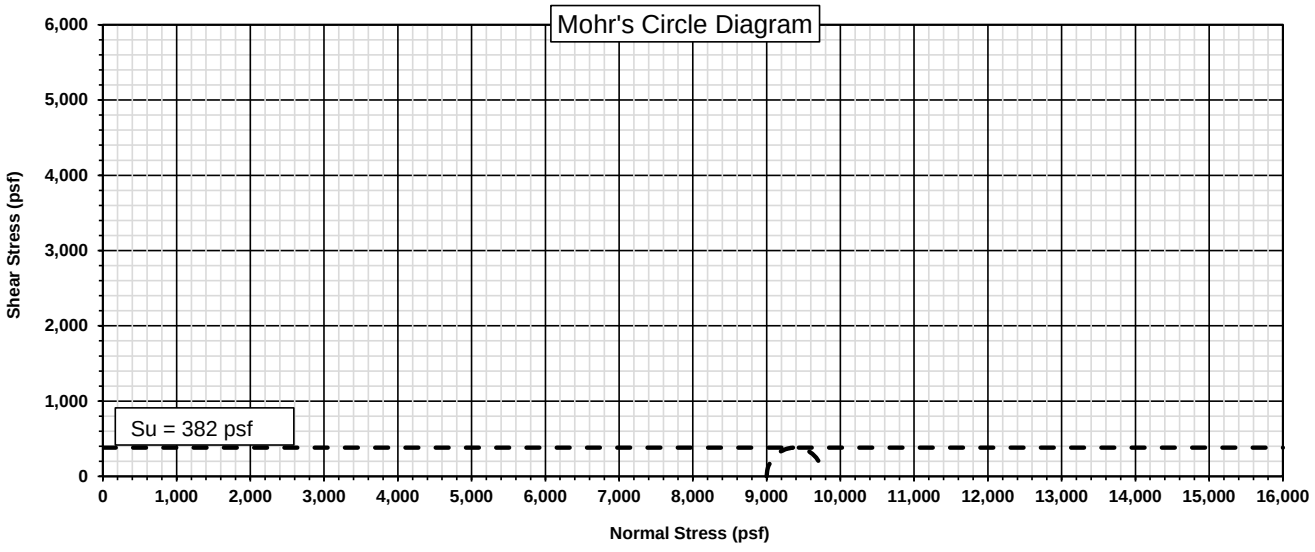
Effective Confining Stress, σ_3: 62.5 psi
9,000 psf
Strain Rate: 1.00 %/min

Deviator Stress @ Failure, $\Delta\sigma$: 763 psf
Axial Strain @ Failure: 15.01 %
Major Principal Stress @ Failure, σ_1: 9,764 psf

Failure Sketch

Unconsolidated-Undrained Compressive Strength





Notes:

Unconsolidated, Undrained Triaxial Compression Test (ASTM D2850)

Project Number:	N-16-034	Boring Number:	BH-16
Project Name:	CPP/CDF 12 Icebreaker	Sample No. / Depth:	ST-4 / 96.0-96.5 ft.
Project Location:		Date of Testing:	11/29/2016
Client:	HULL	Technician:	JJH

Soil Description: Gray LEAN CLAY, trace coarse to fine sand.
Soil Classification: USCS CL

Physical Characteristics	L.L.	P.L.	P.I.	Gravel %	C. Sand %	F. Sand %	Silt %	Clay %
	39	22	17	0.0	2.1	0.2	37.1	62.4

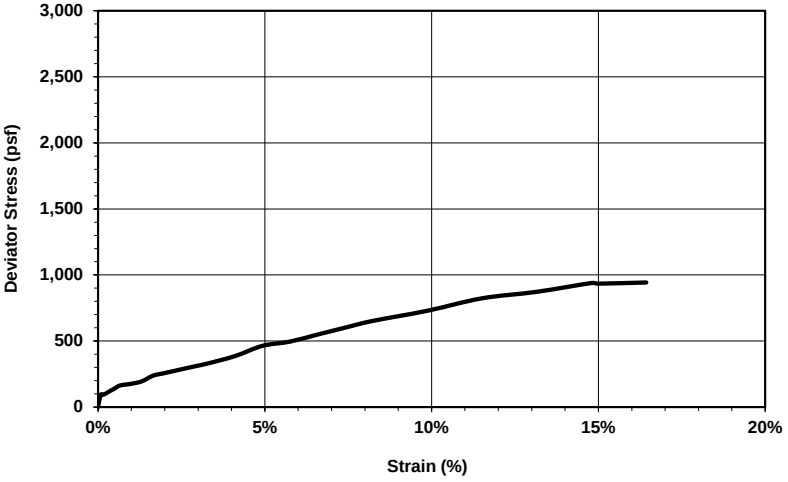
Natural S_o	Natural w_o	D_o (in)	H_o (in)	A_o (in^2)	V_o (in^3)	γ_d (pcf)	γ_{wet} (pcf)	S_G (Assumed)	e_o
116.7%	31.6%	2.792	6.085	6.12	37.26	96.7	127.3	2.67	0.723

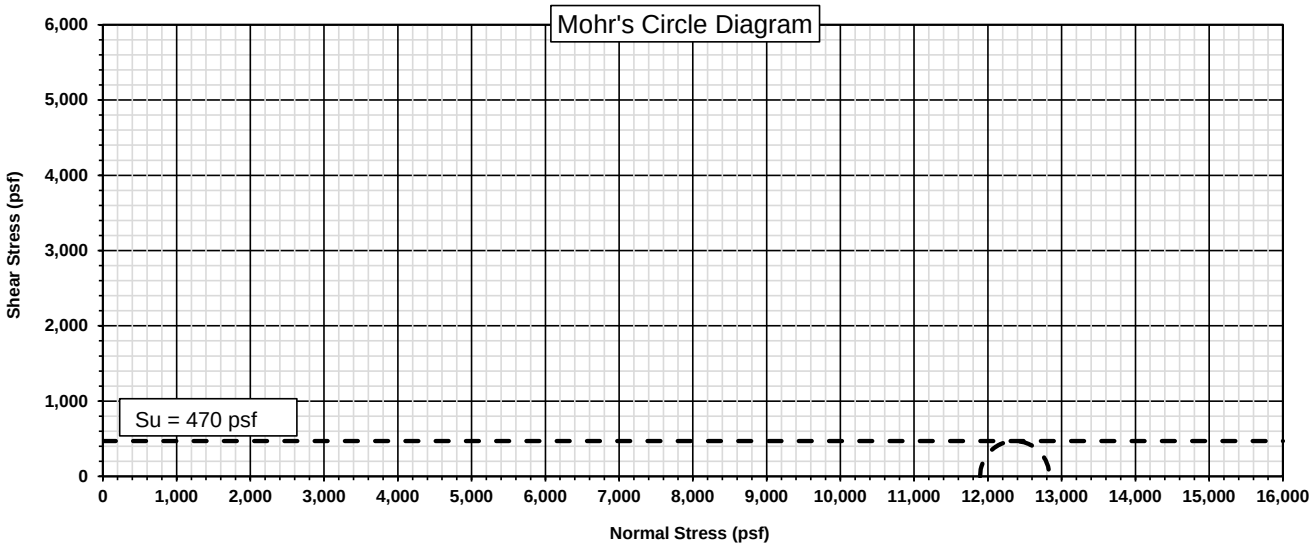
Effective Confining Stress, σ_3: 82.6 psi
11,894 psf
Strain Rate: 1.00 %/min

Deviator Stress @ Failure, $\Delta\sigma$: 939 psf
Axial Strain @ Failure: 14.79 %
Major Principal Stress @ Failure, σ_1: 12,834 psf

Failure Sketch

Unconsolidated-Undrained Compressive Strength





Notes:

Unconsolidated, Undrained Triaxial Compression Test (ASTM D2850)

Project Number:	N-16-034	Boring Number:	BH-16
Project Name:	CPP/CDF 12 Icebreaker	Sample No. / Depth:	ST-6 / 116.4-116.9 ft.
Project Location:		Date of Testing:	11/29/2016
Client:	HULL	Technician:	JJH

Soil Description: Gray LEAN CLAY, trace coarse to fine sand.
Soil Classification: USCS CL

Physical Characteristics	L.L.	P.L.	P.I.	Gravel %	C. Sand %	F. Sand %	Silt %	Clay %
	38	19	19					

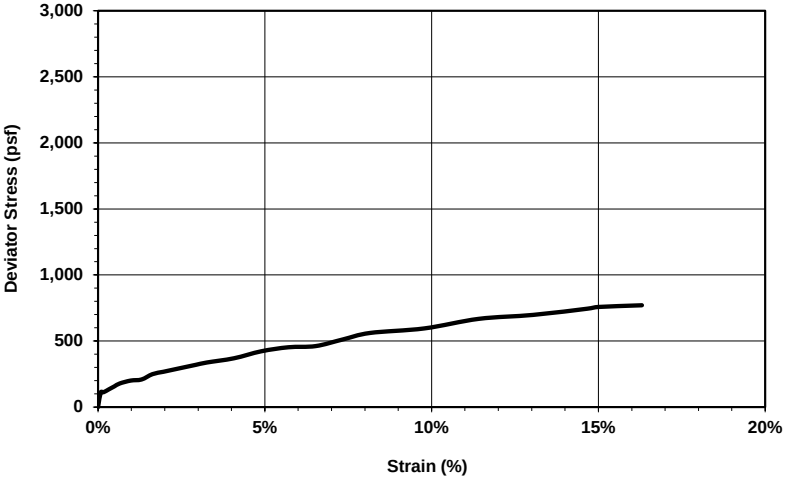
Natural S_o	Natural w_o	D_o (in)	H_o (in)	A_o (in^2)	V_o (in^3)	γ_d (pcf)	γ_{wet} (pcf)	S_G (Assumed)	e_o
105.3%	25.8%	2.853	6.133	6.39	39.22	100.7	126.7	2.67	0.655

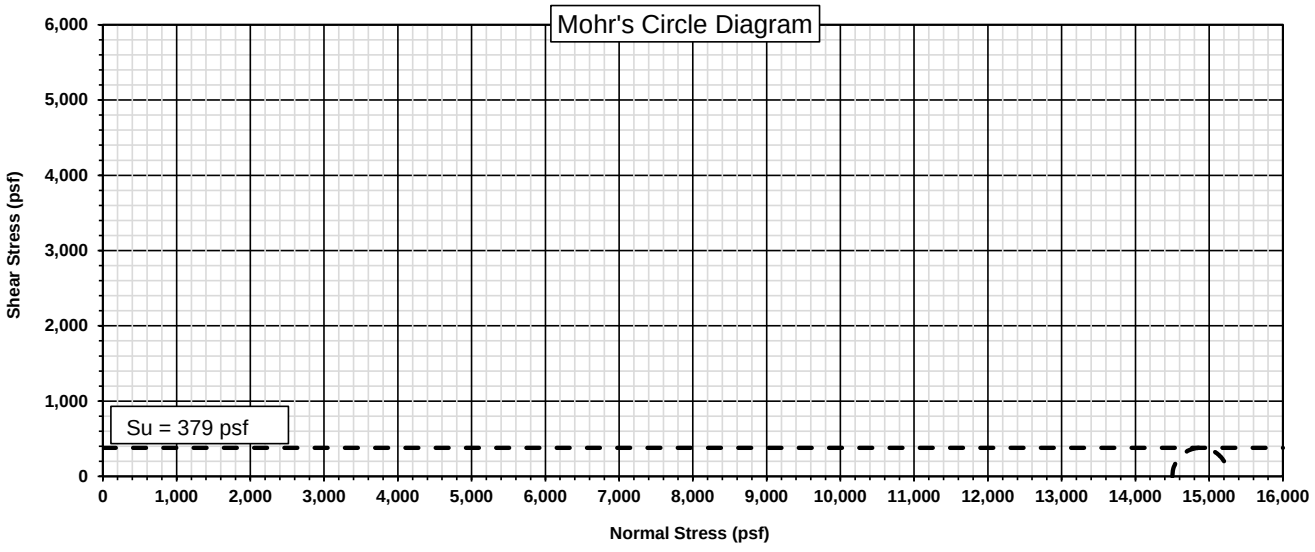
Effective Confining Stress, σ_3: 100.7 psi
14,501 psf
Strain Rate: 1.00 %/min

Deviator Stress @ Failure, $\Delta\sigma$: 758 psf
Axial Strain @ Failure: 15.00 %
Major Principal Stress @ Failure, σ_1: 15,259 psf

Failure Sketch

Unconsolidated-Undrained Compressive Strength





Notes:

APPENDIX C-3

One-Dimensional Consolidation Test Results

One-Dimensional Consolidation Test Report (ASTM D2435)

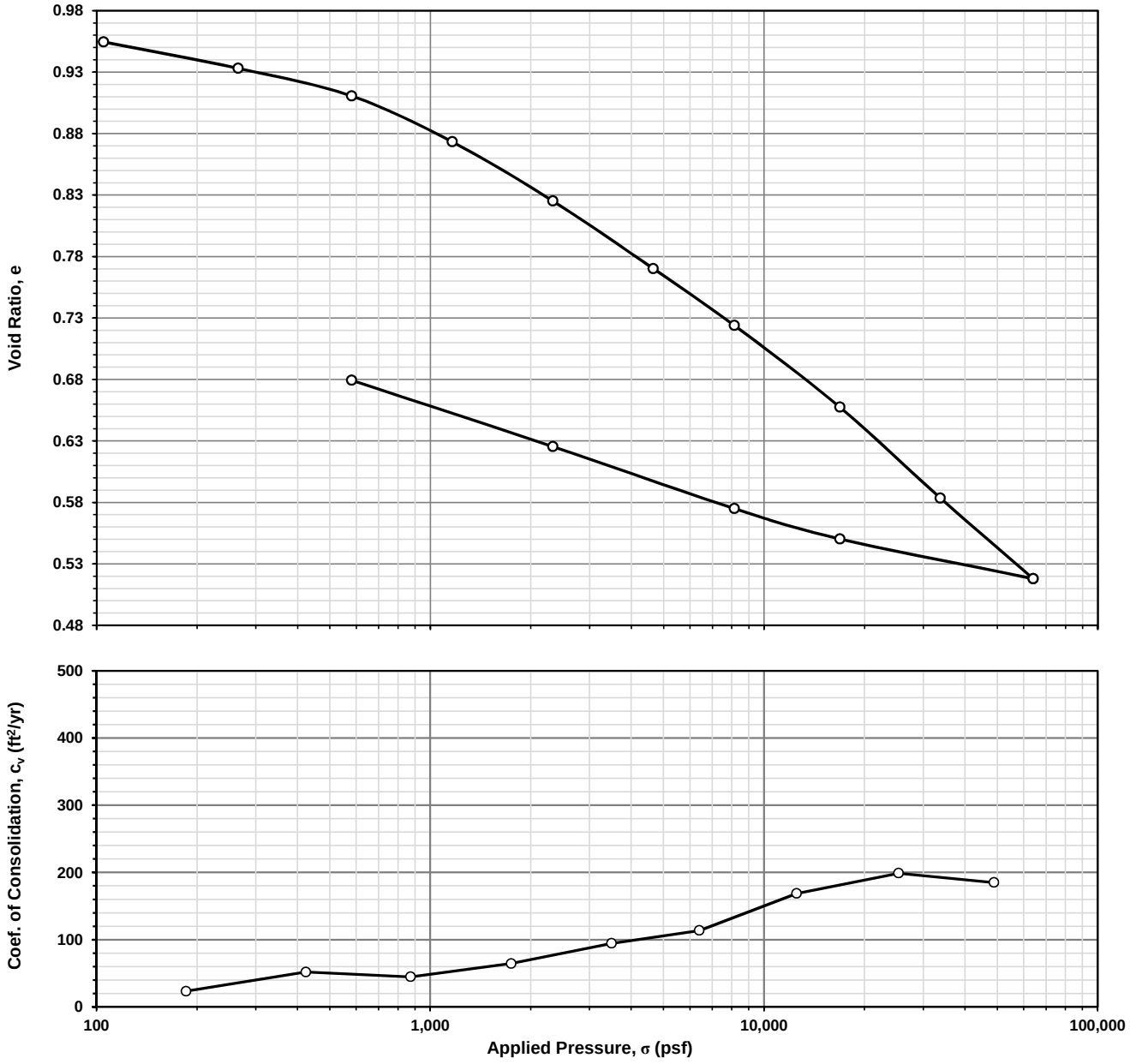
Project Number:	N-16-034(6)	Boring Number:	BH-1
Project Name:	CPP/CPF 12 Icebreaker	Sample No. / Depth:	ST-1 / 41.5 ft
Project Location:		Date of Testing:	11/21/2016 to 12/09/2016
Client:	HULL Associates	Technician:	CS/JJH

Soil Description: Gray LEAN CLAY, some silt, trace sand.

Soil Classification: USCS CL

Physical Characteristics	L.L.	P.L.	P.I.	Gravel%	C. Sand%	F. Sand%	Silt%	Clay%
	47	23	24	0	0.5	0.8	24.7	74.0

Natural		γ_d	γ_{sat}	σ_{vo}'	S_G	e_o	σ_p'	c_c	c_r
S_o	w_o	(pcf)	(pcf)	(psf)			(psf)		
103.5%	34.6%	85.8	117.7	2,183	2.714	0.974	2,409	0.300	0.081



One-Dimensional Consolidation Test Report (ASTM D2435)

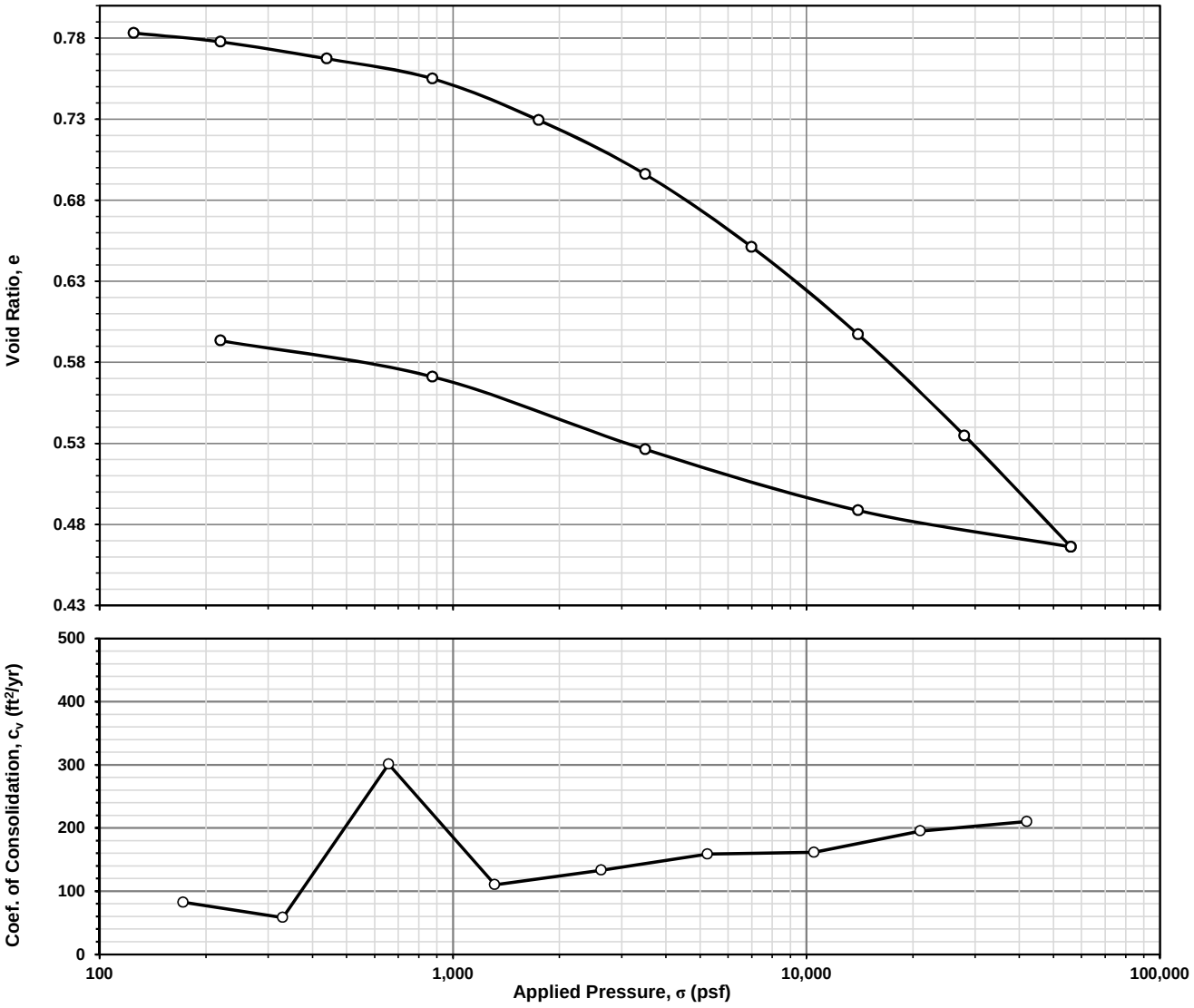
Project Number:	N-14-034	Boring Number:	BH-3
Project Name:	CPP/CDF Icebreaker	Sample No. / Depth:	ST-3 / 46.0 ft
Project Location:		Date of Testing:	11/30/2016 to 12/12/2016
Client:	Hull & Associates, Inc.	Technician:	EM/KL

Soil Description: Gray LEAN CLAY, some silt, trace fine sand.
Soil Classification: Visual USCS CL

Physical Characteristics	L.L.	P.L.	P.I.	Gravel%	C. Sand%	F. Sand%	Silt%	Clay%
	45	24	21					

Natural S_o	Natural w_o	γ_d (pcf)	γ_{sat} (pcf)	σ_{vo}' (psf)	S_G	e_o	σ_p' [1] (psf)	c_c [1]	c_r [1]
105.0%	32.5%	94.1	123.0	2,650	2.699	0.790	4,425	0.258	0.059

1. The vaules listed for σ_p', c_c and c_r are interpreted by Rii using Cassagrande and Schemertman methods. Other interpretation methods may be utilized.



Notes: Final unload decrement was stopped accientally at 60 minutes instead of running for a full 24-hour duration. Therefore, this point was not considered in the calculation of the C_r coefficient value.

One-Dimensional Consolidation Test Report (ASTM D2435)

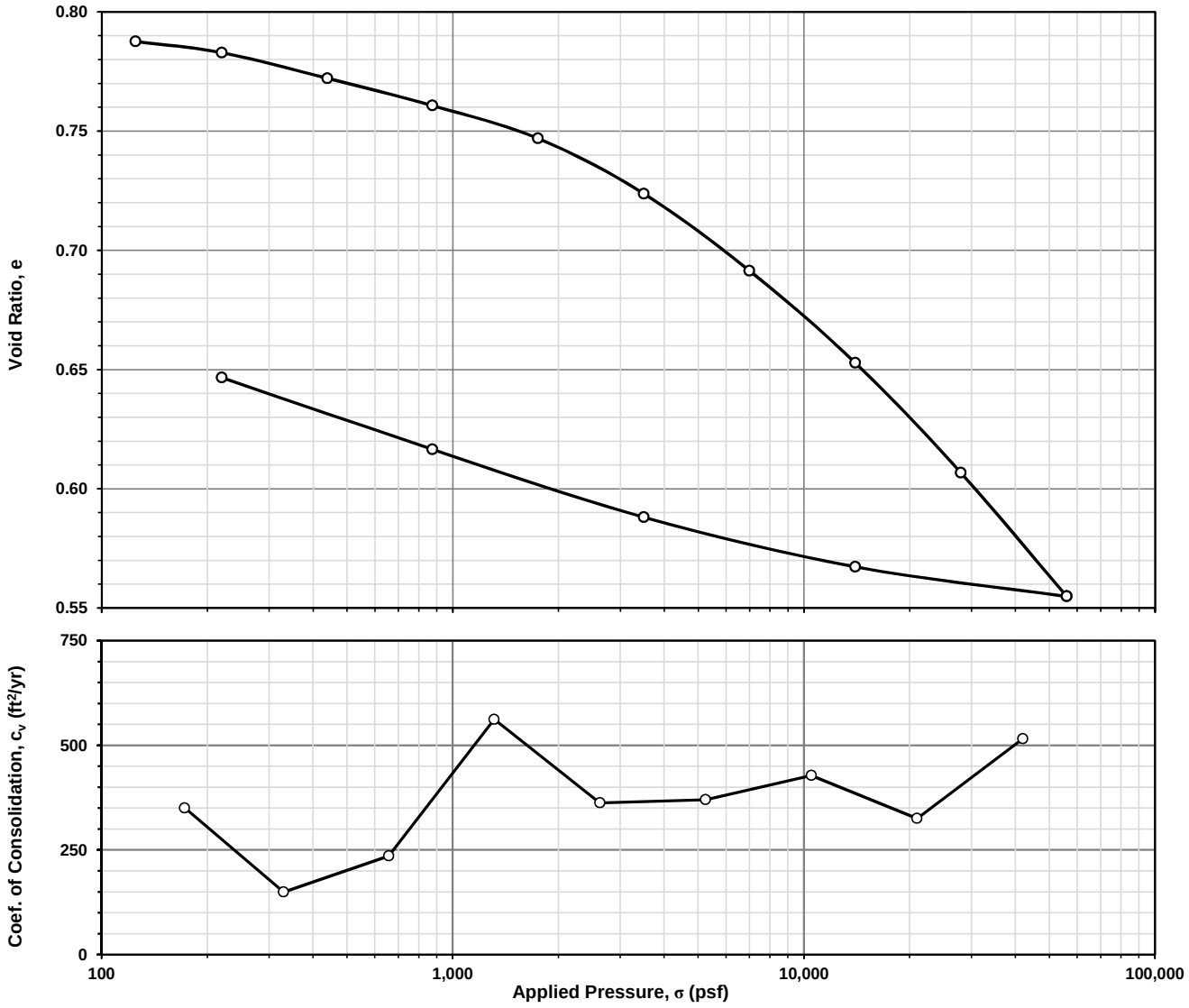
Project Number:	N-16-034(6)	Boring Number:	BH-16
Project Name:	CPP/CDF 12 Icebreaker	Sample No. / Depth:	ST-1 / 65.8 ft
Project Location:		Date of Testing:	11/21/2016 to 12/04/2016
Client:	Hull & Associates, Inc.	Technician:	CS/JJH

Soil Description: Gray LEAN CLAY, some silt, trace sand.
Soil Classification: USCS CL

Physical Characteristics	L.L.	P.L.	P.I.	Gravel%	C. Sand%	F. Sand%	Silt%	Clay%
	35	19	16	0.7	2.5	3.2	36.4	57.2

Natural		γ_d	γ_{sat}	σ_{vo}'	S_G	e_o	σ_p' [1]	c_c [1]	c_r [1]
S_o	w_o	(pcf)	(pcf)	(psf)			(psf)		
99.3%	25.3%	93.8	121.3	3,790	2.7	0.797	6,322	0.197	0.039

1. The vaules listed for σ_p', c_c and c_r are interpreted by Rii using Cassagrande and Schemertman methods. Other interpretation methods may be utilized.



Notes:

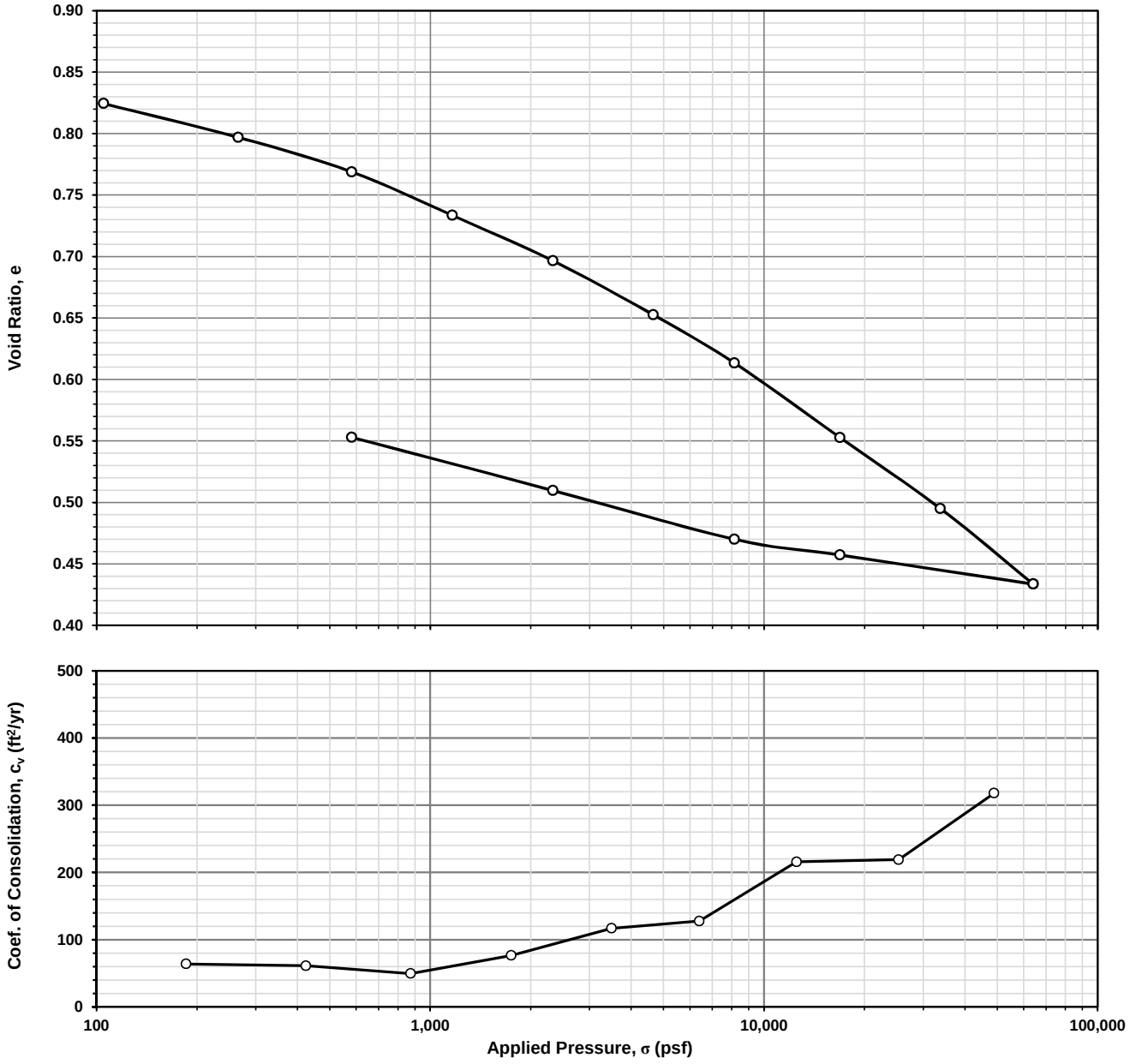
One-Dimensional Consolidation Test Report (ASTM D2435)

Project Number:	N-16-034(6)	Boring Number:	BH-16
Project Name:	CPP/CDF 12 Icebreaker	Sample No. / Depth:	ST-5 / 105.1 ft
Project Location:		Date of Testing:	11/22/2016 to 12/12/2016
Client:	Hull & Associates, Inc.	Technician:	JJH

Soil Description: Gray LEAN CLAY, some silt, trace sand.
Soil Classification: USCS CL

Physical Characteristics	L.L.	P.L.	P.I.	Gravel%	C. Sand%	F. Sand%	Silt%	Clay%
	37	20	17					

Natural S_o	Natural w_o	γ_d (pcf)	γ_{sat} (pcf)	σ_{vo}' (psf)	S_G	e_o	σ_p' (psf)	c_c	c_r
101.3%	31.7%	90.4	119.3	5,528	2.67	0.844	3,346	0.300	0.059



APPENDIX D

Laboratory Analytical Data

LAKE ERIE ENERGY DEVELOPMENT CORPORATION
ICEBREAKER OFFSHORE WIND DEMONSTRATION PROJECT
CLEVELAND, CUAYHOGA COUNTY, OHIO

TABLE D - GEOENVIRONMETAL LABORATORY RESULTS

Station Name	Units	Ohio VAP Direct Contact Soil Standards (mg/kg) [a]		BH-5	BH-7	BH-9	BH-13
Sample Depth				8.5 - 10.5 ft	3.5 - 5.5 ft	3.5 - 5.5 ft	3.5 - 5.5 ft
Sample Date		Commerical/ Industrial	Construction/ Excavation	10/19/2016	10/19/2016	10/18/2016	10/17/2016
FieldSampleID				LAE001:BH-5:S0851005	LAE001:BH-7:S035055	LAE001:BH-9:S035055	LAE001:BH-13:S035055
Metals by U.S. EPA Method 6010							
Arsenic	mg/kg	77	690	**75.3**	**113**	**104**	**30.6**
Barium	mg/kg	NS	NS	**132**	**195**	**156**	**309**
Cadmium	mg/kg	2,600	1,000	**2.7**	<0.7	**0.63**	**6.5**
Chromium [b]	mg/kg	210	1200	**20.8**	**27**	**9.8**	**27.8**
Lead	mg/kg	800	400	**6.4**	**8.4**	**92.7**	**328**
Silver	mg/kg	20,000	11,000	<0.59	<0.7	<0.63	<0.64
Selenium	mg/kg	20,000	11,000	**3.4**	**3.9**	**3.7**	**1.4**
Mercury by U.S. EPA Method 7471							
Mercury	mg/kg	3.1	3.1	<0.28	<0.28	<0.24	**0.41**
PCBs by U.S. EPA Method 8082							
Aroclor 1016	mg/kg	100	260	<0.13	<0.14	<0.13	<0.13
Aroclor 1221	mg/kg	14	210	<0.13	<0.14	<0.13	<0.13
Aroclor 1232	mg/kg	14	73	<0.13	<0.14	<0.13	<0.13
Aroclor 1242	mg/kg	20	440	<0.13	<0.14	<0.13	<0.13
Aroclor 1248	mg/kg	20	440	<0.13	<0.14	<0.13	<0.13
Aroclor 1254	mg/kg	20	75	<0.13	<0.14	<0.13	<0.13
Aroclor 1260	mg/kg	20	440	<0.13	<0.14	<0.13	<0.13
VOCs by U.S. EPA Method 8260							
1,1,1,2-Tetrachloroethane	mg/kg	240	680	<0.0067	<0.0073	<0.0063	<0.0065
1,1,1-Trichloroethane	mg/kg	640	640	<0.0067	<0.0073	<0.0063	<0.0065
1,1,2,2-Tetrachloroethane	mg/kg	75	670	<0.0067	<0.0073	<0.0063	<0.0065
1,1,2-Trichloroethane	mg/kg	140	1,200	<0.0067	<0.0073	<0.0063	<0.0065
1,1-Dichloroethane	mg/kg	420	1,700	<0.0067	<0.0073	<0.0063	<0.0065
1,1-Dichloroethene	mg/kg	1,200	360	<0.0067	<0.0073	<0.0063	<0.0065
1,2,4-Trimethylbenzene	mg/kg	220	220	<0.0067	<0.0073	<0.0063	<0.0065
1,2-Dichloroethane	mg/kg	56	480	<0.0067	<0.0073	<0.0063	<0.0065
1,2-Dichloropropane	mg/kg	120	180	<0.0067	<0.0073	<0.0063	<0.0065
1,3-Dichloropropane	mg/kg	1,500	1,500	<0.0067	<0.0073	<0.0063	<0.0065
2-Butanone	mg/kg	28,000	28,000	<0.034	<0.036	<0.032	<0.032
4-Methyl-2-pentanone	mg/kg	3,400	3,400	<0.034	<0.036	<0.032	<0.032
Acetone	mg/kg	110,000	110,000	<0.13	<0.15	<0.13	<0.13
Benzene	mg/kg	140	1,200	**0.0077**	<0.0073	**0.0091**	**0.0079**
Bromodichloromethane	mg/kg	35	300	<0.0067	<0.0073	<0.0063	<0.0065
Bromomethane	mg/kg	82	550	<0.0067	<0.0073	<0.0063	<0.0065
Carbon Disulfide	mg/kg	740	740	<0.013	<0.015	<0.013	<0.013
Carbon Tetrachloride	mg/kg	79	460	<0.0067	<0.0073	<0.0063	<0.0065
Chlorobenzene	mg/kg	760	760	<0.0067	<0.0073	<0.0063	<0.0065
Chloroethane	mg/kg	2,100	2,100	<0.0067	<0.0073	<0.0063	<0.0065
Chloroform	mg/kg	38	320	<0.0067	<0.0073	<0.0063	<0.0065

LAKE ERIE ENERGY DEVELOPMENT CORPORATION
ICEBREAKER OFFSHORE WIND DEMONSTRATION PROJECT
CLEVELAND, CUAYHOGA COUNTY, OHIO

TABLE D - GEOENVIRONMETAL LABORATORY RESULTS

Station Name	Units	Ohio VAP Direct Contact Soil Standards (mg/kg) [a]		BH-5	BH-7	BH-9	BH-13
Sample Depth				8.5 - 10.5 ft	3.5 - 5.5 ft	3.5 - 5.5 ft	3.5 - 5.5 ft
Sample Date		Commerical/ Industrial	Construction/ Excavation	10/19/2016	10/19/2016	10/18/2016	10/17/2016
FieldSampleID				LAE001:BH-5:S0851005	LAE001:BH-7:S035055	LAE001:BH-9:S035055	LAE001:BH-13:S035055
Chloromethane	mg/kg	1,300	1,300	<0.0067	<0.0073	<0.0063	<0.0065
cis-1,2-Dichloroethene	mg/kg	NS	NS	<0.0067	<0.0073	<0.0063	<0.0065
cis-1,3-Dichloropropene	mg/kg	NS	NS	<0.0067	<0.0073	<0.0063	<0.0065
Dibromochloromethane	mg/kg	84	770	<0.0067	<0.0073	<0.0063	<0.0065
Dibromomethane	mg/kg	2,800	2,800	<0.0067	<0.0073	<0.0063	<0.0065
Dichlorodifluoromethane	mg/kg	850	850	<0.0067	<0.0073	<0.0063	<0.0065
Ethyl Methacrylate	mg/kg	1,100	1,100	<0.13	<0.15	<0.13	<0.13
Ethylbenzene	mg/kg	480	480	<0.0067	<0.0073	<0.0063	<0.0065
Methyl tert butyl ether (MTBE)	mg/kg	5,700	8,900	<0.0067	<0.0073	<0.0063	<0.0065
Methylene Chloride	mg/kg	3,300	3,300	<0.027	**0.091**	<0.025	<0.026
n-Hexane	mg/kg	140	140	<0.0067	<0.0073	<0.0063	<0.0065
Styrene	mg/kg	870	870	<0.0067	<0.0073	<0.0063	<0.0065
Tetrachloroethene	mg/kg	170	170	<0.0067	<0.0073	<0.0063	<0.0065
Toluene	mg/kg	820	820	**0.013**	<0.0073	**0.025**	**0.017**
trans-1,2-Dichloroethene	mg/kg	1,700	1,700	<0.0067	<0.0073	<0.0063	<0.0065
trans-1,3-Dichloropropene	mg/kg	NS	NS	<0.0067	<0.0073	<0.0063	<0.0065
Trichloroethene	mg/kg	51	17	<0.0067	<0.0073	<0.0063	<0.0065
Trichlorofluoromethane	mg/kg	1,200	1,200	<0.0067	<0.0073	<0.0063	<0.0065
Vinyl Chloride	mg/kg	50	280	<0.0067	<0.0073	<0.0063	<0.0065
Xylenes	mg/kg	260	260	<0.013	<0.015	**0.019**	<0.013
1,2,4-Trichlorobenzene	mg/kg	400	400	<0.0067	<0.0073	<0.0063	<0.0065
1,2-Dichlorobenzene	mg/kg	380	380	<0.0067	<0.0073	<0.0063	<0.0065
1,4-Dichlorobenzene	mg/kg	310	2,600	<0.0067	<0.0073	<0.0063	<0.0065
Bromoform	mg/kg	6,200	130,000	<0.0067	<0.0073	<0.0063	<0.0065
Isopropylbenzene (Cumene)	mg/kg	270	270	<0.0067	<0.0073	<0.0063	<0.0065
Vinyl Acetate	mg/kg	2,700	620	<0.13	<0.15	<0.13	<0.13
SVOCs by U.S. EPA Method 8270							
2-Chlorophenol	mg/kg	20,000	22,000	<0.44	<0.47	<0.42	<0.43
Bis(2-chloroethyl) ether	mg/kg	30	290	<0.44	<0.47	<0.42	<0.43
Chloronaphthalene, Beta-	mg/kg	330,000	1,000,000	<0.44	<0.47	<0.42	<0.43
Nitrobenzene	mg/kg	610	3,000	<0.44	<0.47	<0.42	<0.43
2,4,5-Trichlorophenol	mg/kg	180,000	1,000,000	<0.44	<0.47	<0.42	<0.43
2,4,6-Trichlorophenol	mg/kg	1,800	1,400	<0.44	<0.47	<0.42	<0.43
2,4-Dichlorophenol	mg/kg	5,300	28,000	<0.44	<0.47	<0.42	<0.43
2,4-Dimethylphenol	mg/kg	35,000	85,000	<0.44	<0.47	<0.42	<0.43
2,4-Dinitrophenol	mg/kg	3,500	28,000	<2.1	<2.3	<2	<2.1
2,4-Dinitrotoluene	mg/kg	160	2,800	<0.44	<0.47	<0.42	<0.43
2,6-Dinitrotoluene	mg/kg	33	670	<0.44	<0.47	<0.42	<0.43
2-Methylnaphthalene	mg/kg	6,000	5,200	<0.44	<0.47	**0.49**	<0.43
2-Methylphenol	mg/kg	88,000	710,000	<0.44	<0.47	<0.42	<0.43
3&4-Methylphenol	mg/kg	NS	NS	<0.89	<0.95	<0.83	<0.86

LAKE ERIE ENERGY DEVELOPMENT CORPORATION
ICEBREAKER OFFSHORE WIND DEMONSTRATION PROJECT
CLEVELAND, CUAYHOGA COUNTY, OHIO

TABLE D - GEOENVIRONMETAL LABORATORY RESULTS

Station Name	Units	Ohio VAP Direct Contact Soil Standards (mg/kg) [a]		BH-5	BH-7	BH-9	BH-13
Sample Depth				8.5 - 10.5 ft	3.5 - 5.5 ft	3.5 - 5.5 ft	3.5 - 5.5 ft
Sample Date		Commerical/ Industrial	Construction/ Excavation	10/19/2016	10/19/2016	10/18/2016	10/17/2016
FieldSampleID				LAE001:BH-5:S0851005	LAE001:BH-7:S035055	LAE001:BH-9:S035055	LAE001:BH-13:S035055
4-Chloro-3-methylphenol	mg/kg	180,000	140,000	<0.89	<0.95	<0.83	<0.86
Acenaphthene	mg/kg	90,000	780,000	<0.44	<0.47	<0.42	<0.43
Acenaphthylene	mg/kg	NS	NS	<0.44	<0.47	<0.42	<0.43
Anthracene	mg/kg	450,000	1,000,000	<0.44	<0.47	<0.42	<0.43
Benzo(a)anthracene	mg/kg	58	1,200	<0.44	<0.47	<0.42	<0.43
Benzo(a)pyrene	mg/kg	5.8	120	<0.44	<0.47	<0.42	<0.43
Benzo(b)fluoranthene	mg/kg	58	1,200	<0.44	<0.47	<0.42	<0.43
Benzo(g,h,i)perylene	mg/kg	NS	NS	<0.44	<0.47	<0.42	<0.43
Benzo(k)fluoranthene	mg/kg	580	12,000	<0.44	<0.47	<0.42	<0.43
Bis(2-chloroethoxy) methane	mg/kg	5,300	43,000	<0.44	<0.47	<0.42	<0.43
Bis(2-chloroisopropyl) ether	mg/kg	680	1,000	<0.44	<0.47	<0.42	<0.43
Bis(2-ethylhexyl) Phthalate	mg/kg	3,500	71,000	<0.44	<0.47	<0.42	<0.43
Butylbenzyl phthalate	mg/kg	26,000	520,000	<0.44	<0.47	<0.42	<0.43
Chrysene	mg/kg	5,800	120,000	<0.44	<0.47	<0.42	<0.43
Dibenz(a,h)anthracene	mg/kg	5.8	120	<0.44	<0.47	<0.42	<0.43
Dibutyl Phthalate	mg/kg	180,000	430,000	<0.44	<0.47	<0.42	<0.43
Diethyl Phthalate	mg/kg	1,000,000	1,000,000	<0.44	<0.47	<0.42	<0.43
Fluoranthene	mg/kg	60,000	160,000	<0.44	<0.47	<0.42	<0.43
Fluorene	mg/kg	60,000	520,000	<0.44	<0.47	<0.42	<0.43
Hexachloroethane	mg/kg	1,200	3,000	<0.44	<0.47	<0.42	<0.43
Indeno(1,2,3-c,d)pyrene	mg/kg	58	1,200	<0.44	<0.47	<0.42	<0.43
Isophorone	mg/kg	52,000	1,000,000	<0.44	<0.47	<0.42	<0.43
Naphthalene	mg/kg	450	560	<0.44	<0.47	<0.42	<0.43
n-Nitroso-di-N-propylamine	mg/kg	7	140	<0.44	<0.47	<0.42	<0.43
n-Nitrosodiphenylamine	mg/kg	10,000	200,000	<0.44	<0.47	<0.42	<0.43
Octyl Phthalate	mg/kg	18,000	140,000	<0.44	<0.47	<0.42	<0.43
p-Chloroaniline	mg/kg	250	710	<0.89	<0.95	<0.83	<0.86
Phenanthrene	mg/kg	NS	NS	<0.44	<0.47	<0.42	<0.43
Phenol	mg/kg	530,000	840,000	<0.44	<0.47	<0.42	<0.43
Pyrene	mg/kg	45,000	390,000	<0.44	<0.47	<0.42	<0.43
Hexachlorocyclopentadiene	mg/kg	11,000	26,000	<0.44	<0.47	<0.42	<0.43
Percent Moisture SM 2540G							
Percent Moisture	%	NS	NS	**25.7**	**31.1**	**21.2**	**23.1**

Notes:

a. Ohio Voluntary Action Program generic numerical standards for direct contact with soil per OAC 3745-300-08, effective May 26, 2016.

b. Total chromium results were conservatively compared to the VAP direct contact standard for hexavalent chromium.

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October 2016

Limited Environmental Review
Cleveland Public Power Northern Storage Yard

Geotechnical Borings

North Marginal Road
Cleveland, Cuyahoga County, Ohio

Figure 2

Produced using ArcGIS 10.3
File Name: LAE001_01_Fig02_Borings.mxd
Edited: 10/14/2016 By: mopel

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October 28, 2016

Ms. Lindsay Crow
Hull & Associates, Inc.
4 Hemisphere Way
Bedford, OH 44146

RE: Project: LAE001
Pace Project No.: 50157217

Dear Ms. Crow:
Enclosed are the analytical results for sample(s) received by the laboratory on October 21, 2016. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Tina Sayer

Tina Sayer
tina.sayer@pacelabs.com
Project Manager

Enclosures

cc: Hull Data/EDD Admin
Ms. Karyn Selle

REPORT OF LABORATORY ANALYSIS

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CERTIFICATIONS

Project: LAE001
Pace Project No.: 50157217

Indiana Certification IDs

7726 Moller Road, Indianapolis, IN 46268
Illinois Certification #: 200074
Indiana Certification #: C-49-06
Kansas/NELAP Certification #:E-10177
Kentucky UST Certification #: 0042
Kentucky WW Certification #:98019
Ohio VAP Certification #: CL-0065
Oklahoma Certification #: 2014-148
Texas Certification #: T104704355-15-9
West Virginia Certification #: 330
Wisconsin Certification #: 999788130
USDA Soil Permit #: P330-10-00128

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SAMPLE SUMMARY

Project: LAE001
Pace Project No.: 50157217

Lab ID	Sample ID	Matrix	Date Collected	Date Received
50157217001	**LAE001:BH9:S035055**	Solid	10/18/16 16:08	10/21/16 08:30
50157217002	**LAE001:BH13:S035055**	Solid	10/17/16 14:44	10/21/16 08:30
50157217003	**LAE001:TRIP:W101716**	Water	10/17/16 08:00	10/21/16 08:30

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SAMPLE ANALYTE COUNT

Project: LAE001
Pace Project No.: 50157217

Lab ID	Sample ID	Method	Analysts	Analytes Reported
50157217001	**LAE001:BH9:S035055**	EPA 8082	NPW	8
		EPA 6010	MJC	7
		EPA 7471	ILP	1
		EPA 8270	TBP	51
		EPA 8260	JLZ	50
		SM 2540G	GWA	1
50157217002	**LAE001:BH13:S035055**	EPA 8082	CPH	8
		EPA 6010	MJC	7
		EPA 7471	ILP	1
		EPA 8270	TBP	51
		EPA 8260	JLZ	50
		SM 2540G	GWA	1
50157217003	**LAE001:TRIP:W101716**	EPA 8260	JLZ	50

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SUMMARY OF DETECTION

Project: LAE001
Pace Project No.: 50157217

Lab Sample ID / Method	Client Sample ID / Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
50157217001	**LAE001:BH9:S035055**					
EPA 6010	Arsenic	104	mg/kg	1.3	10/26/16 11:10	
EPA 6010	Barium	156	mg/kg	1.3	10/26/16 11:10	
EPA 6010	Cadmium	0.63	mg/kg	0.63	10/26/16 11:10	
EPA 6010	Chromium	9.8	mg/kg	1.3	10/26/16 11:10	
EPA 6010	Lead	92.7	mg/kg	1.3	10/26/16 11:10	
EPA 6010	Selenium	3.7	mg/kg	1.3	10/26/16 11:10	
EPA 8270	2-Methylnaphthalene	0.49	mg/kg	0.42	10/24/16 14:24	
EPA 8260	Benzene	0.0091	mg/kg	0.0063	10/25/16 16:22	
EPA 8260	Toluene	0.025	mg/kg	0.0063	10/25/16 16:22	
EPA 8260	Xylene (Total)	0.019	mg/kg	0.013	10/25/16 16:22	
SM 2540G	Percent Moisture	21.2	%	0.10	10/24/16 12:43	
50157217002	**LAE001:BH13:S035055**					
EPA 6010	Arsenic	30.6	mg/kg	1.3	10/26/16 11:12	
EPA 6010	Barium	309	mg/kg	1.3	10/26/16 11:12	
EPA 6010	Cadmium	6.5	mg/kg	0.64	10/26/16 11:12	
EPA 6010	Chromium	27.8	mg/kg	1.3	10/26/16 11:12	
EPA 6010	Lead	328	mg/kg	1.3	10/26/16 11:12	
EPA 6010	Selenium	1.4	mg/kg	1.3	10/26/16 11:12	
EPA 7471	Mercury	0.41	mg/kg	0.26	10/25/16 10:09	
EPA 8260	Benzene	0.0079	mg/kg	0.0065	10/25/16 16:46	
EPA 8260	Toluene	0.017	mg/kg	0.0065	10/25/16 16:46	
SM 2540G	Percent Moisture	23.1	%	0.10	10/24/16 12:43	

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PROJECT NARRATIVE

Project: LAE001
Pace Project No.: 50157217

Method: **EPA 8082**
Description: 8082 GCS PCB Solids
Client: Hull & Associates, Inc. (Bedford)
Date: October 28, 2016

General Information:
2 samples were analyzed for EPA 8082. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 3546 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Surrogates:
All surrogates were within QC limits with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: LAE001
Pace Project No.: 50157217

Method: **EPA 6010**
Description: 6010 MET ICP
Client: Hull & Associates, Inc. (Bedford)
Date: October 28, 2016

General Information:
2 samples were analyzed for EPA 6010. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 3050 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: LAE001
Pace Project No.: 50157217

Method: **EPA 7471**
Description: 7471 Mercury
Client: Hull & Associates, Inc. (Bedford)
Date: October 28, 2016

General Information:
2 samples were analyzed for EPA 7471. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 7471 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: LAE001
Pace Project No.: 50157217

Method: **EPA 8270**
Description: 8270 MSSV SHORT LIST MICROWAVE
Client: Hull & Associates, Inc. (Bedford)
Date: October 28, 2016

General Information:
2 samples were analyzed for EPA 8270. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 3546 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Surrogates:
All surrogates were within QC limits with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

QC Batch: 357688

A matrix spike and/or matrix spike duplicate (MS/MSD) were performed on the following sample(s): 50157217002

R1: RPD value was outside control limits.

- MSD (Lab ID: 1654059)
  - Benzo(k)fluoranthene

Additional Comments:

REPORT OF LABORATORY ANALYSIS

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PROJECT NARRATIVE

Project: LAE001
Pace Project No.: 50157217

Method: **EPA 8260**
Description: 8260 MSV 5030 Low Level
Client: Hull & Associates, Inc. (Bedford)
Date: October 28, 2016

General Information:
2 samples were analyzed for EPA 8260. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Surrogates:
All surrogates were within QC limits with any exceptions noted below.

QC Batch: 357824

S2: Surrogate recovery outside laboratory control limits due to matrix interferences (confirmed by similar results from sample re-analysis).

- LAE001:BH9:S035055 (Lab ID: 50157217001)
  - Toluene-d8 (S)

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

QC Batch: 357824

L0: Analyte recovery in the laboratory control sample (LCS) was outside QC limits.

- LCS (Lab ID: 1654521)
  - Acetone

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: LAE001
Pace Project No.: 50157217

Method: **EPA 8260**
Description: 8260 MSV 5030 Low Level
Client: Hull & Associates, Inc. (Bedford)
Date: October 28, 2016

Analyte Comments:

QC Batch: 357824

1d: The internal standard response was below the laboratory acceptance limits and confirmed by reanalysis. The results reported are from the most QC compliant analysis and may be biased high. JLZ 10/26/16

- LAE001:BH13:S035055 (Lab ID: 50157217002)
  - Dibromofluoromethane (S)
- LAE001:BH9:S035055 (Lab ID: 50157217001)
  - Dibromofluoromethane (S)

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PROJECT NARRATIVE

Project: LAE001
Pace Project No.: 50157217

Method: **EPA 8260**
Description: 8260 MSV
Client: Hull & Associates, Inc. (Bedford)
Date: October 28, 2016

General Information:
1 sample was analyzed for EPA 8260. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Surrogates:
All surrogates were within QC limits with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

QC Batch: 357823

L3: Analyte recovery in the laboratory control sample (LCS) exceeded QC limits. Analyte presence below reporting limits in associated samples. Results unaffected by high bias.

- LCS (Lab ID: 1654519)
  - Acetone

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.

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ANALYTICAL RESULTS

Project: LAE001
Pace Project No.: 50157217

Sample: LAE001:BH9:S035055 **Lab ID: 50157217001** Collected: 10/18/16 16:08 Received: 10/21/16 08:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB Solids	Analytical Method: EPA 8082 Preparation Method: EPA 3546							
PCB-1016 (Aroclor 1016)	ND	mg/kg	0.13	1	10/24/16 09:54	10/26/16 03:11	12674-11-2	
PCB-1221 (Aroclor 1221)	ND	mg/kg	0.13	1	10/24/16 09:54	10/26/16 03:11	11104-28-2	
PCB-1232 (Aroclor 1232)	ND	mg/kg	0.13	1	10/24/16 09:54	10/26/16 03:11	11141-16-5	
PCB-1242 (Aroclor 1242)	ND	mg/kg	0.13	1	10/24/16 09:54	10/26/16 03:11	53469-21-9	
PCB-1248 (Aroclor 1248)	ND	mg/kg	0.13	1	10/24/16 09:54	10/26/16 03:11	12672-29-6	
PCB-1254 (Aroclor 1254)	ND	mg/kg	0.13	1	10/24/16 09:54	10/26/16 03:11	11097-69-1	
PCB-1260 (Aroclor 1260)	ND	mg/kg	0.13	1	10/24/16 09:54	10/26/16 03:11	11096-82-5	
Surrogates								
Tetrachloro-m-xylene (S)	93	%.	24-99	1	10/24/16 09:54	10/26/16 03:11	877-09-8	
6010 MET ICP	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Arsenic	**104**	mg/kg	1.3	1	10/25/16 13:20	10/26/16 11:10	7440-38-2	
Barium	**156**	mg/kg	1.3	1	10/25/16 13:20	10/26/16 11:10	7440-39-3	
Cadmium	**0.63**	mg/kg	0.63	1	10/25/16 13:20	10/26/16 11:10	7440-43-9	
Chromium	**9.8**	mg/kg	1.3	1	10/25/16 13:20	10/26/16 11:10	7440-47-3	
Lead	**92.7**	mg/kg	1.3	1	10/25/16 13:20	10/26/16 11:10	7439-92-1	
Selenium	**3.7**	mg/kg	1.3	1	10/25/16 13:20	10/26/16 11:10	7782-49-2	
Silver	ND	mg/kg	0.63	1	10/25/16 13:20	10/26/16 11:10	7440-22-4	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471							
Mercury	ND	mg/kg	0.24	1	10/24/16 22:40	10/25/16 10:07	7439-97-6	
8270 MSSV SHORT LIST MICROWAVE	Analytical Method: EPA 8270 Preparation Method: EPA 3546							
Acenaphthene	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	83-32-9	
Acenaphthylene	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	208-96-8	
Anthracene	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	120-12-7	
Benzo(a)anthracene	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	56-55-3	
Benzo(a)pyrene	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	50-32-8	
Benzo(b)fluoranthene	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	205-99-2	
Benzo(g,h,i)perylene	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	191-24-2	
Benzo(k)fluoranthene	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	207-08-9	
Butylbenzylphthalate	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	85-68-7	
4-Chloro-3-methylphenol	ND	mg/kg	0.83	1	10/23/16 22:27	10/24/16 14:24	59-50-7	
4-Chloroaniline	ND	mg/kg	0.83	1	10/23/16 22:27	10/24/16 14:24	106-47-8	
bis(2-Chloroethoxy)methane	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	111-91-1	
bis(2-Chloroethyl) ether	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	111-44-4	
bis(2chloro1methylethyl) ether	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	108-60-1	
2-Chloronaphthalene	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	91-58-7	
2-Chlorophenol	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	95-57-8	
Chrysene	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	218-01-9	
Dibenz(a,h)anthracene	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	53-70-3	
2,4-Dichlorophenol	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	120-83-2	
Diethylphthalate	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	84-66-2	
2,4-Dimethylphenol	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	105-67-9	
Di-n-butylphthalate	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	84-74-2	

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ANALYTICAL RESULTS

Project: LAE001
Pace Project No.: 50157217

Sample: LAE001:BH9:S035055 **Lab ID: 50157217001** Collected: 10/18/16 16:08 Received: 10/21/16 08:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV SHORT LIST MICROWAVE Analytical Method: EPA 8270 Preparation Method: EPA 3546								
2,4-Dinitrophenol	ND	mg/kg	2.0	1	10/23/16 22:27	10/24/16 14:24	51-28-5	
2,4-Dinitrotoluene	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	121-14-2	
2,6-Dinitrotoluene	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	606-20-2	
Di-n-octylphthalate	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	117-84-0	
bis(2-Ethylhexyl)phthalate	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	117-81-7	
Fluoranthene	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	206-44-0	
Fluorene	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	86-73-7	
Hexachlorocyclopentadiene	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	77-47-4	
Hexachloroethane	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	67-72-1	
Indeno(1,2,3-cd)pyrene	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	193-39-5	
Isophorone	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	78-59-1	
2-Methylnaphthalene	**0.49**	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	91-57-6	
2-Methylphenol(o-Cresol)	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	95-48-7	
3&4-Methylphenol(m&p Cresol)	ND	mg/kg	0.83	1	10/23/16 22:27	10/24/16 14:24		
Naphthalene	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	91-20-3	
Nitrobenzene	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	98-95-3	
N-Nitroso-di-n-propylamine	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	621-64-7	
N-Nitrosodiphenylamine	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	86-30-6	
Phenanthrene	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	85-01-8	
Phenol	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	108-95-2	
Pyrene	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	129-00-0	
2,4,5-Trichlorophenol	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	95-95-4	
2,4,6-Trichlorophenol	ND	mg/kg	0.42	1	10/23/16 22:27	10/24/16 14:24	88-06-2	
Surrogates								
Nitrobenzene-d5 (S)	62	%.	22-97	1	10/23/16 22:27	10/24/16 14:24	4165-60-0	
Phenol-d5 (S)	69	%.	28-108	1	10/23/16 22:27	10/24/16 14:24	4165-62-2	
2-Fluorophenol (S)	74	%.	23-110	1	10/23/16 22:27	10/24/16 14:24	367-12-4	
2,4,6-Tribromophenol (S)	69	%.	18-110	1	10/23/16 22:27	10/24/16 14:24	118-79-6	
2-Fluorobiphenyl (S)	61	%.	22-96	1	10/23/16 22:27	10/24/16 14:24	321-60-8	
p-Terphenyl-d14 (S)	59	%.	17-102	1	10/23/16 22:27	10/24/16 14:24	1718-51-0	
8260 MSV 5030 Low Level Analytical Method: EPA 8260								
1,1,1,2-Tetrachloroethane	ND	mg/kg	0.0063	1		10/25/16 16:22	630-20-6	
1,1,1-Trichloroethane	ND	mg/kg	0.0063	1		10/25/16 16:22	71-55-6	
1,1,2,2-Tetrachloroethane	ND	mg/kg	0.0063	1		10/25/16 16:22	79-34-5	
1,1,2-Trichloroethane	ND	mg/kg	0.0063	1		10/25/16 16:22	79-00-5	
1,1-Dichloroethane	ND	mg/kg	0.0063	1		10/25/16 16:22	75-34-3	
1,1-Dichloroethene	ND	mg/kg	0.0063	1		10/25/16 16:22	75-35-4	
1,2,4-Trichlorobenzene	ND	mg/kg	0.0063	1		10/25/16 16:22	120-82-1	
1,2,4-Trimethylbenzene	ND	mg/kg	0.0063	1		10/25/16 16:22	95-63-6	
1,2-Dichlorobenzene	ND	mg/kg	0.0063	1		10/25/16 16:22	95-50-1	
1,2-Dichloroethane	ND	mg/kg	0.0063	1		10/25/16 16:22	107-06-2	
1,2-Dichloropropane	ND	mg/kg	0.0063	1		10/25/16 16:22	78-87-5	
1,3-Dichloropropane	ND	mg/kg	0.0063	1		10/25/16 16:22	142-28-9	
1,4-Dichlorobenzene	ND	mg/kg	0.0063	1		10/25/16 16:22	106-46-7	
2-Butanone (MEK)	ND	mg/kg	0.032	1		10/25/16 16:22	78-93-3	

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ANALYTICAL RESULTS

Project: LAE001
Pace Project No.: 50157217

Sample: LAE001:BH9:S035055 **Lab ID: 50157217001** Collected: 10/18/16 16:08 Received: 10/21/16 08:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV 5030 Low Level	Analytical Method: EPA 8260							
4-Methyl-2-pentanone (MIBK)	ND	mg/kg	0.032	1		10/25/16 16:22	108-10-1	
Acetone	ND	mg/kg	0.13	1		10/25/16 16:22	67-64-1	L3
Benzene	**0.0091**	mg/kg	0.0063	1		10/25/16 16:22	71-43-2	
Bromodichloromethane	ND	mg/kg	0.0063	1		10/25/16 16:22	75-27-4	
Bromoform	ND	mg/kg	0.0063	1		10/25/16 16:22	75-25-2	
Bromomethane	ND	mg/kg	0.0063	1		10/25/16 16:22	74-83-9	
Carbon disulfide	ND	mg/kg	0.013	1		10/25/16 16:22	75-15-0	
Carbon tetrachloride	ND	mg/kg	0.0063	1		10/25/16 16:22	56-23-5	
Chlorobenzene	ND	mg/kg	0.0063	1		10/25/16 16:22	108-90-7	
Chloroethane	ND	mg/kg	0.0063	1		10/25/16 16:22	75-00-3	
Chloroform	ND	mg/kg	0.0063	1		10/25/16 16:22	67-66-3	
Chloromethane	ND	mg/kg	0.0063	1		10/25/16 16:22	74-87-3	
Dibromochloromethane	ND	mg/kg	0.0063	1		10/25/16 16:22	124-48-1	
Dibromomethane	ND	mg/kg	0.0063	1		10/25/16 16:22	74-95-3	
Dichlorodifluoromethane	ND	mg/kg	0.0063	1		10/25/16 16:22	75-71-8	
Ethyl methacrylate	ND	mg/kg	0.13	1		10/25/16 16:22	97-63-2	
Ethylbenzene	ND	mg/kg	0.0063	1		10/25/16 16:22	100-41-4	
Isopropylbenzene (Cumene)	ND	mg/kg	0.0063	1		10/25/16 16:22	98-82-8	
Methyl-tert-butyl ether	ND	mg/kg	0.0063	1		10/25/16 16:22	1634-04-4	
Methylene Chloride	ND	mg/kg	0.025	1		10/25/16 16:22	75-09-2	
Styrene	ND	mg/kg	0.0063	1		10/25/16 16:22	100-42-5	
Tetrachloroethene	ND	mg/kg	0.0063	1		10/25/16 16:22	127-18-4	
Toluene	**0.025**	mg/kg	0.0063	1		10/25/16 16:22	108-88-3	
Trichloroethene	ND	mg/kg	0.0063	1		10/25/16 16:22	79-01-6	
Trichlorofluoromethane	ND	mg/kg	0.0063	1		10/25/16 16:22	75-69-4	
Vinyl acetate	ND	mg/kg	0.13	1		10/25/16 16:22	108-05-4	
Vinyl chloride	ND	mg/kg	0.0063	1		10/25/16 16:22	75-01-4	
Xylene (Total)	**0.019**	mg/kg	0.013	1		10/25/16 16:22	1330-20-7	
cis-1,2-Dichloroethene	ND	mg/kg	0.0063	1		10/25/16 16:22	156-59-2	
cis-1,3-Dichloropropene	ND	mg/kg	0.0063	1		10/25/16 16:22	10061-01-5	
n-Hexane	ND	mg/kg	0.0063	1		10/25/16 16:22	110-54-3	
trans-1,2-Dichloroethene	ND	mg/kg	0.0063	1		10/25/16 16:22	156-60-5	
trans-1,3-Dichloropropene	ND	mg/kg	0.0063	1		10/25/16 16:22	10061-02-6	
Surrogates								
Dibromofluoromethane (S)	108	%.	70-128	1		10/25/16 16:22	1868-53-7	1d
Toluene-d8 (S)	158	%.	72-139	1		10/25/16 16:22	2037-26-5	S2
4-Bromofluorobenzene (S)	73	%.	65-127	1		10/25/16 16:22	460-00-4	
Percent Moisture	Analytical Method: SM 2540G							
Percent Moisture	**21.2**	%	0.10	1		10/24/16 12:43		

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ANALYTICAL RESULTS

Project: LAE001
Pace Project No.: 50157217

Sample: LAE001:BH13:S035055 **Lab ID: 50157217002** Collected: 10/17/16 14:44 Received: 10/21/16 08:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB Solids	Analytical Method: EPA 8082 Preparation Method: EPA 3546							
PCB-1016 (Aroclor 1016)	ND	mg/kg	0.13	1	10/26/16 11:20	10/27/16 01:03	12674-11-2	
PCB-1221 (Aroclor 1221)	ND	mg/kg	0.13	1	10/26/16 11:20	10/27/16 01:03	11104-28-2	
PCB-1232 (Aroclor 1232)	ND	mg/kg	0.13	1	10/26/16 11:20	10/27/16 01:03	11141-16-5	
PCB-1242 (Aroclor 1242)	ND	mg/kg	0.13	1	10/26/16 11:20	10/27/16 01:03	53469-21-9	
PCB-1248 (Aroclor 1248)	ND	mg/kg	0.13	1	10/26/16 11:20	10/27/16 01:03	12672-29-6	
PCB-1254 (Aroclor 1254)	ND	mg/kg	0.13	1	10/26/16 11:20	10/27/16 01:03	11097-69-1	
PCB-1260 (Aroclor 1260)	ND	mg/kg	0.13	1	10/26/16 11:20	10/27/16 01:03	11096-82-5	
Surrogates								
Tetrachloro-m-xylene (S)	56	%.	24-99	1	10/26/16 11:20	10/27/16 01:03	877-09-8	
6010 MET ICP	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Arsenic	**30.6**	mg/kg	1.3	1	10/25/16 13:20	10/26/16 11:12	7440-38-2	
Barium	**309**	mg/kg	1.3	1	10/25/16 13:20	10/26/16 11:12	7440-39-3	
Cadmium	**6.5**	mg/kg	0.64	1	10/25/16 13:20	10/26/16 11:12	7440-43-9	
Chromium	**27.8**	mg/kg	1.3	1	10/25/16 13:20	10/26/16 11:12	7440-47-3	
Lead	**328**	mg/kg	1.3	1	10/25/16 13:20	10/26/16 11:12	7439-92-1	
Selenium	**1.4**	mg/kg	1.3	1	10/25/16 13:20	10/26/16 11:12	7782-49-2	
Silver	ND	mg/kg	0.64	1	10/25/16 13:20	10/26/16 11:12	7440-22-4	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471							
Mercury	**0.41**	mg/kg	0.26	1	10/24/16 22:40	10/25/16 10:09	7439-97-6	
8270 MSSV SHORT LIST MICROWAVE	Analytical Method: EPA 8270 Preparation Method: EPA 3546							
Acenaphthene	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	83-32-9	
Acenaphthylene	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	208-96-8	
Anthracene	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	120-12-7	
Benzo(a)anthracene	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	56-55-3	
Benzo(a)pyrene	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	50-32-8	
Benzo(b)fluoranthene	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	205-99-2	
Benzo(g,h,i)perylene	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	191-24-2	
Benzo(k)fluoranthene	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	207-08-9	
Butylbenzylphthalate	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	85-68-7	
4-Chloro-3-methylphenol	ND	mg/kg	0.86	1	10/23/16 22:27	10/24/16 14:43	59-50-7	
4-Chloroaniline	ND	mg/kg	0.86	1	10/23/16 22:27	10/24/16 14:43	106-47-8	
bis(2-Chloroethoxy)methane	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	111-91-1	
bis(2-Chloroethyl) ether	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	111-44-4	
bis(2chloro1methylethyl) ether	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	108-60-1	
2-Chloronaphthalene	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	91-58-7	
2-Chlorophenol	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	95-57-8	
Chrysene	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	218-01-9	
Dibenz(a,h)anthracene	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	53-70-3	
2,4-Dichlorophenol	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	120-83-2	
Diethylphthalate	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	84-66-2	
2,4-Dimethylphenol	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	105-67-9	
Di-n-butylphthalate	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	84-74-2	

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(317)228-3100

ANALYTICAL RESULTS

Project: LAE001
Pace Project No.: 50157217

Sample: LAE001:BH13:S035055 **Lab ID: 50157217002** Collected: 10/17/16 14:44 Received: 10/21/16 08:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV SHORT LIST MICROWAVE Analytical Method: EPA 8270 Preparation Method: EPA 3546								
2,4-Dinitrophenol	ND	mg/kg	2.1	1	10/23/16 22:27	10/24/16 14:43	51-28-5	
2,4-Dinitrotoluene	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	121-14-2	
2,6-Dinitrotoluene	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	606-20-2	
Di-n-octylphthalate	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	117-84-0	
bis(2-Ethylhexyl)phthalate	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	117-81-7	
Fluoranthene	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	206-44-0	
Fluorene	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	86-73-7	
Hexachlorocyclopentadiene	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	77-47-4	
Hexachloroethane	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	67-72-1	
Indeno(1,2,3-cd)pyrene	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	193-39-5	
Isophorone	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	78-59-1	
2-Methylnaphthalene	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	91-57-6	
2-Methylphenol(o-Cresol)	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	95-48-7	
3&4-Methylphenol(m&p Cresol)	ND	mg/kg	0.86	1	10/23/16 22:27	10/24/16 14:43		
Naphthalene	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	91-20-3	
Nitrobenzene	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	98-95-3	
N-Nitroso-di-n-propylamine	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	621-64-7	
N-Nitrosodiphenylamine	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	86-30-6	
Phenanthrene	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	85-01-8	
Phenol	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	108-95-2	
Pyrene	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	129-00-0	
2,4,5-Trichlorophenol	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	95-95-4	
2,4,6-Trichlorophenol	ND	mg/kg	0.43	1	10/23/16 22:27	10/24/16 14:43	88-06-2	
Surrogates								
Nitrobenzene-d5 (S)	59	%.	22-97	1	10/23/16 22:27	10/24/16 14:43	4165-60-0	
Phenol-d5 (S)	64	%.	28-108	1	10/23/16 22:27	10/24/16 14:43	4165-62-2	
2-Fluorophenol (S)	68	%.	23-110	1	10/23/16 22:27	10/24/16 14:43	367-12-4	
2,4,6-Tribromophenol (S)	61	%.	18-110	1	10/23/16 22:27	10/24/16 14:43	118-79-6	
2-Fluorobiphenyl (S)	58	%.	22-96	1	10/23/16 22:27	10/24/16 14:43	321-60-8	
p-Terphenyl-d14 (S)	54	%.	17-102	1	10/23/16 22:27	10/24/16 14:43	1718-51-0	
8260 MSV 5030 Low Level Analytical Method: EPA 8260								
1,1,1,2-Tetrachloroethane	ND	mg/kg	0.0065	1		10/25/16 16:46	630-20-6	
1,1,1-Trichloroethane	ND	mg/kg	0.0065	1		10/25/16 16:46	71-55-6	
1,1,2,2-Tetrachloroethane	ND	mg/kg	0.0065	1		10/25/16 16:46	79-34-5	
1,1,2-Trichloroethane	ND	mg/kg	0.0065	1		10/25/16 16:46	79-00-5	
1,1-Dichloroethane	ND	mg/kg	0.0065	1		10/25/16 16:46	75-34-3	
1,1-Dichloroethene	ND	mg/kg	0.0065	1		10/25/16 16:46	75-35-4	
1,2,4-Trichlorobenzene	ND	mg/kg	0.0065	1		10/25/16 16:46	120-82-1	
1,2,4-Trimethylbenzene	ND	mg/kg	0.0065	1		10/25/16 16:46	95-63-6	
1,2-Dichlorobenzene	ND	mg/kg	0.0065	1		10/25/16 16:46	95-50-1	
1,2-Dichloroethane	ND	mg/kg	0.0065	1		10/25/16 16:46	107-06-2	
1,2-Dichloropropane	ND	mg/kg	0.0065	1		10/25/16 16:46	78-87-5	
1,3-Dichloropropane	ND	mg/kg	0.0065	1		10/25/16 16:46	142-28-9	
1,4-Dichlorobenzene	ND	mg/kg	0.0065	1		10/25/16 16:46	106-46-7	
2-Butanone (MEK)	ND	mg/kg	0.032	1		10/25/16 16:46	78-93-3	

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ANALYTICAL RESULTS

Project: LAE001
Pace Project No.: 50157217

Sample: LAE001:BH13:S035055 **Lab ID: 50157217002** Collected: 10/17/16 14:44 Received: 10/21/16 08:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV 5030 Low Level	Analytical Method: EPA 8260							
4-Methyl-2-pentanone (MIBK)	ND	mg/kg	0.032	1		10/25/16 16:46	108-10-1	
Acetone	ND	mg/kg	0.13	1		10/25/16 16:46	67-64-1	L3
Benzene	**0.0079**	mg/kg	0.0065	1		10/25/16 16:46	71-43-2	
Bromodichloromethane	ND	mg/kg	0.0065	1		10/25/16 16:46	75-27-4	
Bromoform	ND	mg/kg	0.0065	1		10/25/16 16:46	75-25-2	
Bromomethane	ND	mg/kg	0.0065	1		10/25/16 16:46	74-83-9	
Carbon disulfide	ND	mg/kg	0.013	1		10/25/16 16:46	75-15-0	
Carbon tetrachloride	ND	mg/kg	0.0065	1		10/25/16 16:46	56-23-5	
Chlorobenzene	ND	mg/kg	0.0065	1		10/25/16 16:46	108-90-7	
Chloroethane	ND	mg/kg	0.0065	1		10/25/16 16:46	75-00-3	
Chloroform	ND	mg/kg	0.0065	1		10/25/16 16:46	67-66-3	
Chloromethane	ND	mg/kg	0.0065	1		10/25/16 16:46	74-87-3	
Dibromochloromethane	ND	mg/kg	0.0065	1		10/25/16 16:46	124-48-1	
Dibromomethane	ND	mg/kg	0.0065	1		10/25/16 16:46	74-95-3	
Dichlorodifluoromethane	ND	mg/kg	0.0065	1		10/25/16 16:46	75-71-8	
Ethyl methacrylate	ND	mg/kg	0.13	1		10/25/16 16:46	97-63-2	
Ethylbenzene	ND	mg/kg	0.0065	1		10/25/16 16:46	100-41-4	
Isopropylbenzene (Cumene)	ND	mg/kg	0.0065	1		10/25/16 16:46	98-82-8	
Methyl-tert-butyl ether	ND	mg/kg	0.0065	1		10/25/16 16:46	1634-04-4	
Methylene Chloride	ND	mg/kg	0.026	1		10/25/16 16:46	75-09-2	
Styrene	ND	mg/kg	0.0065	1		10/25/16 16:46	100-42-5	
Tetrachloroethene	ND	mg/kg	0.0065	1		10/25/16 16:46	127-18-4	
Toluene	**0.017**	mg/kg	0.0065	1		10/25/16 16:46	108-88-3	
Trichloroethene	ND	mg/kg	0.0065	1		10/25/16 16:46	79-01-6	
Trichlorofluoromethane	ND	mg/kg	0.0065	1		10/25/16 16:46	75-69-4	
Vinyl acetate	ND	mg/kg	0.13	1		10/25/16 16:46	108-05-4	
Vinyl chloride	ND	mg/kg	0.0065	1		10/25/16 16:46	75-01-4	
Xylene (Total)	ND	mg/kg	0.013	1		10/25/16 16:46	1330-20-7	
cis-1,2-Dichloroethene	ND	mg/kg	0.0065	1		10/25/16 16:46	156-59-2	
cis-1,3-Dichloropropene	ND	mg/kg	0.0065	1		10/25/16 16:46	10061-01-5	
n-Hexane	ND	mg/kg	0.0065	1		10/25/16 16:46	110-54-3	
trans-1,2-Dichloroethene	ND	mg/kg	0.0065	1		10/25/16 16:46	156-60-5	
trans-1,3-Dichloropropene	ND	mg/kg	0.0065	1		10/25/16 16:46	10061-02-6	
Surrogates								
Dibromofluoromethane (S)	105	%.	70-128	1		10/25/16 16:46	1868-53-7	1d
Toluene-d8 (S)	131	%.	72-139	1		10/25/16 16:46	2037-26-5	
4-Bromofluorobenzene (S)	73	%.	65-127	1		10/25/16 16:46	460-00-4	
Percent Moisture	Analytical Method: SM 2540G							
Percent Moisture	**23.1**	%	0.10	1		10/24/16 12:43		

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ANALYTICAL RESULTS

Project: LAE001
Pace Project No.: 50157217

Sample: LAE001:TRIP:W101716 **Lab ID: 50157217003** Collected: 10/17/16 08:00 Received: 10/21/16 08:30 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV	Analytical Method: EPA 8260							
Acetone	ND	ug/L	100	1		10/24/16 16:25	67-64-1	
Benzene	ND	ug/L	5.0	1		10/24/16 16:25	71-43-2	
Bromodichloromethane	ND	ug/L	5.0	1		10/24/16 16:25	75-27-4	
Bromoform	ND	ug/L	5.0	1		10/24/16 16:25	75-25-2	
Bromomethane	ND	ug/L	5.0	1		10/24/16 16:25	74-83-9	
2-Butanone (MEK)	ND	ug/L	25.0	1		10/24/16 16:25	78-93-3	
Carbon disulfide	ND	ug/L	10.0	1		10/24/16 16:25	75-15-0	
Carbon tetrachloride	ND	ug/L	5.0	1		10/24/16 16:25	56-23-5	
Chlorobenzene	ND	ug/L	5.0	1		10/24/16 16:25	108-90-7	
Chloroethane	ND	ug/L	5.0	1		10/24/16 16:25	75-00-3	
Chloroform	ND	ug/L	5.0	1		10/24/16 16:25	67-66-3	
Chloromethane	ND	ug/L	5.0	1		10/25/16 15:58	74-87-3	
Dibromochloromethane	ND	ug/L	5.0	1		10/24/16 16:25	124-48-1	
Dibromomethane	ND	ug/L	5.0	1		10/24/16 16:25	74-95-3	
1,2-Dichlorobenzene	ND	ug/L	5.0	1		10/24/16 16:25	95-50-1	
1,4-Dichlorobenzene	ND	ug/L	5.0	1		10/24/16 16:25	106-46-7	
Dichlorodifluoromethane	ND	ug/L	5.0	1		10/24/16 16:25	75-71-8	
1,1-Dichloroethane	ND	ug/L	5.0	1		10/24/16 16:25	75-34-3	
1,2-Dichloroethane	ND	ug/L	5.0	1		10/24/16 16:25	107-06-2	
1,1-Dichloroethene	ND	ug/L	5.0	1		10/24/16 16:25	75-35-4	
cis-1,2-Dichloroethene	ND	ug/L	5.0	1		10/24/16 16:25	156-59-2	
trans-1,2-Dichloroethene	ND	ug/L	5.0	1		10/24/16 16:25	156-60-5	
1,2-Dichloropropane	ND	ug/L	5.0	1		10/24/16 16:25	78-87-5	
1,3-Dichloropropane	ND	ug/L	5.0	1		10/24/16 16:25	142-28-9	
cis-1,3-Dichloropropene	ND	ug/L	4.1	1		10/24/16 16:25	10061-01-5	
trans-1,3-Dichloropropene	ND	ug/L	4.1	1		10/24/16 16:25	10061-02-6	
Ethylbenzene	ND	ug/L	5.0	1		10/24/16 16:25	100-41-4	
Ethyl methacrylate	ND	ug/L	100	1		10/24/16 16:25	97-63-2	
n-Hexane	ND	ug/L	5.0	1		10/24/16 16:25	110-54-3	
Isopropylbenzene (Cumene)	ND	ug/L	5.0	1		10/24/16 16:25	98-82-8	
Methylene Chloride	ND	ug/L	5.0	1		10/24/16 16:25	75-09-2	
4-Methyl-2-pentanone (MIBK)	ND	ug/L	25.0	1		10/24/16 16:25	108-10-1	
Methyl-tert-butyl ether	ND	ug/L	4.0	1		10/24/16 16:25	1634-04-4	
Styrene	ND	ug/L	5.0	1		10/24/16 16:25	100-42-5	
1,1,1,2-Tetrachloroethane	ND	ug/L	5.0	1		10/24/16 16:25	630-20-6	
1,1,2,2-Tetrachloroethane	ND	ug/L	5.0	1		10/24/16 16:25	79-34-5	
Tetrachloroethene	ND	ug/L	5.0	1		10/24/16 16:25	127-18-4	
Toluene	ND	ug/L	5.0	1		10/24/16 16:25	108-88-3	
1,2,4-Trichlorobenzene	ND	ug/L	5.0	1		10/24/16 16:25	120-82-1	
1,1,1-Trichloroethane	ND	ug/L	5.0	1		10/24/16 16:25	71-55-6	
1,1,2-Trichloroethane	ND	ug/L	5.0	1		10/24/16 16:25	79-00-5	
Trichloroethene	ND	ug/L	5.0	1		10/24/16 16:25	79-01-6	
Trichlorofluoromethane	ND	ug/L	5.0	1		10/24/16 16:25	75-69-4	
1,2,4-Trimethylbenzene	ND	ug/L	5.0	1		10/24/16 16:25	95-63-6	
Vinyl acetate	ND	ug/L	50.0	1		10/24/16 16:25	108-05-4	
Vinyl chloride	ND	ug/L	2.0	1		10/24/16 16:25	75-01-4	
Xylene (Total)	ND	ug/L	10.0	1		10/24/16 16:25	1330-20-7	

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ANALYTICAL RESULTS

Project: LAE001
Pace Project No.: 50157217

Sample: LAE001:TRIP:W101716 **Lab ID: 50157217003** Collected: 10/17/16 08:00 Received: 10/21/16 08:30 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV	Analytical Method: EPA 8260							
Surrogates								
Dibromofluoromethane (S)	101	%.	84-118	1		10/24/16 16:25	1868-53-7	
4-Bromofluorobenzene (S)	103	%.	79-116	1		10/24/16 16:25	460-00-4	
Toluene-d8 (S)	97	%.	86-110	1		10/24/16 16:25	2037-26-5	

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QUALITY CONTROL DATA

Project: LAE001
Pace Project No.: 50157217

QC Batch: 357783
QC Batch Method: EPA 7471
Analysis Method: EPA 7471
Analysis Description: 7471 Mercury
Associated Lab Samples: 50157217001, 50157217002

METHOD BLANK: 1654336 Matrix: Solid
Associated Lab Samples: 50157217001, 50157217002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	mg/kg	ND	0.20	10/25/16 09:39	

LABORATORY CONTROL SAMPLE: 1654337

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	mg/kg	.49	0.48	98	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1654338 1654339

Parameter	Units	50157127001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	mg/kg	ND	.57	.61	0.61	0.66	103	104	75-125	8	20	

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QUALITY CONTROL DATA

Project: LAE001
Pace Project No.: 50157217

QC Batch: 357677 Analysis Method: EPA 6010
QC Batch Method: EPA 3050 Analysis Description: 6010 MET
Associated Lab Samples: 50157217001, 50157217002

METHOD BLANK: 1654026 Matrix: Solid
Associated Lab Samples: 50157217001, 50157217002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Arsenic	mg/kg	ND	1.0	10/26/16 11:08	
Barium	mg/kg	ND	1.0	10/26/16 11:08	
Cadmium	mg/kg	ND	0.50	10/26/16 11:08	
Chromium	mg/kg	ND	1.0	10/26/16 11:08	
Lead	mg/kg	ND	1.0	10/26/16 11:08	
Selenium	mg/kg	ND	1.0	10/26/16 11:08	
Silver	mg/kg	ND	0.50	10/26/16 11:08	

LABORATORY CONTROL SAMPLE: 1654027

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/kg	50	50.2	100	80-120	
Barium	mg/kg	50	49.4	99	80-120	
Cadmium	mg/kg	50	50.6	101	80-120	
Chromium	mg/kg	50	49.0	98	80-120	
Lead	mg/kg	50	48.5	97	80-120	
Selenium	mg/kg	50	50.6	101	80-120	
Silver	mg/kg	25	23.9	96	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1654028 1654029

Parameter	Units	50157242001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic	mg/kg	5.9	66.1	65.8	66.8	65.8	92	91	75-125	2	20	
Barium	mg/kg	73.1	66.1	65.8	142	140	105	102	75-125	2	20	
Cadmium	mg/kg	ND	66.1	65.8	63.0	62.6	95	95	75-125	1	20	
Chromium	mg/kg	12.3	66.1	65.8	73.9	73.3	93	92	75-125	1	20	
Lead	mg/kg	ND	66.1	65.8	70.1	69.6	85	85	75-125	1	20	
Selenium	mg/kg	ND	66.1	65.8	60.4	60.4	91	92	75-125	0	20	
Silver	mg/kg	ND	33.1	32.9	28.1	28.0	85	85	75-125	1	20	

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QUALITY CONTROL DATA

Project: LAE001
Pace Project No.: 50157217

QC Batch: 357824 Analysis Method: EPA 8260
QC Batch Method: EPA 8260 Analysis Description: 8260 MSV 5030 Low
Associated Lab Samples: 50157217001, 50157217002

METHOD BLANK: 1654520 Matrix: Solid
Associated Lab Samples: 50157217001, 50157217002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,1,1,2-Tetrachloroethane	mg/kg	ND	0.0050	10/25/16 12:01	
1,1,1-Trichloroethane	mg/kg	ND	0.0050	10/25/16 12:01	
1,1,2,2-Tetrachloroethane	mg/kg	ND	0.0050	10/25/16 12:01	
1,1,2-Trichloroethane	mg/kg	ND	0.0050	10/25/16 12:01	
1,1-Dichloroethane	mg/kg	ND	0.0050	10/25/16 12:01	
1,1-Dichloroethene	mg/kg	ND	0.0050	10/25/16 12:01	
1,2,4-Trichlorobenzene	mg/kg	ND	0.0050	10/25/16 12:01	
1,2,4-Trimethylbenzene	mg/kg	ND	0.0050	10/25/16 12:01	
1,2-Dichlorobenzene	mg/kg	ND	0.0050	10/25/16 12:01	
1,2-Dichloroethane	mg/kg	ND	0.0050	10/25/16 12:01	
1,2-Dichloropropane	mg/kg	ND	0.0050	10/25/16 12:01	
1,3-Dichloropropane	mg/kg	ND	0.0050	10/25/16 12:01	
1,4-Dichlorobenzene	mg/kg	ND	0.0050	10/25/16 12:01	
2-Butanone (MEK)	mg/kg	ND	0.025	10/25/16 12:01	
4-Methyl-2-pentanone (MIBK)	mg/kg	ND	0.025	10/25/16 12:01	
Acetone	mg/kg	ND	0.10	10/25/16 12:01	
Benzene	mg/kg	ND	0.0050	10/25/16 12:01	
Bromodichloromethane	mg/kg	ND	0.0050	10/25/16 12:01	
Bromoform	mg/kg	ND	0.0050	10/25/16 12:01	
Bromomethane	mg/kg	ND	0.0050	10/25/16 12:01	
Carbon disulfide	mg/kg	ND	0.010	10/25/16 12:01	
Carbon tetrachloride	mg/kg	ND	0.0050	10/25/16 12:01	
Chlorobenzene	mg/kg	ND	0.0050	10/25/16 12:01	
Chloroethane	mg/kg	ND	0.0050	10/25/16 12:01	
Chloroform	mg/kg	ND	0.0050	10/25/16 12:01	
Chloromethane	mg/kg	ND	0.0050	10/25/16 12:01	
cis-1,2-Dichloroethene	mg/kg	ND	0.0050	10/25/16 12:01	
cis-1,3-Dichloropropene	mg/kg	ND	0.0050	10/25/16 12:01	
Dibromochloromethane	mg/kg	ND	0.0050	10/25/16 12:01	
Dibromomethane	mg/kg	ND	0.0050	10/25/16 12:01	
Dichlorodifluoromethane	mg/kg	ND	0.0050	10/25/16 12:01	
Ethyl methacrylate	mg/kg	ND	0.10	10/25/16 12:01	
Ethylbenzene	mg/kg	ND	0.0050	10/25/16 12:01	
Isopropylbenzene (Cumene)	mg/kg	ND	0.0050	10/25/16 12:01	
Methyl-tert-butyl ether	mg/kg	ND	0.0050	10/25/16 12:01	
Methylene Chloride	mg/kg	ND	0.020	10/25/16 12:01	
n-Hexane	mg/kg	ND	0.0050	10/25/16 12:01	
Styrene	mg/kg	ND	0.0050	10/25/16 12:01	
Tetrachloroethene	mg/kg	ND	0.0050	10/25/16 12:01	
Toluene	mg/kg	ND	0.0050	10/25/16 12:01	
trans-1,2-Dichloroethene	mg/kg	ND	0.0050	10/25/16 12:01	

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QUALITY CONTROL DATA

Project: LAE001
Pace Project No.: 50157217

METHOD BLANK: 1654520 Matrix: Solid
Associated Lab Samples: 50157217001, 50157217002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
trans-1,3-Dichloropropene	mg/kg	ND	0.0050	10/25/16 12:01	
Trichloroethene	mg/kg	ND	0.0050	10/25/16 12:01	
Trichlorofluoromethane	mg/kg	ND	0.0050	10/25/16 12:01	
Vinyl acetate	mg/kg	ND	0.10	10/25/16 12:01	
Vinyl chloride	mg/kg	ND	0.0050	10/25/16 12:01	
Xylene (Total)	mg/kg	ND	0.010	10/25/16 12:01	
4-Bromofluorobenzene (S)	%.	102	65-127	10/25/16 12:01	
Dibromofluoromethane (S)	%.	96	70-128	10/25/16 12:01	
Toluene-d8 (S)	%.	99	72-139	10/25/16 12:01	

LABORATORY CONTROL SAMPLE: 1654521

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,1,1,2-Tetrachloroethane	mg/kg	.05	0.048	96	71-125	
1,1,1-Trichloroethane	mg/kg	.05	0.045	91	67-123	
1,1,2,2-Tetrachloroethane	mg/kg	.05	0.046	92	67-129	
1,1,2-Trichloroethane	mg/kg	.05	0.049	99	74-125	
1,1-Dichloroethane	mg/kg	.05	0.048	96	69-115	
1,1-Dichloroethene	mg/kg	.05	0.051	101	64-133	
1,2,4-Trichlorobenzene	mg/kg	.05	0.047	94	55-120	
1,2,4-Trimethylbenzene	mg/kg	.05	0.047	95	66-118	
1,2-Dichlorobenzene	mg/kg	.05	0.045	90	71-115	
1,2-Dichloroethane	mg/kg	.05	0.041	82	71-121	
1,2-Dichloropropane	mg/kg	.05	0.052	103	74-119	
1,3-Dichloropropane	mg/kg	.05	0.051	102	75-121	
1,4-Dichlorobenzene	mg/kg	.05	0.046	92	66-112	
2-Butanone (MEK)	mg/kg	.25	0.32	127	61-129	
4-Methyl-2-pentanone (MIBK)	mg/kg	.25	0.25	102	70-129	
Acetone	mg/kg	.25	0.40	160	37-158	L0
Benzene	mg/kg	.05	0.051	102	72-120	
Bromodichloromethane	mg/kg	.05	0.046	92	72-114	
Bromoform	mg/kg	.05	0.043	85	56-125	
Bromomethane	mg/kg	.05	0.051	102	41-175	
Carbon disulfide	mg/kg	.05	0.050	99	58-130	
Carbon tetrachloride	mg/kg	.05	0.045	90	73-129	
Chlorobenzene	mg/kg	.05	0.047	94	72-115	
Chloroethane	mg/kg	.05	0.048	96	52-154	
Chloroform	mg/kg	.05	0.045	89	66-116	
Chloromethane	mg/kg	.05	0.046	91	49-139	
cis-1,2-Dichloroethene	mg/kg	.05	0.049	99	74-115	
cis-1,3-Dichloropropene	mg/kg	.05	0.050	100	74-122	
Dibromochloromethane	mg/kg	.05	0.046	93	72-123	
Dibromomethane	mg/kg	.05	0.047	94	78-118	
Dichlorodifluoromethane	mg/kg	.05	0.059	118	31-182	

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QUALITY CONTROL DATA

Project: LAE001
Pace Project No.: 50157217

LABORATORY CONTROL SAMPLE: 1654521

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Ethyl methacrylate	mg/kg	.2	0.21	104	73-136	
Ethylbenzene	mg/kg	.05	0.049	99	70-121	
Isopropylbenzene (Cumene)	mg/kg	.05	0.049	97	78-130	
Methyl-tert-butyl ether	mg/kg	.05	0.047	94	68-123	
Methylene Chloride	mg/kg	.05	0.047	94	57-126	
n-Hexane	mg/kg	.05	0.051	102	64-124	
Styrene	mg/kg	.05	0.050	100	71-121	
Tetrachloroethene	mg/kg	.05	0.048	97	66-118	
Toluene	mg/kg	.05	0.044	89	68-121	
trans-1,2-Dichloroethene	mg/kg	.05	0.050	99	71-120	
trans-1,3-Dichloropropene	mg/kg	.05	0.050	100	72-127	
Trichloroethene	mg/kg	.05	0.047	94	73-120	
Trichlorofluoromethane	mg/kg	.05	0.049	98	61-158	
Vinyl acetate	mg/kg	.2	0.18	92	76-150	
Vinyl chloride	mg/kg	.05	0.050	99	54-155	
Xylene (Total)	mg/kg	.15	0.15	100	69-122	
4-Bromofluorobenzene (S)	%.			101	65-127	
Dibromofluoromethane (S)	%.			93	70-128	
Toluene-d8 (S)	%.			98	72-139	

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QUALITY CONTROL DATA

Project: LAE001
Pace Project No.: 50157217

QC Batch: 357823
QC Batch Method: EPA 8260
Analysis Method: EPA 8260
Analysis Description: 8260 MSV
Associated Lab Samples: 50157217003

METHOD BLANK: 1654518
Matrix: Water
Associated Lab Samples: 50157217003

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	ND	5.0	10/24/16 10:23	
1,1,1-Trichloroethane	ug/L	ND	5.0	10/24/16 10:23	
1,1,2,2-Tetrachloroethane	ug/L	ND	5.0	10/24/16 10:23	
1,1,2-Trichloroethane	ug/L	ND	5.0	10/24/16 10:23	
1,1-Dichloroethane	ug/L	ND	5.0	10/24/16 10:23	
1,1-Dichloroethene	ug/L	ND	5.0	10/24/16 10:23	
1,2,4-Trichlorobenzene	ug/L	ND	5.0	10/24/16 10:23	
1,2,4-Trimethylbenzene	ug/L	ND	5.0	10/24/16 10:23	
1,2-Dichlorobenzene	ug/L	ND	5.0	10/24/16 10:23	
1,2-Dichloroethane	ug/L	ND	5.0	10/24/16 10:23	
1,2-Dichloropropane	ug/L	ND	5.0	10/24/16 10:23	
1,3-Dichloropropane	ug/L	ND	5.0	10/24/16 10:23	
1,4-Dichlorobenzene	ug/L	ND	5.0	10/24/16 10:23	
2-Butanone (MEK)	ug/L	ND	25.0	10/24/16 10:23	
4-Methyl-2-pentanone (MIBK)	ug/L	ND	25.0	10/24/16 10:23	
Acetone	ug/L	ND	100	10/24/16 10:23	
Benzene	ug/L	ND	5.0	10/24/16 10:23	
Bromodichloromethane	ug/L	ND	5.0	10/24/16 10:23	
Bromoform	ug/L	ND	5.0	10/24/16 10:23	
Bromomethane	ug/L	ND	5.0	10/24/16 10:23	
Carbon disulfide	ug/L	ND	10.0	10/24/16 10:23	
Carbon tetrachloride	ug/L	ND	5.0	10/24/16 10:23	
Chlorobenzene	ug/L	ND	5.0	10/24/16 10:23	
Chloroethane	ug/L	ND	5.0	10/24/16 10:23	
Chloroform	ug/L	ND	5.0	10/24/16 10:23	
Chloromethane	ug/L	ND	5.0	10/24/16 10:23	
cis-1,2-Dichloroethene	ug/L	ND	5.0	10/24/16 10:23	
cis-1,3-Dichloropropene	ug/L	ND	4.1	10/24/16 10:23	
Dibromochloromethane	ug/L	ND	5.0	10/24/16 10:23	
Dibromomethane	ug/L	ND	5.0	10/24/16 10:23	
Dichlorodifluoromethane	ug/L	ND	5.0	10/24/16 10:23	
Ethyl methacrylate	ug/L	ND	100	10/24/16 10:23	
Ethylbenzene	ug/L	ND	5.0	10/24/16 10:23	
Isopropylbenzene (Cumene)	ug/L	ND	5.0	10/24/16 10:23	
Methyl-tert-butyl ether	ug/L	ND	4.0	10/24/16 10:23	
Methylene Chloride	ug/L	ND	5.0	10/24/16 10:23	
n-Hexane	ug/L	ND	5.0	10/24/16 10:23	
Styrene	ug/L	ND	5.0	10/24/16 10:23	
Tetrachloroethene	ug/L	ND	5.0	10/24/16 10:23	
Toluene	ug/L	ND	5.0	10/24/16 10:23	
trans-1,2-Dichloroethene	ug/L	ND	5.0	10/24/16 10:23	

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QUALITY CONTROL DATA

Project: LAE001
Pace Project No.: 50157217

METHOD BLANK: 1654518 Matrix: Water
Associated Lab Samples: 50157217003

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
trans-1,3-Dichloropropene	ug/L	ND	4.1	10/24/16 10:23	
Trichloroethene	ug/L	ND	5.0	10/24/16 10:23	
Trichlorofluoromethane	ug/L	ND	5.0	10/24/16 10:23	
Vinyl acetate	ug/L	ND	50.0	10/24/16 10:23	
Vinyl chloride	ug/L	ND	2.0	10/24/16 10:23	
Xylene (Total)	ug/L	ND	10.0	10/24/16 10:23	
4-Bromofluorobenzene (S)	%.	101	79-116	10/24/16 10:23	
Dibromofluoromethane (S)	%.	103	84-118	10/24/16 10:23	
Toluene-d8 (S)	%.	96	86-110	10/24/16 10:23	

LABORATORY CONTROL SAMPLE: 1654519

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	50	51.9	104	74-130	
1,1,1-Trichloroethane	ug/L	50	48.5	97	72-123	
1,1,2,2-Tetrachloroethane	ug/L	50	45.3	91	72-124	
1,1,2-Trichloroethane	ug/L	50	46.6	93	75-125	
1,1-Dichloroethane	ug/L	50	49.1	98	70-120	
1,1-Dichloroethene	ug/L	50	50.3	101	69-127	
1,2,4-Trichlorobenzene	ug/L	50	50.6	101	66-126	
1,2,4-Trimethylbenzene	ug/L	50	48.9	98	73-125	
1,2-Dichlorobenzene	ug/L	50	46.5	93	77-122	
1,2-Dichloroethane	ug/L	50	44.6	89	70-123	
1,2-Dichloropropane	ug/L	50	52.0	104	77-124	
1,3-Dichloropropane	ug/L	50	49.9	100	77-123	
1,4-Dichlorobenzene	ug/L	50	48.1	96	75-117	
2-Butanone (MEK)	ug/L	250	294	118	60-135	
4-Methyl-2-pentanone (MIBK)	ug/L	250	234	94	66-134	
Acetone	ug/L	250	377	151	47-144	L3
Benzene	ug/L	50	50.6	101	76-122	
Bromodichloromethane	ug/L	50	48.9	98	71-124	
Bromoform	ug/L	50	46.7	93	60-125	
Bromomethane	ug/L	50	50.1	100	23-194	
Carbon disulfide	ug/L	50	49.3	99	63-130	
Carbon tetrachloride	ug/L	50	49.1	98	73-133	
Chlorobenzene	ug/L	50	46.9	94	76-118	
Chloroethane	ug/L	50	50.1	100	50-147	
Chloroform	ug/L	50	45.9	92	70-119	
Chloromethane	ug/L	50	44.3	89	52-136	
cis-1,2-Dichloroethene	ug/L	50	51.4	103	74-120	
cis-1,3-Dichloropropene	ug/L	50	52.3	105	71-134	
Dibromochloromethane	ug/L	50	49.1	98	73-127	
Dibromomethane	ug/L	50	47.9	96	75-124	
Dichlorodifluoromethane	ug/L	50	54.8	110	39-166	

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QUALITY CONTROL DATA

Project: LAE001
Pace Project No.: 50157217

LABORATORY CONTROL SAMPLE: 1654519

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Ethyl methacrylate	ug/L	200	203	102	73-136	
Ethylbenzene	ug/L	50	50.9	102	75-123	
Isopropylbenzene (Cumene)	ug/L	50	49.3	99	84-134	
Methyl-tert-butyl ether	ug/L	50	48.5	97	65-131	
Methylene Chloride	ug/L	50	46.6	93	66-130	
n-Hexane	ug/L	50	52.2	104	64-131	
Styrene	ug/L	50	50.9	102	78-128	
Tetrachloroethene	ug/L	50	48.1	96	69-119	
Toluene	ug/L	50	45.2	90	74-122	
trans-1,2-Dichloroethene	ug/L	50	50.0	100	72-122	
trans-1,3-Dichloropropene	ug/L	50	53.4	107	66-135	
Trichloroethene	ug/L	50	47.0	94	75-123	
Trichlorofluoromethane	ug/L	50	51.5	103	58-148	
Vinyl acetate	ug/L	200	213	106	67-154	
Vinyl chloride	ug/L	50	49.4	99	61-147	
Xylene (Total)	ug/L	150	152	101	75-127	
4-Bromofluorobenzene (S)	%.			103	79-116	
Dibromofluoromethane (S)	%.			96	84-118	
Toluene-d8 (S)	%.			99	86-110	

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QUALITY CONTROL DATA

Project: LAE001
Pace Project No.: 50157217

QC Batch: 357701
QC Batch Method: EPA 3546
Analysis Method: EPA 8082
Analysis Description: 8082 GCS PCB
Associated Lab Samples: 50157217001

METHOD BLANK: 1654112
Matrix: Solid
Associated Lab Samples: 50157217001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
PCB-1016 (Aroclor 1016)	mg/kg	ND	0.099	10/26/16 01:25	
PCB-1221 (Aroclor 1221)	mg/kg	ND	0.099	10/26/16 01:25	
PCB-1232 (Aroclor 1232)	mg/kg	ND	0.099	10/26/16 01:25	
PCB-1242 (Aroclor 1242)	mg/kg	ND	0.099	10/26/16 01:25	
PCB-1248 (Aroclor 1248)	mg/kg	ND	0.099	10/26/16 01:25	
PCB-1254 (Aroclor 1254)	mg/kg	ND	0.099	10/26/16 01:25	
PCB-1260 (Aroclor 1260)	mg/kg	ND	0.099	10/26/16 01:25	
Tetrachloro-m-xylene (S)	%.	71	24-99	10/26/16 01:25	

LABORATORY CONTROL SAMPLE: 1654113

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
PCB-1016 (Aroclor 1016)	mg/kg	.17	0.13	78	40-107	
PCB-1260 (Aroclor 1260)	mg/kg	.17	0.15	89	41-110	
Tetrachloro-m-xylene (S)	%.			72	24-99	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1654114 1654115

Parameter	Units	50157217001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
PCB-1016 (Aroclor 1016)	mg/kg	ND	.22	.22	0.13	.12J	62	57	10-141		20	
PCB-1260 (Aroclor 1260)	mg/kg	ND	.22	.22	.12J	.12J	44	42	10-131		20	
Tetrachloro-m-xylene (S)	%.						58	57	24-99			

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QUALITY CONTROL DATA

Project: LAE001
Pace Project No.: 50157217

QC Batch: 358147
QC Batch Method: EPA 3546
Analysis Method: EPA 8082
Analysis Description: 8082 GCS PCB
Associated Lab Samples: 50157217002

METHOD BLANK: 1655728
Matrix: Solid
Associated Lab Samples: 50157217002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
PCB-1016 (Aroclor 1016)	mg/kg	ND	0.10	10/26/16 19:09	
PCB-1221 (Aroclor 1221)	mg/kg	ND	0.10	10/26/16 19:09	
PCB-1232 (Aroclor 1232)	mg/kg	ND	0.10	10/26/16 19:09	
PCB-1242 (Aroclor 1242)	mg/kg	ND	0.10	10/26/16 19:09	
PCB-1248 (Aroclor 1248)	mg/kg	ND	0.10	10/26/16 19:09	
PCB-1254 (Aroclor 1254)	mg/kg	ND	0.10	10/26/16 19:09	
PCB-1260 (Aroclor 1260)	mg/kg	ND	0.10	10/26/16 19:09	
Tetrachloro-m-xylene (S)	%.	79	24-99	10/26/16 19:09	

LABORATORY CONTROL SAMPLE: 1655729

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
PCB-1016 (Aroclor 1016)	mg/kg	.16	0.15	92	40-107	
PCB-1260 (Aroclor 1260)	mg/kg	.16	0.18	107	41-110	
Tetrachloro-m-xylene (S)	%.			77	24-99	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1655730 1655731

Parameter	Units	50157353001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
PCB-1016 (Aroclor 1016)	mg/kg	ND	.16	.17	0.14	0.14	84	86	10-141	2	20	
PCB-1260 (Aroclor 1260)	mg/kg	ND	.16	.17	0.15	0.16	93	95	10-131	2	20	
Tetrachloro-m-xylene (S)	%.						81	81	24-99			

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1655732 1655733

Parameter	Units	50157353002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
PCB-1016 (Aroclor 1016)	mg/kg	ND	.17	.17	0.16	0.16	86	88	10-141	2	20	
PCB-1260 (Aroclor 1260)	mg/kg	ND	.17	.17	0.17	0.17	97	97	10-131	0	20	
Tetrachloro-m-xylene (S)	%.						81	82	24-99			

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QUALITY CONTROL DATA

Project: LAE001
Pace Project No.: 50157217

QC Batch: 357688
QC Batch Method: EPA 3546
Analysis Method: EPA 8270
Analysis Description: 8270 Solid MSSV Microwave Short Spike
Associated Lab Samples: 50157217001, 50157217002

METHOD BLANK: 1654056
Matrix: Solid
Associated Lab Samples: 50157217001, 50157217002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
2,4,5-Trichlorophenol	mg/kg	ND	0.33	10/24/16 13:46	
2,4,6-Trichlorophenol	mg/kg	ND	0.33	10/24/16 13:46	
2,4-Dichlorophenol	mg/kg	ND	0.33	10/24/16 13:46	
2,4-Dimethylphenol	mg/kg	ND	0.33	10/24/16 13:46	
2,4-Dinitrophenol	mg/kg	ND	1.6	10/24/16 13:46	
2,4-Dinitrotoluene	mg/kg	ND	0.33	10/24/16 13:46	
2,6-Dinitrotoluene	mg/kg	ND	0.33	10/24/16 13:46	
2-Chloronaphthalene	mg/kg	ND	0.33	10/24/16 13:46	
2-Chlorophenol	mg/kg	ND	0.33	10/24/16 13:46	
2-Methylnaphthalene	mg/kg	ND	0.33	10/24/16 13:46	
2-Methylphenol(o-Cresol)	mg/kg	ND	0.33	10/24/16 13:46	
3&4-Methylphenol(m&p Cresol)	mg/kg	ND	0.66	10/24/16 13:46	
4-Chloro-3-methylphenol	mg/kg	ND	0.66	10/24/16 13:46	
4-Chloroaniline	mg/kg	ND	0.66	10/24/16 13:46	
Acenaphthene	mg/kg	ND	0.33	10/24/16 13:46	
Acenaphthylene	mg/kg	ND	0.33	10/24/16 13:46	
Anthracene	mg/kg	ND	0.33	10/24/16 13:46	
Benzo(a)anthracene	mg/kg	ND	0.33	10/24/16 13:46	
Benzo(a)pyrene	mg/kg	ND	0.33	10/24/16 13:46	
Benzo(b)fluoranthene	mg/kg	ND	0.33	10/24/16 13:46	
Benzo(g,h,i)perylene	mg/kg	ND	0.33	10/24/16 13:46	
Benzo(k)fluoranthene	mg/kg	ND	0.33	10/24/16 13:46	
bis(2-Chloroethoxy)methane	mg/kg	ND	0.33	10/24/16 13:46	
bis(2-Chloroethyl) ether	mg/kg	ND	0.33	10/24/16 13:46	
bis(2-Ethylhexyl)phthalate	mg/kg	ND	0.33	10/24/16 13:46	
bis(2chloro1methylethyl) ether	mg/kg	ND	0.33	10/24/16 13:46	
Butylbenzylphthalate	mg/kg	ND	0.33	10/24/16 13:46	
Chrysene	mg/kg	ND	0.33	10/24/16 13:46	
Di-n-butylphthalate	mg/kg	ND	0.33	10/24/16 13:46	
Di-n-octylphthalate	mg/kg	ND	0.33	10/24/16 13:46	
Dibenz(a,h)anthracene	mg/kg	ND	0.33	10/24/16 13:46	
Diethylphthalate	mg/kg	ND	0.33	10/24/16 13:46	
Fluoranthene	mg/kg	ND	0.33	10/24/16 13:46	
Fluorene	mg/kg	ND	0.33	10/24/16 13:46	
Hexachlorocyclopentadiene	mg/kg	ND	0.33	10/24/16 13:46	
Hexachloroethane	mg/kg	ND	0.33	10/24/16 13:46	
Indeno(1,2,3-cd)pyrene	mg/kg	ND	0.33	10/24/16 13:46	
Isophorone	mg/kg	ND	0.33	10/24/16 13:46	
N-Nitroso-di-n-propylamine	mg/kg	ND	0.33	10/24/16 13:46	
N-Nitrosodiphenylamine	mg/kg	ND	0.33	10/24/16 13:46	
Naphthalene	mg/kg	ND	0.33	10/24/16 13:46	

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(317)228-3100

QUALITY CONTROL DATA

Project: LAE001
Pace Project No.: 50157217

METHOD BLANK: 1654056 Matrix: Solid
Associated Lab Samples: 50157217001, 50157217002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrobenzene	mg/kg	ND	0.33	10/24/16 13:46	
Phenanthrene	mg/kg	ND	0.33	10/24/16 13:46	
Phenol	mg/kg	ND	0.33	10/24/16 13:46	
Pyrene	mg/kg	ND	0.33	10/24/16 13:46	
2,4,6-Tribromophenol (S)	%.	63	18-110	10/24/16 13:46	
2-Fluorobiphenyl (S)	%.	55	22-96	10/24/16 13:46	
2-Fluorophenol (S)	%.	69	23-110	10/24/16 13:46	
Nitrobenzene-d5 (S)	%.	58	22-97	10/24/16 13:46	
p-Terphenyl-d14 (S)	%.	57	17-102	10/24/16 13:46	
Phenol-d5 (S)	%.	64	28-108	10/24/16 13:46	

LABORATORY CONTROL SAMPLE: 1654057

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
2,4-Dinitrotoluene	mg/kg	3.3	2.0	59	37-115	
2-Chlorophenol	mg/kg	3.3	2.1	64	44-100	
2-Methylnaphthalene	mg/kg	3.3	2.7	80	33-110	
4-Chloro-3-methylphenol	mg/kg	3.3	2.4	74	42-113	
Acenaphthene	mg/kg	3.3	2.0	61	44-102	
Acenaphthylene	mg/kg	3.3	2.1	63	44-102	
Anthracene	mg/kg	3.3	2.2	68	48-107	
Benzo(a)anthracene	mg/kg	3.3	2.3	68	50-105	
Benzo(a)pyrene	mg/kg	3.3	2.0	61	48-116	
Benzo(b)fluoranthene	mg/kg	3.3	1.9	58	45-114	
Benzo(g,h,i)perylene	mg/kg	3.3	1.9	58	43-112	
Benzo(k)fluoranthene	mg/kg	3.3	2.0	60	47-114	
Chrysene	mg/kg	3.3	2.2	65	49-106	
Dibenz(a,h)anthracene	mg/kg	3.3	1.9	56	44-113	
Fluoranthene	mg/kg	3.3	1.9	57	46-111	
Fluorene	mg/kg	3.3	1.9	58	45-105	
Indeno(1,2,3-cd)pyrene	mg/kg	3.3	1.9	58	45-112	
N-Nitroso-di-n-propylamine	mg/kg	3.3	1.9	56	38-95	
Naphthalene	mg/kg	3.3	1.9	56	41-94	
Phenanthrene	mg/kg	3.3	2.2	66	48-106	
Phenol	mg/kg	3.3	2.3	68	42-102	
Pyrene	mg/kg	3.3	2.7	80	49-110	
2,4,6-Tribromophenol (S)	%.			69	18-110	
2-Fluorobiphenyl (S)	%.			60	22-96	
2-Fluorophenol (S)	%.			71	23-110	
Nitrobenzene-d5 (S)	%.			61	22-97	
p-Terphenyl-d14 (S)	%.			57	17-102	
Phenol-d5 (S)	%.			66	28-108	

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QUALITY CONTROL DATA

Project: LAE001
Pace Project No.: 50157217

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1654058 1654059

Parameter	Units	50157217002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
2,4-Dinitrotoluene	mg/kg	ND	4.3	4.3	2.6	2.3	61	53	12-108	14	20	
2-Chlorophenol	mg/kg	ND	4.3	4.3	2.7	2.6	64	61	27-99	4	20	
2-Methylnaphthalene	mg/kg	ND	4.3	4.3	2.6	2.4	60	54	17-113	8	20	
4-Chloro-3-methylphenol	mg/kg	ND	4.3	4.3	3.1	2.8	72	65	24-111	9	20	
Acenaphthene	mg/kg	ND	4.3	4.3	2.7	2.4	62	56	28-96	9	20	
Acenaphthylene	mg/kg	ND	4.3	4.3	2.7	2.6	63	59	17-109	6	20	
Anthracene	mg/kg	ND	4.3	4.3	2.9	2.6	68	60	23-104	12	20	
Benzo(a)anthracene	mg/kg	ND	4.3	4.3	2.9	2.5	69	58	16-109	15	20	
Benzo(a)pyrene	mg/kg	ND	4.3	4.3	2.7	2.3	63	54	14-112	14	20	
Benzo(b)fluoranthene	mg/kg	ND	4.3	4.3	2.7	2.5	63	57	10-117	8	20	
Benzo(g,h,i)perylene	mg/kg	ND	4.3	4.3	2.4	2.1	57	49	10-110	13	20	
Benzo(k)fluoranthene	mg/kg	ND	4.3	4.3	2.6	2.1	60	48	18-108	21	20	R1
Chrysene	mg/kg	ND	4.3	4.3	2.9	2.4	67	56	23-100	16	20	
Dibenz(a,h)anthracene	mg/kg	ND	4.3	4.3	2.4	2.1	55	48	18-105	13	20	
Fluoranthene	mg/kg	ND	4.3	4.3	2.8	2.4	58	48	16-111	17	20	
Fluorene	mg/kg	ND	4.3	4.3	2.5	2.3	59	53	25-101	9	20	
Indeno(1,2,3-cd)pyrene	mg/kg	ND	4.3	4.3	2.4	2.1	57	49	11-107	13	20	
N-Nitroso-di-n-propylamine	mg/kg	ND	4.3	4.3	2.5	2.3	58	54	28-89	7	20	
Naphthalene	mg/kg	ND	4.3	4.3	2.6	2.4	61	55	26-95	8	20	
Phenanthrene	mg/kg	ND	4.3	4.3	3.1	2.7	64	54	24-105	15	20	
Phenol	mg/kg	ND	4.3	4.3	2.8	2.7	66	62	23-99	5	20	
Pyrene	mg/kg	ND	4.3	4.3	3.5	3.0	75	62	25-107	17	20	
2,4,6-Tribromophenol (S)	%.						66	59	18-110			
2-Fluorobiphenyl (S)	%.						61	56	22-96			
2-Fluorophenol (S)	%.						69	68	23-110			
Nitrobenzene-d5 (S)	%.						61	57	22-97			
p-Terphenyl-d14 (S)	%.						60	51	17-102			
Phenol-d5 (S)	%.						65	61	28-108			

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QUALITY CONTROL DATA

Project: LAE001
Pace Project No.: 50157217

QC Batch: 357762
QC Batch Method: SM 2540G
Analysis Method: SM 2540G
Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 50157217001, 50157217002

SAMPLE DUPLICATE: 1654268

Parameter	Units	50157174002 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	12.7	12.7	0	5	

SAMPLE DUPLICATE: 1654387

Parameter	Units	50157138002 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	ND	ND		5	

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QUALIFIERS

Project: LAE001
Pace Project No.: 50157217

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

1d	The internal standard response was below the laboratory acceptance limits and confirmed by reanalysis. The results reported are from the most QC compliant analysis and may be biased high. JLZ 10/26/16
L0	Analyte recovery in the laboratory control sample (LCS) was outside QC limits.
L3	Analyte recovery in the laboratory control sample (LCS) exceeded QC limits. Analyte presence below reporting limits in associated samples. Results unaffected by high bias.
R1	RPD value was outside control limits.
S2	Surrogate recovery outside laboratory control limits due to matrix interferences (confirmed by similar results from sample re-analysis).

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: LAE001
Pace Project No.: 50157217

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
50157217001	**LAE001:BH9:S035055**	EPA 3546	357701	EPA 8082	357925
50157217002	**LAE001:BH13:S035055**	EPA 3546	358147	EPA 8082	358297
50157217001	**LAE001:BH9:S035055**	EPA 3050	357677	EPA 6010	358155
50157217002	**LAE001:BH13:S035055**	EPA 3050	357677	EPA 6010	358155
50157217001	**LAE001:BH9:S035055**	EPA 7471	357783	EPA 7471	357936
50157217002	**LAE001:BH13:S035055**	EPA 7471	357783	EPA 7471	357936
50157217001	**LAE001:BH9:S035055**	EPA 3546	357688	EPA 8270	357737
50157217002	**LAE001:BH13:S035055**	EPA 3546	357688	EPA 8270	357737
50157217001	**LAE001:BH9:S035055**	EPA 8260	357824		
50157217002	**LAE001:BH13:S035055**	EPA 8260	357824		
50157217003	**LAE001:TRIP:W101716**	EPA 8260	357823		
50157217001	**LAE001:BH9:S035055**	SM 2540G	357762		
50157217002	**LAE001:BH13:S035055**	SM 2540G	357762		

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HULL

CHAIN OF CUSTODY RECORD

NO. 0988

1 cont

Dublin, OH ☐	Indianapolis, IN ☐	Mason, OH ☐	Bedford, OH ☒	Toledo, OH ☐	St. Clairsville, OH ☐	Pittsburgh, PA ☐
6397 Emerald Pkwy	8445 Keystone Crossing	4770 Duke Dr.	4 Hemisphere Way	3401 Glendale Ave.	146 W. Main St.	Campbells Run Business Center
Suite 200	Suite 135	Suite 300	Bedford, OH 44146	Suite 300	2nd Floor	300 Business Center Dr., Suite 320
Dublin, OH 43016	Indianapolis, IN 46240	Mason, OH 45040	P: (440) 232-9945	Toledo, OH 43614	St. Clairsville, OH 43950	Pittsburgh, PA 15205
P: (614) 793-8777	P: (800) 241-7173	P: (513) 459-9677		P: (419) 385-2018	P: (800) 241-7173	P: (412) 446-0315

REPORT TO: SHAWN McGEE

Client: LEED Co

Site: ICEBREAKER

Project #: LAE001 Phase:

Samplers: MIELECKI

Purchase Order #

SAMPLE MATRIX
AA-AMBIENT AIR
C-ASBESTOS
D-SEDIMENT
G-GROUNDWATER
IA-INDOOR AIR
L-LEACHATE
P-PRODUCT
S-SOIL
SG-SOIL GAS
SS-SUBSLAB VAPOR
W-WATER
X-CONCRETE

PRESERVATIVES
A-Cool only, <4 deg. C
B-HNO_3 pH<2
C-H_2SO_4 pH<2
D-NaOH pH>12
E-ZnAcetate + NaOH, pH>9
F-$Na_2S_2O_3$ (0.008%)
G-HCL pH <2
H-EDTA
I-5ml 1:1 HCL
J-none
K-Stored in dark
L-NH4Cl
M-Methanol
S-Sodium

METALS
N - Not filtered
F45u- filtered with 0.45 micron
F5u- filtered with 5 micron

ANALYSES

PROJECT NO. : SAMPLE LOCATION : SAMPLE MATRIX & ID	NO. OF CONT.	SAMPLE TYPE (discrete, composite)	COLLECTION DATE/TIME	METALS	PRESERVATIVES	5VOC	VOC	RCRA 8 METALS	PCB					COMMENTS
						A	A	A	A					50157217
LAE001 : BH9 : SO35055	3	D	10-18-16/16:08			X	X	X	X					001
: BH13 : SO35055	3	↓	10-17-16/14:44			X	X	X	X					002
↓ : TRIP : W101716	3 1	↓	10-17-16/—				X							003
: :			/											
: :			/											
: :			/											
: :			/											
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: :			/											
: :			/											

RELINQUISHED BY: J. Mielecki	DATE: 10-20-16	RECEIVED BY: PQS / PACE	DATE: 10/20/16
	TIME: 13:05		TIME: 13:05
RELINQUISHED BY: PQS / PACE	DATE: 10/20/16	RECEIVED BY: FEDEX / PQS	DATE: 10/20/16
	TIME: 1305		TIME: 1305
RELINQUISHED BY: FED EX	DATE: 10/21/16	RECEIVED BY: [signature]	DATE: 10/21/16
	TIME: 0830		TIME: 0830

COOLER TEMPERATURE AS RECEIVED 0.4 °C

DISTRIBUTION: WHITE -LAB USE (MUST BE RETURNED WITH REPORT)
YELLOW -LAB USE
PINK -RETAINED BY HULL

Deliver To: PACE INDY
Method of Delivery:
Airbill Number:
Regulatory Program:
Required Limits:
NOTES:
TURN AROUND TIME: STANDARD DAYS

Sample Condition Upon Receipt

Pace Analytical

Client Name: Hull

Project # 50157217

Courier: ☑ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace Other _____

Tracking #: 7844 1201 6072

Custody Seal on Cooler/Box Present: ☐ yes ☑ no Seals intact: ☑ yes ☐ no

Date/Time 5035A kits placed in freezer: _____

Packing Material: ☐ Bubble Wrap ☑ Bubble Bags ☐ None ☑ Other Ziploc

Thermometer 1 2 3 4 5 6 ⓐ B C D E F Type of Ice: (Wet) Blue None ☐ Samples on ice, cooling process has begun

Cooler Temperature (Initial/Corrected) 0.4°/0.4° Ice Visible in Sample Containers: ☐ yes ☑ no

Temp should be above freezing to 6°C

Comments:

Date and Initials of person examining contents: 10/21/16 BS

Are samples from West Virginia? Document any containers out of temp.	☐Yes	☑No	1.	
Chain of Custody Present:	☑Yes	☐No	☐N/A	2.
Chain of Custody Filled Out:	☑Yes	☐No	☐N/A	3.
Chain of Custody Relinquished:	☑Yes	☐No	☐N/A	4.
Sampler Name & Signature on COC:	☐Yes	☐No	☑N/A	5.
Short Hold Time Analysis (<72hr):	☐Yes	☑No	☐N/A	6.
Rush Turn Around Time Requested:	☐Yes	☑No	☐N/A	7.
Containers Intact:	☑Yes	☐No	☐N/A	8.
Sample Labels match COC: -Includes date/time/ID/Analysis	☑Yes	☐No	☐N/A	9.
All containers needing acid/base pres. have been checked? exceptions: VOA, coliform, TOC, O&G All containers needing preservation are found to be in compliance with EPA recommendation (<2, >9, >12) unless otherwise noted.	☐Yes	☐No	☑N/A	10 (Circle) HNO3 H2SO4 NaOH NaOH/ZnAc
Residual Chlorine Check (SVOC 625 Pest/PCB 608)				11. Present Absent
Residual Chlorine Check (Total/Amenable/Free Cyanide)				12. Present Absent
Headspace in VOA Vials (>6mm):	☐Yes	☑No	☐N/A	13
Headspace Wisconsin Sulfide	☐Yes	☐No		14
Trip Blank Present:	☑Yes	☐No	☐N/A	15
Trip Blank Custody Seals Present	☑Yes	☐No	☐N/A	
Project Manager Review:				
Samples Arrived within Hold Time:	☑Yes	☐No	☐N/A	15.
Sufficient Volume:	☑Yes	☐No	☐N/A	16.
Correct Containers Used:	☑Yes	☐No	☐N/A	17.

Client Notification/ Resolution: Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: VAP per quote

Project Manager Review: _____ **Date:** 10/21/16

Sample Container Count

CLIENT: Hull

COC PAGE 1 of 1

COC ID# _____

Project # 5015 7217

Sample Line Item	DG9H / VG9H	AG1U	WGFU	AG0U	R	4 / 6 Bulk Kit	BP2N	BP2U	BP2S	BP3N	BP3U	BP3S	AG3S	AG1H	BP3C	BP1U	SP5T	AG2U				Matrix SI/Wt/Ot (Soil/Water/Other)	pH <2	pH >9	pH>
1			3																			Soil			
2			3																			1			
3	1																					WT			
4																									
5																									
6																									
7																									
8																									
9																									
10																									
11																									
12																									

Container Codes

DG9H	40mL HCL amber voa vial	AG0U	100mL unpreserved amber glass	BP1N	1 liter HNO3 plastic	DG9P	40mL TSP amber vial
AG1U	1liter unpreserved amber glass	AG1H	1 liter HCL amber glass	BP1S	1 liter H2SO4 plastic	DG9S	40mL H2SO4 amber vial
WGFU	4oz clear soil jar	AG1S	1 liter H2SO4 amber glass	BP1U	1 liter unpreserved plastic	DG9T	40mL Na Thio amber vial
R	terra core kit	AG1T	1 liter Na Thiosulfate amber glass	BP1Z	1 liter NaOH, Zn, Ac	DG9U	40mL unpreserved amber via
BP2N	500mL HNO3 plastic	AG2N	500mL HNO3 amber glass	BP2A	500mL NaOH, Asc Acid plastic	SP5T	120mL Coliform Na Thiosulfat
BP2U	500mL unpreserved plastic	AG2S	500mL H2SO4 amber glass	BP2O	500mL NaOH plastic	JGFU	4oz unpreserved amber wide
BP2S	500mL H2SO4 plastic	AG2U	500mL unpreserved amber glass	BP2Z	500mL NaOH, Zn Ac	U	Summa Can
BP3N	250mL HNO3 plastic	AG3U	250mL unpreserved amber glass	AF	Air Filter	VG9H	40mL HCL clear vial
BP3U	250mL unpreserved plastic	BG1H	1 liter HCL clear glass	BP3C	250mL NaOH plastic	VG9T	40mL Na Thio. clear vial
BP3S	250mL H2SO4 plastic	BG1S	1 liter H2SO4 clear glass	BP3Z	250mL NaOH, Zn Ac plastic	VG9U	40mL unpreserved clear vial
AG3S	250mL H2SO4 glass amber	BG1T	1 liter Na Thiosulfate clear glass	C	Air Cassettes	VSG	Headspace septa vial & HCL
AG1S	1 liter H2SO4 amber glass	BG1U	1 liter unpreserved glass	DG9B	40mL Na Bisulfate amber vial	WGFX	4oz wide jar w/hexane wipe
BP1U	1 liter unpreserved plastic	BP1A	1 liter NaOH, Asc Acid plastic	DG9M	40mL MeOH clear vial	ZPLC	Ziploc Bag

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November 01, 2016

Ms. Lindsay Crow
Hull & Associates, Inc.
4 Hemisphere Way
Bedford, OH 44146

RE: Project: LAE001
Pace Project No.: 50157354

Dear Ms. Crow:
Enclosed are the analytical results for sample(s) received by the laboratory on October 25, 2016. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Tina Sayer

Tina Sayer
tina.sayer@pacelabs.com
Project Manager

Enclosures

cc: Hull Data/EDD Admin
Ms. Karyn Selle

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CERTIFICATIONS

Project: LAE001
Pace Project No.: 50157354

Indiana Certification IDs

7726 Moller Road, Indianapolis, IN 46268
Illinois Certification #: 200074
Indiana Certification #: C-49-06
Kansas/NELAP Certification #:E-10177
Kentucky UST Certification #: 0042
Kentucky WW Certification #:98019
Ohio VAP Certification #: CL-0065
Oklahoma Certification #: 2014-148
Texas Certification #: T104704355-15-9
West Virginia Certification #: 330
Wisconsin Certification #: 999788130
USDA Soil Permit #: P330-10-00128

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SAMPLE SUMMARY

Project: LAE001
Pace Project No.: 50157354

Lab ID	Sample ID	Matrix	Date Collected	Date Received
50157354001	**LAE001:BH-5:S0851005**	Solid	10/19/16 14:40	10/25/16 08:35
50157354002	**LAE001:BH-7:S035055**	Solid	10/19/16 12:43	10/25/16 08:35
50157354003	**LAE001:Trip:W101916**	Solid	10/19/16 08:00	10/25/16 08:35

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SAMPLE ANALYTE COUNT

Project: LAE001
Pace Project No.: 50157354

Lab ID	Sample ID	Method	Analysts	Analytes Reported
50157354001	**LAE001:BH-5:S0851005**	EPA 8082	CPH	8
		EPA 6010	JPK	7
		EPA 7471	ILP	1
		EPA 8270	TBP	51
		EPA 8260	GRM	50
		SM 2540G	SCM	1
50157354002	**LAE001:BH-7:S035055**	EPA 8082	CPH	8
		EPA 6010	JPK	7
		EPA 7471	ILP	1
		EPA 8270	TBP	51
		EPA 8260	GRM	50
		SM 2540G	SCM	1
50157354003	**LAE001:Trip:W101916**	EPA 8260	GRM	50

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SUMMARY OF DETECTION

Project: LAE001
Pace Project No.: 50157354

Lab Sample ID / Method	Client Sample ID / Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
50157354001	**LAE001:BH-5:S0851005**					
EPA 6010	Arsenic	75.3	mg/kg	1.2	10/28/16 22:40	
EPA 6010	Barium	132	mg/kg	1.2	10/28/16 22:40	
EPA 6010	Cadmium	2.7	mg/kg	0.59	10/28/16 22:40	
EPA 6010	Chromium	20.8	mg/kg	1.2	10/28/16 22:40	
EPA 6010	Lead	6.4	mg/kg	1.2	10/28/16 22:40	
EPA 6010	Selenium	3.4	mg/kg	1.2	10/28/16 22:40	
EPA 8260	Benzene	0.0077	mg/kg	0.0067	10/27/16 03:50	
EPA 8260	Toluene	0.013	mg/kg	0.0067	10/27/16 03:50	
SM 2540G	Percent Moisture	25.7	%	0.10	10/26/16 10:35	
50157354002	**LAE001:BH-7:S035055**					
EPA 6010	Arsenic	113	mg/kg	1.4	10/28/16 22:43	
EPA 6010	Barium	195	mg/kg	1.4	10/28/16 22:43	
EPA 6010	Chromium	27.0	mg/kg	1.4	10/28/16 22:43	
EPA 6010	Lead	8.4	mg/kg	1.4	10/28/16 22:43	
EPA 6010	Selenium	3.9	mg/kg	1.4	10/28/16 22:43	
EPA 8260	Methylene Chloride	0.091	mg/kg	0.029	10/27/16 04:23	C9
SM 2540G	Percent Moisture	31.1	%	0.10	10/26/16 10:35	
50157354003	**LAE001:Trip:W101916**					
EPA 8260	Toluene	0.0077	mg/kg	0.0050	10/26/16 07:02	C0

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PROJECT NARRATIVE

Project: LAE001
Pace Project No.: 50157354

Method: **EPA 8082**
Description: 8082 GCS PCB Solids
Client: Hull & Associates, Inc. (Bedford)
Date: November 01, 2016

General Information:
2 samples were analyzed for EPA 8082. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 3546 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Surrogates:
All surrogates were within QC limits with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: LAE001
Pace Project No.: 50157354

Method: **EPA 6010**
Description: 6010 MET ICP
Client: Hull & Associates, Inc. (Bedford)
Date: November 01, 2016

General Information:
2 samples were analyzed for EPA 6010. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 3050 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: LAE001
Pace Project No.: 50157354

Method: **EPA 7471**
Description: 7471 Mercury
Client: Hull & Associates, Inc. (Bedford)
Date: November 01, 2016

General Information:
2 samples were analyzed for EPA 7471. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 7471 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: LAE001
Pace Project No.: 50157354

Method: **EPA 8270**
Description: 8270 MSSV SHORT LIST MICROWAVE
Client: Hull & Associates, Inc. (Bedford)
Date: November 01, 2016

General Information:
2 samples were analyzed for EPA 8270. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 3546 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Surrogates:
All surrogates were within QC limits with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

QC Batch: 358149

A matrix spike and/or matrix spike duplicate (MS/MSD) were performed on the following sample(s): 50157354001

M1: Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

- MS (Lab ID: 1655738)
  - Acenaphthene
  - Anthracene
  - Benzo(a)anthracene
  - Benzo(a)pyrene
  - Benzo(b)fluoranthene
  - Benzo(g,h,i)perylene
  - Benzo(k)fluoranthene
  - Chrysene
  - Dibenz(a,h)anthracene

REPORT OF LABORATORY ANALYSIS

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PROJECT NARRATIVE

Project: LAE001
Pace Project No.: 50157354

Method: **EPA 8270**
Description: 8270 MSSV SHORT LIST MICROWAVE
Client: Hull & Associates, Inc. (Bedford)
Date: November 01, 2016

QC Batch: 358149

A matrix spike and/or matrix spike duplicate (MS/MSD) were performed on the following sample(s): 50157354001

M1: Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

- Fluoranthene
- Fluorene
- Indeno(1,2,3-cd)pyrene
- Phenanthrene
- Pyrene

- MSD (Lab ID: 1655739)
  - Acenaphthene
  - Anthracene
  - Benzo(a)anthracene
  - Benzo(a)pyrene
  - Benzo(g,h,i)perylene
  - Benzo(k)fluoranthene
  - Chrysene
  - Dibenz(a,h)anthracene
  - Fluoranthene
  - Fluorene
  - Indeno(1,2,3-cd)pyrene
  - Phenanthrene
  - Pyrene

R1: RPD value was outside control limits.

- MSD (Lab ID: 1655739)
  - 2,4-Dinitrotoluene
  - 2-Methylnaphthalene
  - Acenaphthene
  - Acenaphthylene
  - Benzo(a)anthracene
  - Naphthalene

Additional Comments:

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PROJECT NARRATIVE

Project: LAE001
Pace Project No.: 50157354

Method: **EPA 8260**
Description: 8260 MSV 5030 Low Level
Client: Hull & Associates, Inc. (Bedford)
Date: November 01, 2016

General Information:
2 samples were analyzed for EPA 8260. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Surrogates:
All surrogates were within QC limits with any exceptions noted below.

QC Batch: 358363

S1: Surrogate recovery outside laboratory control limits (confirmed by re-analysis).

- LAE001:BH-5:S0851005 (Lab ID: 50157354001)
  - Dibromofluoromethane (S)
  - Toluene-d8 (S)
- LAE001:BH-7:S035055 (Lab ID: 50157354002)
  - Dibromofluoromethane (S)
  - Toluene-d8 (S)
- MS (Lab ID: 1656593)
  - Dibromofluoromethane (S)
  - Toluene-d8 (S)
- MSD (Lab ID: 1656594)
  - Dibromofluoromethane (S)
  - Toluene-d8 (S)

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

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PROJECT NARRATIVE

Project: LAE001
Pace Project No.: 50157354

Method: **EPA 8260**
Description: 8260 MSV 5030 Low Level
Client: Hull & Associates, Inc. (Bedford)
Date: November 01, 2016

QC Batch: 358363

A matrix spike and/or matrix spike duplicate (MS/MSD) were performed on the following sample(s): 50157354002

M1: Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

- MS (Lab ID: 1656593)
  - 1,1,1-Trichloroethane
  - 1,1-Dichloroethene
  - 1,2-Dichloropropane
  - Benzene
  - Chloroform
  - Ethylbenzene
  - Methyl-tert-butyl ether
  - Tetrachloroethene
  - Toluene
  - Trichloroethene
  - Vinyl chloride
  - cis-1,2-Dichloroethene
  - trans-1,2-Dichloroethene
- MSD (Lab ID: 1656594)
  - 1,1,1-Trichloroethane
  - 1,1-Dichloroethene
  - 1,2-Dichloropropane
  - Chloroform
  - Methyl-tert-butyl ether
  - Tetrachloroethene
  - Vinyl chloride
  - cis-1,2-Dichloroethene
  - trans-1,2-Dichloroethene

R1: RPD value was outside control limits.

- MSD (Lab ID: 1656594)
  - 1,1,1-Trichloroethane
  - 1,1,2,2-Tetrachloroethane
  - 1,1-Dichloroethene
  - 1,2,4-Trimethylbenzene
  - Benzene
  - Chlorobenzene
  - Ethylbenzene
  - Isopropylbenzene (Cumene)
  - Methyl-tert-butyl ether
  - Tetrachloroethene
  - Toluene
  - Trichloroethene

Additional Comments:

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PROJECT NARRATIVE

Project: LAE001
Pace Project No.: 50157354

Method: **EPA 8260**
Description: 8260 MSV 5030 Low Level
Client: Hull & Associates, Inc. (Bedford)
Date: November 01, 2016

Analyte Comments:

QC Batch: 358363

C9: Common Laboratory Contaminant.

- LAE001:BH-7:S035055 (Lab ID: 50157354002)
  - Methylene Chloride

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PROJECT NARRATIVE

Project: LAE001
Pace Project No.: 50157354

Method: **EPA 8260**
Description: 8260 MSV 5035A VOA
Client: Hull & Associates, Inc. (Bedford)
Date: November 01, 2016

General Information:
1 sample was analyzed for EPA 8260. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Surrogates:
All surrogates were within QC limits with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

Analyte Comments:

QC Batch: 358124

C0: Result confirmed by second analysis.
- LAE001:Trip:W101916 (Lab ID: 50157354003)
  - Toluene

This data package has been reviewed for quality and completeness and is approved for release.

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ANALYTICAL RESULTS

Project: LAE001
Pace Project No.: 50157354

Sample: LAE001:BH-5:S0851005 **Lab ID: 50157354001** Collected: 10/19/16 14:40 Received: 10/25/16 08:35 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB Solids	Analytical Method: EPA 8082 Preparation Method: EPA 3546							
PCB-1016 (Aroclor 1016)	ND	mg/kg	0.13	1	10/26/16 11:20	10/26/16 21:56	12674-11-2	
PCB-1221 (Aroclor 1221)	ND	mg/kg	0.13	1	10/26/16 11:20	10/26/16 21:56	11104-28-2	
PCB-1232 (Aroclor 1232)	ND	mg/kg	0.13	1	10/26/16 11:20	10/26/16 21:56	11141-16-5	
PCB-1242 (Aroclor 1242)	ND	mg/kg	0.13	1	10/26/16 11:20	10/26/16 21:56	53469-21-9	
PCB-1248 (Aroclor 1248)	ND	mg/kg	0.13	1	10/26/16 11:20	10/26/16 21:56	12672-29-6	
PCB-1254 (Aroclor 1254)	ND	mg/kg	0.13	1	10/26/16 11:20	10/26/16 21:56	11097-69-1	
PCB-1260 (Aroclor 1260)	ND	mg/kg	0.13	1	10/26/16 11:20	10/26/16 21:56	11096-82-5	
Surrogates								
Tetrachloro-m-xylene (S)	28	%.	24-99	1	10/26/16 11:20	10/26/16 21:56	877-09-8	
6010 MET ICP	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Arsenic	**75.3**	mg/kg	1.2	1	10/28/16 08:06	10/28/16 22:40	7440-38-2	
Barium	**132**	mg/kg	1.2	1	10/28/16 08:06	10/28/16 22:40	7440-39-3	
Cadmium	**2.7**	mg/kg	0.59	1	10/28/16 08:06	10/28/16 22:40	7440-43-9	
Chromium	**20.8**	mg/kg	1.2	1	10/28/16 08:06	10/28/16 22:40	7440-47-3	
Lead	**6.4**	mg/kg	1.2	1	10/28/16 08:06	10/28/16 22:40	7439-92-1	
Selenium	**3.4**	mg/kg	1.2	1	10/28/16 08:06	10/28/16 22:40	7782-49-2	
Silver	ND	mg/kg	0.59	1	10/28/16 08:06	10/28/16 22:40	7440-22-4	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471							
Mercury	ND	mg/kg	0.28	1	10/25/16 21:37	10/26/16 09:54	7439-97-6	
8270 MSSV SHORT LIST MICROWAVE	Analytical Method: EPA 8270 Preparation Method: EPA 3546							
Acenaphthene	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	83-32-9	M1,R1
Acenaphthylene	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	208-96-8	R1
Anthracene	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	120-12-7	M1
Benzo(a)anthracene	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	56-55-3	M1,R1
Benzo(a)pyrene	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	50-32-8	M1
Benzo(b)fluoranthene	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	205-99-2	M1
Benzo(g,h,i)perylene	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	191-24-2	M1
Benzo(k)fluoranthene	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	207-08-9	M1
Butylbenzylphthalate	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	85-68-7	
4-Chloro-3-methylphenol	ND	mg/kg	0.89	1	10/26/16 11:40	10/27/16 16:12	59-50-7	
4-Chloroaniline	ND	mg/kg	0.89	1	10/26/16 11:40	10/27/16 16:12	106-47-8	
bis(2-Chloroethoxy)methane	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	111-91-1	
bis(2-Chloroethyl) ether	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	111-44-4	
bis(2chloro1methylethyl) ether	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	108-60-1	
2-Chloronaphthalene	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	91-58-7	
2-Chlorophenol	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	95-57-8	
Chrysene	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	218-01-9	M1
Dibenz(a,h)anthracene	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	53-70-3	M1
2,4-Dichlorophenol	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	120-83-2	
Diethylphthalate	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	84-66-2	
2,4-Dimethylphenol	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	105-67-9	
Di-n-butylphthalate	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	84-74-2	

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ANALYTICAL RESULTS

Project: LAE001
Pace Project No.: 50157354

Sample: LAE001:BH-5:S0851005 **Lab ID: 50157354001** Collected: 10/19/16 14:40 Received: 10/25/16 08:35 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV SHORT LIST MICROWAVE Analytical Method: EPA 8270 Preparation Method: EPA 3546								
2,4-Dinitrophenol	ND	mg/kg	2.1	1	10/26/16 11:40	10/27/16 16:12	51-28-5	
2,4-Dinitrotoluene	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	121-14-2	R1
2,6-Dinitrotoluene	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	606-20-2	
Di-n-octylphthalate	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	117-84-0	
bis(2-Ethylhexyl)phthalate	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	117-81-7	
Fluoranthene	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	206-44-0	M1
Fluorene	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	86-73-7	M1
Hexachlorocyclopentadiene	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	77-47-4	
Hexachloroethane	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	67-72-1	
Indeno(1,2,3-cd)pyrene	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	193-39-5	M1
Isophorone	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	78-59-1	
2-Methylnaphthalene	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	91-57-6	R1
2-Methylphenol(o-Cresol)	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	95-48-7	
3&4-Methylphenol(m&p Cresol)	ND	mg/kg	0.89	1	10/26/16 11:40	10/27/16 16:12		
Naphthalene	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	91-20-3	R1
Nitrobenzene	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	98-95-3	
N-Nitroso-di-n-propylamine	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	621-64-7	
N-Nitrosodiphenylamine	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	86-30-6	
Phenanthrene	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	85-01-8	M1
Phenol	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	108-95-2	
Pyrene	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	129-00-0	M1
2,4,5-Trichlorophenol	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	95-95-4	
2,4,6-Trichlorophenol	ND	mg/kg	0.44	1	10/26/16 11:40	10/27/16 16:12	88-06-2	
Surrogates								
Nitrobenzene-d5 (S)	32	%.	22-97	1	10/26/16 11:40	10/27/16 16:12	4165-60-0	
Phenol-d5 (S)	34	%.	28-108	1	10/26/16 11:40	10/27/16 16:12	4165-62-2	
2-Fluorophenol (S)	33	%.	23-110	1	10/26/16 11:40	10/27/16 16:12	367-12-4	
2,4,6-Tribromophenol (S)	14	%.	18-110	1	10/26/16 11:40	10/27/16 16:12	118-79-6	S8
2-Fluorobiphenyl (S)	16	%.	22-96	1	10/26/16 11:40	10/27/16 16:12	321-60-8	S8
p-Terphenyl-d14 (S)	9	%.	17-102	1	10/26/16 11:40	10/27/16 16:12	1718-51-0	S8
8260 MSV 5030 Low Level Analytical Method: EPA 8260								
1,1,1,2-Tetrachloroethane	ND	mg/kg	0.0067	1		10/27/16 03:50	630-20-6	
1,1,1-Trichloroethane	ND	mg/kg	0.0067	1		10/27/16 03:50	71-55-6	
1,1,2,2-Tetrachloroethane	ND	mg/kg	0.0067	1		10/27/16 03:50	79-34-5	
1,1,2-Trichloroethane	ND	mg/kg	0.0067	1		10/27/16 03:50	79-00-5	
1,1-Dichloroethane	ND	mg/kg	0.0067	1		10/27/16 03:50	75-34-3	
1,1-Dichloroethene	ND	mg/kg	0.0067	1		10/27/16 03:50	75-35-4	
1,2,4-Trichlorobenzene	ND	mg/kg	0.0067	1		10/27/16 03:50	120-82-1	
1,2,4-Trimethylbenzene	ND	mg/kg	0.0067	1		10/27/16 03:50	95-63-6	
1,2-Dichlorobenzene	ND	mg/kg	0.0067	1		10/27/16 03:50	95-50-1	
1,2-Dichloroethane	ND	mg/kg	0.0067	1		10/27/16 03:50	107-06-2	
1,2-Dichloropropane	ND	mg/kg	0.0067	1		10/27/16 03:50	78-87-5	
1,3-Dichloropropane	ND	mg/kg	0.0067	1		10/27/16 03:50	142-28-9	
1,4-Dichlorobenzene	ND	mg/kg	0.0067	1		10/27/16 03:50	106-46-7	
2-Butanone (MEK)	ND	mg/kg	0.034	1		10/27/16 03:50	78-93-3	

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ANALYTICAL RESULTS

Project: LAE001
Pace Project No.: 50157354

Sample: LAE001:BH-5:S0851005 **Lab ID: 50157354001** Collected: 10/19/16 14:40 Received: 10/25/16 08:35 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV 5030 Low Level	Analytical Method: EPA 8260							
4-Methyl-2-pentanone (MIBK)	ND	mg/kg	0.034	1		10/27/16 03:50	108-10-1	
Acetone	ND	mg/kg	0.13	1		10/27/16 03:50	67-64-1	
Benzene	**0.0077**	mg/kg	0.0067	1		10/27/16 03:50	71-43-2	
Bromodichloromethane	ND	mg/kg	0.0067	1		10/27/16 03:50	75-27-4	
Bromoform	ND	mg/kg	0.0067	1		10/27/16 03:50	75-25-2	
Bromomethane	ND	mg/kg	0.0067	1		10/27/16 03:50	74-83-9	
Carbon disulfide	ND	mg/kg	0.013	1		10/27/16 03:50	75-15-0	
Carbon tetrachloride	ND	mg/kg	0.0067	1		10/27/16 03:50	56-23-5	
Chlorobenzene	ND	mg/kg	0.0067	1		10/27/16 03:50	108-90-7	
Chloroethane	ND	mg/kg	0.0067	1		10/27/16 03:50	75-00-3	
Chloroform	ND	mg/kg	0.0067	1		10/27/16 03:50	67-66-3	
Chloromethane	ND	mg/kg	0.0067	1		10/27/16 03:50	74-87-3	
Dibromochloromethane	ND	mg/kg	0.0067	1		10/27/16 03:50	124-48-1	
Dibromomethane	ND	mg/kg	0.0067	1		10/27/16 03:50	74-95-3	
Dichlorodifluoromethane	ND	mg/kg	0.0067	1		10/27/16 03:50	75-71-8	
Ethyl methacrylate	ND	mg/kg	0.13	1		10/27/16 03:50	97-63-2	
Ethylbenzene	ND	mg/kg	0.0067	1		10/27/16 03:50	100-41-4	
Isopropylbenzene (Cumene)	ND	mg/kg	0.0067	1		10/27/16 03:50	98-82-8	
Methyl-tert-butyl ether	ND	mg/kg	0.0067	1		10/27/16 03:50	1634-04-4	
Methylene Chloride	ND	mg/kg	0.027	1		10/27/16 03:50	75-09-2	
Styrene	ND	mg/kg	0.0067	1		10/27/16 03:50	100-42-5	
Tetrachloroethene	ND	mg/kg	0.0067	1		10/27/16 03:50	127-18-4	
Toluene	**0.013**	mg/kg	0.0067	1		10/27/16 03:50	108-88-3	
Trichloroethene	ND	mg/kg	0.0067	1		10/27/16 03:50	79-01-6	
Trichlorofluoromethane	ND	mg/kg	0.0067	1		10/27/16 03:50	75-69-4	
Vinyl acetate	ND	mg/kg	0.13	1		10/27/16 03:50	108-05-4	
Vinyl chloride	ND	mg/kg	0.0067	1		10/27/16 03:50	75-01-4	
Xylene (Total)	ND	mg/kg	0.013	1		10/27/16 03:50	1330-20-7	
cis-1,2-Dichloroethene	ND	mg/kg	0.0067	1		10/27/16 03:50	156-59-2	
cis-1,3-Dichloropropene	ND	mg/kg	0.0067	1		10/27/16 03:50	10061-01-5	
n-Hexane	ND	mg/kg	0.0067	1		10/27/16 03:50	110-54-3	
trans-1,2-Dichloroethene	ND	mg/kg	0.0067	1		10/27/16 03:50	156-60-5	
trans-1,3-Dichloropropene	ND	mg/kg	0.0067	1		10/27/16 03:50	10061-02-6	
Surrogates								
Dibromofluoromethane (S)	202	%.	70-128	1		10/27/16 03:50	1868-53-7	S1
Toluene-d8 (S)	145	%.	72-139	1		10/27/16 03:50	2037-26-5	S1
4-Bromofluorobenzene (S)	75	%.	65-127	1		10/27/16 03:50	460-00-4	
Percent Moisture	Analytical Method: SM 2540G							
Percent Moisture	**25.7**	%	0.10	1		10/26/16 10:35		

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ANALYTICAL RESULTS

Project: LAE001
Pace Project No.: 50157354

Sample: LAE001:BH-7:S035055 **Lab ID: 50157354002** Collected: 10/19/16 12:43 Received: 10/25/16 08:35 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB Solids	Analytical Method: EPA 8082 Preparation Method: EPA 3546							
PCB-1016 (Aroclor 1016)	ND	mg/kg	0.14	1	10/26/16 11:20	10/26/16 22:16	12674-11-2	
PCB-1221 (Aroclor 1221)	ND	mg/kg	0.14	1	10/26/16 11:20	10/26/16 22:16	11104-28-2	
PCB-1232 (Aroclor 1232)	ND	mg/kg	0.14	1	10/26/16 11:20	10/26/16 22:16	11141-16-5	
PCB-1242 (Aroclor 1242)	ND	mg/kg	0.14	1	10/26/16 11:20	10/26/16 22:16	53469-21-9	
PCB-1248 (Aroclor 1248)	ND	mg/kg	0.14	1	10/26/16 11:20	10/26/16 22:16	12672-29-6	
PCB-1254 (Aroclor 1254)	ND	mg/kg	0.14	1	10/26/16 11:20	10/26/16 22:16	11097-69-1	
PCB-1260 (Aroclor 1260)	ND	mg/kg	0.14	1	10/26/16 11:20	10/26/16 22:16	11096-82-5	
Surrogates								
Tetrachloro-m-xylene (S)	35	%.	24-99	1	10/26/16 11:20	10/26/16 22:16	877-09-8	
6010 MET ICP	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Arsenic	**113**	mg/kg	1.4	1	10/28/16 08:06	10/28/16 22:43	7440-38-2	
Barium	**195**	mg/kg	1.4	1	10/28/16 08:06	10/28/16 22:43	7440-39-3	
Cadmium	ND	mg/kg	0.70	1	10/28/16 08:06	10/28/16 22:43	7440-43-9	
Chromium	**27.0**	mg/kg	1.4	1	10/28/16 08:06	10/28/16 22:43	7440-47-3	
Lead	**8.4**	mg/kg	1.4	1	10/28/16 08:06	10/28/16 22:43	7439-92-1	
Selenium	**3.9**	mg/kg	1.4	1	10/28/16 08:06	10/28/16 22:43	7782-49-2	
Silver	ND	mg/kg	0.70	1	10/28/16 08:06	10/28/16 22:43	7440-22-4	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471							
Mercury	ND	mg/kg	0.28	1	10/25/16 21:37	10/26/16 09:56	7439-97-6	
8270 MSSV SHORT LIST MICROWAVE	Analytical Method: EPA 8270 Preparation Method: EPA 3546							
Acenaphthene	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	83-32-9	
Acenaphthylene	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	208-96-8	
Anthracene	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	120-12-7	
Benzo(a)anthracene	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	56-55-3	
Benzo(a)pyrene	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	50-32-8	
Benzo(b)fluoranthene	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	205-99-2	
Benzo(g,h,i)perylene	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	191-24-2	
Benzo(k)fluoranthene	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	207-08-9	
Butylbenzylphthalate	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	85-68-7	
4-Chloro-3-methylphenol	ND	mg/kg	0.95	1	10/26/16 11:40	10/27/16 17:08	59-50-7	
4-Chloroaniline	ND	mg/kg	0.95	1	10/26/16 11:40	10/27/16 17:08	106-47-8	
bis(2-Chloroethoxy)methane	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	111-91-1	
bis(2-Chloroethyl) ether	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	111-44-4	
bis(2chloro1methylethyl) ether	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	108-60-1	
2-Chloronaphthalene	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	91-58-7	
2-Chlorophenol	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	95-57-8	
Chrysene	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	218-01-9	
Dibenz(a,h)anthracene	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	53-70-3	
2,4-Dichlorophenol	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	120-83-2	
Diethylphthalate	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	84-66-2	
2,4-Dimethylphenol	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	105-67-9	
Di-n-butylphthalate	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	84-74-2	

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ANALYTICAL RESULTS

Project: LAE001
Pace Project No.: 50157354

Sample: LAE001:BH-7:S035055 **Lab ID: 50157354002** Collected: 10/19/16 12:43 Received: 10/25/16 08:35 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV SHORT LIST MICROWAVE Analytical Method: EPA 8270 Preparation Method: EPA 3546								
2,4-Dinitrophenol	ND	mg/kg	2.3	1	10/26/16 11:40	10/27/16 17:08	51-28-5	
2,4-Dinitrotoluene	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	121-14-2	
2,6-Dinitrotoluene	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	606-20-2	
Di-n-octylphthalate	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	117-84-0	
bis(2-Ethylhexyl)phthalate	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	117-81-7	
Fluoranthene	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	206-44-0	
Fluorene	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	86-73-7	
Hexachlorocyclopentadiene	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	77-47-4	
Hexachloroethane	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	67-72-1	
Indeno(1,2,3-cd)pyrene	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	193-39-5	
Isophorone	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	78-59-1	
2-Methylnaphthalene	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	91-57-6	
2-Methylphenol(o-Cresol)	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	95-48-7	
3&4-Methylphenol(m&p Cresol)	ND	mg/kg	0.95	1	10/26/16 11:40	10/27/16 17:08		
Naphthalene	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	91-20-3	
Nitrobenzene	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	98-95-3	
N-Nitroso-di-n-propylamine	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	621-64-7	
N-Nitrosodiphenylamine	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	86-30-6	
Phenanthrene	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	85-01-8	
Phenol	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	108-95-2	
Pyrene	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	129-00-0	
2,4,5-Trichlorophenol	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	95-95-4	
2,4,6-Trichlorophenol	ND	mg/kg	0.47	1	10/26/16 11:40	10/27/16 17:08	88-06-2	
Surrogates								
Nitrobenzene-d5 (S)	51	%.	22-97	1	10/26/16 11:40	10/27/16 17:08	4165-60-0	
Phenol-d5 (S)	41	%.	28-108	1	10/26/16 11:40	10/27/16 17:08	4165-62-2	
2-Fluorophenol (S)	42	%.	23-110	1	10/26/16 11:40	10/27/16 17:08	367-12-4	
2,4,6-Tribromophenol (S)	35	%.	18-110	1	10/26/16 11:40	10/27/16 17:08	118-79-6	
2-Fluorobiphenyl (S)	42	%.	22-96	1	10/26/16 11:40	10/27/16 17:08	321-60-8	
p-Terphenyl-d14 (S)	47	%.	17-102	1	10/26/16 11:40	10/27/16 17:08	1718-51-0	
8260 MSV 5030 Low Level Analytical Method: EPA 8260								
1,1,1,2-Tetrachloroethane	ND	mg/kg	0.0073	1		10/27/16 04:23	630-20-6	
1,1,1-Trichloroethane	ND	mg/kg	0.0073	1		10/27/16 04:23	71-55-6	M1,R1
1,1,2,2-Tetrachloroethane	ND	mg/kg	0.0073	1		10/27/16 04:23	79-34-5	R1
1,1,2-Trichloroethane	ND	mg/kg	0.0073	1		10/27/16 04:23	79-00-5	
1,1-Dichloroethane	ND	mg/kg	0.0073	1		10/27/16 04:23	75-34-3	
1,1-Dichloroethene	ND	mg/kg	0.0073	1		10/27/16 04:23	75-35-4	M1,R1
1,2,4-Trichlorobenzene	ND	mg/kg	0.0073	1		10/27/16 04:23	120-82-1	
1,2,4-Trimethylbenzene	ND	mg/kg	0.0073	1		10/27/16 04:23	95-63-6	R1
1,2-Dichlorobenzene	ND	mg/kg	0.0073	1		10/27/16 04:23	95-50-1	
1,2-Dichloroethane	ND	mg/kg	0.0073	1		10/27/16 04:23	107-06-2	
1,2-Dichloropropane	ND	mg/kg	0.0073	1		10/27/16 04:23	78-87-5	M1
1,3-Dichloropropane	ND	mg/kg	0.0073	1		10/27/16 04:23	142-28-9	
1,4-Dichlorobenzene	ND	mg/kg	0.0073	1		10/27/16 04:23	106-46-7	
2-Butanone (MEK)	ND	mg/kg	0.036	1		10/27/16 04:23	78-93-3	

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ANALYTICAL RESULTS

Project: LAE001
Pace Project No.: 50157354

Sample: LAE001:BH-7:S035055 **Lab ID: 50157354002** Collected: 10/19/16 12:43 Received: 10/25/16 08:35 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV 5030 Low Level	Analytical Method: EPA 8260							
4-Methyl-2-pentanone (MIBK)	ND	mg/kg	0.036	1		10/27/16 04:23	108-10-1	
Acetone	ND	mg/kg	0.15	1		10/27/16 04:23	67-64-1	
Benzene	ND	mg/kg	0.0073	1		10/27/16 04:23	71-43-2	M1,R1
Bromodichloromethane	ND	mg/kg	0.0073	1		10/27/16 04:23	75-27-4	
Bromoform	ND	mg/kg	0.0073	1		10/27/16 04:23	75-25-2	
Bromomethane	ND	mg/kg	0.0073	1		10/27/16 04:23	74-83-9	
Carbon disulfide	ND	mg/kg	0.015	1		10/27/16 04:23	75-15-0	
Carbon tetrachloride	ND	mg/kg	0.0073	1		10/27/16 04:23	56-23-5	
Chlorobenzene	ND	mg/kg	0.0073	1		10/27/16 04:23	108-90-7	R1
Chloroethane	ND	mg/kg	0.0073	1		10/27/16 04:23	75-00-3	
Chloroform	ND	mg/kg	0.0073	1		10/27/16 04:23	67-66-3	M1
Chloromethane	ND	mg/kg	0.0073	1		10/27/16 04:23	74-87-3	
Dibromochloromethane	ND	mg/kg	0.0073	1		10/27/16 04:23	124-48-1	
Dibromomethane	ND	mg/kg	0.0073	1		10/27/16 04:23	74-95-3	
Dichlorodifluoromethane	ND	mg/kg	0.0073	1		10/27/16 04:23	75-71-8	
Ethyl methacrylate	ND	mg/kg	0.15	1		10/27/16 04:23	97-63-2	
Ethylbenzene	ND	mg/kg	0.0073	1		10/27/16 04:23	100-41-4	M1,R1
Isopropylbenzene (Cumene)	ND	mg/kg	0.0073	1		10/27/16 04:23	98-82-8	R1
Methyl-tert-butyl ether	ND	mg/kg	0.0073	1		10/27/16 04:23	1634-04-4	M1,R1
Methylene Chloride	**0.091**	mg/kg	0.029	1		10/27/16 04:23	75-09-2	C9
Styrene	ND	mg/kg	0.0073	1		10/27/16 04:23	100-42-5	
Tetrachloroethene	ND	mg/kg	0.0073	1		10/27/16 04:23	127-18-4	M1,R1
Toluene	ND	mg/kg	0.0073	1		10/27/16 04:23	108-88-3	M1,R1
Trichloroethene	ND	mg/kg	0.0073	1		10/27/16 04:23	79-01-6	M1,R1
Trichlorofluoromethane	ND	mg/kg	0.0073	1		10/27/16 04:23	75-69-4	
Vinyl acetate	ND	mg/kg	0.15	1		10/27/16 04:23	108-05-4	
Vinyl chloride	ND	mg/kg	0.0073	1		10/27/16 04:23	75-01-4	M1
Xylene (Total)	ND	mg/kg	0.015	1		10/27/16 04:23	1330-20-7	RS
cis-1,2-Dichloroethene	ND	mg/kg	0.0073	1		10/27/16 04:23	156-59-2	M1
cis-1,3-Dichloropropene	ND	mg/kg	0.0073	1		10/27/16 04:23	10061-01-5	
n-Hexane	ND	mg/kg	0.0073	1		10/27/16 04:23	110-54-3	
trans-1,2-Dichloroethene	ND	mg/kg	0.0073	1		10/27/16 04:23	156-60-5	M1
trans-1,3-Dichloropropene	ND	mg/kg	0.0073	1		10/27/16 04:23	10061-02-6	
Surrogates								
Dibromofluoromethane (S)	282	%.	70-128	1		10/27/16 04:23	1868-53-7	S1
Toluene-d8 (S)	146	%.	72-139	1		10/27/16 04:23	2037-26-5	S1
4-Bromofluorobenzene (S)	71	%.	65-127	1		10/27/16 04:23	460-00-4	
Percent Moisture	Analytical Method: SM 2540G							
Percent Moisture	**31.1**	%	0.10	1		10/26/16 10:35		

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ANALYTICAL RESULTS

Project: LAE001
Pace Project No.: 50157354

Sample: LAE001:Trip:W101916 **Lab ID: 50157354003** Collected: 10/19/16 08:00 Received: 10/25/16 08:35 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV 5035A VOA	Analytical Method: EPA 8260							
Acetone	ND	mg/kg	0.10	1		10/26/16 07:02	67-64-1	
Benzene	ND	mg/kg	0.0050	1		10/26/16 07:02	71-43-2	
Bromodichloromethane	ND	mg/kg	0.0050	1		10/26/16 07:02	75-27-4	
Bromoform	ND	mg/kg	0.0050	1		10/26/16 07:02	75-25-2	
Bromomethane	ND	mg/kg	0.0050	1		10/26/16 07:02	74-83-9	
2-Butanone (MEK)	ND	mg/kg	0.025	1		10/26/16 07:02	78-93-3	
Carbon disulfide	ND	mg/kg	0.010	1		10/26/16 07:02	75-15-0	
Carbon tetrachloride	ND	mg/kg	0.0050	1		10/26/16 07:02	56-23-5	
Chlorobenzene	ND	mg/kg	0.0050	1		10/26/16 07:02	108-90-7	
Chloroethane	ND	mg/kg	0.0050	1		10/26/16 07:02	75-00-3	
Chloroform	ND	mg/kg	0.0050	1		10/26/16 07:02	67-66-3	
Chloromethane	ND	mg/kg	0.0050	1		10/26/16 07:02	74-87-3	
Dibromochloromethane	ND	mg/kg	0.0050	1		10/26/16 07:02	124-48-1	
Dibromomethane	ND	mg/kg	0.0050	1		10/26/16 07:02	74-95-3	
1,2-Dichlorobenzene	ND	mg/kg	0.0050	1		10/26/16 07:02	95-50-1	
1,4-Dichlorobenzene	ND	mg/kg	0.0050	1		10/26/16 07:02	106-46-7	
Dichlorodifluoromethane	ND	mg/kg	0.0050	1		10/26/16 07:02	75-71-8	
1,1-Dichloroethane	ND	mg/kg	0.0050	1		10/26/16 07:02	75-34-3	
1,2-Dichloroethane	ND	mg/kg	0.0050	1		10/26/16 07:02	107-06-2	
1,1-Dichloroethene	ND	mg/kg	0.0050	1		10/26/16 07:02	75-35-4	
cis-1,2-Dichloroethene	ND	mg/kg	0.0050	1		10/26/16 07:02	156-59-2	
trans-1,2-Dichloroethene	ND	mg/kg	0.0050	1		10/26/16 07:02	156-60-5	
1,2-Dichloropropane	ND	mg/kg	0.0050	1		10/26/16 07:02	78-87-5	
1,3-Dichloropropane	ND	mg/kg	0.0050	1		10/26/16 07:02	142-28-9	
cis-1,3-Dichloropropene	ND	mg/kg	0.0050	1		10/26/16 07:02	10061-01-5	
trans-1,3-Dichloropropene	ND	mg/kg	0.0050	1		10/26/16 07:02	10061-02-6	
Ethylbenzene	ND	mg/kg	0.0050	1		10/26/16 07:02	100-41-4	
Ethyl methacrylate	ND	mg/kg	0.10	1		10/26/16 07:02	97-63-2	
n-Hexane	ND	mg/kg	0.0050	1		10/26/16 07:02	110-54-3	
Isopropylbenzene (Cumene)	ND	mg/kg	0.0050	1		10/26/16 07:02	98-82-8	
Methylene Chloride	ND	mg/kg	0.020	1		10/26/16 07:02	75-09-2	
4-Methyl-2-pentanone (MIBK)	ND	mg/kg	0.025	1		10/26/16 07:02	108-10-1	
Methyl-tert-butyl ether	ND	mg/kg	0.0050	1		10/26/16 07:02	1634-04-4	
Styrene	ND	mg/kg	0.0050	1		10/26/16 07:02	100-42-5	
1,1,1,2-Tetrachloroethane	ND	mg/kg	0.0050	1		10/26/16 07:02	630-20-6	
1,1,2,2-Tetrachloroethane	ND	mg/kg	0.0050	1		10/26/16 07:02	79-34-5	
Tetrachloroethene	ND	mg/kg	0.0050	1		10/26/16 07:02	127-18-4	
Toluene	**0.0077**	mg/kg	0.0050	1		10/26/16 07:02	108-88-3	C0
1,2,4-Trichlorobenzene	ND	mg/kg	0.0050	1		10/26/16 07:02	120-82-1	
1,1,1-Trichloroethane	ND	mg/kg	0.0050	1		10/26/16 07:02	71-55-6	
1,1,2-Trichloroethane	ND	mg/kg	0.0050	1		10/26/16 07:02	79-00-5	
Trichloroethene	ND	mg/kg	0.0050	1		10/26/16 07:02	79-01-6	
Trichlorofluoromethane	ND	mg/kg	0.0050	1		10/26/16 07:02	75-69-4	
1,2,4-Trimethylbenzene	ND	mg/kg	0.0050	1		10/26/16 07:02	95-63-6	
Vinyl acetate	ND	mg/kg	0.10	1		10/26/16 07:02	108-05-4	
Vinyl chloride	ND	mg/kg	0.0050	1		10/26/16 07:02	75-01-4	

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ANALYTICAL RESULTS

Project: LAE001
Pace Project No.: 50157354

Sample: LAE001:Trip:W101916 **Lab ID: 50157354003** Collected: 10/19/16 08:00 Received: 10/25/16 08:35 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV 5035A VOA	Analytical Method: EPA 8260							
Xylene (Total)	ND	mg/kg	0.010	1		10/26/16 07:02	1330-20-7	
Surrogates								
Dibromofluoromethane (S)	104	%.	70-128	1		10/26/16 07:02	1868-53-7	
Toluene-d8 (S)	98	%.	72-139	1		10/26/16 07:02	2037-26-5	
4-Bromofluorobenzene (S)	102	%.	65-127	1		10/26/16 07:02	460-00-4	

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QUALITY CONTROL DATA

Project: LAE001
Pace Project No.: 50157354

QC Batch: 358125 Analysis Method: EPA 7471
QC Batch Method: EPA 7471 Analysis Description: 7471 Mercury
Associated Lab Samples: 50157354001, 50157354002

METHOD BLANK: 1655673 Matrix: Solid
Associated Lab Samples: 50157354001, 50157354002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	mg/kg	ND	0.20	10/26/16 09:39	

LABORATORY CONTROL SAMPLE: 1655674

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	mg/kg	.5	0.51	103	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1655675 1655676

Parameter	Units	50157287001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	mg/kg	ND	.48	.52	0.46	0.49	95	95	75-125	7	20	

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QUALITY CONTROL DATA

Project: LAE001
Pace Project No.: 50157354

QC Batch: 358161 Analysis Method: EPA 6010
QC Batch Method: EPA 3050 Analysis Description: 6010 MET
Associated Lab Samples: 50157354001, 50157354002

METHOD BLANK: 1655771 Matrix: Solid
Associated Lab Samples: 50157354001, 50157354002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Arsenic	mg/kg	ND	1.0	10/28/16 21:45	
Barium	mg/kg	ND	1.0	10/28/16 21:45	
Cadmium	mg/kg	ND	0.50	10/28/16 21:45	
Chromium	mg/kg	ND	1.0	10/28/16 21:45	
Lead	mg/kg	ND	1.0	10/28/16 21:45	
Selenium	mg/kg	ND	1.0	10/28/16 21:45	
Silver	mg/kg	ND	0.50	10/28/16 21:45	

LABORATORY CONTROL SAMPLE: 1655772

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/kg	50	51.6	103	80-120	
Barium	mg/kg	50	51.9	104	80-120	
Cadmium	mg/kg	50	52.0	104	80-120	
Chromium	mg/kg	50	51.0	102	80-120	
Lead	mg/kg	50	50.9	102	80-120	
Selenium	mg/kg	50	52.8	106	80-120	
Silver	mg/kg	25	25.6	102	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1655773 1655774

Parameter	Units	50157326003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic	mg/kg	4.8	53.5	52.9	61.0	59.1	105	103	75-125	3	20	
Barium	mg/kg	11.3	53.5	52.9	64.6	62.8	99	98	75-125	3	20	
Cadmium	mg/kg	ND	53.5	52.9	55.2	54.7	103	103	75-125	1	20	
Chromium	mg/kg	6.2	53.5	52.9	54.7	56.6	90	95	75-125	3	20	
Lead	mg/kg	3.3	53.5	52.9	48.5	48.8	84	86	75-125	1	20	
Selenium	mg/kg	ND	53.5	52.9	55.0	54.5	103	103	75-125	1	20	
Silver	mg/kg	ND	26.8	26.4	25.9	25.6	97	97	75-125	1	20	

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QUALITY CONTROL DATA

Project: LAE001
Pace Project No.: 50157354

QC Batch: 358363 Analysis Method: EPA 8260
QC Batch Method: EPA 8260 Analysis Description: 8260 MSV 5030 Low
Associated Lab Samples: 50157354001, 50157354002

METHOD BLANK: 1656591 Matrix: Solid
Associated Lab Samples: 50157354001, 50157354002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,1,1,2-Tetrachloroethane	mg/kg	ND	0.0050	10/27/16 03:17	
1,1,1-Trichloroethane	mg/kg	ND	0.0050	10/27/16 03:17	
1,1,2,2-Tetrachloroethane	mg/kg	ND	0.0050	10/27/16 03:17	
1,1,2-Trichloroethane	mg/kg	ND	0.0050	10/27/16 03:17	
1,1-Dichloroethane	mg/kg	ND	0.0050	10/27/16 03:17	
1,1-Dichloroethene	mg/kg	ND	0.0050	10/27/16 03:17	
1,2,4-Trichlorobenzene	mg/kg	ND	0.0050	10/27/16 03:17	
1,2,4-Trimethylbenzene	mg/kg	ND	0.0050	10/27/16 03:17	
1,2-Dichlorobenzene	mg/kg	ND	0.0050	10/27/16 03:17	
1,2-Dichloroethane	mg/kg	ND	0.0050	10/27/16 03:17	
1,2-Dichloropropane	mg/kg	ND	0.0050	10/27/16 03:17	
1,3-Dichloropropane	mg/kg	ND	0.0050	10/27/16 03:17	
1,4-Dichlorobenzene	mg/kg	ND	0.0050	10/27/16 03:17	
2-Butanone (MEK)	mg/kg	ND	0.025	10/27/16 03:17	
4-Methyl-2-pentanone (MIBK)	mg/kg	ND	0.025	10/27/16 03:17	
Acetone	mg/kg	ND	0.10	10/27/16 03:17	
Benzene	mg/kg	ND	0.0050	10/27/16 03:17	
Bromodichloromethane	mg/kg	ND	0.0050	10/27/16 03:17	
Bromoform	mg/kg	ND	0.0050	10/27/16 03:17	
Bromomethane	mg/kg	ND	0.0050	10/27/16 03:17	
Carbon disulfide	mg/kg	ND	0.010	10/27/16 03:17	
Carbon tetrachloride	mg/kg	ND	0.0050	10/27/16 03:17	
Chlorobenzene	mg/kg	ND	0.0050	10/27/16 03:17	
Chloroethane	mg/kg	ND	0.0050	10/27/16 03:17	
Chloroform	mg/kg	ND	0.0050	10/27/16 03:17	
Chloromethane	mg/kg	ND	0.0050	10/27/16 03:17	
cis-1,2-Dichloroethene	mg/kg	ND	0.0050	10/27/16 03:17	
cis-1,3-Dichloropropene	mg/kg	ND	0.0050	10/27/16 03:17	
Dibromochloromethane	mg/kg	ND	0.0050	10/27/16 03:17	
Dibromomethane	mg/kg	ND	0.0050	10/27/16 03:17	
Dichlorodifluoromethane	mg/kg	ND	0.0050	10/27/16 03:17	
Ethyl methacrylate	mg/kg	ND	0.10	10/27/16 03:17	
Ethylbenzene	mg/kg	ND	0.0050	10/27/16 03:17	
Isopropylbenzene (Cumene)	mg/kg	ND	0.0050	10/27/16 03:17	
Methyl-tert-butyl ether	mg/kg	ND	0.0050	10/27/16 03:17	
Methylene Chloride	mg/kg	ND	0.020	10/27/16 03:17	
n-Hexane	mg/kg	ND	0.0050	10/27/16 03:17	
Styrene	mg/kg	ND	0.0050	10/27/16 03:17	
Tetrachloroethene	mg/kg	ND	0.0050	10/27/16 03:17	
Toluene	mg/kg	ND	0.0050	10/27/16 03:17	
trans-1,2-Dichloroethene	mg/kg	ND	0.0050	10/27/16 03:17	

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QUALITY CONTROL DATA

Project: LAE001
Pace Project No.: 50157354

METHOD BLANK: 1656591 Matrix: Solid
Associated Lab Samples: 50157354001, 50157354002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
trans-1,3-Dichloropropene	mg/kg	ND	0.0050	10/27/16 03:17	
Trichloroethene	mg/kg	ND	0.0050	10/27/16 03:17	
Trichlorofluoromethane	mg/kg	ND	0.0050	10/27/16 03:17	
Vinyl acetate	mg/kg	ND	0.10	10/27/16 03:17	
Vinyl chloride	mg/kg	ND	0.0050	10/27/16 03:17	
Xylene (Total)	mg/kg	ND	0.010	10/27/16 03:17	
4-Bromofluorobenzene (S)	%.	102	65-127	10/27/16 03:17	
Dibromofluoromethane (S)	%.	101	70-128	10/27/16 03:17	
Toluene-d8 (S)	%.	99	72-139	10/27/16 03:17	

LABORATORY CONTROL SAMPLE: 1656592

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,1,1-Trichloroethane	mg/kg	.05	0.049	98	67-123	
1,1,2,2-Tetrachloroethane	mg/kg	.05	0.048	95	67-129	
1,1-Dichloroethene	mg/kg	.05	0.051	102	64-133	
1,2,4-Trimethylbenzene	mg/kg	.05	0.042	83	66-118	
1,2-Dichloropropane	mg/kg	.05	0.049	98	74-119	
Benzene	mg/kg	.05	0.048	96	72-120	
Chlorobenzene	mg/kg	.05	0.045	91	72-115	
Chloroform	mg/kg	.05	0.047	94	66-116	
cis-1,2-Dichloroethene	mg/kg	.05	0.050	101	74-115	
Ethylbenzene	mg/kg	.05	0.047	94	70-121	
Isopropylbenzene (Cumene)	mg/kg	.05	0.047	95	78-130	
Methyl-tert-butyl ether	mg/kg	.05	0.051	103	68-123	
Tetrachloroethene	mg/kg	.05	0.044	89	66-118	
Toluene	mg/kg	.05	0.046	91	68-121	
trans-1,2-Dichloroethene	mg/kg	.05	0.050	99	71-120	
Trichloroethene	mg/kg	.05	0.048	97	73-120	
Vinyl chloride	mg/kg	.05	0.053	107	54-155	
Xylene (Total)	mg/kg	.15	0.14	93	69-122	
4-Bromofluorobenzene (S)	%.			102	65-127	
Dibromofluoromethane (S)	%.			100	70-128	
Toluene-d8 (S)	%.			98	72-139	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1656593 1656594

Parameter	Units	50157354002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
1,1,1-Trichloroethane	mg/kg	ND	.073	.073	0.14	0.21	191	285	37-144	39	20	M1,R1
1,1,2,2-Tetrachloroethane	mg/kg	ND	.073	.073	0.069	0.051	94	71	12-174	29	20	R1
1,1-Dichloroethene	mg/kg	ND	.073	.073	0.32	0.25	445	338	36-162	27	20	M1,R1

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QUALITY CONTROL DATA

Project: LAE001
Pace Project No.: 50157354

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1656593 1656594

Parameter	Units	50157354002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
1,2,4-Trimethylbenzene	mg/kg	ND	.073	.073	0.036	0.023	49	31	10-157	45	20	R1
1,2-Dichloropropane	mg/kg	ND	.073	.073	0.14	0.14	199	186	43-138	6	20	M1
Benzene	mg/kg	ND	.073	.073	0.12	0.097	165	133	36-144	21	20	M1,R1
Chlorobenzene	mg/kg	ND	.073	.073	0.072	0.043	99	60	16-140	50	20	R1
Chloroform	mg/kg	ND	.073	.073	0.21	0.20	293	277	39-136	6	20	M1
cis-1,2-Dichloroethene	mg/kg	ND	.073	.073	0.17	0.15	229	206	34-143	11	20	M1
Ethylbenzene	mg/kg	ND	.073	.073	0.12	0.076	165	105	15-147	45	20	M1,R1
Isopropylbenzene (Cumene)	mg/kg	ND	.073	.073	0.12	0.074	161	102	10-163	45	20	R1
Methyl-tert-butyl ether	mg/kg	ND	.073	.073	0.12	0.19	159	255	48-145	46	20	M1,R1
Tetrachloroethene	mg/kg	ND	.073	.073	0.19	0.14	263	189	14-156	33	20	M1,R1
Toluene	mg/kg	ND	.073	.073	0.13	0.089	180	123	24-151	38	20	M1,R1
trans-1,2-Dichloroethene	mg/kg	ND	.073	.073	0.17	0.15	231	204	33-147	12	20	M1
Trichloroethene	mg/kg	ND	.073	.073	0.15	0.12	206	161	21-164	24	20	M1,R1
Vinyl chloride	mg/kg	ND	.073	.073	0.31	0.30	420	414	32-177	1	20	M1
Xylene (Total)	mg/kg	ND	.22	.22	0.25	0.15	113	67	12-148	50	20	RS
4-Bromofluorobenzene (S)	%.						81	81	65-127			
Dibromofluoromethane (S)	%.						262	267	70-128			S1
Toluene-d8 (S)	%.						133	135	72-139			S1

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QUALITY CONTROL DATA

Project: LAE001
Pace Project No.: 50157354

QC Batch: 358124
QC Batch Method: EPA 8260
Analysis Method: EPA 8260
Analysis Description: 8260 MSV 5035A Volatile Organics
Associated Lab Samples: 50157354003

METHOD BLANK: 1655671
Matrix: Solid
Associated Lab Samples: 50157354003

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,1,1,2-Tetrachloroethane	mg/kg	ND	0.0050	10/26/16 03:09	
1,1,1-Trichloroethane	mg/kg	ND	0.0050	10/26/16 03:09	
1,1,2,2-Tetrachloroethane	mg/kg	ND	0.0050	10/26/16 03:09	
1,1,2-Trichloroethane	mg/kg	ND	0.0050	10/26/16 03:09	
1,1-Dichloroethane	mg/kg	ND	0.0050	10/26/16 03:09	
1,1-Dichloroethene	mg/kg	ND	0.0050	10/26/16 03:09	
1,2,4-Trichlorobenzene	mg/kg	ND	0.0050	10/26/16 03:09	
1,2,4-Trimethylbenzene	mg/kg	ND	0.0050	10/26/16 03:09	
1,2-Dichlorobenzene	mg/kg	ND	0.0050	10/26/16 03:09	
1,2-Dichloroethane	mg/kg	ND	0.0050	10/26/16 03:09	
1,2-Dichloropropane	mg/kg	ND	0.0050	10/26/16 03:09	
1,3-Dichloropropane	mg/kg	ND	0.0050	10/26/16 03:09	
1,4-Dichlorobenzene	mg/kg	ND	0.0050	10/26/16 03:09	
2-Butanone (MEK)	mg/kg	ND	0.025	10/26/16 03:09	
4-Methyl-2-pentanone (MIBK)	mg/kg	ND	0.025	10/26/16 03:09	
Acetone	mg/kg	ND	0.10	10/26/16 03:09	
Benzene	mg/kg	ND	0.0050	10/26/16 03:09	
Bromodichloromethane	mg/kg	ND	0.0050	10/26/16 03:09	
Bromoform	mg/kg	ND	0.0050	10/26/16 03:09	
Bromomethane	mg/kg	ND	0.0050	10/26/16 03:09	
Carbon disulfide	mg/kg	ND	0.010	10/26/16 03:09	
Carbon tetrachloride	mg/kg	ND	0.0050	10/26/16 03:09	
Chlorobenzene	mg/kg	ND	0.0050	10/26/16 03:09	
Chloroethane	mg/kg	ND	0.0050	10/26/16 03:09	
Chloroform	mg/kg	ND	0.0050	10/26/16 03:09	
Chloromethane	mg/kg	ND	0.0050	10/26/16 03:09	
cis-1,2-Dichloroethene	mg/kg	ND	0.0050	10/26/16 03:09	
cis-1,3-Dichloropropene	mg/kg	ND	0.0050	10/26/16 03:09	
Dibromochloromethane	mg/kg	ND	0.0050	10/26/16 03:09	
Dibromomethane	mg/kg	ND	0.0050	10/26/16 03:09	
Dichlorodifluoromethane	mg/kg	ND	0.0050	10/26/16 03:09	
Ethyl methacrylate	mg/kg	ND	0.10	10/26/16 03:09	
Ethylbenzene	mg/kg	ND	0.0050	10/26/16 03:09	
Isopropylbenzene (Cumene)	mg/kg	ND	0.0050	10/26/16 03:09	
Methyl-tert-butyl ether	mg/kg	ND	0.0050	10/26/16 03:09	
Methylene Chloride	mg/kg	ND	0.020	10/26/16 03:09	
n-Hexane	mg/kg	ND	0.0050	10/26/16 03:09	
Styrene	mg/kg	ND	0.0050	10/26/16 03:09	
Tetrachloroethene	mg/kg	ND	0.0050	10/26/16 03:09	
Toluene	mg/kg	ND	0.0050	10/26/16 03:09	
trans-1,2-Dichloroethene	mg/kg	ND	0.0050	10/26/16 03:09	

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QUALITY CONTROL DATA

Project: LAE001
Pace Project No.: 50157354

METHOD BLANK: 1655671 Matrix: Solid
Associated Lab Samples: 50157354003

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
trans-1,3-Dichloropropene	mg/kg	ND	0.0050	10/26/16 03:09	
Trichloroethene	mg/kg	ND	0.0050	10/26/16 03:09	
Trichlorofluoromethane	mg/kg	ND	0.0050	10/26/16 03:09	
Vinyl acetate	mg/kg	ND	0.10	10/26/16 03:09	
Vinyl chloride	mg/kg	ND	0.0050	10/26/16 03:09	
Xylene (Total)	mg/kg	ND	0.010	10/26/16 03:09	
4-Bromofluorobenzene (S)	%.	101	65-127	10/26/16 03:09	
Dibromofluoromethane (S)	%.	103	70-128	10/26/16 03:09	
Toluene-d8 (S)	%.	99	72-139	10/26/16 03:09	

LABORATORY CONTROL SAMPLE: 1655672

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,1,1-Trichloroethane	mg/kg	.05	0.050	101	67-123	
1,1,2,2-Tetrachloroethane	mg/kg	.05	0.051	101	67-129	
1,1-Dichloroethene	mg/kg	.05	0.051	103	64-133	
1,2,4-Trimethylbenzene	mg/kg	.05	0.043	87	66-118	
1,2-Dichloropropane	mg/kg	.05	0.050	100	74-119	
Benzene	mg/kg	.05	0.049	97	72-120	
Chlorobenzene	mg/kg	.05	0.046	91	72-115	
Chloroform	mg/kg	.05	0.046	93	66-116	
cis-1,2-Dichloroethene	mg/kg	.05	0.050	100	74-115	
Ethylbenzene	mg/kg	.05	0.048	96	70-121	
Isopropylbenzene (Cumene)	mg/kg	.05	0.047	94	78-130	
Methyl-tert-butyl ether	mg/kg	.05	0.053	106	68-123	
Tetrachloroethene	mg/kg	.05	0.046	93	66-118	
Toluene	mg/kg	.05	0.046	92	68-121	
trans-1,2-Dichloroethene	mg/kg	.05	0.051	101	71-120	
Trichloroethene	mg/kg	.05	0.049	98	73-120	
Vinyl chloride	mg/kg	.05	0.053	107	54-155	
Xylene (Total)	mg/kg	.15	0.14	94	69-122	
4-Bromofluorobenzene (S)	%.			100	65-127	
Dibromofluoromethane (S)	%.			100	70-128	
Toluene-d8 (S)	%.			100	72-139	

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QUALITY CONTROL DATA

Project: LAE001
Pace Project No.: 50157354

QC Batch: 358147 Analysis Method: EPA 8082
QC Batch Method: EPA 3546 Analysis Description: 8082 GCS PCB
Associated Lab Samples: 50157354001, 50157354002

METHOD BLANK: 1655728 Matrix: Solid
Associated Lab Samples: 50157354001, 50157354002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
PCB-1016 (Aroclor 1016)	mg/kg	ND	0.10	10/26/16 19:09	
PCB-1221 (Aroclor 1221)	mg/kg	ND	0.10	10/26/16 19:09	
PCB-1232 (Aroclor 1232)	mg/kg	ND	0.10	10/26/16 19:09	
PCB-1242 (Aroclor 1242)	mg/kg	ND	0.10	10/26/16 19:09	
PCB-1248 (Aroclor 1248)	mg/kg	ND	0.10	10/26/16 19:09	
PCB-1254 (Aroclor 1254)	mg/kg	ND	0.10	10/26/16 19:09	
PCB-1260 (Aroclor 1260)	mg/kg	ND	0.10	10/26/16 19:09	
Tetrachloro-m-xylene (S)	%.	79	24-99	10/26/16 19:09	

LABORATORY CONTROL SAMPLE: 1655729

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
PCB-1016 (Aroclor 1016)	mg/kg	.16	0.15	92	40-107	
PCB-1260 (Aroclor 1260)	mg/kg	.16	0.18	107	41-110	
Tetrachloro-m-xylene (S)	%.			77	24-99	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1655730 1655731

Parameter	Units	50157353001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
PCB-1016 (Aroclor 1016)	mg/kg	ND	.16	.17	0.14	0.14	84	86	10-141	2	20	
PCB-1260 (Aroclor 1260)	mg/kg	ND	.16	.17	0.15	0.16	93	95	10-131	2	20	
Tetrachloro-m-xylene (S)	%.						81	81	24-99			

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1655732 1655733

Parameter	Units	50157353002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
PCB-1016 (Aroclor 1016)	mg/kg	ND	.17	.17	0.16	0.16	86	88	10-141	2	20	
PCB-1260 (Aroclor 1260)	mg/kg	ND	.17	.17	0.17	0.17	97	97	10-131	0	20	
Tetrachloro-m-xylene (S)	%.						81	82	24-99			

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QUALITY CONTROL DATA

Project: LAE001
Pace Project No.: 50157354

QC Batch: 358149
QC Batch Method: EPA 3546
Analysis Method: EPA 8270
Analysis Description: 8270 Solid MSSV Microwave Short Spike
Associated Lab Samples: 50157354001, 50157354002

METHOD BLANK: 1655736
Matrix: Solid
Associated Lab Samples: 50157354001, 50157354002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
2,4,5-Trichlorophenol	mg/kg	ND	0.33	10/27/16 10:35	
2,4,6-Trichlorophenol	mg/kg	ND	0.33	10/27/16 10:35	
2,4-Dichlorophenol	mg/kg	ND	0.33	10/27/16 10:35	
2,4-Dimethylphenol	mg/kg	ND	0.33	10/27/16 10:35	
2,4-Dinitrophenol	mg/kg	ND	1.6	10/27/16 10:35	
2,4-Dinitrotoluene	mg/kg	ND	0.33	10/27/16 10:35	
2,6-Dinitrotoluene	mg/kg	ND	0.33	10/27/16 10:35	
2-Chloronaphthalene	mg/kg	ND	0.33	10/27/16 10:35	
2-Chlorophenol	mg/kg	ND	0.33	10/27/16 10:35	
2-Methylnaphthalene	mg/kg	ND	0.33	10/27/16 10:35	
2-Methylphenol(o-Cresol)	mg/kg	ND	0.33	10/27/16 10:35	
3&4-Methylphenol(m&p Cresol)	mg/kg	ND	0.66	10/27/16 10:35	
4-Chloro-3-methylphenol	mg/kg	ND	0.66	10/27/16 10:35	
4-Chloroaniline	mg/kg	ND	0.66	10/27/16 10:35	
Acenaphthene	mg/kg	ND	0.33	10/27/16 10:35	
Acenaphthylene	mg/kg	ND	0.33	10/27/16 10:35	
Anthracene	mg/kg	ND	0.33	10/27/16 10:35	
Benzo(a)anthracene	mg/kg	ND	0.33	10/27/16 10:35	
Benzo(a)pyrene	mg/kg	ND	0.33	10/27/16 10:35	
Benzo(b)fluoranthene	mg/kg	ND	0.33	10/27/16 10:35	
Benzo(g,h,i)perylene	mg/kg	ND	0.33	10/27/16 10:35	
Benzo(k)fluoranthene	mg/kg	ND	0.33	10/27/16 10:35	
bis(2-Chloroethoxy)methane	mg/kg	ND	0.33	10/27/16 10:35	
bis(2-Chloroethyl) ether	mg/kg	ND	0.33	10/27/16 10:35	
bis(2-Ethylhexyl)phthalate	mg/kg	ND	0.33	10/27/16 10:35	
bis(2chloro1methylethyl) ether	mg/kg	ND	0.33	10/27/16 10:35	
Butylbenzylphthalate	mg/kg	ND	0.33	10/27/16 10:35	
Chrysene	mg/kg	ND	0.33	10/27/16 10:35	
Di-n-butylphthalate	mg/kg	ND	0.33	10/27/16 10:35	
Di-n-octylphthalate	mg/kg	ND	0.33	10/27/16 10:35	
Dibenz(a,h)anthracene	mg/kg	ND	0.33	10/27/16 10:35	
Diethylphthalate	mg/kg	ND	0.33	10/27/16 10:35	
Fluoranthene	mg/kg	ND	0.33	10/27/16 10:35	
Fluorene	mg/kg	ND	0.33	10/27/16 10:35	
Hexachlorocyclopentadiene	mg/kg	ND	0.33	10/27/16 10:35	
Hexachloroethane	mg/kg	ND	0.33	10/27/16 10:35	
Indeno(1,2,3-cd)pyrene	mg/kg	ND	0.33	10/27/16 10:35	
Isophorone	mg/kg	ND	0.33	10/27/16 10:35	
N-Nitroso-di-n-propylamine	mg/kg	ND	0.33	10/27/16 10:35	
N-Nitrosodiphenylamine	mg/kg	ND	0.33	10/27/16 10:35	
Naphthalene	mg/kg	ND	0.33	10/27/16 10:35	

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REPORT OF LABORATORY ANALYSIS

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Dublin, OH 43017
(614)486-5421

Pace Analytical Services, LLC
7726 Moller Road
Indianapolis, IN 46268
(317)228-3100

QUALITY CONTROL DATA

Project: LAE001
Pace Project No.: 50157354

METHOD BLANK: 1655736 Matrix: Solid
Associated Lab Samples: 50157354001, 50157354002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrobenzene	mg/kg	ND	0.33	10/27/16 10:35	
Phenanthrene	mg/kg	ND	0.33	10/27/16 10:35	
Phenol	mg/kg	ND	0.33	10/27/16 10:35	
Pyrene	mg/kg	ND	0.33	10/27/16 10:35	
2,4,6-Tribromophenol (S)	%.	78	18-110	10/27/16 10:35	
2-Fluorobiphenyl (S)	%.	76	22-96	10/27/16 10:35	
2-Fluorophenol (S)	%.	73	23-110	10/27/16 10:35	
Nitrobenzene-d5 (S)	%.	81	22-97	10/27/16 10:35	
p-Terphenyl-d14 (S)	%.	96	17-102	10/27/16 10:35	
Phenol-d5 (S)	%.	68	28-108	10/27/16 10:35	

LABORATORY CONTROL SAMPLE: 1655737

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
2,4-Dinitrotoluene	mg/kg	3.3	2.7	82	37-115	
2-Chlorophenol	mg/kg	3.3	2.4	71	44-100	
2-Methylnaphthalene	mg/kg	3.3	3.0	91	33-110	
4-Chloro-3-methylphenol	mg/kg	3.3	3.0	91	42-113	
Acenaphthene	mg/kg	3.3	2.5	77	44-102	
Acenaphthylene	mg/kg	3.3	2.6	79	44-102	
Anthracene	mg/kg	3.3	2.8	84	48-107	
Benzo(a)anthracene	mg/kg	3.3	2.8	84	50-105	
Benzo(a)pyrene	mg/kg	3.3	2.8	86	48-116	
Benzo(b)fluoranthene	mg/kg	3.3	2.8	84	45-114	
Benzo(g,h,i)perylene	mg/kg	3.3	2.6	78	43-112	
Benzo(k)fluoranthene	mg/kg	3.3	2.6	78	47-114	
Chrysene	mg/kg	3.3	2.7	83	49-106	
Dibenz(a,h)anthracene	mg/kg	3.3	2.7	80	44-113	
Fluoranthene	mg/kg	3.3	2.8	84	46-111	
Fluorene	mg/kg	3.3	2.6	79	45-105	
Indeno(1,2,3-cd)pyrene	mg/kg	3.3	2.6	79	45-112	
N-Nitroso-di-n-propylamine	mg/kg	3.3	2.2	67	38-95	
Naphthalene	mg/kg	3.3	2.8	84	41-94	
Phenanthrene	mg/kg	3.3	2.8	84	48-106	
Phenol	mg/kg	3.3	2.4	73	42-102	
Pyrene	mg/kg	3.3	2.6	78	49-110	
2,4,6-Tribromophenol (S)	%.			83	18-110	
2-Fluorobiphenyl (S)	%.			76	22-96	
2-Fluorophenol (S)	%.			73	23-110	
Nitrobenzene-d5 (S)	%.			82	22-97	
p-Terphenyl-d14 (S)	%.			94	17-102	
Phenol-d5 (S)	%.			70	28-108	

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QUALITY CONTROL DATA

Project: LAE001
Pace Project No.: 50157354

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1655738 1655739

Parameter	Units	50157354001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
2,4-Dinitrotoluene	mg/kg	ND	4.4	4.4	1.2	0.94	27	21	12-108	25	20	R1
2-Chlorophenol	mg/kg	ND	4.4	4.4	1.4	1.3	32	29	27-99	8	20	
2-Methylnaphthalene	mg/kg	ND	4.4	4.4	1.4	1.2	33	26	17-113	23	20	R1
4-Chloro-3-methylphenol	mg/kg	ND	4.4	4.4	1.5	1.2	33	28	24-111	16	20	
Acenaphthene	mg/kg	ND	4.4	4.4	1.1	0.91	26	20	28-96	23	20	M1,R1
Acenaphthylene	mg/kg	ND	4.4	4.4	1.0	0.82	23	18	17-109	21	20	R1
Anthracene	mg/kg	ND	4.4	4.4	0.68	0.64	15	14	23-104	6	20	M1
Benzo(a)anthracene	mg/kg	ND	4.4	4.4	0.49	0.61	11	14	16-109	23	20	M1,R1
Benzo(a)pyrene	mg/kg	ND	4.4	4.4	.37J	0.50	8	11	14-112		20	M1
Benzo(b)fluoranthene	mg/kg	ND	4.4	4.4	.41J	0.50	9	11	10-117		20	M1
Benzo(g,h,i)perylene	mg/kg	ND	4.4	4.4	.26J	.39J	6	9	10-110		20	M1
Benzo(k)fluoranthene	mg/kg	ND	4.4	4.4	.42J	0.58	10	13	18-108		20	M1
Chrysene	mg/kg	ND	4.4	4.4	0.51	0.62	11	14	23-100	19	20	M1
Dibenz(a,h)anthracene	mg/kg	ND	4.4	4.4	.31J	0.46	7	10	18-105		20	M1
Fluoranthene	mg/kg	ND	4.4	4.4	0.62	0.66	14	15	16-111	6	20	M1
Fluorene	mg/kg	ND	4.4	4.4	0.93	0.77	21	17	25-101	19	20	M1
Indeno(1,2,3-cd)pyrene	mg/kg	ND	4.4	4.4	.28J	.42J	6	9	11-107		20	M1
N-Nitroso-di-n-propylamine	mg/kg	ND	4.4	4.4	2.0	2.1	45	47	28-89	4	20	
Naphthalene	mg/kg	ND	4.4	4.4	1.5	1.2	34	27	26-95	23	20	R1
Phenanthrene	mg/kg	ND	4.4	4.4	0.74	0.69	17	16	24-105	6	20	M1
Phenol	mg/kg	ND	4.4	4.4	1.6	1.6	35	36	23-99	1	20	
Pyrene	mg/kg	ND	4.4	4.4	0.57	0.61	13	14	25-107	7	20	M1
2,4,6-Tribromophenol (S)	%.						34	26	18-110			
2-Fluorobiphenyl (S)	%.						41	30	22-96			
2-Fluorophenol (S)	%.						44	42	23-110			
Nitrobenzene-d5 (S)	%.						45	40	22-97			
p-Terphenyl-d14 (S)	%.						32	26	17-102			
Phenol-d5 (S)	%.						41	41	28-108			

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7726 Moller Road
Indianapolis, IN 46268
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QUALITY CONTROL DATA

Project: LAE001
Pace Project No.: 50157354

QC Batch: 358185
QC Batch Method: SM 2540G
Analysis Method: SM 2540G
Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 50157354001, 50157354002

SAMPLE DUPLICATE: 1655853

Parameter	Units	50156898001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	13.9	12.7	9	5	R1

SAMPLE DUPLICATE: 1655854

Parameter	Units	50157384002 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	11.0	11.5	5	5	

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QUALIFIERS

Project: LAE001
Pace Project No.: 50157354

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

C0	Result confirmed by second analysis.
C9	Common Laboratory Contaminant.
M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.
R1	RPD value was outside control limits.
RS	The RPD value in one of the constituent analytes was outside the control limits.
S1	Surrogate recovery outside laboratory control limits (confirmed by re-analysis).
S8	Surrogate recovery outside laboratory control limits due to matrix interferences (confirmed by similar results from sample re-extraction and/or re-analysis)

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METHOD CROSS REFERENCE TABLE

Project: LAE001
Pace Project No.: 50157354

Parameter	Matrix	Analytical Method	Preparation Method
6010 MET ICP	Solid	SW-846 6010B	SW-846 3050B
7471 Mercury	Solid	SW-846 7471A	SW-846 7471A
8082 GCS PCB Solids	Solid	SW-846 8082A	SW-846 3546
8260 MSV 5030 Low Level	Solid	SW-846 8260A	SW-846 5030A
8260 MSV 5035A VOA	Solid	SW-846 8260C	SW-846 5035A
8270 MSSV SHORT LIST MICROWAVE	Solid	SW-846 8270C	SW-846 3546

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: LAE001
Pace Project No.: 50157354

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
50157354001	**LAE001:BH-5:S0851005**	EPA 3546	358147	EPA 8082	358297
50157354002	**LAE001:BH-7:S035055**	EPA 3546	358147	EPA 8082	358297
50157354001	**LAE001:BH-5:S0851005**	EPA 3050	358161	EPA 6010	358845
50157354002	**LAE001:BH-7:S035055**	EPA 3050	358161	EPA 6010	358845
50157354001	**LAE001:BH-5:S0851005**	EPA 7471	358125	EPA 7471	358173
50157354002	**LAE001:BH-7:S035055**	EPA 7471	358125	EPA 7471	358173
50157354001	**LAE001:BH-5:S0851005**	EPA 3546	358149	EPA 8270	358417
50157354002	**LAE001:BH-7:S035055**	EPA 3546	358149	EPA 8270	358417
50157354001	**LAE001:BH-5:S0851005**	EPA 8260	358363		
50157354002	**LAE001:BH-7:S035055**	EPA 8260	358363		
50157354003	**LAE001:Trip:W101916**	EPA 8260	358124		
50157354001	**LAE001:BH-5:S0851005**	SM 2540G	358185		
50157354002	**LAE001:BH-7:S035055**	SM 2540G	358185		

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HULL

CHAIN OF CUSTODY RECORD

NO. 0989

Dublin, OH ☐	Indianapolis, IN ☐	Mason, OH ☐	Bedford, OH ☒	Toledo, OH ☐	St. Clairsville, OH ☐	Pittsburgh, PA ☐
6397 Emerald Pkwy	8445 Keystone Crossing	4770 Duke Dr.	4 Hemisphere Way	3401 Glendale Ave.	148 W. Main St.	Campbells Run Business Center
Suite 200	Suite 135	Suite 300	Bedford, OH 44146	Suite 300	2nd Floor	300 Business Center Dr., Suite 320
Dublin, OH 43016	Indianapolis, IN 46240	Mason, OH 45040	P: (440) 232-9945	Toledo, OH 43614	St. Clairsville, OH 43950	Pittsburgh, PA 15205
P: (614) 793-8777	P: (800) 241-7173	P: (513) 459-9677		P: (419) 385-2018	P: (800) 241-7173	P: (412) 446-0315

REPORT TO: Shawn McGee

Client: LEED CO.
Site: ICEBREAKER
Project #: LAE001 Phase:
Samplers: MIELECKI
Purchase Order #

SAMPLE MATRIX
AA-AMBIENT AIR
C-ASBESTOS
D-SEDIMENT
G-GROUNDWATER
IA-INDOOR AIR
L-LEACHATE
P-PRODUCT
S-SOIL
SG-SOIL GAS
SS-SUBSLAB VAPOR
W-WATER
X-CONCRETE

PRESERVATIVES
A-Cool only, <4 deg. C
B-HNO_3 pH<2
C-H_2SO_4 pH<2
D-NaOH pH>12
E-ZnAcetate + NaOH, pH>9
F-$Na_2S_2O_3$ (0.008%)
G-HCL pH <2
H-EDTA
I-5ml 1:1 HCL
J-none
K-Stored in dark
L-NH4Cl
M-Methanol
S-Sodium

METALS
N - Not filtered
F45u- filtered with 0.45 micron
F5u- filtered with 5 micron

ANALYSES

PRESERVATIVES: A A A A

PROJECT NO. : SAMPLE LOCATION : SAMPLE MATRIX & ID	NO. OF CONT.	SAMPLE TYPE (discrete, composite)	COLLECTION DATE/TIME	METALS	VOCs	SVOCs	PCBs & Metals	PCBs	COMMENTS
LAE001 : BH-5 : S0851005	3	D	10/19/16/14:40		X	X	X	X	-001
LAE001 : BH-7 : S0350055	3	D	10/19/16/12:43		X	X	X	X	-002
LAE001 : TRIP : W1019116	3	D	10/19/16/—		X				-003
: :			/						
: :			/						
: :			/						
: :			/						
: :			/						
: :			/						
: :			/						
: :			/						
: :			/						

50157354

RELINQUISHED BY:	DATE: 10-24-16	RECEIVED BY:	DATE: 10/24/16
	TIME: 14:45	DGA / PACE	TIME: 1445
RELINQUISHED BY:	DATE: 10/24/16	RECEIVED BY:	DATE: 10/24/16
DGA / PACE	TIME: 1445	FEDEX / PGA	TIME: 1445
RELINQUISHED BY:	DATE:	RECEIVED BY:	DATE: 10/25/16
FEDEX	TIME:		TIME: 0835

Deliver To: Pace Analytical
Method of Delivery: courier / FEDEX
Airbill Number:
Regulatory Program:
Required Limits:

COOLER TEMPERATURE AS RECEIVED 1.1 °C Rec

DISTRIBUTION: WHITE -LAB USE (MUST BE RETURNED WITH REPORT)
YELLOW -LAB USE
PINK -RETAINED BY HULL

NOTES:

TURN AROUND TIME: Standard DAYS

Sample Condition Upon Receipt

Pace Analytical

Client Name: Hunt

Project # 50157354

Courier: ☑ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace Other _____

Tracking #: 7844 4171 2543

Custody Seal on Cooler/Box Present: ☑ yes ☐ no Seals intact: ☑ yes ☐ no

Date/Time 5035A kits placed in freezer: 10/25/16 1117

Packing Material: ☐ Bubble Wrap ☑ Bubble Bags ☐ None ☐ Other _____

Thermometer 1 2 3 4 5 6 ~~A~~ B C D E F **Type of Ice:** ~~Wet~~ Blue None ☐ Samples on ice, cooling process has begun

Cooler Temperature (Initial/Corrected) 1.1/1.1 **Ice Visible in Sample Containers:** ☐ yes ☑ no

Temp should be above freezing to 6°C

Comments:

Date and Initials of person examining contents: ~~JMZ~~ 10/25/16

Are samples from West Virginia? Document any containers out of temp.	☐Yes	☑~~No~~		1.
Chain of Custody Present:	☑~~Yes~~	☐No	☐N/A	2.
Chain of Custody Filled Out:	☑~~Yes~~	☐No	☐N/A	3.
Chain of Custody Relinquished:	☑~~Yes~~	☐No	☐N/A	4.
Sampler Name & Signature on COC:	☑~~Yes~~	☐No	☐N/A	5.
Short Hold Time Analysis (<72hr):	☐Yes	☑~~No~~	☐N/A	6.
Rush Turn Around Time Requested:	☐Yes	☑~~No~~	☐N/A	7.
Containers Intact:	☑~~Yes~~	☐No	☐N/A	8.
Sample Labels match COC: -Includes date/time/ID/Analysis	☑~~Yes~~	☐No	☐N/A	9.
All containers needing acid/base pres. have been checked? exceptions: VOA, coliform, TOC, O&G All containers needing preservation are found to be in compliance with EPA recommendation (<2, >9, >12) unless otherwise noted.	☐Yes	☐No	☑~~N/A~~	10 (Circle) HNO3 H2SO4 NaOH NaOH/ZnAc
Residual Chlorine Check (SVOC 625 Pest/PCB 608)				11. Present Absent
Residual Chlorine Check (Total/Amenable/Free Cyanide)				12. Present Absent
Headspace in VOA Vials (>6mm):	☐Yes	☑~~No~~	☐N/A	13
Headspace Wisconsin Sulfide	☐Yes	☐No		14
Trip Blank Present:	☑~~Yes~~	☐No	☐N/A	15
Trip Blank Custody Seals Present	☑~~Yes~~	☑~~No~~	☐N/A	
Project Manager Review				
Samples Arrived within Hold Time:	☑~~Yes~~	☐No	☐N/A	15.
Sufficient Volume:	☑~~Yes~~	☐No	☐N/A	16.
Correct Containers Used:	☑~~Yes~~	☐No	☐N/A	17.

Client Notification/ Resolution: Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution:

Project Manager Review: T Sayer **Date:** 10/26/16

Sample Container Count

CLIENT: Kiwi

COC PAGE 1 of 1
COC ID# 0989

Project # SO157354

Sample Line Item	DG9H VG9H	AG1U	WGFU	AG0U	R Soil Kit 4/6	BP2N	BP2U	BP2S	BP3N	BP3U	BP3S	AG3S	AG1H	BP3C	BP1U	SP5T	AG2U	Matrix Sl/Wt/Ot (Soil/Water/Other)	pH <2	pH >9	pH>12
1			3															Sc			
2			3															|			
3					3													|			
4																					
5																					
6																					
7																					
8																					
9																					
10																					
11																					
12																					

Container Codes

DG9H	40mL HCL amber voa vial	AG0U	100mL unpreserved amber glass	BP1N	1 liter HNO3 plastic	DG9P	40mL TSP amber vial
AG1U	1liter unpreserved amber glass	AG1H	1 liter HCL amber glass	BP1S	1 liter H2SO4 plastic	DG9S	40mL H2SO4 amber vial
WGFU	4oz clear soil jar	AG1S	1 liter H2SO4 amber glass	BP1U	1 liter unpreserved plastic	DG9T	40mL Na Thio amber vial
R	terra core kit	AG1T	1 liter Na Thiosulfate amber glass	BP1Z	1 liter NaOH, Zn, Ac	DG9U	40mL unpreserved **amber** vial
BP2N	500mL HNO3 plastic	AG2N	500mL HNO3 amber glass	BP2A	500mL NaOH, Asc Acid plastic	SP5T	120mL Coliform Na Thiosulfate
BP2U	500mL unpreserved plastic	AG2S	500mL H2SO4 amber glass	BP2O	500mL NaOH plastic	JGFU	4oz unpreserved amber wide
BP2S	500mL H2SO4 plastic	AG2U	500mL unpreserved amber glass	BP2Z	500mL NaOH, Zn Ac	U	Summa Can
BP3N	250mL HNO3 plastic	AG3U	250mL unpreserved amber glass	AF	Air Filter	VG9H	40mL HCL clear vial
BP3U	250mL unpreserved plastic	BG1H	1 liter HCL clear glass	BP3C	250mL NaOH plastic	VG9T	40mL Na Thio. clear vial
BP3S	250mL H2SO4 plastic	BG1S	1 liter H2SO4 clear glass	BP3Z	250mL NaOH, Zn Ac plastic	VG9U	40mL unpreserved **clear** vial
AG3S	250mL H2SO4 glass amber	BG1T	1 liter Na Thiosulfate clear glass	C	Air Cassettes	VSG	Headspace septa vial & HCL
AG1S	1 liter H2SO4 amber glass	BG1U	1 liter unpreserved glass	DG9B	40mL Na Bisulfate amber vial	WGFX	4oz wide jar w/hexane wipe
BP1U	1 liter unpreserved plastic	BP1A	1 liter NaOH, Asc Acid plastic	DG9M	40mL MeOH clear vial	ZPLC	Ziploc Bag

APPENDIX E

Report of Geophysical Surveys
(prepared by Grumman Exploration, Inc.; dated October 28, 2016)

Grumman Exploration, Inc.
2309 Dorset Road
Columbus, Ohio 43221
(614) 488-7860 tel www.GrummanExploration.com

Non-destructive Subsurface Exploration
Near-surface Geophysics

October 28, 2016

Shawn McGee
Hull & Associates, Inc.
4 Hemisphere Way,
Bedford, OH 44146

RE: Report of Geophysical Surveys at the LEEDCo/CPP Icebreaker Wind Demonstration Project, 2551 N. Marginal Road, Cleveland, Ohio; GEI Project No. 01-36087

Dear Shawn:

This letter-report briefly summarizes the results and interpretations regarding the geophysical surveys performed at the LEEDCo/CPP project site. Anomalous strong EM responses were observed in a few locations within the investigation areas. These responses are believed to indicate buried metallic structures, demolition debris and/or possibly industrial fill, such as slag. The GPR results show strong reflective targets in the switchgear area what may indicate reinforced concrete structures. Further invasive exploration would be required to observe actual subsurface target conditions at this and other EM anomaly locations. Obstructions and significant sources of interference were present throughout both areas.

Project Overview

Grumman Exploration, Inc. conducted Electromagnetic (EM) induction profiling and Ground-penetrating radar (GPR) surveys on October 7, 2014 at the above referenced former Cleveland Public Power (CPP) generating station. The investigation areas consisted of two sub parcels located between the former generating station and Lake Erie, and included:

- Southwest: Proposed Switchgear Yard Area
- Northeast: Proposed HDD and 138 kV Interconnect Areas.

The investigation areas are located within an active public utility service yard area. Compacted gravel covers much of the ground surface. A 202-ft by 43-ft concrete

containment slab is located in the center of the yard. There were many obstructions and sources of electrical interference within both investigation areas, including: electrical transformers, utility boxes, debris piles, concrete vaults, a dumpster, soil and fill piles, various stored equipment, debris piles, steel superstructure and foundations related to an overhead coal loading chute and conveyors, a brick electrical building and loading dock, and areas with dense vegetation. Additionally, trial directional borings were being conducted in the HDD/Interconnect area at the same time as the geophysical investigation. Note that the originally intended geophysical investigation areas were larger than what was actually surveyed; The extensive obstructions, site activity and related complications at the time of the investigation limited the feasible survey coverage in both areas.

The yard area has a long history of industrial usage including for coal yard and material storage and as a general service yard. Because of its location on Lake Erie, it is believed that the shallow subsurface consists of 5-ft to 15-ft of fill used to raise the elevation of the former ground or lake bottom surface for the benefit of the generating station operations. According to information available to Hull & Associates, Inc., there is concern that the shallow subsurface may contain any number of complicating conditions such as former concrete structures, rip-rap, piping, foundations, demolition and concrete debris, dredge material, and industrial fill, such as slag and cinders. Little or no information is available regarding former structures, piping or fill conditions within the yard area.

Geophysical surveys using EM and/or GPR were requested to non-destructively assess subsurface conditions within the two yard areas noted above. The presence of obstructions and buried structures could affect the planned wind development project within the yard. The designated investigation areas covered the open and accessible regions within the two parcels noted above. A gridded survey approach was used over both areas, although significant obstructions and electrical interferences sources complicated the geophysical surveys. Completely inaccessible zones or areas with excessive interference included the region below the overhead coal conveyor and associated superstructure, a large portion of the concrete containment slab, and along the north, northeast and northwest edges of the yard where several large soil/fill piles and concrete vaults were located. Informal EM and GPR scans were also performed in the vicinity of a trailer within the substation west of the yard area. A narrow area outside of the site fence along the Lake Erie frontage could not be scanned because of dense vegetation, the limited working area, the extremely rough and hazardous ground surface conditions and the unlikely usefulness of the geophysical results over this area given these conditions.

Field Procedures

A single survey grid was established over the accessible, open areas spanning both investigation areas. The southernmost corner of the concrete containment slab was used as the survey grid origin (See Figures 1 and 2) and the south edge of the concrete pad was used

as the grid baseline. Note that project north differs from compass north by several tens of degrees. The field grid was established using fiberglass measuring tapes, metal pin flags and marking paint. Following the field survey, the positions of designated field grid and other site features were measured using a Trimble GeoXH hand-held GPS system with Zephyr antenna. An overlay of the Ohio-North State Plane geospatial grid is also included on Figures 1 and 2.

The survey instrumentation consisted of a GSSI GEM-300 multi-frequency electromagnetic (EM) induction profiling system. Vertical dipole quadrature phase (proportional to induction conductivity) and in-phase (metal-sensitive) measurements using a single coil alignment at three frequencies (15,030Hz and 9,810 Hz [similar to that used by the Geonics, Ltd. EM-31] and 4,410 Hz) were recorded electronically at each grid location. The gridded EM survey was limited to the open, accessible portions of the southern, eastern and western regions of the site. The transect spacing was 5-ft and the in-line measurement interval was ~2.2-ft. A "continuous survey" mode was used. In this survey mode, data are acquired at a fixed time interval while the operator walks along a survey line at a steady pace. Regularly spaced reference marks were incorporated into the data during acquisition to "fix" the measurement locations. Subsequently a computer program was used to adjust the station positions with respect to the coordinate system being used.

Following the survey, the data were downloaded onto a laptop computer and prepared for contouring. The EM data were contoured using a commercially available program (Surfer, Golden Software, Inc.). The conductivity readings are reported as relative units in terms of milli-Siemens/meter (mS/m) and the in-phase in parts-per-million (ppm). The conductivity measurements are considered relative since no actual calibration location was available on site to verify these measurements. The in-phase response is also a relative measurement and generally should be close to zero when not in the vicinity of highly conductive or metallic objects.

GPR scans were also performed in targeted areas of the site, and mainly over anomalous EM targets and in the northern sector of the east parcel. The GPR system used was a GSSI SIR-3000 in conjunction with a 270 MHz dipole antenna. This antenna was selected for its greater depth penetration compared to that of the 400 MHz antenna. The first field task involved equipment setup and the completion of several test scans to observe the GPR response and to adjust the data acquisition parameters. A survey wheel was used to acquire distance-based data at the density of approximately 10.0 GPR traces per foot. GPR scans were performed along 5-ft spaced east-west and north-south transects in both investigation areas as access and ground surface conditions allowed. The time window used was 80 nanoseconds (ns) and band-pass filters were applied to reduce extraneous interference. Preliminary interpretations regarding the possible presence of excavations and anomalous buried structures and objects were made as the GPR data were acquired. The data were

recorded electronically on an internal hard disk in the field and later transferred to a desktop PC computer and computer workstation for subsequent processing, display and analysis.

The correspondence between 2-way travel time and actual subsurface depth is determined by the dielectric permittivity of the subsurface. Low permittivity materials allow reduced signal attenuation and greater depth penetration, and vice versa. However, because the permittivity of the subsurface fill materials on site could not be estimated, no depth correspondence can be provided on the GPR records. Consequently, the vertical axis on the GPR records (Figure 3 and 4) are shown in terms of 2-way travel time. In general, the maximum attainable exploration depth at this site is believed to have been on the order of 4-ft to 5-ft, although the actual signal penetration could be greater or lower depending on the actual electrical properties of the fill on site.

Results and Interpretations

Figures 1 and 2 show the contoured EM conductivity and in-phase (metal sensitive) survey results superimposed on a site diagram, respectively. Figures 3 and 4 presents selected GPR transects from the two investigation areas that illustrate various subsurface targets and conditions of interest.

In general, the EM and GPR results show only a handful of clearly anomalous responses in the accessible areas that could be scanned. No clear indication of buried piping, foundations or large buried building structures were observed in either the EM or GPR responses. This does not imply that no buried structures are present – for GPR, it is possible that buried structures, such as pipes, are present beyond the maximum attainable exploration depth. The EM results were largely inconclusive in the close proximity (<8-ft +/-) to large metallic objects and structures, including metal transformers, equipment and debris. As a result, the lateral extent of some of the observed strong EM responses was difficult to map, particularly below the concrete pad and in the vicinity of the overhead conveyor/coal chute area. The exploration depth for the EM induction profiler is believed to be on the order of 15-ft, however, the EM results cannot provide any depth information about the anomalous targets that were detected.

A moderate depth reflective surface was detected on many of the GPR scans in both investigation areas (e.g. Figure 3). This intermediate depth surface may represent a former ground, pavement or fill surface below several feet of fill. The actual depth to this surface is not known, although it would appear to range from 1-ft to 3-ft below the existing ground level. The GPR scans showed moderate to strong signal attenuation effects, which is consistent with the presence of highly conductive fill such as wet clay, slag, cinders, elevated salt content, rubble debris etc. With the elevated GPR signal attenuation comes reduced signal penetration into the subsurface. The maximum GPR exploration depth is believed to be in the range of 4-ft to 5-ft at this site, and could have been less depending on actual ground

surface and fill conditions. As such, it is possible that some targets of interest, including pipes, foundations, former structures and other conditions of interest may be undetectable to GPR if they are buried beyond the attainable exploration depth at this site.

Specific targets or conditions of interest in the two investigation areas are summarized in the following paragraphs.

Southwest: Switchgear Yard Area
Anomalous EM in-phase and GPR responses were noted in three general locations within the switchgear yard area, including:

- 0-ft to 15-ft N/ 20-ft to 30-ft+ W: west of concrete pad (Figure 2). Possible interpretations of this zone include a more deeply buried reinforced concrete pad, metal equipment or a concentration of metallic debris. There was no corresponding EM conductivity response over this target which may indicate that the target is metallic. GPR scans over the EM anomaly show no clear indication of a buried structure, although the cause of the EM response may be too deep to detect using GPR.

- 20-ft to 45-ft W/ 5-ft to 40-ft N: west-central end of the concrete containment pad
  Erratic strong EM in-phase responses were observed between the obstructions on the pad. Some of the strong EM responses may be interference effects caused by nearby metallic obstructions. GPR scans over the southern portion of this area (Figure 3) show strong reflective objects or structures buried a few feet below the slab surface. It is not clear what the reflective objects are and the lateral extent of this area and outline of the targets could not be determined because of the limited working area. A possible explanation is that the targets are large fragments of reinforced concrete or stone (e.g. rip-rap). Deeper, chaotic GPR reflections were observed over the reflective targets which may indicate coarse demolition debris.

- 10-ft to 50-ft E/ 25-ft to 40-ft S: west of brick building
  Anomalous strong reflective surfaces were observed in the shallow subsurface region west of the brick building. No corresponding EM responses were noted over this region. The reflective targets appears to be on the order of 1-ft to 2-ft below the ground surface. These reflective surfaces may indicate large fragments of concrete debris, former foundations, former support structures/flooring, or large pieces of stone.

Further invasive exploration in these locations would be required to document the cause(s) of the anomalous responses.

Northeast: HDD and 138 kV Interconnect Area
Relatively few anomalous EM or GPR responses were observed within the HDD & Interconnect areas, although large portions of this area were obstructed and could not be scanned. The significant observations from this area include:

140-ft to 175-ft E/10-ft to 20-ft S: Vicinity of dumpster, south of containment pad
An anomalous strong EM in-phase response was observed in the driveway area. No corresponding EM conductivity response was observed over this area. Possible explanations for this response include a more deeply buried reinforced concrete pad or other metallic structure. It is also considered possible that the response is an interference effect caused by the nearby dumpster and other metallic equipment. No indication of a reflective target was noted on GPR scans over this target (Figure 4).

180-ft to 250-ft E/35-ft to 90-ft N: far northeast (northern) corner of service yard
Strong EM conductivity and strong, negative EM in-phase responses were observed across the northeast corner of the HDD/Interconnect area. A strong negative EM in-phase response is often observed over regions with deeper, highly conductive industrial fill such as slag, cinders, or fill material with elevated iron or salt content. These types of materials are commonly observed throughout the Cleveland metro area. The increasingly negative response moving to the northeast may indicate that the highly conductive fill increases in thickness or concentration moving toward Lake Erie. No anomalous GPR responses were noted over this area, however the possible highly conductive fill would tend to severely reduce the effective GPR exploration depth over this area.

General Qualifications
The use of geophysical exploration methods, such as those described herein, should not be considered a substitute for invasive subsurface exploration such as drilling, digging or excavation. The EM and GPR data are interpreted. No warranty or statement of fact regarding actual subsurface conditions is contained herein. If questions or uncertainties exist regarding the interpreted presence or absence of subsurface conditions based on the geophysical data obtained from this site, it is recommended that supplemental subsurface explorations, such as drilling or test-pit explorations, be conducted if possible to further characterize and document actual subsurface conditions. No interpretation of subsurface conditions can be provided for obstructed or inaccessible areas on site.

Grumman Exploration, Inc. has appreciated this opportunity to be of service again to Hull & Associates, Inc. If you have any questions or comments regarding this report, please feel free to contact us.

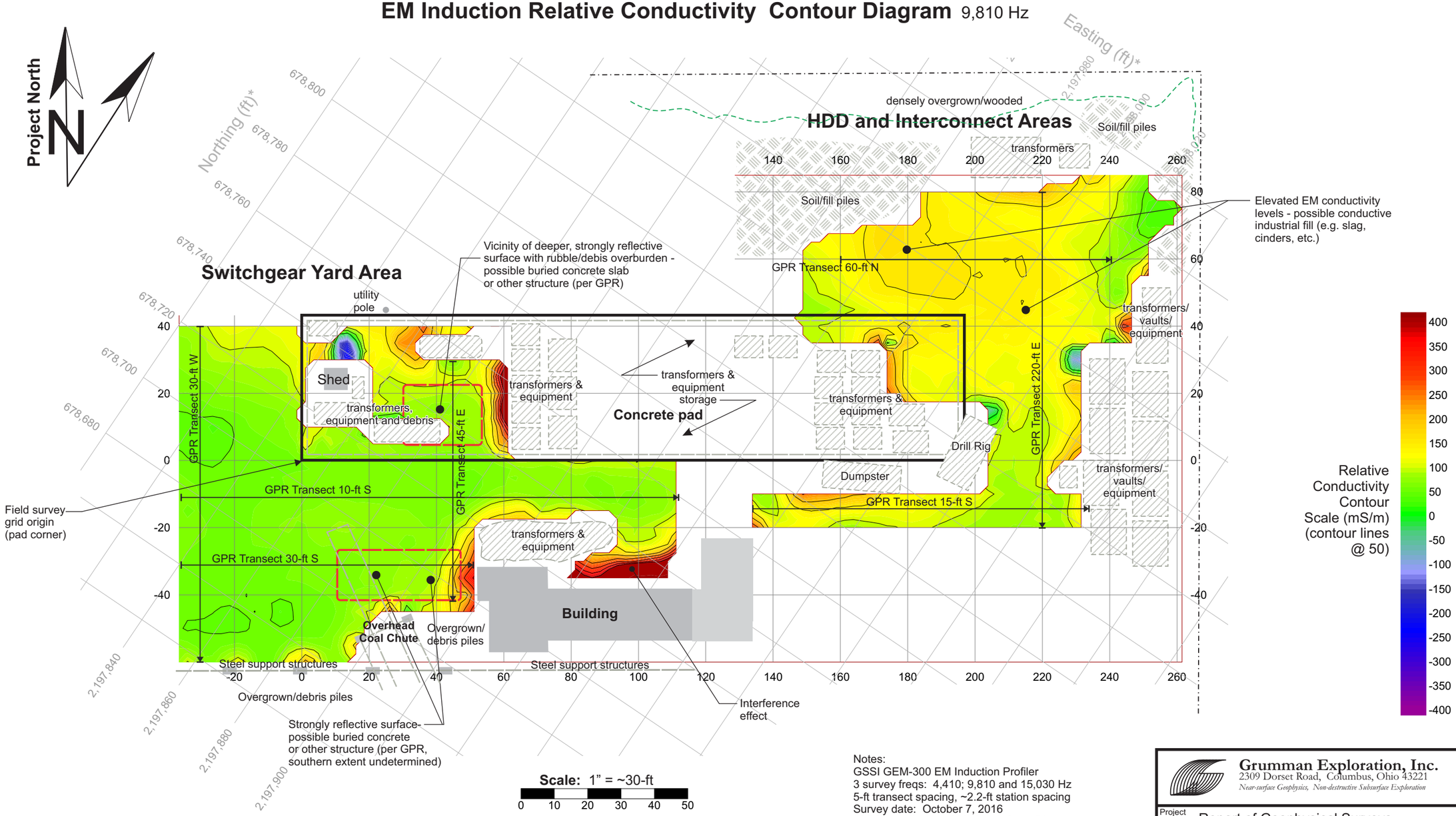
Sincerely,

Grumman Exploration, Inc.

David L. Grumman, Jr.
President/Geophysicist

Attachments:
Figures 1-4
Overview and Limitations of EM and GPR

EM Induction Relative Conductivity Contour Diagram 9,810 Hz



Scale: 1" = ~30-ft

0 10 20 30 40 50

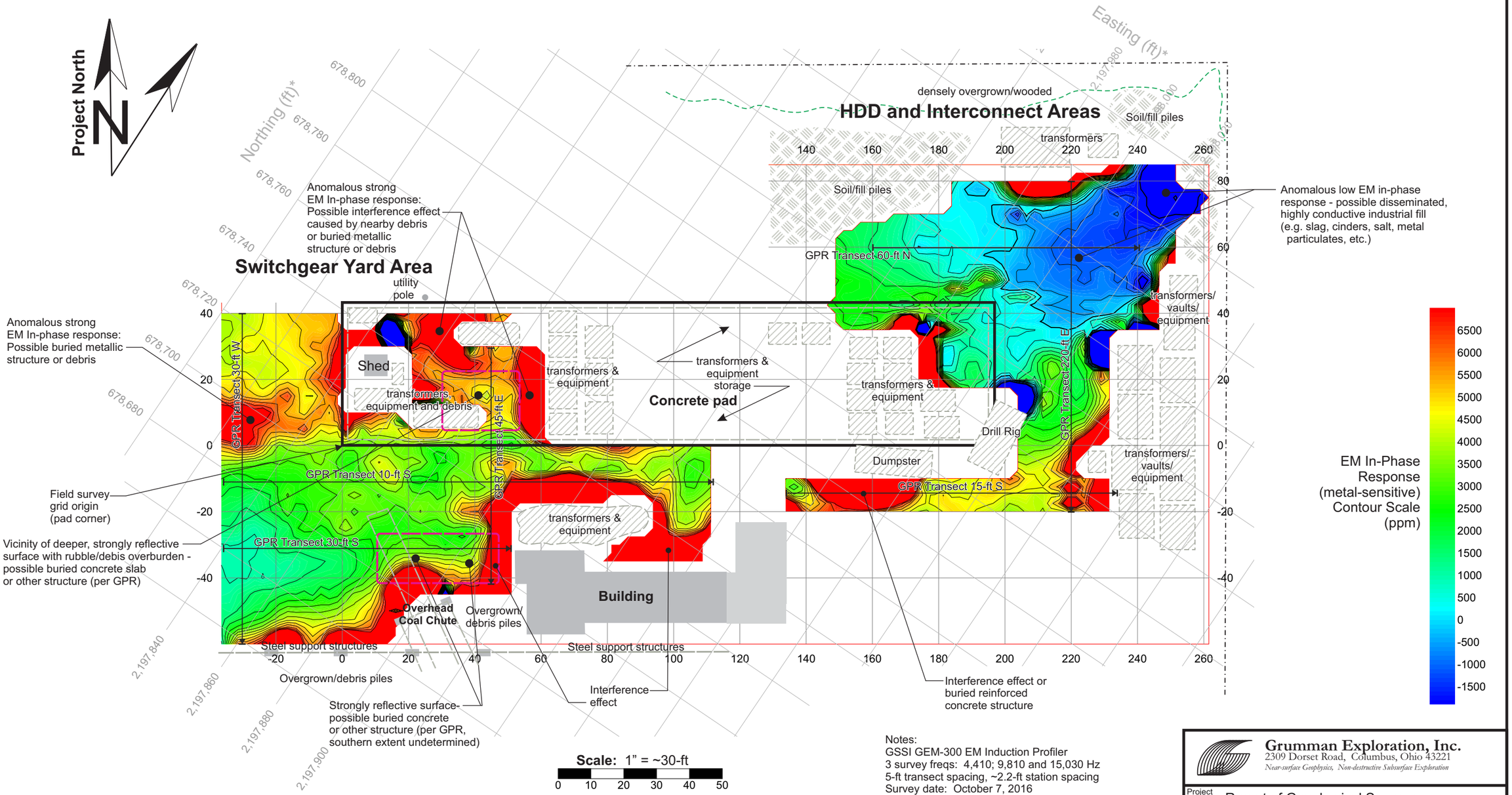
Notes:
GSSI GEM-300 EM Induction Profiler
3 survey freqs: 4,410; 9,810 and 15,030 Hz
5-ft transect spacing, ~2.2-ft station spacing
Survey date: October 7, 2016
*GPS coordinates Ohio North State Plane system (per Trimble GeoXH GPS)
Locations of site and interpreted features are approximate.

Grumman Exploration, Inc.
2309 Dorset Road, Columbus, Ohio 43221
Near-surface Geophysics, Non-destructive Subsurface Exploration

Project: Report of Geophysical Surveys			
Location: LEEDCo/CPP Site, Cleveland, Ohio			
Client: Hull & Associates	By: dlg	Date: 10/24/16	
Project No.: 01-36087	Checked:	Scale: 1"=30-ft	

Figure	Title
1	HDD, Interconnect & Switchgear Areas: EM Induction Relative Conductivity Contour Diagram - 9,810 Hz

EM Induction In-Phase Response (metal-sensitive) Contour Diagram 9,810 Hz



Scale: 1" = ~30-ft

0 10 20 30 40 50

Notes:
GSSI GEM-300 EM Induction Profiler
3 survey freqs: 4,410; 9,810 and 15,030 Hz
5-ft transect spacing, ~2.2-ft station spacing
Survey date: October 7, 2016
*GPS coordinates Ohio North State Plane system (per Trimble GeoXH GPS)
Locations of site and interpreted features are approximate.

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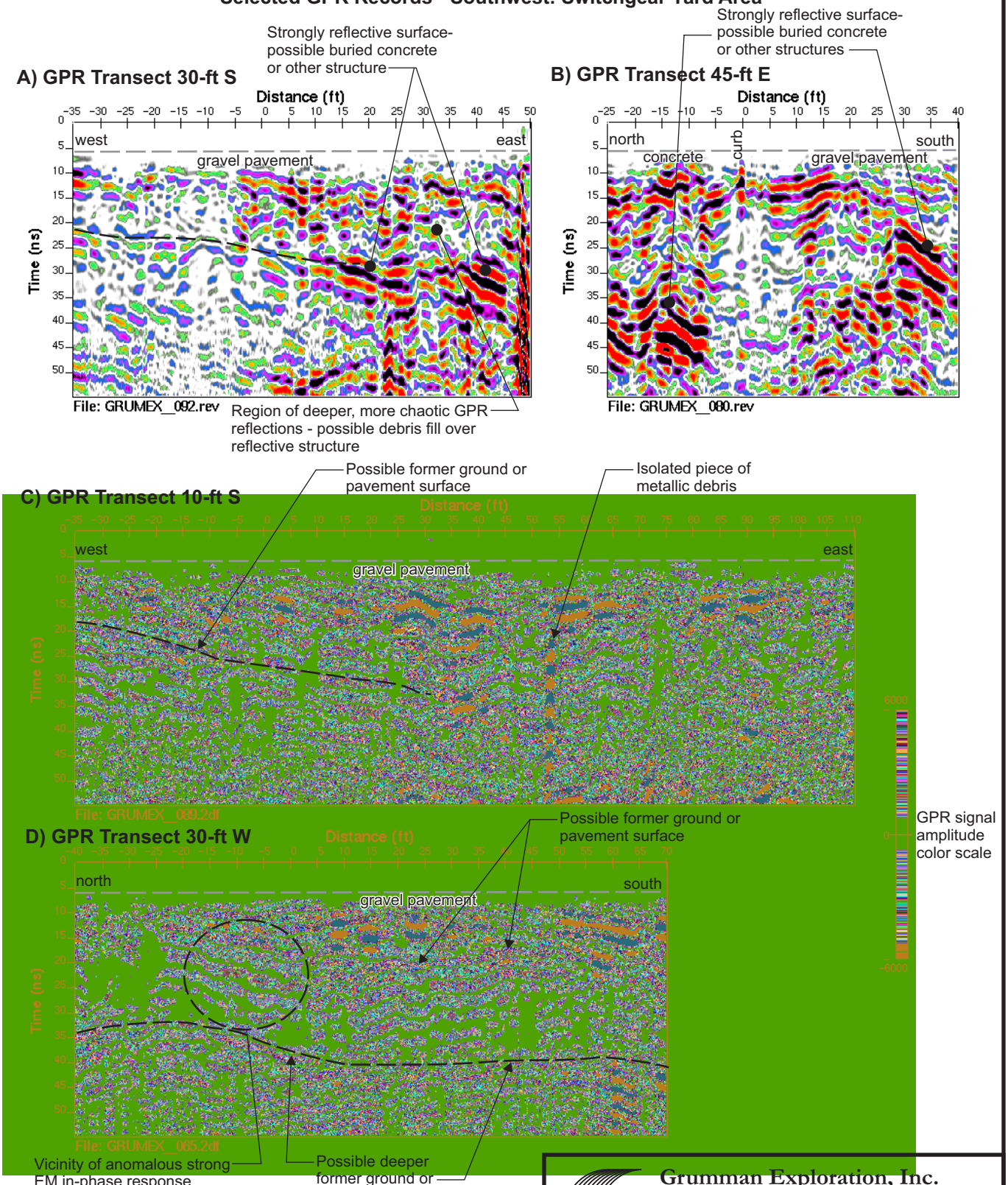
Client: Hull & Associates	By: dlg	Date: 10/24/16	
Project No.: 01-36087	Checked:	Scale: 1"=30-ft	

Figure	Title
2	HDD, Interconnect & Switchgear Areas: EM Induction In-Phase Response (metal-sensitive) Contour Diagram - 9,810 Hz

Selected GPR Records - Southwest: Switchgear Yard Area



Notes:
GSSI SIR-3000 w/ 270 MHZ antenna GPR system
512 samples/trace; ~10 traces/ft;
5-ft transect interval, N-S & E-W
Survey date: October 7, 2016
Refer to Figure 1 or 2 for GPR transect locations

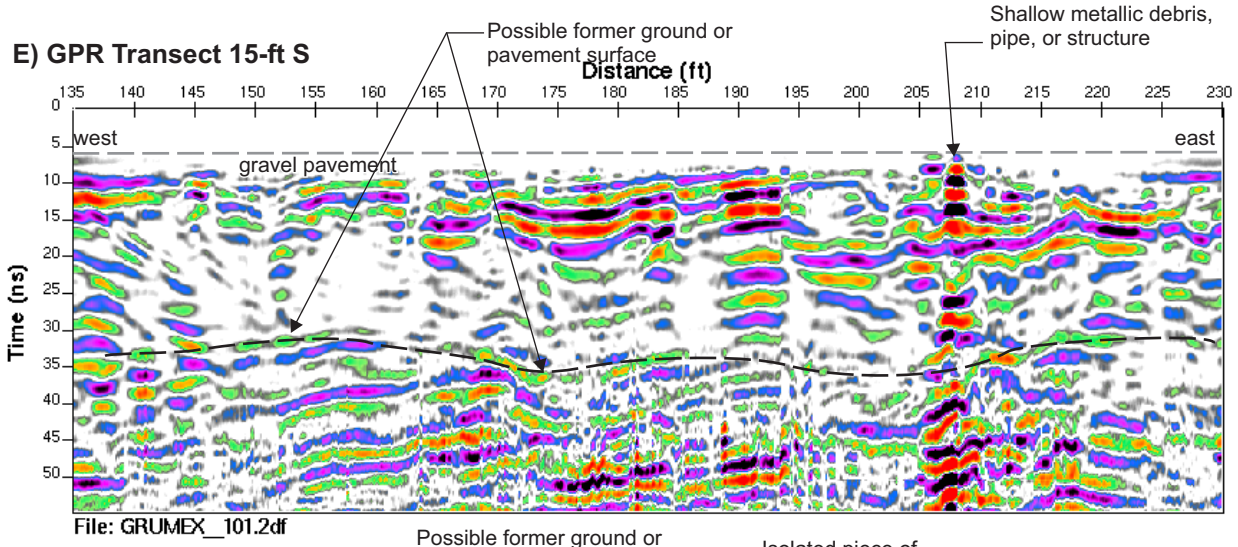
Figure	3
Title	Selected GPR Records - Switchgear Yard

Grumman Exploration, Inc.
2309 Dorset Road, Columbus, Ohio 43221
Near-surface Geophysics, Non-destructive Subsurface Exploration

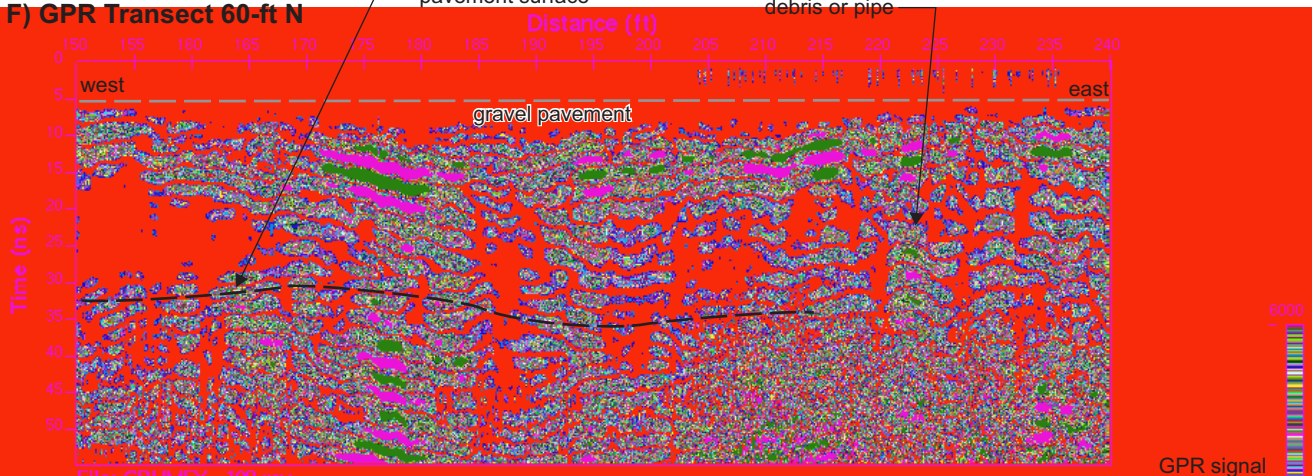
Project	Report of Geophysical Investigations		
Location	LEEDCo/CPP Site, Cleveland, Ohio		
Client	Hull & Associates	By: dlg	Date: 10/26/16
Project No.	01-36087	Checked	Scale: as shown

Selected GPR Records - Northeast: HDD & Interconnect Areas

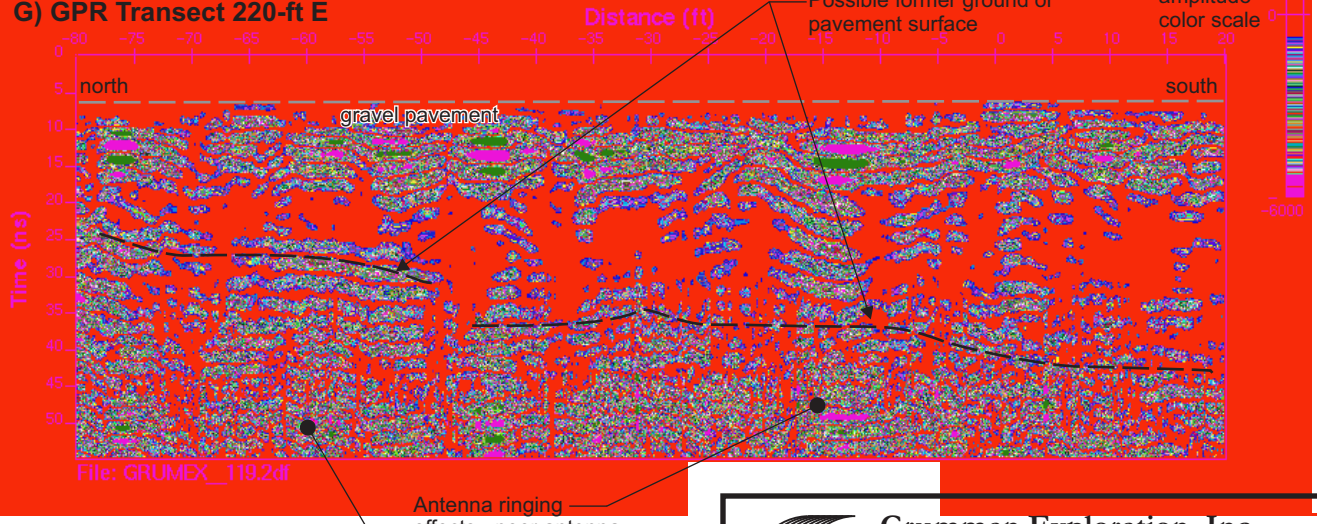
E) GPR Transect 15-ft S



F) GPR Transect 60-ft N



G) GPR Transect 220-ft E



Notes:
GSSI SIR-3000 w/ 270 MHZ antenna GPR system
512 samples/trace; ~10 traces/ft;
5-ft transect interval, N-S & E-W
Survey date: October 7, 2016
Refer to Figure 1 or 2 for GPR transect locations

Grumman Exploration, Inc.
2309 Dorset Road, Columbus, Ohio 43221
Near-surface Geophysics, Non-destructive Subsurface Exploration

Project	Report of Geophysical Investigations		
Location	LEEDCo/CPP Site, Cleveland, Ohio		
Client: Hull & Associates		By: dlg	Date: 10/26/16
Project No.: 01-36087		Checked	Scale: as shown

Figure	4
Title	Selected GPR Records - HDD & Intercon.

Case No. 16-1871-EL-BGN

Icebreaker Windpower Inc.

Application-Part 10 of 13

- Exhibit Y. Inadvertent Return Contingency Plan

Icebreaker Windpower Inc.
Icebreaker Wind
Preliminary Inadvertent Return Contingency Plan
January 19, 2017

This Preliminary Inadvertent Return Contingency Plan (Plan) describes the procedures Icebreaker Windpower Inc. and its contractor will implement to avoid, minimize and remediate potential environmental impacts that could result from an inadvertent return of drilling fluids during horizontal directional drilling (HDD) operations associated with the proposed Icebreaker Wind project.

The Plan includes the following components:

(1) Project Description;

(2) Horizontal Directional Drilling Design;

(3) Drilling Fluids;

(4) Monitoring;

(5) Notification Procedures; and

(6) Containment and Remediation.

This preliminary Plan is a template to provide minimum requirements for a site-specific plan to be developed by the HDD contractor once that contractor has been selected. Copies of the final site-specific plan will be provided to interested state and federal regulatory agencies prior to commencement of HDD operations.

Project Description

Construction of the proposed approximately 21 megawatt offshore wind facility consists of:

- Six wind turbines in Lake Erie, approximately 8-10 miles offshore of Cleveland.
- Buried and shielded submarine cables including a fiber optic communications cable interconnecting the turbines (inter-array cables), in total approximately 2.8 miles
- One approximately 9-mile-long buried and shielded submarine cable, including a fiber optic communications cable (export cable) connecting the demonstration project to the new Project Substation located at the existing Cleveland Public Power (CPP) Lake Road Substation in Cleveland, Ohio
- Installation of equipment including a Project Substation at the CPP Lake Road Substation in Cleveland, Ohio to accept power from the Proposed Project
- Approximately 150 feet of new, pole supported, overhead transmission line to transmit electricity from the new Project Substation to the existing CPP Lake Road Substation

The proposed export cable would be brought ashore entirely under the Cleveland Harbor and the breakwater through a duct installed using HDD. Entry/exit points for the HDD would be located at the CPP Lake Road Substation and approximately 3,700 feet offshore. A drawback machine or similar would be used to drill an approximately 30 cm (11.8 inch) diameter bore. The bore would be lined with High-Density Polyethylene conduit or other commonly used lining material.

Horizontal Directional Drilling Design

For a successful HDD and to minimize the potential for an inadvertent return, a site-specific investigation and detailed design of the drill bore is needed.

Subsurface Conditions

Geotechnical investigations have been completed by Icebreaker Windpower Inc. and its contractor to identify subsurface conditions along the proposed HDD path.

Drill Design and Drilling Procedures

Based on the geotechnical investigations, Icebreaker Windpower Inc.'s HDD contractor will develop detailed HDD design plans and procedures identifying the optimal location, depth and methodology for the drill. It is anticipated that these plans will be finalized by the end of 2017.

Drilling Fluids

HDD operations will use drilling fluids to stabilize the bore hole and to lubricate the drilling process. Drilling fluids would be used that are biocompatible with freshwater. The detailed HDD design plan will include the specifications for the chosen drilling fluids. During HDD operations, an inadvertent return of drilling fluids may occur when the drilling fluids follow a path of least resistance through the overburden to the surface (land or water). Some minimal losses of drilling fluids can be expected within the subsurface materials voids or sediments; typically, these losses do not reach the surface.

Additives

Drilling fluids consist of water, bentonite clay and additives. The specific design mix for the drilling fluid depends on site-specific conditions and the drill design (variables may include a water softener, viscosities, filtration control additives, or torque reduction). Since the fluids largely consist of bentonite clay-water mix, they are generally considered non-toxic. Material Safety Data Sheets for fluid additives will be provided in the final site-specific plan.

Disposal

Drilling fluids will be recycled or disposed of at an approved disposal facility according to regulatory requirements. Recovered materials may be collected in containers for temporary storage prior to removal from the site. Qualified disposal facilities will be identified in the final site-specific plan.

Monitoring

Drilling activities will be monitored throughout the HDD operation to determine if an inadvertent release is occurring. Monitoring fluid volumes (circulation), fluid pressures, penetration rates, and fluid viscosity will help minimize the potential for a release and identify releases or potential releases. Specific monitoring protocols based on the HDD design and procedures will be identified in the final site-specific plan.

Visual monitoring will occur on land and in water at set distance intervals along the drilling path. A log will be kept to include the inspector, time of monitoring event and observations. Visual monitoring frequency will be increased if a significant loss of fluids is suspected.

Notification Procedures

The intent of notification procedure is to notify the appropriate agencies when a release occurs according to regulatory requirements. Specific agency personnel, contact information and timeframes will be provided in the final site-specific plan. Agencies to be notified include but are not limited to:

- U.S. Army Corps of Engineers Buffalo District
- U.S. Department of Energy
- Ohio Power Siting Board

- Ohio Environmental Protection Agency
- Ohio Department of Natural Resources

Containment and Remediation

In the event of an inadvertent return, measures will be implemented to control, contain and clean up the release of drilling fluid and the affected area. Site-specific measures will be refined by Icebreaker Windpower Inc.'s HDD contractor as the HDD design is completed and included in the final site-specific plan. The following measures provide a minimum guideline.

- Reduce or suspend drilling activities to determine the extent of the release and implement corrective actions;
- Attempt to seal off the release to the surface from the borehole using approved loss circulation materials;
- Pull back the drill string allowing the fluids in the fracture to solidify;
- Determine the cause of the release and implement measures to minimize reoccurrence, such as adjusting fluid viscosity;
- Containment equipment will be on site during HDD operations;
- Depending on the amount of fluid released on land the area may be swept, shoveled, or mixed with sand and temporarily left in place to dry prior to proper disposal of the material. Appropriate erosion and sediment control measures will be used as needed to prevent drilling fluid from entering the lake or other resources; and,
- The HDD contractor will ensure that appropriate personnel will be available to assist in the containment and cleanup effort that may be necessary within the lake.

The contractor will also use environmentally responsible work practices and methods including the best management practices associated with spill prevention and containment and storm water pollution and prevention.

Case No. 16-1871-EL-BGN

Icebreaker Windpower Inc.

Application-Part 10 of 13

- Exhibit Z. LimnoTech EMF Memorandum

LimnoTech
Water Environment | Scientists Engineers

501 Avis Drive
Ann Arbor, MI 48108
734.332.1200
www.limno.com

Memorandum

From: Ed Verhamme
Jen Daley, PhD
Greg Peterson

Date: June 29, 2016

Project: LEEDCo

To: Scudder Mackey, PhD, ODNR
Jennifer Norris, ODNR
Jeff Tyson, ODNR

CC: Stuart Siegfried, OPSB
Grant Zeto, OPSB

SUBJECT: Summary of Current Information Related to Electromagnetic Field Impacts on Fish and LEEDCo Proposed Transmission Cable.

Introduction

The Lake Erie Energy Development Corporation (LEEDCo) is proposing to develop the first offshore freshwater wind project in the Great Lakes – planned to be located in Lake Erie offshore of Cleveland. As part of the project, an eight mile long, three-phase, 34.5kV, AC transmission cable will be buried below the sediment surface along the bottom of Lake Erie to transmit electricity from the turbines to the mainland transformer station. During recent discussions regarding the LEEDCo project, the Ohio Department of Natural Resources (ODNR) expressed an interest in the potential impacts of the electric transmission cable on fish in the project area; particularly with respect to electromagnetic field (EMF) impacts. In addition, the ODNR Aquatic Sampling Protocol for Offshore Wind Development requires acoustic telemetry studies to monitor fish behavior and the ODNR has suggested that LEEDCo's study should also include monitoring near the transmission line to evaluate its effects on fish behavior. This memorandum is intended to summarize current research and information regarding the impact of EMFs on fish and provide our assessment of the likely impact to fish in the vicinity of the proposed transmission line. Based on the current research and existing EMF fish impact studies that have been done in the Great Lakes, the expected EMF to be generated by the LEEDCo electric transmission line will not have an adverse impact on fish behavior and habitat.

Background

When considering the impact of submarine cables on aquatic environments there are two major concerns –the electric field and the magnetic field. The electric field is produced by stationary charges, and the magnetic field is produced by moving charges (currents). Both of these issues are described in more detail below.

Electric Field Impacts

Electric fields are caused by electric charges and are associated with the positive and negative electrons in the cable conductors. The electric field impacts are not a concern for the LEEDCo project because the cable conductors are shielded and jacketed with an insulator, which is designed to virtually eliminate any electric field losses outside the cable, thus maximizing the power delivered by the cable to its final destination on shore (Hampton et al., 2007). In addition, the electric field effects of electric transmission cables should not be confused with electric barrier/deterrent system designs. For example, large fish deterrents/barriers, such as those used at the Chicago Ship Canal, are electrical systems designed to transfer as much energy into the water as possible, using exposed bare electrodes in the water to be effective as a fish deterrent. The impact on fish habitat and behavior from electric transmission lines is not comparable to the impact from electric deterrent systems; one system is designed to transfer as much energy as possible into the water, while the other, as is the case for the LEEDCo project, is designed to prevent as much of this energy loss as possible. More information on the Chicago Ship Canal electric barrier can be found at http://www.lrc.usace.army.mil/Missions/CivilWorksProjects/ANSPortal/Barrier.aspx.

Magnetic Field Impacts

The primary concern with submarine cables is the magnetic field that develops around the cable. A magnetic field cannot be contained by the cable shielding and can travel through sediment and water, to some degree. However, studies conducted on magnetic fields created by submarine transmission lines indicate that the magnetic fields are similar to background levels and decrease exponentially with distance from the transmission line. As summarized in Figure 1, Cada et al. (2011, 2012) found that even at 1 meter from the cable, the EMF levels were near background levels (50 micro tesla units (μT)). In a personal communication with Verdant Power Inc., the researchers found that three additional Verdant alternative energy projects had underwater transmission cables that were estimated to generate magnetic fields ranging from 20-100 micro tesla units (μT), one meter away from the surface of the cables. For context, the naturally occurring earth magnetic field is approximately 50 μT in the United States (Bochert and Zettler 2004, Normandeau et al., 2011). Normandeau et al. (2011) evaluated 10 alternating current (AC) projects with standard cable specifications in marine environments. Of the 10 projects the maximum magnetic field at the seabed was estimated to be 18 micro tesla units (μT). The average estimated magnetic field at the seabed for all 10 projects evaluated was found to be 7.8 μT, well below the naturally occurring earth magnetic field. For comparison purposes and as discussed below, the estimated magnetic field from the proposed LEEDCo transmission cable, at 1 meter from the cable, is approximately 2 μT (See Figure 1). Therefore, the estimated magnetic field from the LEEDCo transmission line is much less than background levels and the average magnetic fields measured for other underwater transmission line projects.

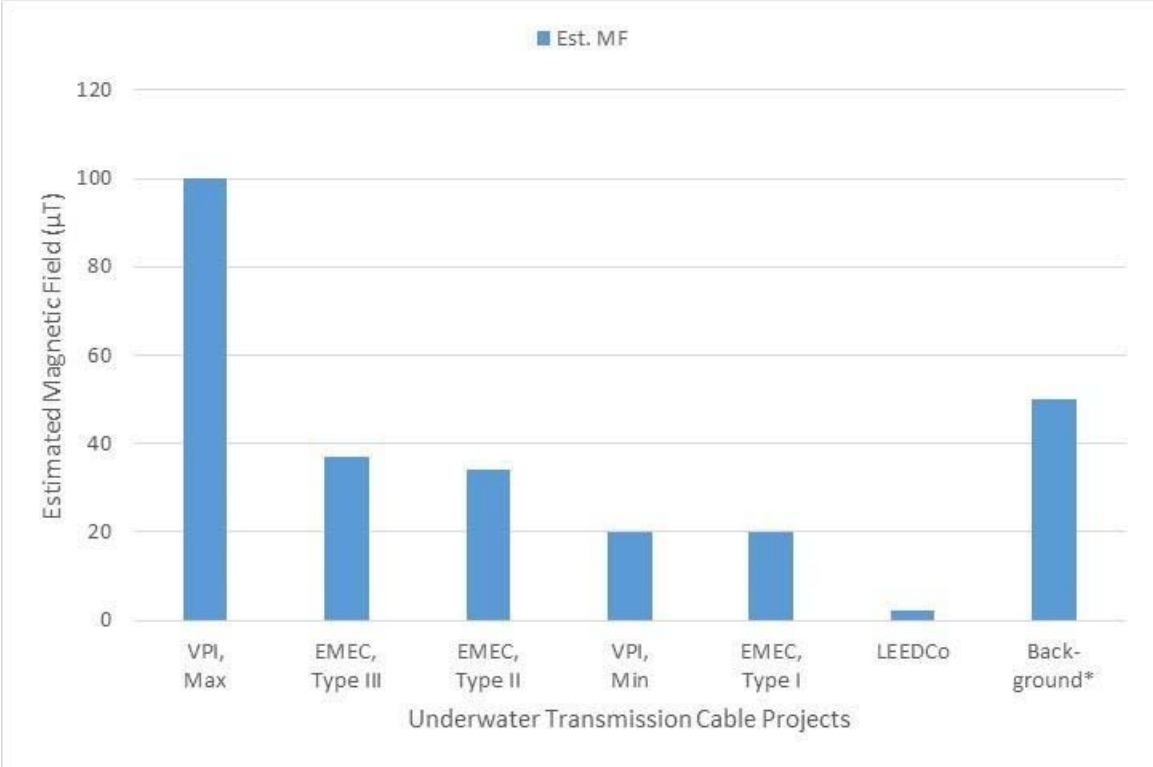


Figure 1. EMF levels for various underwater transmission cable projects (VPI and EMEC) are summarized in Cada et al. (2012). Note for comparison purposes, the insertion of the estimated LEEDCo transmission line EMF at 1m above the buried cable (JDR, 2013) and the inclusion of the naturally occurring earth magnetic field (*) as background.

In addition to demonstrating that the magnetic fields generated by transmission lines are small relative to background, research has also shown that the strength of magnetic field decreased exponentially with distance from the cable center and that burying the cable(s) further diminishes the impacts of magnetic fields (Bevelhimer et al. 2013). For example, a study by Cada et al. (2011, 2012) at the Oak Ridge National Laboratory, found that the strength of the magnetic field decreased as a function of the distance from the source. Based on their calculations, the researchers also found that the strength of the magnetic field decreased exponentially as the distance from the electric transmission cable increased. Using a similar method, Cada et al. (2011) estimated expected magnetic fields based on electric transmission cable characteristics. As part of their experiment, Cada et al. measured the magnetic field at the source of the magnetic field and at several locations away from the source. Even when operating the electromagnet at maximum strength (165,780 μT), they found that the strength of the magnetic field returned to background levels (~100-200 μT) 11 inches away from the source of the field. Preliminary results from ongoing research on in situ cables have corroborated the conclusion that transmission line generated, magnetic fields diminish significantly with distance to near background levels (Bull, 2015; Thomsen,2015).

LEEDCo Transmission Cable

Figure 2. Example LEEDCo cable cross section

The electric transmission cable specifications chosen by LEEDCo operate at a voltage of 34.5kV, AC, and the cable is made with crosslinked polyethelene (XLPE) insulation. The cable has three inner conductors, and an outer armored steel jacket (Figure 2). For the LEEDCo pilot project the cable will carry a maximum load of 20.7MW (3.45 MW per turbine). This translates to a current of 345 amps. The cable has an approximate total diameter of 100 mm (~4"). The cable will be buried below the surface using a cut and fill approach. Crosslinked polyethylene (XLPE) has become the globally preferred insulation for power cables, both for distribution and transmission system applications. Semiconducting screens are extruded over the three individual conductors and the insulation outer surface to maintain a uniform electric field, and to contain the electric field entirely within the cable jacket (Hampton et al., 2007). The construction of the electric transmission cable for the LEEDCo project is intended to reduce or eliminate any electric field losses outside the jacket of the cable. Any electric fields that escape the jacket decrease the efficiency of the cable and therefore, decrease the amount of power delivered by the cable to its final destination onshore. The proposed LEEDCo cable was specifically chosen to reduce or eliminate electric field losses, and thus reduce or eliminate effects of the electric field to surrounding biota or habitats.

Although a manufacturer has not been chosen, the magnetic field generated by the line is governed by the voltage and current of the transmission cable and not the cable design. Calculation of the estimated magnetic field from the LEEDCo cable was done by one of the transmission cable contractors, JDR Cable Systems in 2013 (JDR, 2013). A maximum magnetic field density of 2 μT was calculated for a load of 379 amps at a distance of 1 meter from the cable center. Note that this calculation was carried out at a slightly higher amperage than the LEEDCo proposed 345 amps. Even at 0.5m above the cable the magnetic field strength is only 8.5 μT, which is considerably less than the earth's magnetic field strength (~50 μT). An estimate of the magnetic field strength at various distances from the cable center is shown below is Figure 3.

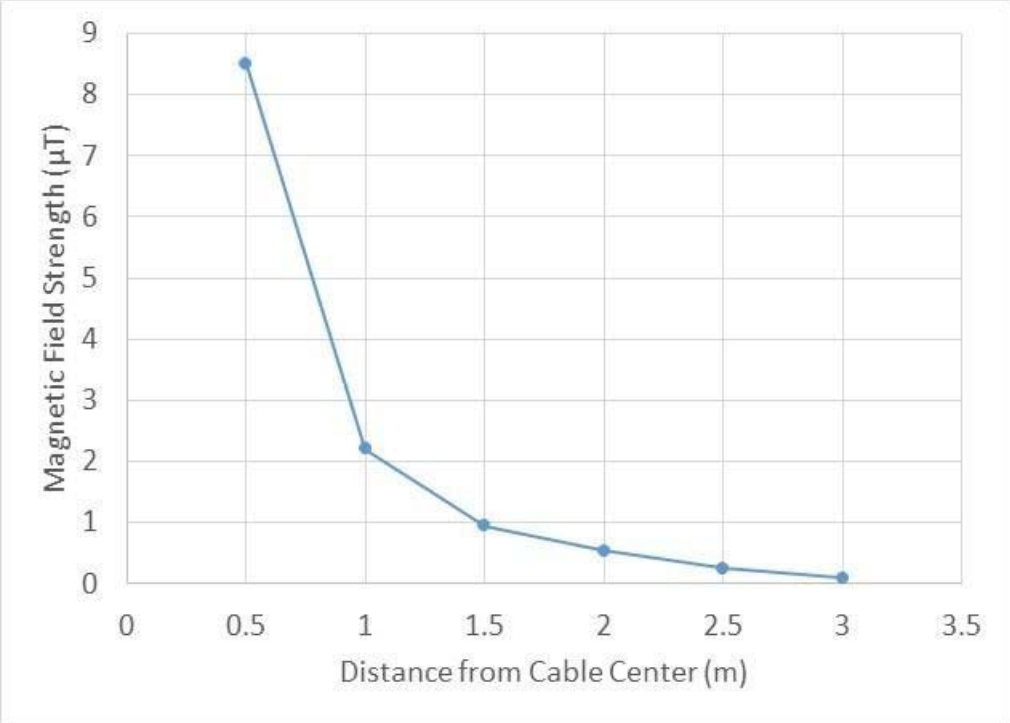


Figure 3. Magnetic field strength at various distances (estimated from JDR, 2013)

Current Research and Information: Electromagnetic Fields and Fish

It is important to understand the spatial scale when assessing the impacts of magnetic and induced electric fields on fish. Although behavioral and physiological effects on fish from electromagnetic fields have been documented in small scale laboratory experiments with embryos, larger scale experiments on juvenile and adult fish, both show little to no impact.

Fish, other aquatic organisms, and even currents can induce electric fields when passing through magnetic fields. The strength of an induced electric field varies depending on the speed and orientation of the object passing through the field. For example, perpendicular movement through a magnetic field will induce an electric field of maximum strength while parallel movement through the same field will not induce an electric field. So induced electric field strength depends on the distance from the field as well as on the speed of the organism (or current) and the orientation of the organism relative to the field. (Gill, 2005; OSPAR, 2009; Normandeau et al., 2011; Bergstrom, 2014; Thomsen et al., 2015; Copping, 2016).

Negative effects related to EMFs have mostly been observed in laboratory settings involving fish embryos exposed directly to EMFs. Increases in mortality due to EMF exposure does not appear to be a major concern (Shultz et al., 2012), but some studies have demonstrated sub-lethal effects. In a recent literature review of EMF experiments on fish embryos, delays in hatching were observed in magnetic fields stronger than 1,000 μT for several species (Krylov et al., 2014). Exposure to even stronger fields (2,000 μT) has been reported to increase the exchange rate between the embryo and the surrounding water (Krylov et al., 2014). However, these effects are not well understood (Thomsen et al., 2015). For example, when zebrafish embryos were exposed to 1,000 μT two hours after fertilization no significant developmental delay was observed, but when similar embryos received the same exposure 48 hours after fertilization a delay was detected (Skauli et al., 2000). Additionally, results from other sets of experiments on freshwater

fish suggest that many of the observed effects seen in EMF-exposed embryos were not statistically different from the control groups, even at higher exposure levels (up to 3,000 μT) (Schultz et al., 2012). Although sub-lethal effects were observed in these studies, the levels of magnetic fields were significantly higher than the levels that are estimated to result from the electric transmission cable for the LEEDCo project. Therefore, it is not anticipated that the LEEDCo electric transmission cable will have any adverse impact on fish embryos in Lake Erie.

One study, which saw effects at lower magnetic field strengths, was conducted using Japanese rice fish. When exposing Japanese rice fish embryos to magnetic fields ranging between 15-60 μT, Lee et al. (2014) found that embryos exposed to 60 μT had higher levels of anxiety-like behavior and exhibited changes in morphology. The EMF-exposed embryos also developed faster than the control. Another experiment on roach embryos observed faster development in embryos, and a decrease in yearling size and weight (Chebotareva et al., 2009). Notably, the above studies were all completed with direct exposures of EMF on embryos, which tend to be the most sensitive life stage of a fish.

Cada et al. (2012) performed an experiment to evaluate the impact of magnetic fields generated by an instantaneous AC power source on juvenile freshwater fish. Juvenile paddlefish and juvenile lake sturgeon were placed in a circular tank, and an electromagnet was activated when the fish approached. The experiment was repeated at a variety of electromagnet strengths. The magnetic fields created by the AC electromagnet used in the experiment produced a field at full power of approximately 165,780 μT, whereas the control (background) level was 100-200μT. Even at 1% of the field strength of the maximum value the field was as high as 3,510 μT, which is several folds higher than typical transmission lines (Figure 1). The paddlefish experienced no statistically significant changes in behavior when exposed to the instantaneous magnetic fields. In contrast, lake sturgeon reacted to the magnetic fields at all strengths. Control groups of lake sturgeon also exhibited some altered behavior patterns, but the fish exposed to the magnetic fields displayed longer reaction times. Overall, no long-term changes in sturgeon behavior were observed. A follow up study by Bevelhimer et al. (2013) found that the EMF strength threshold for no behavioral response in lake sturgeon was approximately 1,000-2,000 μT, located about 4 to 8 inches away from the full strength electromagnet producing the EMF. Below this average threshold short-term responses disappeared. Based on the results of this work, researchers suggested burying the cables in order to take advantage of the rapid decay in magnetic field strength and to position cables in a way that would minimize crossings with migratory pathways (Bevelhimer et al. 2013).

An unpublished study by Westerberg and Lagenfelt found that 60 migrating silver eels had significantly slower swimming speeds when in the vicinity of a 130 kV AC transmission cable in the Baltic Sea (Ohman et al., 2007), which Ohman et al. (2007) suggested was a relatively minor impact. Some fish (like eels) are known to be sensitive to EMFs, but this does not necessarily mean that transmission cables will have a significant impact on movement and behavior (Ohman et al., 2007; Bull, 2015; Dunlop et al., 2016). Additionally, as documented earlier, recent lab experiments support the importance of spatial scale in mitigating the ecological impact of electromagnetic fields.

To assess whether EMFs from the LEEDCo transmission line could have an adverse impact on fish species of concern in the Great Lakes, we took a further look at a study involving Lake Sturgeon (*Acipenser fulvescens*). Lake Sturgeon have both shallow and deep water life-history requirements associated with the substrates, and are benthic feeding. Lake Sturgeon are also considered an electro-sensitive species, having developed complex electroreceptors for the purpose of feeding and migration (Map of Life, 2016). Bevelhimer et al. (2013), studied EMF

effects on Lake Sturgeon and found that the EMF strength threshold for no behavioral response in Lake Sturgeon was 1,000-2,000 μT, when located about 4 to 8 inches away from the full strength EMF. Figure 4 below shows the threshold level versus estimated EMF levels from Figure 1 above. If Sturgeon are in the vicinity of the LEEDCo transmission line, this large species could be exposed to EMFs however, the LEEDCo transmission cable is planned to be buried below the substrate, at a great enough depth so that any EMF from the transmission line will be well below the strength threshold for no behavioral response in Lake Sturgeon. (See Figure 4). Therefore, EMFs from the LEEDCo transmission cable are not expected to adversely affect Lake Sturgeon.

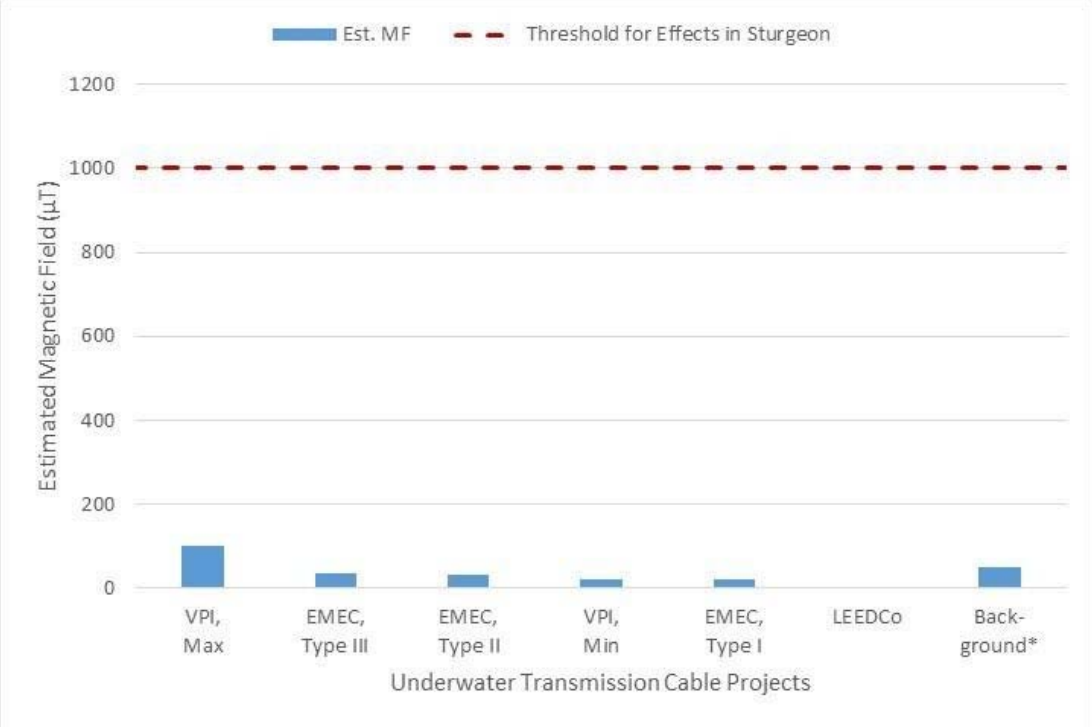


Figure 4. EMF levels (at 1m above buried cables) for various transmission lines (Cada et. al. 2012) and LEEDCo (JDR, 2013) estimate versus Sturgeon effects level.

Magnetic Field Studies

Electric transmission lines within Lake Erie, the Great Lakes or in coastal regions of the United States in general, are not unique and have been permitted and installed for many decades. Several large electric transmission lines are already in place not too far from the project site transiting from Port Clinton to Put-in-Bay, Catawba to South Bass Island, and over 25 miles of electric transmission cable from the Ontario mainland to Pelee Island. Other transmission cables are also in the proposal phase, such as a 73 mile Lake Erie cable, known as the ITC Lake Erie Connector, which will interconnect power grids in Pennsylvania and Ontario.

California Power Cable ObservationStudy

A study just released in June 2016 by the U.S. Department of the Interior, Bureau of Ocean Energy Management, summarized research from 2012 to 2014, which investigated the potential behavior and reaction of electromagnetic-sensitive species to energized and unenergized cables in a corridor on the seafloor in an offshore area of Southern California (Love et al., 2016). All of the cables in the Love et al. study are very similar to the LEEDCo proposed cable (35kV AC cable

with similar power loads) except the cables were not buried below the sediment surface (as will be the case for the LEEDCo electric transmission cables). Over the course of the study, average EMF levels were between 73 μT and 91.4 μT, at the sediment surface which are significantly higher than the LEEDCo estimated EMF levels (of no more than 2 μT one meter above the buried cable). The study did not find any biologically significant differences among fish and invertebrate communities between energized cables, pipe, and natural habitat. The authors noted there was not any compelling evidence that the EMF produced by the energized power cables in this study were either attracting or repelling fishes. The Love et al. study also corroborated the findings of previous studies which determined that EMF strength dissipates with distance from the transmission cable and approaches background levels at approximately 1 meter from the cable. Furthermore, Love et al. concluded that, "[i]n this and similar cases, cable burial at sufficient depth would be an adequate tool to prevent EMF emissions from being present at the seafloor."

Lake Ontario Magnetic Field Study

A recent study conducted within the Great Lakes to monitor for the potential impacts of magnetic fields on fish, Dunlop (2016), concluded "…no detectable effects of the cable on the fish community were found. Local habitat variables, including substrate or depth, were more important in explaining variation in fish density than proximity to the cable". This project monitored the Wolfe Island wind power project which has a 7.8km buried transmission line running from an island offshore to the mainland. The transmission line carries up to 200MW of power at a maximum of 170kV, which is much larger than the LEEDCo proposed transmission line voltage and power. The study involved nearshore electrofishing surveys and acoustic surveys paired with gill netting. Little difference between fish communities in transects near the cable and reference transects was detected. In the acoustic surveys, researchers did not see significant changes in fish density related to transmission cable proximity either.

Lake Erie Connector Project

The most relevant and nearby project is the ITC Lake Erie Connector project, which is a proposed 1,000MW, 320kV, direct current (DC) transmission cable to link the Ontario Independent Electric System Operator (IESO) with the Pennsylvania PJM Interconnection (PJM). This cable would carry ten times the voltage and almost fifty times the power compared with the LEEDCo proposed transmission cable. More information on the project can be found at http://www.itclakeerieconnector.com/. Although this project does not enter Ohio waters, it is going through a similar permit process with the Province of Ontario, State of Pennsylvania, US Department of Energy, Canada's National Energy Board, and US Army Corps of Engineers. The cable will span the entire width of Lake Erie and will cross both nearshore and offshore fish habitat areas. Based on personal conversations, we learned that to date, none of the relevant permitting agencies involved have focused on magnetic field concerns. ITC Holdings, LLC, the project owner, reviewed the relevant magnetic field concerns early on in the project and found no significant impacts were expected. Per conversations with project staff, impact concerns have centered on construction methods and shoreline directional drilling rather than magnetic field concerns.

Conclusion

Based on the expected low EMF levels to be generated by the LEEDCO project and the current research regarding EMF impacts on fish behavior and habitat, including some studies that have been completed in the Great Lakes or on Great Lakes species of concern, it is our assessment that additional review or studies of potential EMF impacts from the planned transmission cable

proposed by LEEDCo are not necessary. The ODNR required acoustic telemetry studies, as specified in the ODNR Aquatic Sampling Protocol for Offshore Wind Development, to monitor for transmission line effects on fish behavior would be of limited value given the evidence that no measureable EMF impacts are expected from the LEEDCo transmission line project and the abundant current research showing that EMFs from transmission cables similar to the one proposed by LEEDCo do not have a significant effect on fish behavior. Acoustic telemetry research has been widely used across the Great Lakes to understand general fish movement patterns and can be used to monitor local fish behavior within river mouths and channels, but it has limited value to monitor local fish behavior within the open waters of the Great Lakes and should not be a requirement of the pre-, during, and post-construction monitoring.

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