THURBER ENGINEERING LTD.

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Submission 01

MARY RIVER PROJECT
STEENSBY INLET AND MILNE INLET PORT
OFFSHORE GEOTECHNICAL INVESTIGATION
SUMMARY OF RESULTS

Report

Submitted to

HATCH Ltd.

Matthew Boucher, EIT
Field Supervisor

PERMIT TO PRACTICE
THURBER ENGINEERING LTD.
Signature
Date 9 November 2011
PERMIT NUMBER: P0176
The Association of Professional Engineers, Geologists and Geophysicists of the NWT / NU

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Date: November 9, 2011
File: 19-1605-126

S.M. Sather, P.Eng.
Review Engineer

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1. INTRODUCTION

1.1 General

This report presents the results of a geotechnical investigation supervised by Thurber Engineering Ltd. (Thurber) relating to the proposed marine facilities for the Steensby Inlet port and Milne Inlet port on Baffin Island, Nunavut.

The scope of work was outlined in our proposal letter dated March 18, 2011, prepared for Hatch Ltd. (Hatch). Authorization to proceed with the work was received from Hatch on April 12, 2011.

This report is subject to the Statement of General Conditions, which is included at the end of the text. The reader's attention is specifically drawn to these conditions as it is considered essential that they be followed for the proper use and interpretation of this report.

1.2 Project Description

Baffinland Iron Mines Corporation is planning to extract iron ore from a deposit located near the Mary River on Baffin Island, about 800 km northwest of Iqaluit, Nunavut. The development will require construction of an open pit mine near Mary River and a port facility on Steensby Inlet on the south coast of Baffin Island. The ore will be transported from the Mary River Mine Site to Port Steensby by rail, a distance of about 150 km. At Steensby Inlet, the ore will be loaded only ocean going vessels for transportation to world markets.

The selected ore dock location (referred to as the alternate ore dock in this report) will be located on the west side of the southernmost of two small islands. Access to the islands will require a causeway and railway bridge (referred to as the Island Bridge in this report) between the mainland and the northern island. The proposed ore dock facilities are to operate year round. The selected freight dock location (referred to as the south freight dock in this report) is located on the mainland approximately 2.5 kilometres east of the ore dock discussed above.

The 2011 site investigation also included several boreholes advanced at two separate locations referred to as the Base Case Ore Dock and the North Freight Dock. These two locations have subsequently been abandoned based on the conditions encountered.

Milne Inlet is located on the north coast of Baffin Island, approximately 80 km northwest of the Mary River mine site. Milne Inlet is connected to the Mary River Mine Site by an existing tote road. The facilities at Milne Inlet will support the construction and operation of the Mary River Mine site.

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2. SCOPE OF WORK

2.1 2011 Offshore Field Investigation

The 2011 offshore field investigation at Steensby Inlet was carried out during the period of April 28 to May 26. The program was carried out using up to 4 drill rigs operating from the sea ice to undertake 69 boreholes and Dynamic Cone Penetration Tests (DCPT). A total of 98 potential borehole and probe locations were originally identified by Hatch for planning purposes prior to commencing the program. A number of proposed boreholes were deleted or modified as necessary to address the site conditions encountered during the work. Also included in this report are 9 boreholes that were drilled on land but relate to the offshore port facilities included in this report.

The 2011 offshore field investigation at Milne Inlet was carried out during the period of June 3 to June 6. The program was carried out using one drill rig operating from the ice. A total of 3 sampled boreholes and 8 DCPTs were completed.

Table 1 below lists the structures at Port Steensby and Milne Inlet that were included in the investigation, the approximate coordinates of the structure and the naming convention for the boreholes associated with each structure.

TABLE 1: Structure Coordinates and Borehole Naming

Site	Structure	Coordinates		Borehole Naming
		Northing (m)	Easting (m)	
Steensby	Island Bridge	7,800,370	594,385	MSIB, SI-RL & SI-MHS
Steensby	Base Case Ore Dock	7,799,275	592,700	MSOD
Steensby	Alternate Ore Dock	7,798,420	592,845	SI-OLD
Steensby	South Freight Dock	7,798,910	595,565	MSFD
Steensby	North Freight Dock	7,803,225	592,460	MSNFD
Steensby	Construction Docks	Various	Various	SMLCD & SMICD
Milne	Freight Dock	7,976,640	504,120	MMFD

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3. BACKGROUND

3.1 Site Locations

Port Steensby port is located on the south side of Baffin Island, in Nunavut at 70.28 N latitude, 78.49 W longitude. Milne Inlet facilities are located on the north side of Baffin Island at 71.53 N latitude, 80.54 W longitude.

3.2 Port Steensby Facility Layout

The relative location of the various Port Steensby facilities at which geotechnical investigations were carried out under the current program are provided in Drawing A1 in Appendix A. The marine facilities investigated at Port Steensby include:

- Island Bridge
- Base Case Ore Dock
- Alternate Ore Dock
- South Freight Dock
- North Freight Dock (alternate location)
- Construction Docks (3 out of 5 proposed locations investigated)

3.3 Milne Inlet Facilities Layout

The relative locations of the proposed and existing facilities at Milne Inlet are shown on Drawing A8 in Appendix A. The geotechnical investigation was carried out for the proposed freight dock.

3.4 Steensby Inlet Previous Field Investigations - 2007 and 2008

Previous site investigations in the Steensby Inlet area have been carried out by Knight Piésold Ltd. (KP) during 2007 and 2008. The results of these investigations are summarized in the respective reports prepared by KP, dated February 15, 2008 and November 13, 2008.

KP faced similar challenges and limitations to those that were encountered during the 2011 offshore investigation. The reports note poor recovery and loss of drill steel due to tides, currents and difficult overburden conditions which appear to have limited their investigation. The 2011 offshore investigations incorporated full Dynamic Cone Testing (DCPT) and additional Standard Penetration Testing (SPT) equipment which had not been utilized sufficiently in the previous investigations.

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4. METHODOLOGY

4.1 Drilling Equipment and Methods

The site investigation at Port Steensby was carried out using up to 4 drill rigs operated by Boart Longyear (2) and Walker Drilling (2). At Milne Inlet only one drill rig operated by Walker Drilling was used. All rigs and equipment were heli-portable and operated on a continuous basis, 24 hours per day. Two of the drilling rigs were Boart Longyear LN-55 machines set up for wireline NQ coring, but not suitable for Standard Penetration Testing (SPT). The third rig was an Atlas Copco machine equipped for NQ wireline coring and capable of carrying out regular SPT tests. The fourth rig was a Diedrich D-50 which is also capable of coring and SPT testing. The latter two rigs were also set-up to carry out Dynamic Cone Penetration Tests (DCPT) in which a standard diameter (2 inch) cone is driven continuously using a standardized energy hammer (140 lbs dropped from 30 inches).

Drill rigs were mounted on skids and were moved into position either by dragging them on the ice or taking them apart and flying them to the location with a helicopter. Once a borehole location was selected, two holes were augered through the ice, and the drill rig was set up over one hole, while the second hole was used as a water source for drilling and to measure ice thickness.

Rock coring was carried out with NQ size core barrels capable of coring either 3 m or 1.5 m long runs. The diamond drills operated by Boart Longyear, which are typically used for mining exploration applications, were set up for using the longer core barrels producing 3 m runs. The Walker Drilling drill rigs, typically used for geotechnical drilling applications, used the shorter core barrels capable of 1.5 m runs.

Upon completion of the borehole the drill site was cleaned up as required by the permit conditions.

4.2 Borehole Locations

Boreholes were advanced at coordinates identified by Hatch. Monteith and Sutherland Ltd. staked the borehole locations using GPS survey equipment. Once a borehole was completed Monteith and Sutherland returned to survey the as-drilled location as some borehole locations had to be moved due to ice conditions.

Borehole locations at Port Steensby and Milne Inlet are provided on Drawings A1 through A9 in Appendix A.

4.3 Tidal Corrections

Seafloor elevations and bottom of borehole elevations were surveyed by Monteith and Sutherland. These elevations were surveyed relative to the geodetic coordinate system. Sample depths collected between the surveyed elevations were adjusted to allow for elevation corrections that were required due to the tidal ice movement.

Ice elevations at Port Steensby were surveyed hourly for a period of 24 hours at the beginning of the investigation and the results were compared to the Sevigny Point tidal charts provided by the Canadian Hydrographic Service. The comparison showed that the tidal charts from Sevigny Point were generally a good estimate of the measured tides at the Steensby Inlet port site. Subsequently, these tidal charts were used to correct elevations on the borehole logs. Allowing for some variations, this method provided a reasonable estimate of the elevations between the seafloor and the bottom of the borehole.

4.4 Borehole Logging

Subsurface conditions encountered in the boreholes were logged in the field by drill inspectors provided by Hatch, Thurber and Inspec-sol, under the supervision of Thurber Engineering Ltd. All material recovered, overburden and bedrock, in each core run was placed in a core box starting in the upper left corner. The beginning and ending of each run were marked with core blocks. The material recovered was then described and photographed. When overburden retrieved by coring was thought to be representative of the actual conditions (i.e. no material was believed to have been washed out) a sample was taken and placed in a sealed bag. Samples collect by split spoon sampling were described and also placed in a sealed bag. All samples, those bagged and those placed in core boxes were labeled and transported to the laboratory at Mary River Camp.

4.5 Laboratory Sampling and Testing

All bagged samples and core boxes were returned to the laboratory operated at Mary River and Representative samples were selected for testing. The laboratory test results are summarized in Appendix C and include:

- Moisture content and visual classification
- Particle size analysis (ASTM D422)
- Atterberg Limit Tests (ASTM D4318)
- Point load testing (bedrock)
- Bedrock core logging

One sample of seabed sediment (silty clay) at borehole MSFD-P was selected and submitted to an analytical laboratory to assess chemical constituents related to disposal of dredged material. The analytical test results for this sample are included in Appendix C.

Borehole logs were prepared from the field and laboratory information and are included in Appendix B. Core photographs are also included in Appendix B.

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5. SITE DESCRIPTION

5.1 Steensby Inlet

5.1.1 Geology

Baffin Island was extensively glaciated starting about 120,000 years before present (BP). The last glacial maximum is thought to have occurred approximately 18,000 years BP, at which time the Laurentide ice sheet covered the area. Glacial drift from this phase is found over extensive areas of Baffin Island. Based on the trace of glacial erratics, it has been postulated (Dyke, A.S, 2004) that the ice generally flowed from south to north originating in an ice dome source area located in the Foxe Basin south of Steensby Inlet area. Rapid melt out of glacial ice in Foxe Basin approximately 6000 to 7000 years BP shifted the ice dome onto Baffin Island and reversed the flow direction where generally ice flowed south to the retreating ice front. The relatively sea-level at this time is expected to have been 50 – 100 m higher than currently.

The quaternary geology of the Steensby Inlet map area (Dyke, A.S. 2006) is controlled by a pattern of ice regression, in which the ice front retreating in numerous stages from south to the north through the inlet. Carbon date tests of molluscs in marine shoreline deposits indicate that the deglaciation occurred in this area from about 5500 to 4000 years before present (BP). The deglaciation was accompanied by a higher relative sea level than exists today, approximately 95 m above the current sea level at that time (5500 years BP). The relative sea-level curve for the Rowley River, Steensby Inlet area is shown in Figure A.1 in Appendix A and indicates the relative sea-level had dropped to about 35 m elevation by 4000 BP. Continuing glacial rebound following deglaciation has resulted in the emergence of the lowland coastal areas from the sea since this time.

Valleys such as Cockburn Lake exhibit series of lateral and end moraine deposits associated with temporary re-advance or standstill of the ice front during the course of the icefront regression. Moraine deposits can contain significant quantities of remnant ice which remains frozen in place where ground temperatures have remained below the freezing point. At locations where ice rich materials have been covered by bodies of surface water, ground temperatures would have increased resulting in melting of the ground ice and formation of kettles. An example of this is present near the Nina Bang lake area west of the project area where end moraine deposits are typically kettled indicating that they contained significant remnant ice since melted out by thawing conditions present beneath former bodies of water (such as the sea or lakes).

There are ongoing active depositional processes that continue to deposit materials overtop of the older materials discussed above, and these processes have resulted in the formation of

several landform types encountered in the offshore project area including: beach deposits, colluvial deposits and marine sediments.

Based on the geology of the area, it is expected that the following sequence of materials will be encountered in the port areas starting with youngest materials at the top of the sequence:

- marine sediment deposits (clays, silts and sands) or marine deltaic sediments that have accumulated below the sea-level. These deposits are expected to contain ice-rafted dropstones and colluvium (talus) associated with mass movement of jointed bedrock or submarine sediments.
- Moraine deposits
- Bedrock

The bedrock in the Steensby Inlet port area on the east side of Steensby Inlet consists of Proterozoic Eon banded migmatite where bands of white to light grey granitoid rock alternate with darker more mafic bands. The migmatite also contains occasional intrusive diabase sills. The regional bedrock mapping also indicates a second bedrock type is present on the west side of Steensby Inlet where much younger sedimentary rocks of the Ordovician Period are mapped. These rocks consist of dolomite, limestone and sandstone. The location of the contact between these two rock types is unknown but is located somewhere under the waters of Steensby Inlet.

5.1.2 Surface Conditions

The proposed port facility area is comprised of two islands which lie off the mainland and form an embayment facing open water to the south. The two islands have relatively low relief and bedrock-controlled, irregular surface morphology. The bathymetry shows relatively gently sloped foreshore deposits to the north and south of the islands. The submarine slopes to the east side of the islands are generally steeply sloped, and are likely influenced by erosion from long shore currents.

The ore dock location is comprised of extensive bedrock outcrop showing jointing and undulating gneissic foliation. Photographs showing the bedrock surface are included in Figures A.2 thru A.5 in Appendix A.

5.1.3 Subsurface Conditions

The following section provides a generalized description of the soil conditions for summary purposes. The attached test hole logs provide detailed descriptions of the soil conditions encountered in the investigation and must be used in preference to these generalized descriptions.

The boreholes were advanced through sea-ice and open water to the seabed. The thickness of sea ice varied from about 1.5 m to 1.8 m thick. Based on the condition of the SPT samples recovered and the DCPT test, the soils below the seabed are believed to be unfrozen.

The soil profile encountered below the seabed in boreholes drilled in the Steensby Inlet area generally becomes coarser with increasing depth. The generalized stratigraphy encountered in the boreholes consisted of a layer of soft, silty clay underlain by sand containing variable proportions of gravel, cobbles and boulders. The sand unit was in turn underlain by a deposit of cobbles and boulders or by bedrock. The thicknesses of the deposits encountered were variable.

5.1.4 Silty Clay

At many locations, the silty clay was generally very soft to soft as indicated by the SPT and DCPT tests where the sampler typically sank up to several metres under the weight of the rods or hammer. Higher N-values (up to 50 blows 300 mm) were observed in interbedded sands or gravelly zones. Moisture contents of recovered samples typically ranged from 23 to 45%. The Atterberg limit tests indicated liquid limits ranging from 25 to 37, suggesting low to medium plasticity. The plastic index ranges from 6 to 15. Occasional sand layers and sporadic gravel, cobble and boulders were encountered in the deposit at some locations.

5.1.5 Gravelly Sand

A gravelly sand unit was typically encountered underlying the silty clay. The gradation of this deposit is variable ranging from sand and gravel trace silt to silty or clayey sand trace gravel. Excluding more extreme values likely related to gravel or cobbles, the SPT N-values in the sand generally ranged from 8 to 20 indicating loose to compact relative density. The particle size analysis indicate the deposit is poorly graded. Within the sand unit, the recovery of gravel, cobbles and boulder fragments obtained during coring was 10-25% of the run lengths.

5.1.6 Cobbles and Boulders

The cobble and boulder deposit was comprised of very strong igneous rock particles. Occasional very large boulders with dimensions greater than 0.7 m were encountered in the core at some locations. Relatively minor amounts of sandy silt pockets were noted in some runs.

5.1.7 Bedrock

Bedrock was typically strong to extremely strong granitic gneiss. The weathering state ranged from highly weathered to fresh but the rock mass is typically slightly weathered to fresh. The

use of moderately weathered to highly weathered in the borehole logs applied to specific zones of rock that was more highly fractured and weathered. RQD values ranged from 0 to 100%, indicating very poor to excellent rock quality.

Core recovery was typically good, greater than 95%. Lower recoveries were found in zones that were highly fractured and more highly weathered. These sections of core are difficult to piece together to record an exact length for core recovery accounting for recoveries of less than 100%. Also, it is possible that small pieces of fractured were lost while retrieving the core barrel from the hole.

5.2 Milne Inlet

5.2.1 Geology

Available surficial geology mapping indicates that the Milne Inlet camp sits on deltaic sediments consisting of clay, silt, sand and gravel up to 20 m thick. The general soil profile is upward coarsening consistent with slowly declining sea levels in the area. More recent unconsolidated marine sediments (clays, silts and sands) have accumulated below the current sea-level.

Regional bedrock mapping indicates that the local bedrock consists of granitic and gneissic rock of the Proterozoic Eon.

5.2.2 Surface Conditions

The proposed freight dock is located north of the camp area on Milne Inlet. The onshore topography in area of the freight dock is fairly flat and slopes gently towards the inlet. The bathymetry shows relatively gently sloped foreshore deposits to the north.

5.2.3 Subsurface Conditions

The following section provides a generalized description of the soil conditions for summary purposes. The attached test hole logs provide detailed descriptions of the soil conditions encountered in the investigation and must be used in preference to these generalized descriptions.

The boreholes were advanced through sea-ice and open water to the seabed. The thickness of sea ice varied from about 1.5 m to 1.8 m thick. Based on the condition of the SPT samples recovered and the DCPT tests, the soils below the seabed are believed to be unfrozen.

The generalized stratigraphy encountered in the boreholes consisted of a loose to compact silty sand underlain by sand containing varying amounts of gravel and cobbles. The thickness of the sand deposit is unknown as all boreholes were terminated within this unit.

5.2.4 Silty Sand

In two of the three boreholes a layer of silty sand was encountered at the surface of the seabed. This layer was loose to compact as indicated by the SPT tests. Moisture contents of the recovered samples ranged from 18 to 19%. A grain size analysis carried out on one sample indicated that the sample contained 3% gravel, 47% sand, 35% silt and 14 % clay. This layer ranged from 1.5 to 3 m in thickness.

5.2.5 Sand

A sand unit containing varying amounts of gravel was encountered underlying the silty sand. The gradation of this deposit is variable ranging from sand with trace gravel and silt to sand and gravel. The SPT N-values in the sand ranged between 4 and 59 indicating a loose to very dense relative density. Occasional cobbles were noted within this unit.

5.2.6 Bedrock

Bedrock was not encountered during the 2011 drilling program at Milne Inlet.

6. LIMITATIONS

The use of wireline coring equipment for the investigation allows for portability and rapid penetration through frozen or bouldery deposits, but this method typically does not provide adequate geotechnical sample recovery in soft or loose soils. The samples collected with this equipment may therefore over-represent the coarse fraction such as gravel, cobbles and boulders relative to sand, silt and clay fractions.

The use of SPT samplers, which was available on 2 of the 4 rigs, allowed for recovery of samples of fine-grained material at specific locations, but does typically not provide continuous profiling of the deposit. As a result of the limited recovery, there remains some uncertainty of the extent and nature of the soft or loose fine-grained deposits at the site.

Additional subsurface investigation work using methods specifically suited to offshore sampling and testing of fine-grained material containing cobbles and boulders are recommended where port facilities or fill will be supported by these materials.

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REFERENCES

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Dyke, A.S. 2007: Deglaciation of Steensby Inlet, Baffin Inland Nunavut; Geological Survey of Canada, Open File 5017, scale:1:250,000.

Dyke, A.S. 2005: Surficial Geology, Steensby Inlet North, Baffin Island, Nunavut; Geological Survey of Canada, Open File 4688, scale 1:50,000.

Dyke, A.S. 2000: Map 1961A, Surficial Geology, Phillips Creek, Baffin Island Nunavut; Geological Survey of Canada, scale 1:250,000.

Jackson, G.D., Morgan, W.C. and Davidson, A. 1978: Map 1450A, Geology of Steensby Inlet; Geological Survey of Canada, scale 1:250,000.

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STATEMENT OF LIMITATIONS AND CONDITIONS

1. STANDARD OF CARE

This study and Report have been prepared in accordance with generally accepted engineering or environmental consulting practices in this area. No other warranty, expressed or implied, is made.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report which is of a summary nature and is not intended to stand alone without reference to the instructions given to us by the Client, communications between us and the Client, and to any other reports, writings, proposals or documents prepared by us for the Client relative to the specific site described herein, all of which constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. WE CANNOT BE RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purposes that were described to us by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the document, subject to the limitations provided herein, are only valid to the extent that this Report expressly addresses proposed development, design objectives and purposes, and then only to the extent there has been no material alteration to or variation from any of the said descriptions provided to us unless we are specifically requested by the Client to review and revise the Report in light of such alteration or variation or to consider such representations, information and instructions.

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT OUR WRITTEN CONSENT AND SUCH USE SHALL BE ON SUCH TERMS AND CONDITIONS AS WE MAY EXPRESSLY APPROVE. The contents of the Report remain our copyright property. The Client may not give, lend or, sell the Report, or otherwise make the Report, or any portion thereof, available to any person without our prior written permission. Any use which a third party makes of the Report, are the sole responsibility of such third parties. Unless expressly permitted by us, no person other than the Client is entitled to rely on this Report. We accept no responsibility whatsoever for damages suffered by any third party resulting from use of the Report without our express written permission.

5. INTERPRETATION OF THE REPORT

a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel, may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and this report is delivered on the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. Where special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.

b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to us. We have relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, we cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by us. We are entitled to rely on such representations, information and instructions and are not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.

(see over . . . .)

INTERPRETATION OF THE REPORT *(continued . . . .)*

c) Design Services: The Report may form part of the design and construction documents for information purposes even though it may have been issued prior to the final design being completed. We should be retained to review the final design, project plans and documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the report recommendations and the final design detailed in the contract documents should be reported to us immediately so that we can address potential conflicts.

d) Construction Services: During construction we must be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

6. RISK LIMITATION

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause an accidental release of those substances. In consideration of the provision of the services by us, which are for the Client's benefit, the Client agrees to hold harmless and to indemnify and defend us and our directors, officers, servants, agents, employees, workmen and contractors (hereinafter referred to as the "Company") from and against any and all claims, losses, damages, demands, disputes, liability and legal investigative costs of defence, whether for personal injury including death, or any other loss whatsoever, regardless of any action or omission on the part of the Company, that result from an accidental release of pollutants or hazardous substances occurring as a result of carrying out this Project. This indemnification shall extend to all Claims brought or threatened against the Company under any federal or provincial statute as a result of conducting work on this Project. In addition to the above indemnification, the Client further agrees not to bring any claims against the Company in connection with any of the aforementioned causes.

7. SERVICES OF SUBCONSULTANTS AND CONTRACTORS

The conduct of engineering and environmental studies frequently requires hiring the services of individuals and companies with special expertise and/or services which we do not provide. We may arrange the hiring of these services as a convenience to our Clients. As these services are for the Client's benefit, the Client agrees to hold the Company harmless and to indemnify and defend us from and against all claims arising through such hirings to the extent that the Client would incur had he hired those services directly. This includes responsibility for payment for services rendered and pursuit of damages for errors, omissions or negligence by those parties in carrying out their work. In particular, these conditions apply to the use of drilling, excavation and laboratory testing services.

8. CONTROL OF WORK AND JOBSITE SAFETY

We are responsible only for the activities of our employees on the jobsite. The presence of our personnel on the site shall not be construed in any way to relieve the Client or any contractors on site from their responsibilities for site safety. The Client acknowledges that he, his representatives, contractors or others retain control of the site and that we never occupy a position of control of the site. The Client undertakes to inform us of all hazardous conditions, or other relevant conditions of which the Client is aware. The Client also recognizes that our activities may uncover previously unknown hazardous conditions or materials and that such a discovery may result in the necessity to undertake emergency procedures to protect our employees as well as the public at large and the environment in general. These procedures may well involve additional costs outside of any budgets previously agreed to. The Client agrees to pay us for any expenses incurred as the result of such discoveries and to compensate us through payment of additional fees and expenses for time spent by us to deal with the consequences of such discoveries. The Client also acknowledges that in some cases the discovery of hazardous conditions and materials will require that certain regulatory bodies be informed and the Client agrees that notification to such bodies by us will not be a cause of action or dispute.

9. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on our interpretation of conditions revealed through limited investigation conducted within a defined scope of services. We cannot accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.

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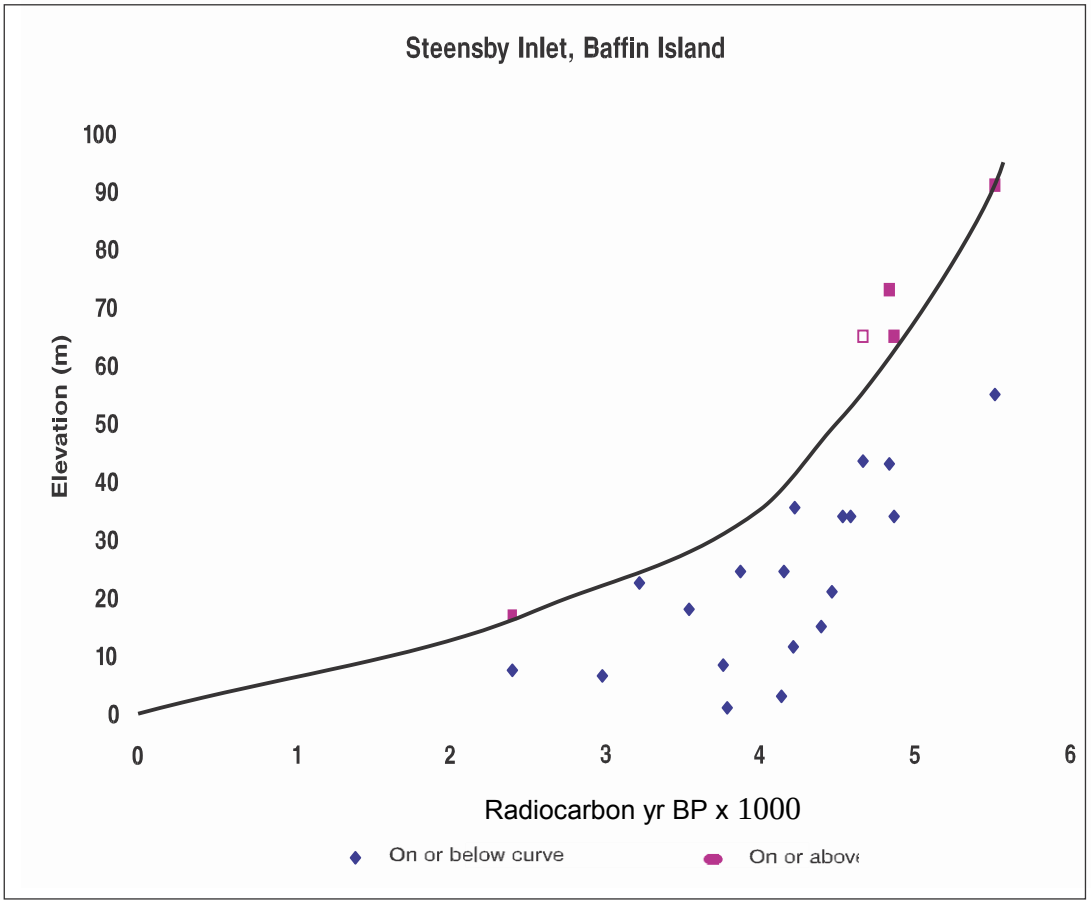
APPENDIX A

DRAWINGS AND FIGURES



Relative sea-level curve for Rowley River area, Steensby Inlet
(Dyke, 2007 A.S. GSC Open File 5017)

FIGURE A.1

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Bedrock at North End of Alternate Ore Dock

FIGURE A.2

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Bedrock at South End Alternate Ore Dock

FIGURE A.3

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Close-Up View of Bedrock at North End of Alternate Ore Dock

FIGURE A.4

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Close-Up View of Bedrock at South End of Alternate Ore Dock

FIGURE A.5

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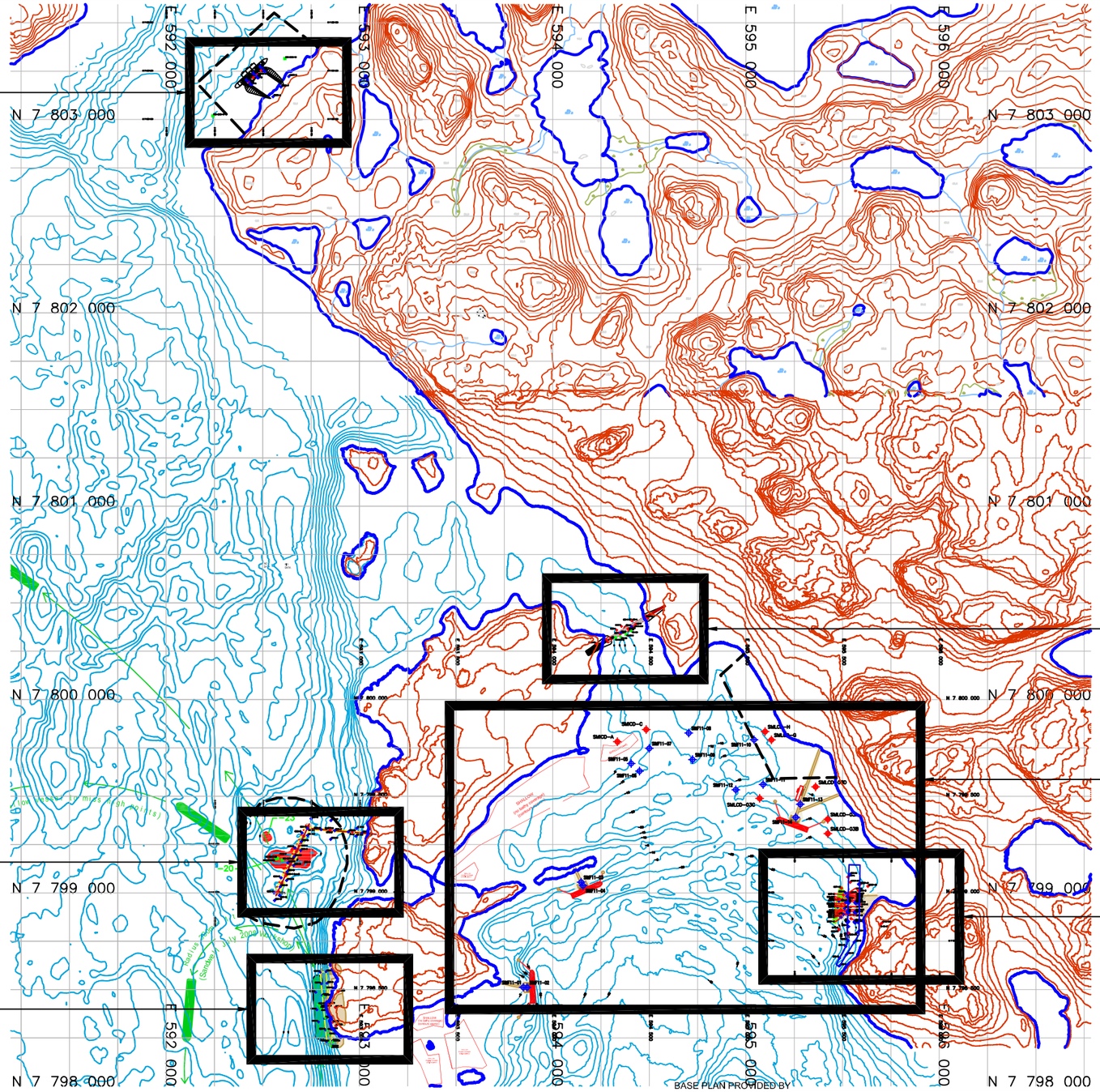


NOTES

1. CO-ORDINATE GRID IS UTM (NAD 83) ZONE 17 AND IS IN METRES.
2. BATHYMETRY IS CHART DATUM OF LNT (LOWEST NORMAL TIDE). MEAN SEA LEVEL IS CALCULATED TO BE 2.266m ABOVE LNT.
3. TOPOGRAPHY IS TO GEODETIC DATUM.

LEGEND

- 5m BATHYMETRY (BELOW SEA LEVEL)
- 5m TOPOGRAPHY (ABOVE SEA LEVEL)
- SHORE LINE

BASE PLAN PROVIDED BY

HATCH LTD.

MARY RIVER PROJECT
STEENSBY INLET
LOCATION PLAN

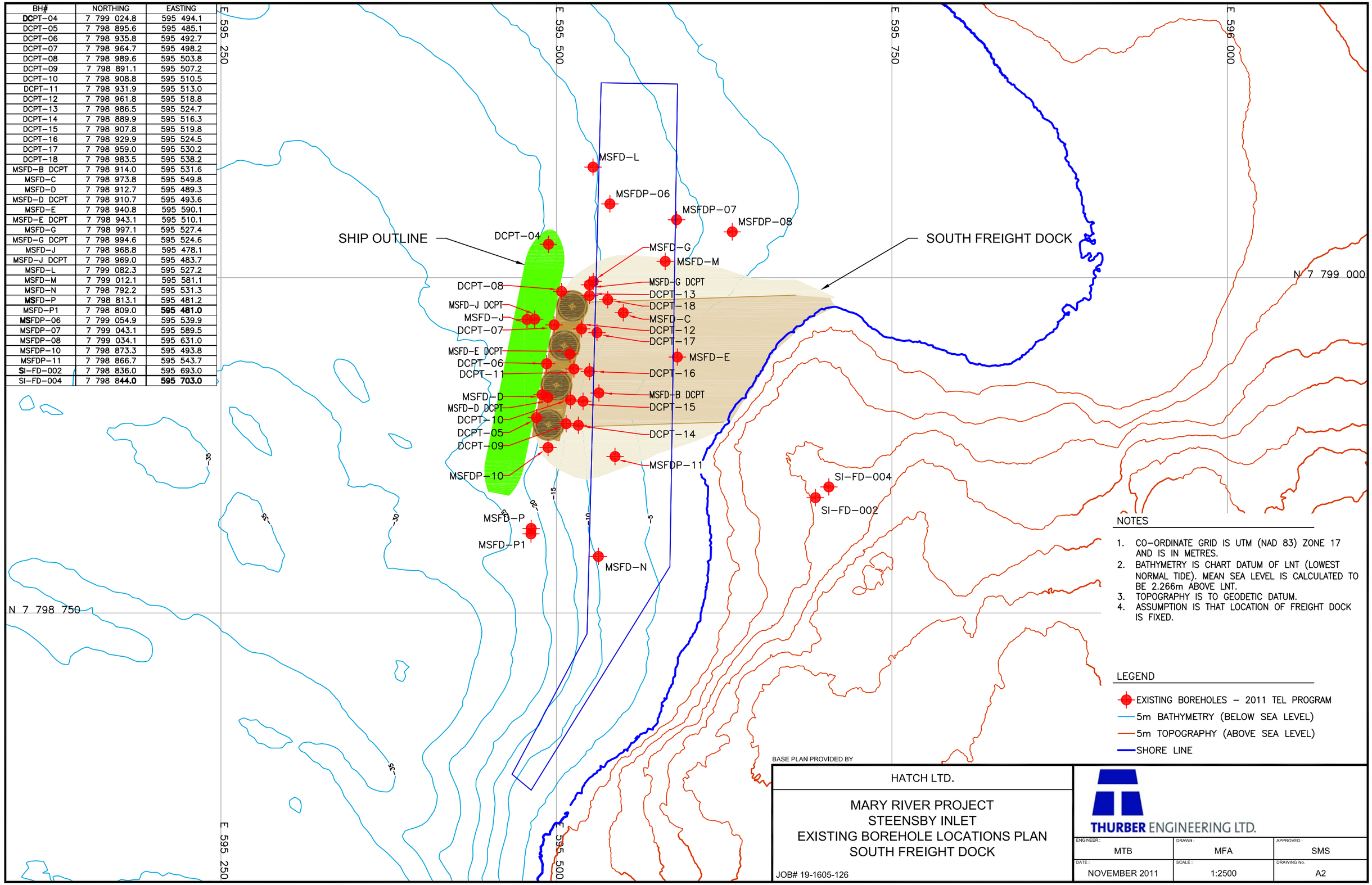
JOB# 19-1605-126

THURBER ENGINEERING LTD.

ENGINEER:	DRAWN:	APPROVED:
MTB	MFA	SMS
DATE:	SCALE:	DRAWING No.
NOVEMBER 2011	1:25000	A1

FILENAME: H:\Drafting\19\1605\126\ted5126-BoreholePlan(Onlce).dwg
PLOTDATE: Nov 9, 2011 - 12:39 PM

BH#	NORTHING	EASTING
DCPT-04	7 799 024.8	595 494.1
DCPT-05	7 798 895.6	595 485.1
DCPT-06	7 798 935.8	595 492.7
DCPT-07	7 798 964.7	595 498.2
DCPT-08	7 798 989.6	595 503.8
DCPT-09	7 798 891.1	595 507.2
DCPT-10	7 798 908.8	595 510.5
DCPT-11	7 798 931.9	595 513.0
DCPT-12	7 798 961.8	595 518.8
DCPT-13	7 798 986.5	595 524.7
DCPT-14	7 798 889.9	595 516.3
DCPT-15	7 798 907.8	595 519.8
DCPT-16	7 798 929.9	595 524.5
DCPT-17	7 798 959.0	595 530.2
DCPT-18	7 798 983.5	595 538.2
MSFD-B DCPT	7 798 914.0	595 531.6
MSFD-C	7 798 973.8	595 549.8
MSFD-D	7 798 912.7	595 489.3
MSFD-D DCPT	7 798 910.7	595 493.6
MSFD-E	7 798 940.8	595 590.1
MSFD-E DCPT	7 798 943.1	595 510.1
MSFD-G	7 798 997.1	595 527.4
MSFD-G DCPT	7 798 994.6	595 524.6
MSFD-J	7 798 968.8	595 478.1
MSFD-J DCPT	7 798 969.0	595 483.7
MSFD-L	7 799 082.3	595 527.2
MSFD-M	7 799 012.1	595 581.1
MSFD-N	7 798 792.2	595 531.3
MSFD-P	7 798 813.1	595 481.2
MSFD-P1	7 798 809.0	595 481.0
MSFDP-06	7 799 054.9	595 539.9
MSFDP-07	7 799 043.1	595 589.5
MSFDP-08	7 799 034.1	595 631.0
MSFDP-10	7 798 873.3	595 493.8
MSFDP-11	7 798 866.7	595 543.7
SI-FD-002	7 798 836.0	595 693.0
SI-FD-004	7 798 844.0	595 703.0



NOTES

1. CO-ORDINATE GRID IS UTM (NAD 83) ZONE 17 AND IS IN METRES.
2. BATHYMETRY IS CHART DATUM OF LNT (LOWEST NORMAL TIDE). MEAN SEA LEVEL IS CALCULATED TO BE 2.266m ABOVE LNT.
3. TOPOGRAPHY IS TO GEODETIC DATUM.
4. ASSUMPTION IS THAT LOCATION OF FREIGHT DOCK IS FIXED.

LEGEND

- EXISTING BOREHOLES – 2011 TEL PROGRAM
- 5m BATHYMETRY (BELOW SEA LEVEL)
- 5m TOPOGRAPHY (ABOVE SEA LEVEL)
- SHORE LINE

BASE PLAN PROVIDED BY

HATCH LTD.

MARY RIVER PROJECT
STEENSBY INLET
EXISTING BOREHOLE LOCATIONS PLAN
SOUTH FREIGHT DOCK

JOB# 19-1605-126

THURBER ENGINEERING LTD.

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MTB	MFA	SMS
DATE:	SCALE:	DRAWING No.
NOVEMBER 2011	1:2500	A2

FILENAME: H:\Drafting\19\1605\126\ted5126-BoreholePlan(Onlce).dwg
PLOTDATE: Nov 9, 2011 - 12:32 PM

BH#	NORTHING	EASTING
MSIB–A	7 800 339.6	594 **348.4**
MSIB–A1	7 800 339.6	594 348.4
MSIB–A2	7 800 339.8	594 349.1
MSIB–B	7 800 364.4	594 390.2
MSIB–B DCPT	7 800 366.4	594 389.2
MSIB–C	7 800 389.3	594 428.2
MSIB–C DCPT	7 800 378.1	594 417.4
MSIB–D	7 800 407.8	594 410.2
MSIB–D DCPT	7 800 407.6	594 409.8
MSIBP–1	7 800 359.1	594 331.3
MSIBP–2	7 800 378.6	594 356.1
PSB–002	7 800 325.0	594 351.0
PSB–003	7 800 35**5.0**	**594 406.0**
PSD–2008–12	7 800 320.0	594 326.0
PSD–2008–13	**7 800 337.0**	**594 380.0**
SI–MHS–008	7 800 289.7	594 **224.5**
SI–RL–004	7 800 424.**3**	**594 481.6**

E 594 250
E 594 500
E 594 750
N 7 800 500
N 7 800 250
E 594 000

ISLAND BRIDGE
SI–RL–004
MSIB–D DCPT
MSIB–D
MSIB–C
MSIBP–2
MSIB–C DCPT
MSIB–B DCPT
MSIB–B
MSIBP–1
PSB–003
MSIB–A
MSIB–A2
MSIB–A1
PSD–2008–13
PSB–002
PSD–2008–12
SI–MHS–008
-5
-10
-10
-5
-10
-10

NOTES

1. CO–ORDINATE GRID IS UTM (NAD 83) ZONE 17 AND IS IN METRES.
2. BATHYMETRY IS CHART DATUM OF LNT (LOWEST NORMAL TIDE). MEAN SEA LEVEL IS CALCULATED TO BE 2.266m ABOVE LNT.
3. TOPOGRAPHY IS TO GEODETIC DATUM.
4. ASSUMPTION IS THAT LOCATION OF BRIDGE IS FIXED.

LEGEND

- EXISTING BOREHOLES – 2011 TEL PROGRAM
- EXISTING BOREHOLES – 2007/2008 KP PROGRAM
- 5m BATHYMETRY (BELOW SEA LEVEL)
- 5m TOPOGRAPHY (ABOVE SEA LEVEL)
- SHORE LINE

BASE PLAN PROVIDED BY

HATCH LTD.

MARY RIVER PROJECT
STEENSBY INLET
EXISTING BOREHOLE LOCATIONS PLAN
ISLAND BRIDGE

JOB# 19-1605-126

THURBER ENGINEERING LTD.

ENGINEER:	DRAWN:	APPROVED:
MTB	MFA	SMS
DATE:	SCALE:	DRAWING No.
NOVEMBER 2011	1:2000	A3

FILENAME: H:\Drafting\19\1605\126\ted5126–BoreholePlan(Onlce).dwg
PLOTDATE: Nov 10, 2011 – 9:00 AM

BH#	NORTHING	EASTING
PSSW-001	7 798 230.0	592 844.0
PSSW-002	7 798 290.0	592 835.0
PSSW-003	7 798 230.0	592 863.0
PSSW-004	7 798 354.0	592 823.0
PSSW-005	7 798 400.0	592 801.0
PSSW-006/006B	7 798 267.0	592 843.0
PSSW-007	7 798 423.0	592 786.0
PSSW-008	7 798 206.0	592 854.0
PSSW-009	7 798 206.0	592 854.0
PSSW-010	7 798 413.0	592 797.0
PSSW-011	7 798 466.0	592 814.0
PSSW-012	7 798 413.0	592 797.0
PSSW-013	7 798 505.0	592 828.0
SI-OLD-004	7 798 313.6	592 878.6
SI-OLD-005	7 798 330.8	592 859.8
SI-OLD-006	7 798 408.7	592 875.8
SI-OLD-007	7 798 424.5	592 839.7
SI-OLD-008	7 798 488.6	592 891.0

ALTERNATE ORE DOCK

FIGURE A.2

FIGURE A.3

PSSW-013
SI-OLD-008
PSSW-011
PSSW-007
SI-OLD-007
PSSW-010
PSSW-012
SI-OLD-006
PSSW-005
PSSW-004
SI-OLD-005
SI-OLD-004
PSSW-002
PSSW-006/006B
PSSW-001
PSSW-003
PSSW-008
PSSW-009

N 7 798 500
N 7 798 250
E 592 500
E 592 750
E 593 000
E 593 250

-50 -45 -40 -35 -30 -25 -20 -15 -10 -5
-55 -60 -65

NOTES

1. CO-ORDINATE GRID IS UTM (NAD 83) ZONE 17 AND IS IN METRES.
2. BATHYMETRY IS CHART DATUM OF LNT (LOWEST NORMAL TIDE). MEAN SEA LEVEL IS CALCULATED TO BE 2.266m ABOVE LNT.
3. TOPOGRAPHY IS TO GEODETIC DATUM.

LEGEND

- EXISTING BOREHOLES – 2011 TEL PROGRAM
- EXISTING BOREHOLES – 2007 KP PROGRAM
- 5m BATHYMETRY (BELOW SEA LEVEL)
- 5m TOPOGRAPHY (ABOVE SEA LEVEL)
- SHORE LINE
- REFERENCE TO PHOTOS IN FIGURE A.2 AND FIGURE A.3

BASE PLAN PROVIDED BY

HATCH LTD.

MARY RIVER PROJECT
STEENSBY INLET
EXISTING BOREHOLE LOCATIONS PLAN
ALTERNATE ORE DOCK

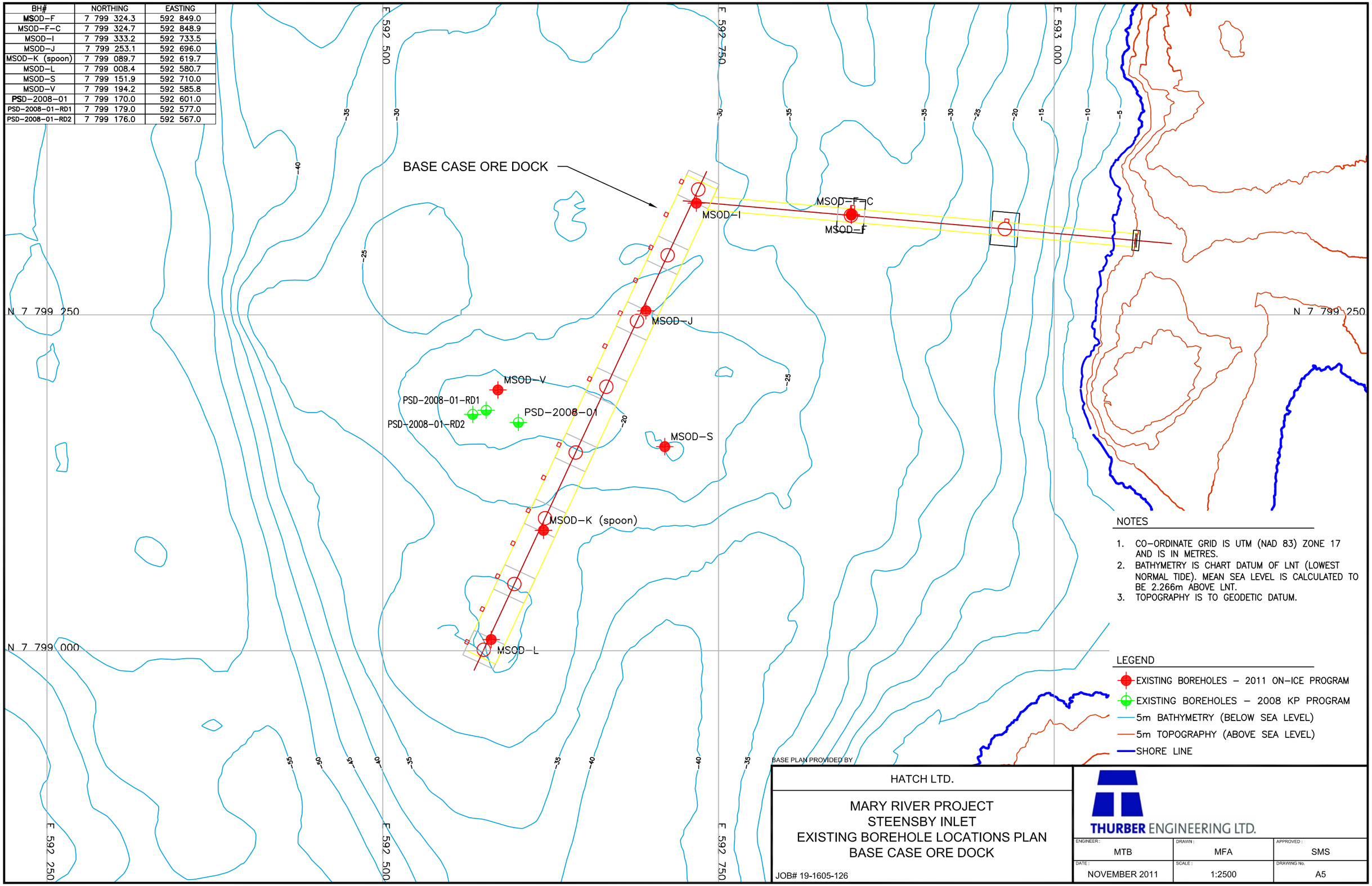
JOB# 19-1605-126

THURBER ENGINEERING LTD.

ENGINEER:	DRAWN:	APPROVED:
MTB	MFA	SMS
DATE:	SCALE:	DRAWING No.
NOVEMBER 2011	1:2000	A4

FILENAME: H:\Drafting\19\1605\126\ted5126-BoreholePlan(Onlce).dwg
PLOTDATE: Nov 9, 2011 - 4:13 PM

BH#	NORTHING	EASTING
MSOD–F	7 799 324.3	592 849.0
MSOD–F–C	7 799 324.7	592 848.9
MSOD–I	7 799 333.2	592 733.5
MSOD–J	7 799 253.1	592 696.0
MSOD–K (spoon)	7 799 089.7	592 619.7
MSOD–L	7 799 008.4	592 580.7
MSOD–S	7 799 151.9	592 710.0
MSOD–V	7 799 194.2	592 585.8
PSD–2008–01	7 799 170.0	592 601.0
PSD–2008–01–RD1	7 799 179.0	592 577.0
PSD–2008–01–RD2	7 799 176.0	592 567.0



NOTES

1. CO–ORDINATE GRID IS UTM (NAD 83) ZONE 17 AND IS IN METRES.
2. BATHYMETRY IS CHART DATUM OF LNT (LOWEST NORMAL TIDE). MEAN SEA LEVEL IS CALCULATED TO BE 2.266m ABOVE LNT.
3. TOPOGRAPHY IS TO GEODETIC DATUM.

LEGEND

- EXISTING BOREHOLES – 2011 ON–ICE PROGRAM
- EXISTING BOREHOLES – 2008 KP PROGRAM
- 5m BATHYMETRY (BELOW SEA LEVEL)
- 5m TOPOGRAPHY (ABOVE SEA LEVEL)
- SHORE LINE

BASE PLAN PROVIDED BY

HATCH LTD.

MARY RIVER PROJECT
STEENSBY INLET
EXISTING BOREHOLE LOCATIONS PLAN
BASE CASE ORE DOCK

JOB# 19-1605-126

THURBER ENGINEERING LTD.

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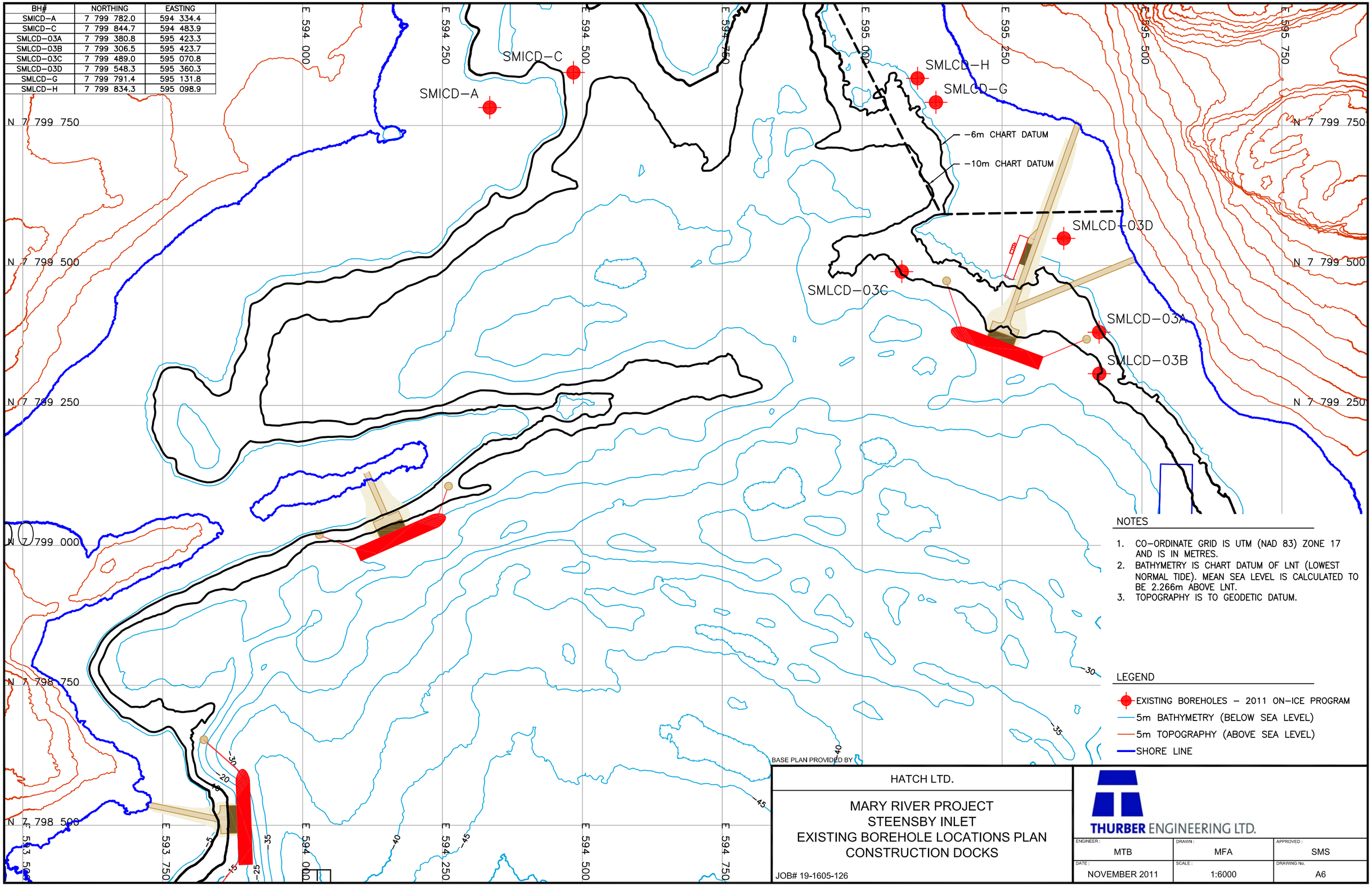
DATE:	SCALE:	DRAWING No.
NOVEMBER 2011	1:2500	A5

FILENAME: H:\Drafting\19\1605\126\ted5126–BoreholePlan(Onice).dwg
PLOTDATE: Nov 9, 2011 – 12:33 PM

BH#	NORTHING	EASTING
SMICD–A	7 799 782.0	594 334.4
SMICD–C	7 799 844.7	594 483.9
SMLCD–03A	7 799 380.8	595 423.3
SMLCD–03B	7 799 306.5	595 423.7
SMLCD–03C	7 799 489.0	595 070.8
SMLCD–03D	7 799 548.3	595 360.3
SMLCD–G	7 799 791.4	595 131.8
SMLCD–H	7 799 834.3	595 098.9



NOTES

1. CO–ORDINATE GRID IS UTM (NAD 83) ZONE 17 AND IS IN METRES.
2. BATHYMETRY IS CHART DATUM OF LNT (LOWEST NORMAL TIDE). MEAN SEA LEVEL IS CALCULATED TO BE 2.266m ABOVE LNT.
3. TOPOGRAPHY IS TO GEODETIC DATUM.

LEGEND

- EXISTING BOREHOLES – 2011 ON–ICE PROGRAM
- 5m BATHYMETRY (BELOW SEA LEVEL)
- 5m TOPOGRAPHY (ABOVE SEA LEVEL)
- SHORE LINE

BASE PLAN PROVIDED BY

HATCH LTD.

MARY RIVER PROJECT
STEENSBY INLET
EXISTING BOREHOLE LOCATIONS PLAN
CONSTRUCTION DOCKS

JOB# 19-1605-126

THURBER ENGINEERING LTD.

ENGINEER:	DRAWN:	APPROVED:
MTB	MFA	SMS
DATE:	SCALE:	DRAWING No.
NOVEMBER 2011	1:6000	A6

FILENAME: H:\Drafting\19\1605\126\ted5126–BoreholePlan(Onlce).dwg
PLOTDATE: Nov 9, 2011 – 12:33 PM

BH#	NORTHING	EASTING
MSNFD–A	7 803 194.4	592 425.1
MSNFD–B	7 803 217.3	592 451.1
MSNFD–C	7 803 234.2	592 469.8
MSNFD–D	7 803 254.6	592 493.0
PSD–2008–10	7 803 315.0	592 614.0
PSD–2008–11	7 803 019.0	592 242.0

N 7 803 500

N 7 803 250

N 7 803 000

E 592 000

E 592 250

E 592 500

E 592 750

SHIP OUTLINE

NORTH FREIGHT DOCK

PSD–2008–10

PSD–2008–11

MSNFD–A

MSNFD–B

MSNFD–C

MSNFD–D

30000

30000

30000

13.7

12.1

NOTES

1. CO–ORDINATE GRID IS UTM (NAD 83) ZONE 17 AND IS IN METRES.
2. BATHYMETRY IS CHART DATUM OF LNT (LOWEST NORMAL TIDE). MEAN SEA LEVEL IS CALCULATED TO BE 2.266m ABOVE LNT.
3. TOPOGRAPHY IS TO GEODETIC DATUM.
4. ASSUMPTION IS THAT LOCATION OF FREIGHT DOCK IS FIXED.

LEGEND

- EXISTING BOREHOLES – 2011 ON–ICE PROGRAM
- EXISTING BOREHOLES – 2007/2008 KP PROGRAM
- 5m BATHYMETRY (BELOW SEA LEVEL)
- 5m TOPOGRAPHY (ABOVE SEA LEVEL)
- SHORE LINE

BASE PLAN PROVIDED BY

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MARY RIVER PROJECT
STEENSBY INLET
EXISTING BOREHOLE LOCATIONS PLAN
NORTH FREIGHT DOCK

JOB# 19-1605-126

THURBER ENGINEERING LTD.

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MTB	MFA	SMS
DATE:	SCALE:	DRAWING No.
NOVEMBER 2011	1:2500	A7

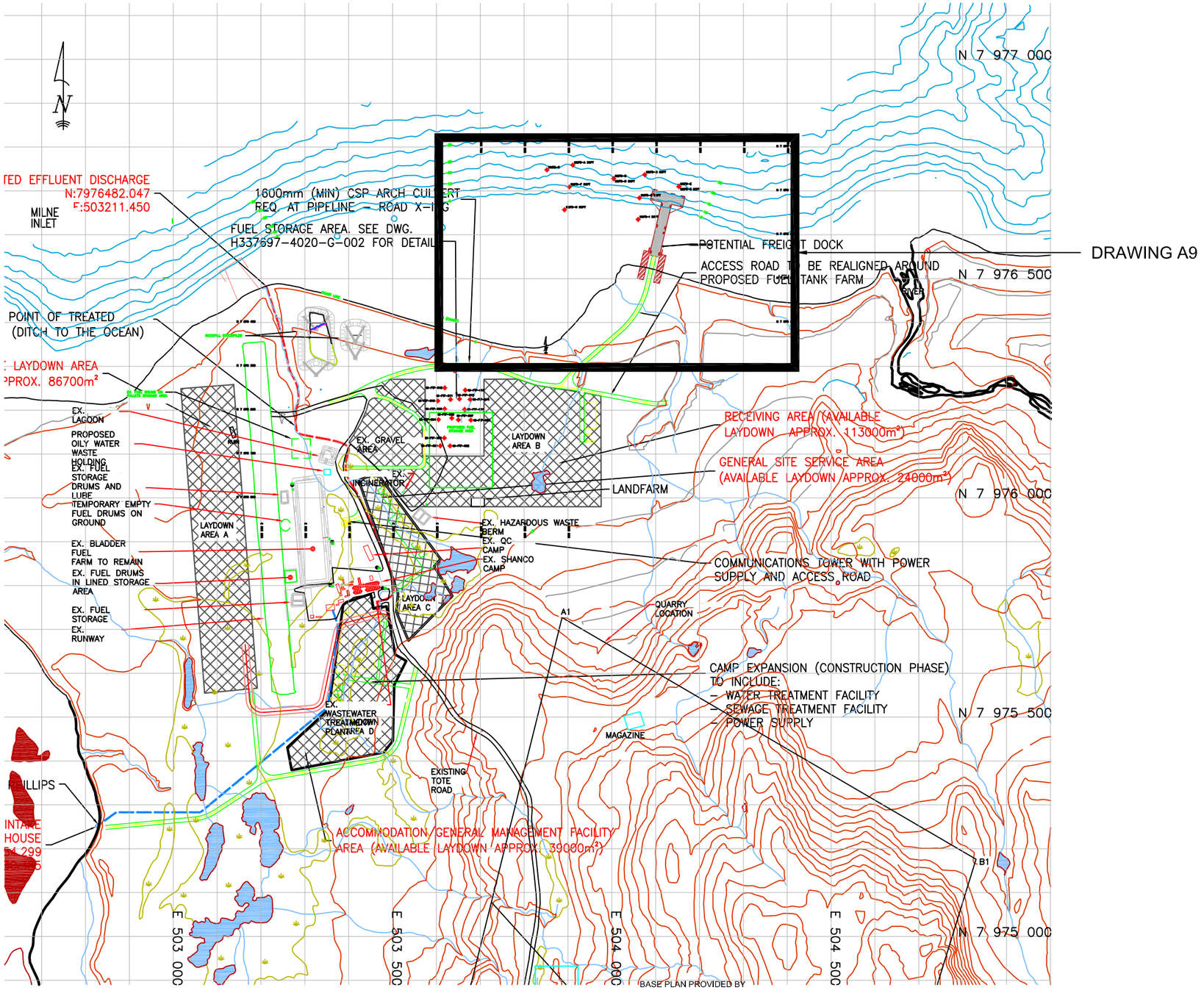
FILENAME: H:\Drafting\19\1605\126\ed5126–BoreholePlan(Onice).dwg
PLOTDATE: Nov 9, 2011 – 12:34 PM

NOTES

1. CO-ORDINATE GRID IS UTM (NAD 83) ZONE 17 AND IS IN METRES.
2. BATHYMETRY IS CHART DATUM OF LNT (LOWEST NORMAL TIDE). MEAN SEA LEVEL IS CALCULATED TO BE 2.266m ABOVE LNT.
3. TOPOGRAPHY IS TO GEODETIC DATUM.

LEGEND

- 5m BATHYMETRY (BELOW SEA LEVEL)
- 5m TOPOGRAPHY (ABOVE SEA LEVEL)
- WATER



BASE PLAN PROVIDED BY

HATCH LTD.

MARY RIVER PROJECT
MILNE INLET
LOCATION PLAN

JOB# 19-1605-126

THURBER ENGINEERING LTD.

ENGINEER:	DRAWN:	APPROVED:
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DATE:	SCALE:	DRAWING No.
NOVEMBER 2011	1:10000	A8

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PLOTDATE: Nov 9, 2011 - 3:51 PM

BH#	NORTHING	EASTING
MMFD–A DCPT	7 976 759.0	503 911.0
MMFD–B DCPT	7 976 737.0	504 075.0
MMFD–C	7 976 748.0	503 852.0
MMFD–D	7 976 728.0	504 004.0
MMFD–D DCPT	7 976 728.0	504 004.0
MMFD–E	7 976 710.0	504 153.0
MMFD–E DCPT	7 976 710.0	504 153.0
MMFD–F DCPT	7 976 709.0	503 903.0
MMFD–G DCPT	7 976 684.0	504 063.0
MMFD–H DCPT	7 976 657.0	503 892.0
MMFD–I DCPT	7 976 635.0	504 060.0

E 503 800
E 503 900
E 504 000
E 504 100
E 504 200
E 504 300
E 504 400
N 7 976 800
N 7 976 700
N 7 976 600
MMFD–A DCPT
MMFD–C
MMFD–B DCPT
MMFD–D
MMFD–D DCPT
MMFD–E
MMFD–E DCPT
MMFD–F DCPT
MMFD–G DCPT
MMFD–H DCPT
MMFD–I DCPT
POTENTIAL FREIGHT DOCK
20
15
10
5
25
20
15
10
5
0 (CHART)
5
10
N

NOTES

1. CO–ORDINATE GRID IS UTM (NAD 83) ZONE 17 AND IS IN METRES.
2. BATHYMETRY IS CHART DATUM OF LNT (LOWEST NORMAL TIDE). MEAN SEA LEVEL IS CALCULATED TO BE 2.266m ABOVE LNT.
3. TOPOGRAPHY IS TO GEODETIC DATUM.

LEGEND

- EXISTING BOREHOLES – 2011 TEL PROGRAM
- 1m BATHYMETRY (BELOW SEA LEVEL)
- 5m TOPOGRAPHY (ABOVE SEA LEVEL)

BASE PLAN PROVIDED BY
HATCH LTD.

MARY RIVER PROJECT
MILNE INLET
EXISTING BOREHOLE LOCATIONS PLAN
FREIGHT DOCK

JOB# 19-1605-126

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ENGINEER:	DRAWN:	APPROVED:
MTB	MFA	SMS
DATE:	SCALE:	DRAWING No.
NOVEMBER 2011	1:2000	A9

FILENAME: H:\Drafting\19\1605\126\ted5126–BoreholePlan(Mil).dwg
PLOTDATE: Nov 9, 2011 – 3:51 PM

THURBER

APPENDIX B

BOREHOLE LOGS

Modified Unified Soils Classification

Symbols and Terms used on the Test Hole Logs

Borehole Logs

Core Photographs

SYMBOLS, ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES

1. TEXTURAL CLASSIFICATION OF SOILS

CLASSIFICATION	PARTICLE SIZE	VISUAL IDENTIFICATION
Boulders	Greater than 200mm	same
Cobbles	75 to 200mm	same
Gravel	4.75 to 75mm	5 to 75mm
Sand	0.075 to 4.75mm	Not visible particles to 5mm
Silt	0.002 to 0.075mm	Non-plastic particles, not visible to the naked eye
Clay	Less than 0.002mm	Plastic particles, not visible to the naked eye

2. COARSE GRAIN SOIL DESCRIPTION (50% greater than 0.075mm)

TERMINOLOGY	PROPORTION
Trace or Occasional	Less than 10%
Some	10 to 20%
Adjective (e.g. silty or sandy)	20 to 35%
And (e.g. sand and gravel)	35 to 50%

3. TERMS DESCRIBING CONSISTENCY (COHESIVE SOILS ONLY)

DESCRIPTIVE TERM	UNDRAINED SHEAR STRENGTH (kPa)	APPROXIMATE SPT[(1)] 'N' VALUE
Very Soft	12 or less	Less than 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	Greater than 200	Greater than 30

NOTE: Hierarchy of Soil Strength Prediction

1) Laboratory Triaxial Testing
2) Field Insitu Vane Testing
3) Laboratory Vane Testing
4) SPT value
5) Pocket Penetrometer

4. TERMS DESCRIBING DENSITY (COHESIONLESS SOILS ONLY)

DESCRIPTIVE TERM	SPT "N" VALUE
Very Loose	Less than 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	Greater than 50

5. LEGEND FOR RECORDS OF BOREHOLES

SYMBOLS AND ABBREVIATIONS FOR SAMPLE TYPE

SS Split Spoon Sample; WS Wash Sample; AS Auger (Grab) Sample
TW Thin Wall Shelby Tube Sample; TP Thin Wall Piston Sample
PH Sampler Advanced by Hydraulic Pressure; PM Sampler Advanced by Manual Pressure
WH Sampler Advanced by Self Static Weight; RC Rock Core; SC Soil Core

$$\text{Sensitivity} = \frac{\text{Undisturbed Shear Strength}}{\text{Remoulded Shear Strength}}$$

$\blacktriangledown$ Water Level

C_{pen} Shear Strength Determination by Pocket Penetrometer

(1) SPT 'N' Value Standard Penetration Test 'N' Value – refers to the number of blows from a 63.5kg hammer free falling a height of 0.76m to advance a standard 50 mm outside diameter split spoon sampler for 0.3 m depth into undisturbed ground.

(2) DCPT Dynamic Cone Penetration Test – Continuous penetration of a 50 mm outside diameter, 60° conical steel point attached to "A" size rods driven by a 63.5 kg hammer free falling a height of 0.76 m. The resistance to cone penetration is the number of hammer blows required for each 0.3 m advance of the conical point into undisturbed ground.

UNIFIED SOILS CLASSIFICATION

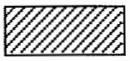
MAJOR DIVISIONS		GROUP SYMBOL	TYPICAL DESCRIPTION
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	Well-graded gravels or gravel-sand mixtures, little or no fines.
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines.
		GM	Silty gravels, gravel-sand-silt mixtures.
		GC	Clayey gravels, gravel-sand-clay mixtures.
	SAND AND SANDY SOILS	SW	Well-graded sands or gravelly sands, little or no fines.
		SP	Poorly-graded sands or gravelly sands, little or no fines.
		SM	Silty sands, sand-silt mixtures.
		SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS	SILTS AND CLAYS $W_L < 50\%$	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. ($W_L < 30\%$).
		CI	Inorganic clays of medium plasticity, silty clays. ($30\% < W_L < 50\%$).
		OL	Organic silts and organic silty-clays of low plasticity.
	SILTS AND CLAYS $W_L > 50\%$	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		CH	Inorganic clays of high plasticity, fat clays.
		OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils.
CLAY SHALE			
SANDSTONE			
SILTSTONE			
CLAYSTONE			
COAL			

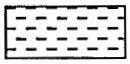
EXPLANATION OF ROCK LOGGING TERMS

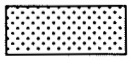
ROCK WEATHERING CLASSIFICATION

Fresh (FR)	No visible signs of weathering.
Fresh Jointed (FJ)	Weathering limited to the surface of major discontinuities.
Slightly Weathered (SW)	Penetrative weathering developed on open discontinuity surfaces, but only slight weathering of rock material.
Moderately Weathered (MW)	Weathering extends throughout the rock mass, but the rock material is not friable.
Highly Weathered (HW)	Weathering extends throughout the rock mass and the rock is partly friable.
Completely Weathered (CW)	Rock is wholly decomposed and in a friable condition, but the rock texture and structure are preserved.

SYMBOLS


CLAYSTONE


SILTSTONE


SANDSTONE


COAL


Bedrock (general)

DISCONTINUITY SPACING

Bedding	Bedding Plane Spacing
Very thickly bedded	Greater than 2m
Thickly bedded	0.6 to 2m
Medium bedded	0.2 to 0.6m
Thinly bedded	60mm to 0.2m
Very thinly bedded	20 to 60mm
Laminated	6 to 20mm
Thinly Laminated	Less than 6mm

TERMS

Total Core Recovery: (TCR)	Core recovered as a percentage of total core run length.
Solid Core Recovery: (SCR)	Percent Ratio of solid core of full cylindrical shape recovered. Expressed with respect to the total length of core run.
Rock Quality Designation: (RQD)	Total length of sound core recovered in pieces 0.1m in length or larger as a percentage of total core run length.
Uniaxial Compressive Strength (UCS)	Axial stress required to break the specimen
Fracture Index: (FI)	Frequency of natural fractures per 0.3m of core run.

STRENGTH CLASSIFICATION

Rock Strength	Approximate Uniaxial Compressive Strength (MPa)	(psi)	Field Estimation of Hardness*
Extremely Strong	Greater than 250	Greater than 36,000	Specimen can only be chipped with a geological hammer
Very Strong	100-250	15,000 to 36,000	Requires many blows of geological hammer to break
Strong	50-100	7,500 to 15,000	Requires more than one blow of geological hammer to break
Medium Strong	25.0 to 50.0	3,500 to 7,500	Breaks under single blow of geological hammer.
Weak	5.0 to 25.0	750 to 3,500	Can be peeled by a pocket knife with difficulty
Very Weak	1.0 to 5.0	150 to 750	Can be peeled by a pocket knife, crumbles under firm blows of geological pick.
Extremely Weak (Rock)	0.25 to 1.0	35 to 150	Indented by thumbnail

THURBER

STEENSBY INLET - CONSTRUCTION DOCKS

SMICD-A

SMICD-C*

SMICD-C1

SMLCD-03A

SMLCD-03A DCPT

SMLCD-03B DCPT

SMLCD-03C DCPT

SMLCD-03D DCPT

SMLCD-03D(2) DCPT

SMLCD-03D(3) DCPT

SMLCD-G

SMLCD-G DCPT

SMLCD-H

* Core photographs not available.

THURBER

RECORD OF BOREHOLE SMICD-A

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Construction Docks
STARTED : May 8, 2011
COMPLETED : May 8, 2011
DRILLER: BOART LONGYEAR
N 7 799 782 E 594 334
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	SAMPLES RECOVERY %	COMMENTS / DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND. (FROZEN / UNFROZEN / UNCERTAIN)
		SEA FLOOR		-2.55								
1	NW/NQ Casing/Coring	**COBBLES** and **BOULDERS**, fines washed out							-no recovery			1.60
				1.60								
2		**GRANITIC GNEISS**, fresh, strong, weakly foliated, grey and pink										
3					1	RUN			TCR=100% SCR=93% RQD=92%			
4												
5												
6					2	RUN			TCR=100% SCR=93% RQD=91%			
7												
8		Rough irregular vertical joints from -10.65 to -11.22m.										
9		Highly fractured from -11.68 to -12.15m. irregular, some rubble			3	RUN			TCR=100% SCR=57% RQD=39%			
10		becomes strong to very strong										
				10.65								
11		END OF BOREHOLE AT 13.20m. Ice thickness = 0.93m										
12												
13												
14												
15												
16												
17												
18												
19												

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Sivak
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SMICD-C

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Construction Docks
STARTED : May 6, 2011
COMPLETED : May 6, 2011
DRILLER: BOART LONGYEAR
N 7 799 845 E 594 484
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-8.98								
1	NW/NQ Casing/Coring	no recovery			1	RUN						
2												
3				3.05								
4		**COBBLES** and **GRAVEL**, fines washed out			2	RUN			UCS=237MPa			
5												
6				6.10								6.10
		END OF BOREHOLE AT 15.07m. Ice thickness = 1.76m Borehole aborted as core barrel was lost.										
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Sivak
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SMICD-C1

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Construction Docks
STARTED : May 6, 2011
COMPLETED : May 6, 2011
DRILLER: WALKER DRILLING
N 7 799 845 E 594 484
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-10.68								
0	NW/NQ Casing/Coring	**SAND**, with some gravel, cobbles, and boulders							-rods sank from sea floor to elev. -20.00m			
1												
2												
3												
4												
5					1	RUN						
6												
7												
8												
9												
10				10.44								10.44
11		**GRANITIC GNEISS**, fresh, lightly foliated, subhorizontal joints, coarse grained, pinkish grey										
12												
13					2	RUN			TCR=100% SCR=100% RQD=88% UCS=251MPa			
14												
15												
16					3	RUN			TCR=100% SCR=86% RQD=88% UCS=161MPa			
17				17.20								
		END OF BOREHOLE AT 27.88m.										
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : RH/Sivak
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SMLCD-03A

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Construction Docks
STARTED : May 22, 2011
COMPLETED : May 23, 2011
DRILLER: WALKER DRILLING
N 7 799 378 E 595 263
Project No. 19-1605-126
SHEET 1 OF 2
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT	EXCESS ICE CONTENT, PERCENT / WATER CONTENT, PERCENT	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-12.58								
1	NW/NQ Casing/Coring	**CLAY**, silty, trace sand, trace gravel, very soft, grey, saturated			1	SS	0	100				
2					2	SS	1	100	Grain Size Analysis: Gr 1%/ Sa 2%/ Si 52%/ Cl 45%			
3												
4		becoming hard			3	SS	48	100	Grain Size Analysis: Gr 1%/ Sa 0%/ Si 54%/ Cl 45%			
5				5.20								
6		**SAND**, gravelly, compact to dense			4	SS	33	46	Grain Size Analysis: Gr 40%/ Sa 44%/ Si & Cl 16%			
7					5	SS	17	25	Grain Size Analysis: Gr 20%/ Sa 65%/ Si & Cl 15%			
8					6	SS	40	8				
9					7	SS	26	17	Grain Size Analysis: Gr 29%/ Sa 58%/ Si & Cl 12%			
10												
11		difficulty advancing casement maximum boulder size is approximately 400mm		11.20								
12		**SAND** and **GRAVEL** (inferred), occasional cobbles and boulders										
13		sand in cuttings			1	RC		23				
14					2	RC		26				
15					3	RC		52				
16					4	RC		80				
17					5	RC		43				
18					6	RC		88				
19					7	RC		61				

EXCESS ICE CONTENT, PERCENT: ice; 10 20 30 40
WATER CONTENT, PERCENT: wp w wl; 10 20 30 40
DYNAMIC CONE PENETRATION RESISTANCE PLOT: 50 100 150 200 250
THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Dunstan/Webster
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SMLCD-03A

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Construction Docks
STARTED : May 22, 2011
COMPLETED : May 23, 2011
DRILLER: WALKER DRILLING
N 7 799 378 E 595 263
Project No. 19-1605-126
SHEET 2 OF 2
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
					8	RC		55				
21				21.28	9	RC			TCR=82% SCR=50% RQD=55%			21.28
22	NW/NQ Casing/Coring	**GRANITIC GNEISS**, fresh, massive, fine grained, grey and pink			10	RC			TCR=94% SCR=52% RQD=76%			
23												
24					11	RC			TCR=100% SCR=100% RQD=100%			
25				25.71								
26		END OF BOREHOLE AT 38.29m.										
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Dunstan/Webster
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SMLCD-03A DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Construction Docks
STARTED : May 20, 2011
COMPLETED : May 20, 2011
DRILLER: WALKER DRILLING
N 7 799 381 E 595 423
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT	EXCESS ICE CONTENT, PERCENT / WATER CONTENT, PERCENT	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-9.38								
		Start of DCPT at -9.38m.										
13				13.26								13.26
		END OF DCPT AT -22.64m.										

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 50 100 150 200 250
EXCESS ICE CONTENT, PERCENT: ice; 10 20 30 40
WATER CONTENT, PERCENT: wp w wl; 10 20 30 40
THERMISTER/ GROUND COND.: FROZEN, UNFROZEN, UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Peters
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SMLCD-03B DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Construction Docks
STARTED : May 20, 2011
COMPLETED : May 20, 2011
DRILLER: WALKER DRILLING
N 7 799 307 E 595 424
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT	EXCESS ICE CONTENT, PERCENT / WATER CONTENT, PERCENT	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-13.42								
		Start of DCPT at -13.42m.							-rods sank under the weight of the hammer from elev. -13.42 to -17.10m			
		END OF DCPT AT -26.50m.		13.08								13.08

RESISTANCE PLOT: 50 100 150 200 250
EXCESS ICE CONTENT, PERCENT: ice; 10 20 30 40
WATER CONTENT, PERCENT: wp w wl; 10 20 30 40
THERMISTER/ GROUND COND.: FROZEN, UNFROZEN, UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Peters
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SMLCD-03C DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Construction Docks
STARTED : May 20, 2011
COMPLETED : May 20, 2011
DRILLER: WALKER DRILLING
N 7 799 489 E 595 071
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-11.52								
0		Start of DCPT at -11.52m.							-rods sank under the weight of the hammer from elev. -11.52 to -14.30m			
1												
2												
3												
4												
5				5.37								5.37
		END OF DCPT AT -16.89m. Ice thickness = 1.60m										
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Holmes
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SMLCD-03D DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Construction Docks
STARTED : May 20, 2011
COMPLETED : May 20, 2011
DRILLER: WALKER DRILLING
N 7 799 547 E 595 364
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-7.08								
0		Start of DCPT at -7.08m										
1												
2												
				2.84								2.84
3		END OF DCPT AT -9.92m.										
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Peters
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SMLCD-03D(2) DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Construction Docks
STARTED : May 20, 2011
COMPLETED : May 20, 2011
DRILLER: WALKER DRILLING
N 7 799 548 E 595 360
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND. (FROZEN / UNFROZEN / UNCERTAIN)
		SEA FLOOR		-6.65								
0		Start of DCPT at -6.65m										
1												
2												
3				3.18								3.18
4		END OF DCPT AT -9.83m. Ice thickness = 1.62m										
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Holmes
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SMLCD-03D(3) DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Construction Docks
STARTED : May 20, 2011
COMPLETED : May 20, 2011
DRILLER: WALKER DRILLING
N 7 799 549 E 595 356
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-7.23								
0		Start of DCPT at -7.23m										
1												
2												
3				2.93								2.93
		END OF DCPT AT -10.16m. Ice thickness = 1.62m										
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Holmes
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SMLCD-G

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Construction Docks
STARTED : May 11, 2011
COMPLETED : May 12, 2011
DRILLER: WALKER DRILLING
N 7 799 791 E 595 132
Project No. 19-1605-126
SHEET 1 OF 2
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-5.75								
0		**SAND**, silty, fine to medium grained, some gravel, trace clay, trace organics and sea shells, compact, grey, wet			1	SS	25	50	Grain Size Analysis: Gr 0%/ Sa 77%/ Si 20%/ Cl 3%			
1					2	SS	31	50	Grain Size Analysis: Gr 21%/ Sa 54%/ Si 22%/ Cl 3%			
2					3	SS	12	50				
3					4	SS	40	25	Grain Size Analysis: Gr 15%/ Sa 58%/ Si 24%/ Cl 3%			
4												
5				5.00								
6	NW/NQ Casing/Coring	**SAND** (inferred), gravelly, some cobbles			1	RUN		20				
7												
8												
9					2	RUN		28				
10		granitic boulders to 700mm			3	RUN		45				
11												
12					4	RUN		100				
13		occasional cobbles			5	RUN		25				
14												
15					6	RUN		33				
					7	RUN		23				
				15.30	8	RUN		0				
16		advance casing, no recovery										
17												
18				18.22								
19		**SAND** and **GRAVEL** (inferred), occasional cobbles			9	RUN		47				

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Kromer/Dunstan
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SMLCD-G

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Construction Docks
STARTED : May 11, 2011
COMPLETED : May 12, 2011
DRILLER: WALKER DRILLING
N 7 799 791 E 595 132
Project No. 19-1605-126
SHEET 2 OF 2
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND. (FROZEN / UNFROZEN / UNCERTAIN)
21					10	RUN		29				
22					11	RUN		30				
23		grey sandy silt pieces (possible till)			12	RUN		20				
24												
25	NW/NQ Casing/Coring				13	RUN		15				
26				26.21	14	RUN		80				26.21
27		**GRANITIC GNEISS**, moderately weathered, highly fractured, greyish red, jointed at 30° and 45°			15	RUN			TCR=100% SCR=43% RQD=26%			
28		slightly weathered, foliated, amethyst nodules, pinkish grey			16	RUN			TCR=100% SCR=69% RQD=76%			
29		fresh, coarse grained, lightly foliated, pink/white/grey										
30					17	RUN			TCR=100% SCR=100% RQD=100% UCS=235MPa			
31		END OF BOREHOLE AT 36.28m.		30.53								
32												
33												
34												
35												
36												
37												
38												
39												

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Kromer/Dunstan
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SMLCD-G DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Construction Docks
STARTED : May 12, 2011
COMPLETED : May 12, 2011
DRILLER: WALKER DRILLING
N 7 799 791 E 595 132
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-5.47								
0		Start of DCPT at -5.47m.										
1												
2												
3												
4												
5												
6												
7				7.11								7.11
		END OF DCPT AT -12.58m.										
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Dunstan/Letts
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SMLCD-H

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Construction Docks
STARTED : May 9, 2011
COMPLETED : May 11, 2011
DRILLER: WALKER DRILLING
N 7 799 834 E 595 099
Project No. 19-1605-126
SHEET 1 OF 2
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-6.28								
0		**SILT**, sandy, some clay, trace gravel, compact, grey			1	SS	23	25	Grain Size Analysis: Gr 1%/ Sa 39%/ Si 47%/ Cl 12%			
1									-easy casing advancement			
2					2	SS	87					
				2.63								
3		**SAND** and **GRAVEL** (inferred), occasional cobbles and boulders, compact to very dense			3	SS	100/.100		-difficult casing advancement			
4												
5					1	RC		0				
6					2	RC		40	-sand/silt washed away			
7												
8					3	RC		50				
9	NW/NQ Casing/Coring				4	SS	34	50	Grain Size Analysis: Gr 37%/ Sa 42%/ Si & Cl 21%			
					5	SS	53	5				
10		boulder, granitic, fresh, pinkish grey (1.06m)			4	RC		100				
					5	RC		100				
11					6	RC		55	-sand/silt washed away			
12												
13												
14					7	RC		30				
15												
16									-difficult casing advancement			
17					8	RC		45				
18					9	RC		35				
					10	RC		50				
19		boulder (250mm)			11	RC		50				
					12	RC		67				

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Dunstan/Kromer
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SMLCD-H

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Construction Docks
STARTED : May 9, 2011
COMPLETED : May 11, 2011
DRILLER: WALKER DRILLING
N 7 799 834 E 595 099
Project No. 19-1605-126
SHEET 2 OF 2
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
				20.37								20.37 FROZEN
21	NW/NQ Casing/Coring	**GRANITE**, slightly weathered, strong, coarse grained, greyish pink, black on joint surfaces, jointed 0°, 45°, and 60° fresh			13	RC			TCR=100% SCR=68% RQD=50%			
					14	RC			TCR=100% SCR=100% RQD=100% UCS=259MPa			
22		slightly weathered			15	RC			TCR=100% SCR=46% RQD=0% UCS=263MPa			
					16	RC			TCR=100% SCR=63% RQD=53%			
23					17	RC			TCR=100% SCR=61% RQD=44% UCS=196MPa			
24		subhorizontal joints			18	RC			TCR=100% SCR=100% RQD=100% UCS=241MPa			
25					19	RC			TCR=100% SCR=85% RQD=79% UCS=243MPa			
26		fresh										
27					20	RC			TCR=100% SCR=100% RQD=100% UCS=207MPa			
28		END OF BOREHOLE AT 34.19m.		27.91								
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Dunstan/Kromer
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

Borehole SMICD-A

Photo 1: Core Box #1 of 3 (Runs 1-2, 4.2m – 8.3m)

Photo 2: Core Box #2 of 3 (Runs 2-3, 8.3m – 12.8m)

Photo 3: Core Box #3 of 3 (Run 3, 12.8m – 13.2m)

Borehole SMICD-C1

Photo 1: Core Box #1 of 2 (Runs 1-2, 10.7m – 21.1m)

Photo 2: Core Box #2 of 2 (Runs 2-3, 21.1m – 24.4m)

Borehole SMLCD-03A

Photo 1: Core Box #1 of 2 (Runs RC-1 to RC-8, 11.2m – 20.6m)

Photo 2: Core Box #2 of 2 (Runs RC-9 to RC-11, 20.6m – 25.7m)

THURBER

Borehole SMLCD-G

Photo 1: Core Box #1 of 4 (Runs 1-5, 5.0m – 14.2m)

Photo 2: Core Box #2 of 4 (Runs 6-13, 14.2m – 24.7m)

Photo 3: Core Box #3 of 4 (Runs 13-16, 24.7m – 28.9m)

Photo 4: Core Box #4 of 4 (Runs 16-17, 28.9m – 30.5m)

Borehole SMLCD-H

Photo 1: Core Box #1 of 4 (Runs RC-2 to RC-6, 7.0m – 11.0m)

Photo 2: Core Box #2 of 4 (Runs RC-7 to RC-13, 13.5m – 20.9m)

Photo 3: Core Box #3 of 4 (Runs RC-14 to RC-18, 20.9m – 24.6m)

Photo 4: Core Box #4 of 4 (Runs RC-18 to RC-20, 24.6m – 27.9m)

THURBER

STEENSBY INLET – SOUTH FREIGHT DOCK

MSFD-B DCPT	MSFD-N DCPT
MSFD-C	MSFD-P*
MSFD-D	MSFD-P1*
MSFD-D DCPT	MSFDP-06 DCPT
MSFD-E DCPT	MSFDP-07 DCPT
MSFD-G	MSFDP-08 DCPT
MSFD-G DCPT	MSFDP-10 DCPT
MSFD-J DCPT	MSFDP-11 DCPT
MSFD-L	SI-FD-002
MSFD-M*	SI-FD-004*

DCPT 04	DCPT 11
DCPT 05	DCPT 12
DCPT 06	DCPT 13
DCPT 07	DCPT 14
DCPT 08	DCPT 15
DCPT 09	DCPT 16
DCPT 10	DCPT 17
	DCPT 18

* Core photographs not available.

THURBER

RECORD OF BOREHOLE MSFD-B DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 18, 2011
COMPLETED : May 18, 2011
DRILLER: WALKER DRILLING
N 7 798 914 E 595 532
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-9.66								
0		Start of DCPT at -9.66m.										
1												
2												
3				3.44								3.44
4		END OF DCPT AT -13.10m. Ice thickness = 1.60m										
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Holmes
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSFD-C

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 15, 2011
COMPLETED : May 16, 2011
DRILLER: WALKER DRILLING
N 7 798 974 E 595 550
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT	EXCESS ICE CONTENT, PERCENT / WATER CONTENT, PERCENT	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-13.68								
0	NW/NQ Casing/Coring	no recovery, casing advanced by washing only.										
3		Coring started at elevation -17.30m which was the top of competent soil.		3.62								
4		**COBBLES** and **BOULDERS**, fine material washed from core										
8					1	RC						
11				11.80								11.80
12		**GRANITE**, fresh to slightly weathered, strong, massive, fine grained, quartzite inlays, dark grey to black with pink crystalline specks			2	RC			TCR=82% SCR=59% RQD=63%			
13					3	RC			TCR=94% SCR=44% RQD=44%			
15					4	RC			TCR=98% SCR=68% RQD=68%			
				15.56								
16		END OF BOREHOLE AT -29.24m.										

EXCESS ICE CONTENT, PERCENT: ice; 10 20 30 40
WATER CONTENT, PERCENT: wp w wl; 10 20 30 40
THERMISTER/ GROUND COND.: FROZEN, UNFROZEN, UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Dunstan/Webster
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSFD-D

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 14, 2011
COMPLETED : May 16, 2011
DRILLER: WALKER DRILLING
N 7 798 913 E 595 489
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-23.04								
0	NW/NQ Casing/Coring	no recovery, all material washed.										
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12				12.73								12.73
13		**GRANITE**, fresh to slightly weathered, strong to very strong, massive, fine grained, dark grey to black			1	RUN			TCR=97% SCR=78% RQD=73%			
14												
15					2	RUN			TCR=94% SCR=81% RQD=73%			
16					3	RUN			TCR=97% SCR=84% RQD=76%			
17				16.88								
		END OF BOREHOLE AT 39.92m. Ice thickness =										
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Dunstan/Webster
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSFD-D DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 16, 2011
COMPLETED : May 16, 2011

Project No. 19-1605-126
DRILLER: WALKER DRILLING
N 7 798 911 E 595 494
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND. (FROZEN / UNFROZEN / UNCERTAIN)
		SEA FLOOR		-22.96								
		Start of DCPT at -22.96m.										
1												
2												
3												
4												
5												
6												
7												
8												
9				9.73								9.73
10		END OF DCPT AT -32.69m. Cone was bouncing at -32.69m. Ice thickness = 1.60m										
11												
12												
13												
14												
15												
16												
17												
18												
19												

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Peters
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSFD-E DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 16, 2011
COMPLETED : May 16, 2011

DRILLER: BOART LONGYEAR
N 7 798 943 E 595 510

Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-18.56								
		Start of DCPT at -18.56m.							-rods sank under the weight of the hammer from elev. -18.56 to -19.17 and from -20.08 to -22.37m			
11		END OF DCPT AT -29.56m.		11.00								11.00

FROZEN
UNFROZEN
UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Peters
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSFD-G

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 13, 2011
COMPLETED : May 14, 2011

DRILLER: WALKER DRILLING
N 7 798 997 E 595 527

Project No. 19-1605-126
SHEET 1 OF 2
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-18.23								
0		**SAND** and **SILT**, clayey, trace gravel, very loose, grey			1	SS	0	25	Grain Size Analysis: Gr 4%/ Sa 37%/ Si 35%/ Cl 24%			
1				1.00								
		CLAY, silty, trace sand, trace gravel, very soft, grey			2	SS	1	100	Grain Size Analysis: Gr 9%/ Sa 4%/ Si 48%/ Cl 39%			
2												
3												
4				4.00								
		GRAVEL, sandy, trace silt, compact, drak grey, saturated										
5												
6												
					3	SS	18	33				
7				7.03								
		SAND and **GRAVEL** (inferred), occasional cobbles and boulders										
8					4	SS	50/ .125	0				
					1	RUN		66				
9	NW/NQ Casing/Coring											
10									Note: At the completion of Run 1, approximately 4m of sandy material blew back up the casing. Runs 2, 3, and 4 cored out the material that blew up the casing.			
11					5	RUN						
12												
13					6	RUN						
14					7	RUN						
15												
					8	RUN						
16												
					9	RUN						
17												
					10	RUN						
18												
19					11	RUN						

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Dunstan/MSD/Webster
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSFD-G

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 13, 2011
COMPLETED : May 14, 2011

DRILLER: WALKER DRILLING
N 7 798 997 E 595 527

Project No. 19-1605-126
SHEET 2 OF 2
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	SOIL PROFILE: STRATA PLOT	SOIL PROFILE: ELEV. (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	SAMPLES: RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
				20.08	12	RUN						20.08
21		END OF BOREHOLE AT -38.31m. Note: Borehole abandoned before bedrock was found as casing sheared off and approximately 25m was lost.										
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Dunstan/MSD/Webster
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSFD-G DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 16, 2011
COMPLETED : May 16, 2011

Project No. 19-1605-126
DRILLER: WALKER DRILLING
N 7 798 995 E 595 525
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-18.76								
0		Start of DCPT at -18.76m.										
1												
2												
3												
4												
5												
6												
7												
8				8.00								8.00
		END OF DCPT AT -26.76m. Ice thickness = 1.58m										
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Peters
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSFD-J DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 16, 2011
COMPLETED : May 16, 2011

DRILLER: BOART LONGYEAR
N 7 798 969 E 595 484

Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-20.57								
		Start of DCPT at -20.57m.							-rods sunk under the weight of the hammer from elev. -20.57 to -22.10m			
9				9.44								9.44
		END OF DCPT AT -30.01m. Ice thickness = 1.60m										

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Peters
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSFD-L

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 16, 2011
COMPLETED : May 17, 2011
DRILLER: WALKER DRILLING
N 7 799 082 E 595 528
Project No. 19-1605-126
SHEET 1 OF 2
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. (m)	NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS / DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-17.83								
0		**CLAY**, **SILT**, and **SAND**, trace gravel, very soft, grey			1	SS	4	100	Grain Size Analysis: Gr 4%/ Sa 40%/ Si 32%/ Cl 24%			
				0.67								
1		no recovery, refusal on possible cobbles/boulders			2	SS	57/ .100	0				
2												
3												
4												
5					3	SS	2	21				
6					4	SS	50/ .100	0				
				6.37								
		SAND, trace silt, very loose, grey, saturated			5	SS	7	25				
				6.87								
7		**SAND**, gravelly, coarse grained, compact, grey			2	RUN		2				
8		grinding on probable boulder dark brown wash water with fine sand particles loose										
9	NW/NQ Casing/Coring				3	RUN		27				
10				10.37								
		SAND and **GRAVEL** (inferred), occasional cobbles and boulders, fines washed out										
11					4	RUN		23				
12												
13					5	RUN		30				
14												
15		fine grained, some clayey soil, reddish grey to dark grey/black			6	RUN		38				
16		boulder (200mm)			7	RUN		53				
17		cobble (100mm)			8	RUN		30				
					9	RUN		35				
18		some possible quartzite pieces, black to greyish black										
19					10	RUN		27				

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Webster/Dunstan
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSFD-L

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 16, 2011
COMPLETED : May 17, 2011

DRILLER: WALKER DRILLING
N 7 799 082 E 595 528

Project No. 19-1605-126
SHEET 2 OF 2
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
21	NW/NQ Casing/Coring	boulder (350mm)			11	RUN		32				
22					12	RUN		75				
23					13	RUN		39				
24					14	RUN		85				
25					15	RUN		55				
26					16	RUN		20				
27					17	RUN		22				
28				28.14								28.14
		END OF BOREHOLE AT -45.97m.										
29		Note: Borehole abandoned before bedrock was found as casing sheared off. Approximately 7.5m of casing was lost.										
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Webster/Dunstan
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSFD-M

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 19, 2011
COMPLETED : May 20, 2011

DRILLER: WALKER DRILLING
N 7 799 012 E 595 581

Project No. 19-1605-126
SHEET 1 OF 2
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-13.73								
1	NW/NQ Casing/Coring	**CLAY**, silty, trace sand, trace gravel, saturated, organics, shells, very soft, dark grey with black staining										
2					1	SS	0	63				
				2.74					Grain Size Analysis: Gr 4%/ Sa 43%/ Si 31%/ Cl 22%			
3		**SAND** (inferred), some gravelly zones, compact, dark grey/pink, granitic										
4					2	SS	18	25				
									Grain Size Analysis: Gr 60%/ Sa 34%/ Si & Cl 6%			
5					3	SS	50/ .050	0	-no recovery due to gravel or cobble			
6												
7		(inferred from wash return), some gravel pieces, occasional cobbles and boulders			1	RC		68	-coarse sand in flush return			
8					2	RC		15				
9												
10					3	RC		0	-sand in flush return			
11												
12					4	RC		0				
13					5	RC						
14					4	SS	54/ .075	0				
		boulders to 300mm			6	RC						
15					7	RC						
					8	RC						
16		boulders to 300mm			9	RC						
17					10	RC						
				17.60								17.60
18		**GRANITE**, strong, fine grained, dark grey			11	RC			TCR=80% SCR=86% RQD=47%			
		numerous diagonal joints										
19		horizontal joint with clay infill			12	RC			TCR=16% SCR=100% RQD=0%			

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Webster/Dunstan
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSFD-M

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 19, 2011
COMPLETED : May 20, 2011

DRILLER: WALKER DRILLING
N 7 799 012 E 595 581

Project No. 19-1605-126
SHEET 2 OF 2
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
21		weathered zone, numerous closed sub-vertical joints			13	RC			TCR=36% SCR=18% RQD=58%			FROZEN / UNFROZEN / UNCERTAIN
					14	RC			TCR=100% SCR=18% RQD=18%			
		END OF BOREHOLE AT -34.95m.		21.22								
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Webster/Dunstan
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSFD-N DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 19, 2011
COMPLETED : May 19, 2011

Project No. 19-1605-126
DRILLER: WALKER DRILLING
N 7 798 792 E 595 531
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-12.21								
0		Begin DCPT at -12.21m.										
1												
2												
3												
4												
				4.69								4.69
5		END OF DCPT AT -16.9m. Ice thickness = 1.70m										
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Holmes
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSFD-P

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 20, 2011
COMPLETED : May 20, 2011

Project No. 19-1605-126
DRILLER: WALKER DRILLING
N 7 798 813 E 595 481
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. (m)	NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS / DYNAMIC CONE PENETRATION RESISTANCE PLOT	EXCESS ICE CONTENT, PERCENT / WATER CONTENT, PERCENT	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-24.46								
0	NW/NQ Casing/Coring	**CLAY**, silty, some sand, trace gravel, grey, very soft to soft, saturated			1	SS	0	100	Grain Size Analysis: Gr 0%/ Sa 24%/ Si 48%/ Cl 28%			
1		layer of gravelly sand			2	SS	14	100	Grain Size Analysis: Gr 4%/ Sa 41%/ Si 30%/ Cl 25%			
2												
3												
4		**SAND**, gravelly, trace silt, grey		3.84	3	SS	6	100	Grain Size Analysis: Gr 30%/ Sa 63%/ Si & Cl 6%			
		CLAY, silty, some sand, trace gravel, grey		4.54								
5					4	SS	11	80	Grain Size Analysis: Gr 1%/ Sa 24%/ Si 48%/ Cl 26%			
6		**SAND**, some gravel, grey		5.54								
				6.40	5	SS	65/ .025	5	Grain Size Analysis: Gr 43%/ Sa 54%/ Si & Cl 3% -casing broke			6.40
7		END OF BOREHOLE AT -30.86m. Hole abandoned after SS#5. Approximately 20m of casing was lost. New borehole (MSFD-P1) started about 4m south of this borehole.										
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN, UNFROZEN, UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Dunstan/Webster
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSFD-P1

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 21, 2011
COMPLETED : May 21, 2011

DRILLER: WALKER DRILLING
N 7 798 809 E 595 481

Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-25.30								
1	NW/NQ Casing/Coring	**CLAY**, silty, trace gravel, with interbedded sand zones, soft, grey										
2												
3												
4												
				4.60	1	SS	11	100	Grain Size Analysis: Gr 5%/ Sa 83%/ Si & Cl 11%			
5		**SAND**, some gravel, very loose to compact, light brown, wet										
					2	SS	70/ .050					
6					1	RC		8	-sand in flush return			
7												
		occasional cobbles			2	RC		13	-sand heave into casing			
8				8.17								8.17
		END OF BOREHOLE AT 33.47m. Casing broke off, hole ended.										
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Webster/Dunstan
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSFDP-06 DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 19, 2011
COMPLETED : May 19, 2011

Project No. 19-1605-126
DRILLER: WALKER DRILLING
N 7 799 055 E 595 540
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND. (FROZEN / UNFROZEN / UNCERTAIN)
		SEA FLOOR		-16.76								
0		Start of DCPT at -16.76m.							-rods sunk under the weight of the hammer from elev. -16.76 to -20.88m			
1												
2												
3												
4												
5												
				5.67								5.67
6		END OF DCPT AT -22.43m. Ice thickness = 1.68m										
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Holmes
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSFDP-07 DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 19, 2011
COMPLETED : May 19, 2011

DRILLER: WALKER DRILLING
N 7 799 043 E 595 590

Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-14.15								
		Start of DCPT at -14.15m.							-rods sunk under the weight of the hammer from elev. -14.15 to -17.68m			
1												
2												
3												
4												
5												
6												
7												
8												
9												
				9.72								9.72
10		END OF DCPT AT -23.87m. Ice thickness = 1.62m										
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Holmes
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSFDP-08 DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 20, 2011
COMPLETED : May 20, 2011
DRILLER: WALKER DRILLING
N 7 799 034 E 595 631
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND. (FROZEN / UNFROZEN / UNCERTAIN)
		SEA FLOOR		-11.65								
0		Start of DCPT at -11.65m.							-rods sunk under the weight of the hammer from elev. -11.65 to -12.81m			
1												
2												
3												
4												
5												
6												
7				7.17								7.17
		END OF DCPT AT -18.82m. Ice thickness = 1.80m										
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Holmes
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSFDP-10 DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 19, 2011
COMPLETED : May 19, 2011

Project No. 19-1605-126
DRILLER: WALKER DRILLING
N 7 798 873 E 595 494
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-22.26								
		Start of DCPT at -22.26m.										
1												
2												
3												
4												
5												
6				6.32								6.32
		END OF DCPT AT -28.58m. Ice thickness = 1.75										
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Holmes
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSFDP-11 DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 20, 2011
COMPLETED : May 20, 2011
DRILLER: WALKER DRILLING
N 7 798 867 E 595 544
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-10.59								
0		Start of DCPT at -10.59m.										
1												
2												
3												
4												
5												
6												
7												
				7.80								7.80
8		END OF DCPT AT -18.39m. Ice thickness = 1.68m										
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Holmes
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SI-FD-002

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : August 11, 2011
COMPLETED : August 11, 2011

Project No. 19-1605-126
DRILLER: WALKER DRILLING, D-50
N 7 798 836 E 595 693
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT	EXCESS ICE CONTENT, PERCENT / WATER CONTENT, PERCENT	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		GROUND SURFACE		15.67								
		no recovery										
1		**GRAVEL**, granitic, fine material washed out		1.22	1	RUN		23				
2		**SILT**, clayey, some sand, grey, moist: (Nf)		1.91	2	RUN		100	Grain Size Analysis: Gr 9%/ Sa 22%/ Si 51%/ Cl 18%			1.90
3		**GRAVEL**, **COBBLES** and **BOULDERS**, granitic, subangular to subrounded, grey, pink, fines washed out		2.80	3	RUN		61				2.80
4					4	RUN		63				
5	Diamond Drill				5	RUN		58				
6					6	RUN		21				
7												
8												
9		**GRANITIC GNEISS**, moderately weathered, weak, jointed (rough, planar, silt coated), black with pink and white patches		9.00	7	RUN			TCR=93% SCR=89% RQD=68%		Fl 0 0 1	9.00
10		sandy silt layer at 10.35 to 10.40m									>10 >10 6	
11		becoming strong, fresh clay infill at 11.00m			8	RUN			TCR=100% SCR=49% RQD=49%		>10 5 0 0	
12		clayey silt layer at 11.95m		12.10	9	RUN			TCR=100% SCR=33% RQD=33%		>10	
		END OF BOREHOLE AT 12.10m.										
13												
14												
15												
16												
17												
18												
19												

EXCESS ICE CONTENT, PERCENT: ice; 10 20 30 40
WATER CONTENT, PERCENT: wp w wl; 10 20 30 40
DYNAMIC CONE PENETRATION RESISTANCE PLOT: 50 100 150 200 250

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Ramos
CHECKED : KS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SI-FD-004

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : August 13, 2011
COMPLETED : August 13, 2011
DRILLER: WALKER DRILLING, D-50
N 7 798 844 E 595 703
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		GROUND SURFACE		16.23								
0	Diamond Drill	limited recovery, minor gravel, granitic, fines washed out			1	RUN		10				
1												
2					2	RUN		17				
3		**CLAY**, silty, some sand, some gravel, occasional cobbles, light grey, wet		2.95	3	RUN		93		o		
4												
5		**GRAVEL** and **BOULDER** (<630mm), subangular to subrounded, dark grey, pink, white		4.45	4	RUN		60				
6		**SAND**, gravelly, some silt to silty, trace clay, with cobbles (<100mm), light grey		5.95	5	RUN		22				
7												
8					6	RUN		45	Grain Size Analysis: Gr 28%/ Sa 49%/ Si & Cl 23%	o		
9												
10		**GRANITIC GNEISS**, slightly to moderately weathered, weak to medium strong, fractured, pink, black, grey		9.85	7	RUN		96				9.85
11					8	RUN			TCR=97% SCR=89% RQD=48%		FI 2 >10 6	
12		clay filled fracture at 12.10m slightly weathered										
13					9	RUN			TCR=100% SCR=100%			
				13.75								
14		END OF BOREHOLE AT 13.75m.										
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Young
CHECKED : KS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE DCPT04

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 24, 2011
COMPLETED : May 24, 2011

DRILLER: WALKER DRILLING, D-50
N 7 799 025 E 595 464

Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-22.16								
		Start of DCPT at -22.16m.							-rods sunk under the weight of the hammer from elev. -22.16 to -26.37m			
9				9.18								9.18
		END OF DCPT AT -31.34m.										

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Holmes
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE DCPT05

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 24, 2011
COMPLETED : May 24, 2011
DRILLER: WALKER DRILLING, D-50
N 7 798 896 E 595 485
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-24.10								
		Start of DCPT at -24.10m.										
				2.60								2.60
		END OF DCPT AT -26.70m. Ice thickness = 1.83m Note: When rods were removed at the end of the test it was noted that the bottom 16.8m of rods were bent. The results of the DCPT may not be representative of actual conditions. Casing not available.							-integrity of rods lost, deflecting -test not valid -rods bent upon retrieval			

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Peters
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE DCPT06

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 24, 2011
COMPLETED : May 24, 2011

DRILLER: WALKER DRILLING
N 7 798 936 E 595 493

Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-25.94								
		Start of DCPT at -25.94m.										
1												
2												
3												
4												
5												
6												
7												
8												
9												
				9.86								9.86
10		END OF DCPT AT -35.80m. Ice thickness = 1.83m (approx.) Casing not available.										
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Peters
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE DCPT07

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 24, 2011
COMPLETED : May 24, 2011

DRILLER: WALKER DRILLING
N 7 798 965 E 595 498

Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-21.08								
		Start of DCPT at -21.08m.										
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16				16.32								16.32
17		END OF DCPT AT -37.40m. Rods deflecting. Casing not available. Note: Rods removed from hole at elev. -37.40 to check condition. The bottom 3.0m had snapped off and 19.8m of rods were bent. Results of DCPT may not be representative of actual conditions.										
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Peters
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE DCPT08

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 24, 2011
COMPLETED : May 24, 2011

DRILLER: WALKER DRILLING
N 7 798 990 E 595 504

Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-21.19								
		Start of DCPT at -21.19m.										
13		END OF DCPT AT -34.29m. Ice thickness = 1.32m		13.10								13.10

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Peters
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE DCPT09

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 22, 2011
COMPLETED : May 22, 2011
DRILLER: WALKER DRILLING
N 779 891 E 595 507
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-18.94								
0		Start of DCPT at -18.94m.										
1												
				1.47					-rods flexing under hammer			1.47
2		END OF DCPT AT -20.41m. Ice thickness = 1.83m										
3		Casing not available.										
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Peters
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE DCPT10

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 22, 2011
COMPLETED : May 22, 2011
DRILLER: WALKER DRILLING
N 7 798 909 E 595 510
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-17.09								
0		Start of DCPT at -17.09m.										
1												
2				2.44								2.44
3		END OF DCPT AT -19.53m. Ice thickness = 1.83m										
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Peters
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE DCPT11

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 22, 2011
COMPLETED : May 24, 2011
DRILLER: WALKER DRILLING, D-50
N 7 798 932 E 595 513
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	SAMPLES: RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-16.58								
		Start of DCPT at -16.58m.										
1												
2												
3												
4												
5												
				5.55								5.55
6		END OF DCPT AT -22.13m. Ice thickness = 1.68m										
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Peters/Holmes
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE DCPT12

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 24, 2011
COMPLETED : May 24, 2011

DRILLER: WALKER DRILLING
N 7 798 962 E 595 519

Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND. (FROZEN / UNFROZEN / UNCERTAIN)
		SEA FLOOR		-17.92								
		Start of DCPT at -17.92m.										
1												
2												
3												
4												
5												
6												
7												
8												
9		END OF DCPT AT -26.95m.		9.03								9.03
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Holmes
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE DCPT13

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 24, 2011
COMPLETED : May 24, 2011

DRILLER: WALKER DRILLING
N 7 798 987 E 595 525

Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-18.50								
		Start of DCPT at -18.50m.										
1												
2												
3												
4												
5												
6												
7												
8												
9												
10		END OF DCPT AT -28.58m.		10.08								10.08
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Holmes
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE DCPT14

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 22, 2011
COMPLETED : May 22, 2011
DRILLER: WALKER DRILLING
N 7 798 890 E 595 516
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-14.68								
0		Start of DCPT at -14.68m.										
1												
2		END OF DCPT AT -16.63m. Ice thickness = 1.83m		1.95								1.95
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Peters
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE DCPT15

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 22, 2011
COMPLETED : May 22, 2011

DRILLER: WALKER DRILLING
N 7 798 908 E 595 520

Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-13.50								
		Start of DCPT at -13.50m.										
				0.79								0.79
1		END OF DCPT AT -14.29m. Ice thickness = 1.83m										
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Peters
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE DCPT16

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 22, 2011
COMPLETED : May 22, 2011

DRILLER: WALKER DRILLING
N 7 798 930 E 595 525

Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-13.30								
		Start of DCPT at -13.30m.										
3				3.38								3.38
		END OF DCPT AT -16.68m. Ice thickness = 1.52m										

FROZEN
UNFROZEN
UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Peters
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE DCPT17

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 22, 2011
COMPLETED : May 22, 2011
DRILLER: WALKER DRILLING
N 7 798 959 E 595 530
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT	EXCESS ICE CONTENT, PERCENT / WATER CONTENT, PERCENT	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-15.04								
		Start of DCPT at -15.04m.										
6				6.23								6.23
		END OF DCPT AT -21.27m.										

RESISTANCE PLOT: 50 100 150 200 250
EXCESS ICE CONTENT, PERCENT: ice; 10 20 30 40
WATER CONTENT, PERCENT: wp w wl; 10 20 30 40
THERMISTER/ GROUND COND.: FROZEN, UNFROZEN, UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Holmes
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE DCPT18

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Freight Dock
STARTED : May 21, 2011
COMPLETED : May 21, 2011

DRILLER: WALKER DRILLING
N 7 798 983 E 595 538

Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-15.19								
		Start of DCPT at -15.19m.										
10				10.40								10.40
		END OF DCPT AT -25.59m.										

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Holmes
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

Borehole MSFD-C

Photo 1: Core Box #1 of 2 (Runs 1-2, 0.0m – 12.3m)

Photo 2: Core Box #2 of 2 (Runs 2-4, 12.3m – 15.6m)

Borehole MSFD-D

Photo 1: Core Box #1 of 2 (Runs 1-3, 0.0m – 16.1m)

Photo 2: Core Box #2 of 2 (Run 3, 16.1m – 16.9m)

THURBER

Borehole MSFD-G

Photo 1: Core Box #1 of 3 (Runs 1-6, 6.6m – 12.4m)

Photo 2: Core Box #2 of 3 (Runs 6-10, 12.4m – 17.8m)

Photo 3: Core Box #3 of 3 (Runs 10-12, 17.8m – 20.1m)

Borehole MSFD-L

Photo 1: Core Box #1 of 2 (Runs 1-10, 6.0m – 19.7m)

Photo 2: Core Box #2 of 2 (Runs 11-17, 19.7m – 28.1m)

Borehole SI-FD-002

Photo 1: Core Box #1 of 2 (Runs 1-5, 0.0m – 7.3m)

Photo 2: Core Box #2 of 2 (Runs 6-9, 7.3m – 12.1m)

STEENSBY INLET - NORTH FREIGHT DOCK

MSNFD-A DCPT

MSNFD-B DCPT

MSNFD-C DCPT

MSNFD-D DCPT

THURBER

RECORD OF BOREHOLE MSNFD-A DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - North Freight Dock
STARTED : May 25, 2011
COMPLETED : May 25, 2011

Project No. 19-1605-126
DRILLER: WALKER DRILLING
N 7 803 194 E 592 425
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	SAMPLES: RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-18.73								
0		Start of DCPT at -18.73m.										
1												
2												
3												
4												
				4.85								4.85
5		END OF DCPT AT -23.58m. Ice thickness = 1.52m										
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Peters
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSNFD-B DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - North Freight Dock
STARTED : May 25, 2011
COMPLETED : May 25, 2011
DRILLER: WALKER DRILLING
N 7 803 217 E 592 451
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-15.27								
		Start of DCPT at -15.27m.										
				2.72								2.72
		END OF DCPT AT -17.99m. Ice thickness = 1.52m										

FROZEN
UNFROZEN
UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Peters
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSNFD-C DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - North Freight Dock
STARTED : May 25, 2011
COMPLETED : May 25, 2011
DRILLER: WALKER DRILLING
N 7 803 234 E 592 470
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-16.62								
		Start of DCPT at -16.62m.										
1				1.45								1.45
		END OF DCPT AT -18.07m. Ice thickness = 1.52m										
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Peters
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSNFD-D DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - North Freight Dock
STARTED : May 25, 2011
COMPLETED : May 25, 2011
DRILLER: WALKER DRILLING
N 7 803 255 E 592 493

Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-16.07								
1		Start of DCPT at -16.07m.										
2				1.96								1.96
		END OF DCPT AT -18.03m. Ice thickness = 1.52m										
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Peters
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

STEENSBY INLET - ISLAND BRIDGE

MSIB-A

MSIB-A1

MSIB-A2*

MSIB-B

MSIB-B DCPT

MSIB-C

MSIB-C DCPT

MSIB-D

MSIB-D DCPT

MSIB-P1(2)

SI-RL-004

SI-MHS-008

* Core photographs not available.

THURBER

RECORD OF BOREHOLE MSIB-A

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Island Bridge
STARTED : May 2, 2011
COMPLETED : May 4, 2011

Project No. 19-1605-126
DRILLER: BOART LONGYEAR
N 7 800 340 E 594 348
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-12.37								
1	NW/NQ Casing/Coring	**GRAVEL**, sandy, some clay, dark grey, wet granitic boulder (230 mm)			1	RUN		35				
2												
3		frequent cobbles and boulders, grey										
4					2	RUN		93				
5												
6												
7					3	RUN			TCR=62% SCR=39% RQD=26%			
8		Possible **BEDROCK**		7.70								7.70
9		END OF BOREHOLE AT -21.37m. Casing lost. Borehole abandoned and restarted (MSIB-A1) 1m to the west. Ice thickness = 2.10m		9.00								
10												
11		Note: Bottom of borehole elevation and top of bedrock elevation unconfirmed as survey of bottom of hole could not be performed after casing lost.										
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Sivak/Harte/Fleury
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSIB-A1

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Island Bridge
STARTED : May 4, 2011
COMPLETED : May 5, 2011

DRILLER: BOART LONGYEAR
N 7 800 340 E 594 348

Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT	EXCESS ICE CONTENT, PERCENT / WATER CONTENT, PERCENT	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-12.37								
1	NW/NQ Casing/Coring	little recovery, fines washed out minor pieces of gravel, cobbles, and boulders (300mm max.)										
2												
3												
4					1	RUN		10				
5												
6												
7				7.67								7.67
8		**GRANITE**, slightly weathered to fresh, jointed horizontal to vertical directions, medium to coarse grained, pink to greyish pink										
9					2	RUN			TCR=100% SCR=67% RQD=46%			
10												
11					3	RUN			TCR=100% SCR=43% RQD=34%			
12												
13					4	RUN			TCR=100% SCR=70% RQD=65%			
14					5	RUN			TCR=100% SCR=46% RQD=29%			
				14.63								
15		END OF BOREHOLE AT 27.00m. Ice thickness = 2.10m										
16												
17												
18												
19												

COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT 50 100 150 200 250

EXCESS ICE CONTENT, PERCENT: ice 10 20 30 40
WATER CONTENT, PERCENT: wp w wl 10 20 30 40

THERMISTER/ GROUND COND.: FROZEN, UNFROZEN, UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Sivak/Harte/Fleury
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSIB-A2

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Island Bridge
STARTED : May 7, 2011
COMPLETED : May 11, 2011

DRILLER: WALKER DRILLING
N 7 800 340 E 594 349

Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. (m)	NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS / DYNAMIC CONE PENETRATION RESISTANCE PLOT	EXCESS ICE CONTENT, PERCENT / WATER CONTENT, PERCENT	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-12.41								
0	NW/NQ Casing/Coring	**SAND**, trace clay, trace silt, trace organic matter, loose, grey, wet			1	SS	8	21	Grain Size Analysis: Gr 0%/ Sa 94%/ Si & Cl 6%			
1												
2					2	SS	2	5				
3												
				3.70								
4		**GRAVEL**, some sand, some silt, dense, grey, wet			3	SS	32	43	Grain Size Analysis: Gr 80%/ Sa 19%/ Si & Cl 1%			
					1	RUN						
				4.99								
5		**SAND**, silty, trace clay, trace gravel pieces, compact, grey, wet			4	SS	25		Grain Size Analysis: Gr 69%/ Sa 24%/ Si & Cl 7%			
6					2	RUN		17				
				6.40								
		COBBLES and **BOULDERS**							Grain Size Analysis: Gr 77%/ Sa 21%/ Si & Cl 1%			
7					3	RUN		39				
8					4	RUN						
				8.86								8.86
9		END OF BOREHOLE AT -21.27m. Hole abandoned at 21.27m. Possible bedrock at 21.27m, unable to continue coring to prove bedrock. Ice thickness =										
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 50 100 150 200 250

EXCESS ICE CONTENT, PERCENT: ice; 10 20 30 40

WATER CONTENT, PERCENT: wp w wl; 10 20 30 40

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Peters/Holmes
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSIB-B

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Island Bridge
STARTED : April 29, 2011
COMPLETED : April 29, 2011

DRILLER: BOART LONGYEAR
N 7 800 364 E 594 390

Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. (m)	NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS DYNAMIC CONE PENETRATION RESISTANCE PLOT 50 100 150 200 250	EXCESS ICE CONTENT, PERCENT ice 10 20 30 40 WATER CONTENT, PERCENT wp w wl 10 20 30 40	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND. FROZEN UNFROZEN UNCERTAIN
		SEA FLOOR		-9.20								
1	NW/NQ Casing/Coring	**CLAY**, silty, some sand, very soft, grey			1	SS	0		-limited recovery			
4				4.00								
		SAND, trace gravel, trace silt			2	SS			Grain Size Analysis: Gr 1%/ Sa 97%/ Si & Cl 2%			
6									-casing filled with sediments, advanced casing to 16.2m			
9									-SPT abondoned, advanced casing to 19.2m			
11				11.42								11.42
12		**GRANITIC GNEISS**, slightly weathered, strong, foliated, coarse grained			1	RUN			TCR=100% SCR=97% RQD=77%			
14		fractures at 45° and 60°			2	RUN			TCR=100% SCR=79% RQD=76%			
16				16.37								
		END OF BOREHOLE AT -25.57m. Ice thickness = 1.80m										

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Gilarski/McFarlane/Kromer/Hol
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSIB-B DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Island Bridge
STARTED : May 17, 2011
COMPLETED : May 17, 2011
DRILLER: WALKER DRILLING
N 7 800 366 E 594 389
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-9.36								
		Start of DCPT at -9.36m.										
1												
2												
3												
4												
5												
6												
7												
8												
9				9.54								9.54
10		END OF DCPT AT -18.90m. Ice thickness = 1.55m										
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Holmes
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSIB-C

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Island Bridge
STARTED : May 1, 2011
COMPLETED : May 1, 2011

Project No. 19-1605-126
DRILLER: BOART LONGYEAR
N 7 800 389 E 594 428
SHEET 1 OF 2
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-7.45								
0	NW/NQ Casing/Coring	little recovery, occasional gravel, cobbles, and boulders			1	RUN		10				
1												
2					2	RUN		10				
3												
4					3	RUN		10				
5												
6					4	RUN		10	-heaving sand			
7												
8												
9												
10												
11												
12				12.55								12.55
13		**GRANITE**, highly weathered to fresh, massive, coarse grained, red/grey/white			5	RUN			TCR=100% SCR=64% RQD=47%			
14												
15												
16		horizontal to subvertical joints			6	RUN			TCR=100% SCR=49% RQD=16%			
17												
18					7	RUN			TCR=100% SCR=78% RQD=62%			
19				19.99								

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Kromer
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSIB-C

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Island Bridge
STARTED : May 1, 2011
COMPLETED : May 1, 2011
DRILLER: BOART LONGYEAR
N 7 800 389 E 594 428
Project No. 19-1605-126
SHEET 2 OF 2
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	SOIL PROFILE: STRATA PLOT	SOIL PROFILE: ELEV. (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	SAMPLES: RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
21		END OF BOREHOLE AT 27.44m. Ice thickness = 2.20m										
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Kromer
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSIB-C DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Island Bridge
STARTED : May 17, 2011
COMPLETED : May 17, 2011

DRILLER: WALKER DRILLING
N 7 800 378 E 594 417

Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-8.44								
		Start of DCPT at -8.44m.										
1												
2												
3												
4												
5												
6												
7				6.95								6.95
		END OF DCPT AT -15.39m. Ice thickness = 1.67m										
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : -
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSIB-D

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Island Bridge
STARTED : April 23, 2011
COMPLETED : April 28, 2011
DRILLER: BOART LONGYEAR
N 7 800 408 E 594 410
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	SAMPLES RECOVERY %	COMMENTS (DYNAMIC CONE PENETRATION RESISTANCE PLOT 50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND. (FROZEN, UNFROZEN, UNCERTAIN)
		SEA FLOOR		-7.92								
1	NW/NQ Casing/Coring	**CLAY** (inferred), some gravel (inferred), occasional cobbles and boulders 320 mm granite boulder			1	RUN		25				
2		boulders, no fines recovered										
3					2	RUN		10				
4												
5				5.00								
6		minor gravel, subrounded, subangular, no fines recovered			3	RUN		2				
7												
8					4	RUN						
		200 mm boulder, no fines recovered										
				8.67	5	RUN			TCR=60% SCR=31% RQD=0% UCS=156MPa			8.67
9		**GRANITIC GNEISS**, fresh, massive, medium grained, pinkish grey										
10												
11					6	RUN			TCR=100% SCR=83% RQD=70% UCS=211MPa			
12												
13												
14					7	RUN			TCR=100% SCR=75% RQD=65%			
15				15.15								
		END OF BOREHOLE AT -23.07m. BOREHOLE CAVED TO -9.60m. Ice thickness = 2.50m										
16												
17												
18												
19												

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Harte/Gilarski
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSIB-D DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Island Bridge
STARTED : May 17, 2011
COMPLETED : May 17, 2011

Project No. 19-1605-126
DRILLER: WALKER DRILLING
N 7 800 408 E 594 410
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT	EXCESS ICE CONTENT, PERCENT / WATER CONTENT, PERCENT	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-7.97								
		Start of DCPT at -7.97m.										
				8.73								8.73
		END OF DCPT AT -16.81m. Ice thickness = 1.68m										

Resistance plot scale: 50 100 150 200 250
Excess ice content, percent: ice; 10 20 30 40
Water content, percent: wp w wl; 10 20 30 40
Thermister/ ground cond.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Holmes
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSIB-P1(2)

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Island Bridge
STARTED : May 6, 2011
COMPLETED : May 7, 2011

Project No. 19-1605-126
DRILLER: WALKER DRILLING
N 7 800 359 E 594 331
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-9.97					-total recovery within overburden = 2.10m			FROZEN / UNFROZEN / UNCERTAIN
0	NW/NQ Casing/Coring	very little recovery, fines washed out minor pieces of gravel, cobbles, and boulders						19				
9				9.76								9.76
10		**GRANITIC GNEISS** slightly weathered to fresh, weakly foliated, coarse grained, subhorizontal to subvertical joints, pinkish grey			1	RUN			TCR=100% SCR=58% RQD=21%			
12					2	RUN			TCR=100% SCR=80% RQD=51%			
13					3	RUN			TCR=100% SCR=84% RQD=64%			
14					4	RUN			TCR=100% SCR=100% RQD=64%			
16					5	RUN			TCR=100% SCR=95% RQD=94%			
17				17.70								
18		END OF BOREHOLE AT 27.67m. Ice thickness = 1.65m										
19		Note: Borehole MSIB-P1 was abandoned. New borehole (MSIB-P1(2)) was drilled 1m from the original location.										

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Kromer/Hossain
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SI-RL-004

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Railway Loop
STARTED : August 13, 2011
COMPLETED : August 13, 2011
DRILLER: WALKER DRILLING, D-50
N 7 800 424 E 594 482
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	SAMPLES RECOVERY %	COMMENTS (DYNAMIC CONE PENETRATION RESISTANCE PLOT 50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		GROUND SURFACE		1.71								
1	NQ Diamond Drill	no recovery			1	RUN		0				
				1.60								
2		**COBBLES** and **BOULDERS**, granitic, fines washed out			2	RUN		33				
3												
4					3	RUN		50				
				4.55								
5		no recovery			4	RUN						
6												
					5	RUN		64				
7				7.10								7.10
		END OF BOREHOLE AT 7.10m. BOREHOLE ABANDONED AS TIDE WAS RISING AND LOCATION WOULD SOON BE UNDER WATER.										
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN, UNFROZEN, UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Selman
CHECKED : MB

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SI-MHS-008

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Material Handling and Storage
STARTED : August 14, 2011
COMPLETED : August 14, 2011
DRILLER: BOART LONGYEAR, LM-55
N 7 800 290 E 594 224
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. (m)	NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS / DYNAMIC CONE PENETRATION RESISTANCE PLOT	EXCESS ICE CONTENT, PERCENT / WATER CONTENT, PERCENT	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		GROUND SURFACE		6.39								
0	NQ Diamond Drill	**SAND/SILT** (INFERRED), some gravel to gravelly, with cobbles and boulders (<590mm), granitic, fines washed out, subrounded, beige, grey, pink			1	RUN		17				
1												
2												
3					2	RUN		21				
4												
5												
6					3	RUN		34				
7												
8												
9				9.41							FI	
10		**GRANITIC GNEISS**, slightly weathered, strong, closely spaced joints, grey with pink and light grey sub-horizontal foliations			4	RUN		89	TCR=100% SCR=100% RQD=85%		1 0 0 0 2 2 1 1	
11												
12				11.92	5	RUN			TCR=100% SCR=100% RQD=100%		3	11.92
		END OF BOREHOLE AT 11.92m.										
13												
14												
15												
16												
17												
18												
19												

EXCESS ICE CONTENT, PERCENT: ice; 10 20 30 40
WATER CONTENT, PERCENT: wp w wl; 10 20 30 40
COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT 50 100 150 200 250
THERMISTER/ GROUND COND.: FROZEN, UNFROZEN, UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Dunstan
CHECKED : KS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

Borehole MSIB-A

Photo 1: Core Box #1 of 2 (Runs 1-3, 0.0m – 6.2m)

Photo 2: Core Box #2 of 2 (Run 3, 6.2m – 9.0m)

THURBER

Borehole MSIB-A1

Photo 1: Core Box #1 of 2 (Runs 1-3, 0.0m – 11.3m)

Photo 2: Core Box #2 of 2 (Runs 3-5, 11.3m – 14.6m)

Borehole MSIB-B

Photo 1: Core Box #1 of 2 (Runs 1-2, 11.4m – 13.4m)

Photo 2: Core Box #2 of 2 (Run 2, 13.4m – 16.4m)

Borehole MSIB-C

Photo 1: Core Box #1 of 3 (Runs 1-5, 0.0m – 15.2m)

Photo 2: Core Box #2 of 3 (Runs 6-7, 15.2m – 19.6m)

Photo 3: Core Box #3 of 3 (Run 7, 19.6m – 20.0m)

Borehole MSIB-D

Photo 1: Core Box #1 of 3 (Runs 1-4, 0.0m – 7.9m)

Photo 2: Core Box #2 of 3 (Runs 5-6, 7.9m – 12.4m)

Photo 3: Core Box #3 of 3 (Run 7, 12.4m – 15.2m)

Borehole MSIB-P1(2)

Photo 1: Core Box #1 of 3 (Runs 1-2, 0.0m – 12.0m)

Photo 2: Core Box #2 of 3 (Runs 2-5, 12.0m – 16.0m)

Photo 3: Core Box #3 of 3 (Run 5, 16.0m – 17.7m)

Borehole SI-RL-004

Photo 1: Core Box #1 of 1 (Runs 1-4, 0.0m – 7.1m)

THURBER

Borehole SI-MHS-008

Photo 1: Core Box #1 of 2 (Runs 1-4, 0.0m – 11.0m)

Photo 2: Core Box #2 of 2 (Runs 4-5, 11.0m – 14.7m)

THURBER

STEENSBY INLET – BASE CASE ORE DOCK

MSOD-F DCPT

MSOD-I DCPT

MSOD-J DCPT

MSOD-K DCPT

MSOD-L DCPT

MSOD-S DCPT

MSOD-V DCPT

MSODP-9*

MSODP-9(2)

* Core photographs not available.

THURBER

RECORD OF BOREHOLE MSOD-F DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Base Case Ore Dock
STARTED : May 14, 2011
COMPLETED : May 14, 2011
DRILLER: WALKER DRILLING
N 7 799 325 E 592 849

Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-34.28								
		Start of DCPT at -34.28m.							-rods sank under weight of the hammer from elev. -34.28 to -38.40m			
8		END OF DCPT AT -42.36m. Ice thickness = 1.20m		8.08								8.08

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Peters
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSOD-I

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Base Case Ore Dock
STARTED : May 14, 2011
COMPLETED : May 14, 2011
DRILLER: WALKER DRILLING
N 7 799 333 E 592 734
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-31.06								
1	NW/NQ Casing/Coring	**CLAY**, silty, with sand, some gravel, low sea floor plasticity, grey							-rods sank under weight of the hammer from elev. -31.06 to -33.40m			
2												
3					1	SS	48		Grain Size Analysis: Gr 12%/ Sa 31%/ Si 34%/ Cl 22%			
		Start of DCPT at -34.40m.		3.34								
4												
5												
6				6.44								6.44
		END OF DCPT AT -37.50m. Ice thickness = 1.60m										
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Holmes
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSOD-J DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Base Case Ore Dock
STARTED : May 13, 2011
COMPLETED : May 13, 2011
DRILLER: WALKER DRILLING
N 7 799 253 E 592 696

Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-28.20								
0		**CLAY**, silty, with sand, low plasticity, very soft, grey		0.60	1	SS	3		Grain Size Analysis: Gr 2%/ Sa 55%/ Si 20%/ Cl 23%			
		Start of DCPT at -28.80m.										
1												
2												
3												
4												
5				5.20								5.20
		END OF DCPT AT -33.40m. Ice thickness =										
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Holmes
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSOD-K DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Base Case Ore Dock
STARTED : May 13, 2011
COMPLETED : May 13, 2011
DRILLER: WALKER DRILLING
N 7 799 090 E 592 620

Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND. (FROZEN / UNFROZEN / UNCERTAIN)
		SEA FLOOR		-30.89								
		Start of DCPT at -30.89m.							-rods sank under the weight of the hammer from elev. -30.89 to -33.38m			
				5.81								5.81
		END OF DCPT AT -36.70m.										

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Holmes
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSOD-L DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Base Case Ore Dock
STARTED : May 15, 2011
COMPLETED : May 15, 2011
DRILLER: WALKER DRILLING
N 7 799 008 E 592 581

Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-27.43								
0		Start of DCPT at -27.43m. Note: When rods were pulled from the hole they were bent. Results are not likely representative of actual conditions. Ice thickness = 1.88m							-no resistance			
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19				20.00								20.00

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Holmes
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSOD-S DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Base Case Ore Dock
STARTED : May 11, 2011
COMPLETED : May 11, 2011
DRILLER: WALKER DRILLING
N 7 799 152 E 592 710
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-23.44								
0		**SAND**, silty, trace clay, trace gravel, dense, grey, wet			1	SS	40	38	Grain Size Analysis: Gr 27%/ Sa 45%/ Si 21%/ Cl 6%			
1				1.20								
		Start of DCPT at -24.64m.										
2												
3												
4												
5												
6												
7												
8				8.44								8.44
		END OF DCPT AT -31.88m.										
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Peters
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSOD-V DCPT

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Base Case Ore Dock
STARTED : May 14, 2011
COMPLETED : May 14, 2011
DRILLER: WALKER DRILLING
N 7 799 194 E 592 586

Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-21.18								
0		Start of DCPT at -21.18m.										
1												
				1.53								1.53
2		END OF DCPT AT -22.71m. Ice thickness = 2.13m										
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Holmes
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSODP-9

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Base Case Ore Dock
STARTED : May 24, 2011
COMPLETED : May 24, 2011
DRILLER: WALKER DRILLING
N 7 799 011 E 592 577
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-27.83								
0		**SILT**, clayey, some sand, trace black gravel, very soft, medium grey, saturated		0.67	1	SS	50/ .250	80				0.67
1		END OF BOREHOLE AT 28.50m. Note: Borehole abandoned as casing sheared off.										
2												
3												
4												
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16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Dunstan
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MSODP-9(2)

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Base Case Ore Dock
STARTED : May 25, 2011
COMPLETED : May 25, 2011
DRILLER: WALKER DRILLING
N 7 799 047 E 592 606
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-30.19								
1	NW/NQ Casing/Coring	**CLAY**, gravelly, stiff, grey, moist to wet										
				1.63	1	SS	11	33				
2		**SAND**, medium to coarse grained, compact, grey, wet										
				2.40								
3		**COBBLES**, **BOULDERS**, and **GRAVEL**, massive, fine grained, dark grey to black with pinkish segments		2.91	2	SS	52/ .050	100				
		SAND (inferred), occasional cobbles and boulders		3.35	1	RUN		0				3.35
4		END OF BOREHOLE AT -33.54m. Borehole abandoned as rods and casing broke.										
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Webster
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

Borehole MSODP-9(2)

Photo 1: Core Box #1 of 1 (Run 1, 2.9m – 3.4m)

THURBER

STEENSBY INLET – ALTERNATE ORE DOCK

MSOOD-A (no log)

Sea Floor Elevation -35.35 m. Hole ended when casing broke off.

SI-OLD-004

SI-OLD-005

SI-OLD-006

SI-OLD-007

SI-OLD-008

THURBER

RECORD OF BOREHOLE SI-OLD-004

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Ore Loading Dock
STARTED : August 8, 2011
COMPLETED : August 8, 2011

INCLINATION: AZIMUTH:
DRILLER: BOART LONGYEAR, LM-55
N 7 798 314 E 592 879

Project No. 19-1605-126
SHEET 1 OF 2
DATUM CGVD28

FR-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT J-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FO-FOLIATED UE-UNEVEN W-WAVY C-CURVED

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	SYMBOLIC LOG	ELEV. (m)	RUN No.	PENETRATION RATE (m/min)	FLUSH / COLOUR % RETURN	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER .3 m	DISCONTINUITY DATA: DIP wrt Core Axis	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Unconfined Compressive Strength (Mpa)	FIELD/LABORATORY TESTING RESULTS
		GROUND SURFACE		4.54											
0	NQ Diamond Drill	**GRANITIC GNEISS**, faintly weathered, moderately wide horizontal foliation, strong, pink with dark and light grey foliations			1								J, open (25mm), irregular J, closed, planar, horizontal J, planar, diagonal J, planar, horizontal J, closed, planar, horizontal		
3					2								J, closed, irregular, horizontal J, closed, irregular, horizontal, weathered J, closed, diagonal, black staining J, closed, black crystalline intrusion J, closed, black crystalline intrusion		
4		slightly weathered													
5													J, closed, irregular, diagonal, black staining		
6					3								J, open, sub-vertical, weathered (5.48 to 5.69m) J, open, diagonal, weathered		
7													J, closed, sub-horizontal, black staining		
8													J, closed, sub-horizontal J, 2mm aperture, stepped, vertical, silt infill (8.23 to 10.36m)		
9					4										
10		becoming coarse grained													
11															
12		strong to very strong, wide spacing			5								J, closed, horizontal, weathered J, sub-vertical, weathered (12.06 to 12.25m)		
13															
14													J, closed, horizontal, black staining J, closed, horizontal, black staining		
15					6										
16															
17															
18					7										
19															

Unconfined Compressive Strength (Mpa): 50, 100, 150

FIELD/LABORATORY TESTING RESULTS
- ● Point Load Test Diametral
- ▲ Point Load Test Axial
- ⊠ Laboratory UCS Test

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Dunstan/Hill
CHECKED : MB

THURBER

ROCKM(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SI-OLD-004

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Ore Loading Dock
STARTED : August 8, 2011
COMPLETED : August 8, 2011

INCLINATION: AZIMUTH:
DRILLER: BOART LONGYEAR, LM-55
N 7 798 314 E 592 879

Project No. 19-1605-126
SHEET 2 OF 2
DATUM CGVD28

FR-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT J-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FO-FOLIATED UE-UNEVEN W-WAVY C-CURVED

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	SYMBOLIC LOG	ELEV. (m)	RUN No.	PENETRATION RATE (m/min)	FLUSH / COLOUR % RETURN	RECOVERY TOTAL CORE % (80 60 40 20)	RECOVERY SOLID CORE % (80 60 40 20)	R.Q.D. % (80 60 40 20)	FRACT. INDEX PER .3 m (5 10 15 20)	DISCONTINUITY DATA: DIP wrt Core Axis (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Unconfined Compressive Strength (Mpa) (50 100 150)	FIELD/LABORATORY TESTING RESULTS
		GROUND SURFACE													
21					8										
22															
23		100mm white silt/sandy silt infill at 23.23m											J, 100mm of white sandy silt infill		
24					9										
25	NQ Diamond Drill														
26															
27					10										
28															
29															
30					11										
31															
32		END OF BOREHOLE AT 32.23m.		32.23											
33															
34															
35															
36															
37															
38															
39															

Unconfined Compressive Strength (Mpa) (50 100 150)

FIELD/LABORATORY TESTING RESULTS
- ● Point Load Test Diametral
- ▲ Point Load Test Axial
- ⊠ Laboratory UCS Test

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Dunstan/Hill
CHECKED : MB

THURBER

ROCKM(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SI-OLD-005

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Ore Loading Dock
STARTED : August 9, 2011
COMPLETED : August 10, 2011
INCLINATION: AZIMUTH:
DRILLER: BOART LONGYEAR, LM-55
N 7 798 331 E 592 860
Project No. 19-1605-126
SHEET 1 OF 2
DATUM CGVD28

FR-FRACTURE F-FAULT SM-SMOOTH FO-FOLIATED
CL-CLEAVAGE J-JOINT R-ROUGH UE-UNEVEN
SH-SHEAR P-POLISHED ST-STEPPED W-WAVY
VN-VEIN S-SLICKENSIDED PL-PLANAR C-CURVED

FIELD/LABORATORY TESTING RESULTS
● Point Load Test Diametral
▲ Point Load Test Axial
⊠ Laboratory UCS Test

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	SYMBOLIC LOG	ELEV. (m)	RUN No.	PENETRATION RATE (m/min)	FLUSH / COLOUR % RETURN	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER .3 m	DISCONTINUITY DATA: DIP wrt Core Axis	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Unconfined Compressive Strength (Mpa)
		GROUND SURFACE		4.05										
0	NQ Diamond Drill	**GRANITIC GNEISS**, faintly weathered, closely spaced sub-horizontal foliation, strong, pink, white and grey			1								J, closed, sub-vertical, brown weathering (0.12 to 0.24m) J, 3 parallel, closed, diagonal (0.64 to 0.84m)	
1													J, open, 4mm silty infill	
2					2								J, open, 3mm, diagonal J, closed, diagonal, black staining J, closed, diagonal, black staining	
3													J, closed, irregular, horizontal, brown weathering	
4		becoming strong to very strong, widely spaced foliation			3								J, closed, horizontal, black weathering J, closed, horizontal to sub-horizontal J, closed, horizontal to sub-horizontal J, closed, horizontal to sub-horizontal J, closed, horizontal to sub-horizontal	
5													J, closed, horizontal to sub-horizontal J, closed, horizontal to sub-horizontal J, closed, horizontal to sub-horizontal	
6		becoming very coarse grained moderately weathered			4								J, closed, vertical, red weathering (9.08 to 9.36m) J, closed, vertical, red weathering (9.98 to 10.39m)	
7													J, closed, horizontal J, closed, horizontal	
8					5								J, open, 2mm, horizontal	
9		becoming fresh											J, closed, horizontal J, open, 3mm, horizontal	
10					6								J, open, 2mm, irregular, horizontal J, open, 2mm, irregular, horizontal	
11		biotite schist, dark grey banding (150mm) at 16.6m			7								J, closed, sub-horizontal J, closed, vertical, black weathering (17.37 to 17.66m)	
12													J, closed, planar, diagonal	
13													J, closed, horizontal	
14														
15														
16														
17														
18														
19														

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Dunstan/Hill
CHECKED : MB

THURBER

ROCKM(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SI-OLD-005

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Ore Loading Dock
STARTED : August 9, 2011
COMPLETED : August 10, 2011
INCLINATION: AZIMUTH:
DRILLER: BOART LONGYEAR, LM-55
N 7 798 331 E 592 860
Project No. 19-1605-126
SHEET 2 OF 2
DATUM CGVD28

FR-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT J-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FO-FOLIATED UE-UNEVEN W-WAVY C-CURVED

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	SYMBOLIC LOG	ELEV. (m)	RUN No.	PENETRATION RATE (m/min)	FLUSH / COLOUR % RETURN	RECOVERY TOTAL CORE % (80 60 40 20)	RECOVERY SOLID CORE % (80 60 40 20)	R.Q.D. % (80 60 40 20)	FRACT. INDEX PER .3 m (5 10 15 20)	DISCONTINUITY DATA: DIP wrt Core Axis (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Unconfined Compressive Strength (Mpa) (50 100 150)	FIELD/LABORATORY TESTING RESULTS
		GROUND SURFACE													
21	NQ Diamond Drill				8								J, closed, planar, vertical (20.23 to 20.46m)		
22															
23															
24					9										
25													J, closed, planar, sub-vertical, black weathering (24.90 to 25.02m)		
26					10								J, closed, planar, diagonal, grey and black weathering (25.89 to 25.96m) J, sub-vertical, 70°		
27													J, sub-vertical, 70°		
28													J, sub-vertical, 70° J, horizontal J, horizontal		
29					11								J, sub-vertical, 70°		
30													J, horizontal J, horizontal		
31													J, horizontal J, sub-vertical J, sub-vertical J, sub-vertical		
32		END OF BOREHOLE AT 31.96m.		31.96											
33															
34															
35															
36															
37															
38															
39															

FIELD/LABORATORY TESTING RESULTS
● Point Load Test Diametral
▲ Point Load Test Axial
⊠ Laboratory UCS Test

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Dunstan/Hill
CHECKED : MB

THURBER

ROCKM(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SI-OLD-006

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Ore Loading Dock
STARTED : August 10, 2011
COMPLETED : August 11, 2011
INCLINATION: AZIMUTH:
DRILLER: BOART LONGYEAR, LM-55
N 7 798 409 E 592 876
Project No. 19-1605-126
SHEET 1 OF 2
DATUM CGVD28

FR-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT J-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FO-FOLIATED UE-UNEVEN W-WAVY C-CURVED

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	SYMBOLIC LOG	ELEV. (m)	RUN No.	PENETRATION RATE (m/min)	FLUSH / % RETURN	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER .3 m	DISCONTINUITY DATA: DIP wrt Core Axis	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Unconfined Compressive Strength (Mpa)	FIELD/LABORATORY TESTING RESULTS
		GROUND SURFACE		9.09											
1	NQ Diamond Drill	**GRANITIC GNEISS**, slightly weathered, fine to medium grained foliation, strong, pinkish grey to black			1										
2													J, sub-horizontal		
3		heavily fractured zone from 2.3m to 2.6m moderately weathered, sub-vertical foliation											J, sub-vertical, 80°		
4					2								J, closed, sub-vertical, rusty weathering (3.97 to 4.18m)		
5		becoming grey biotite schist at 4.89 to 5.38m											J, closed, sub-vertical, rusty weathering (4.45 to 4.64m)		
6													J, sub-vertical		
7					3								J, sub-vertical		
8													J, horizontal		
9													J, horizontal		
10					4								J, sub-vertical		
11													J, sub-vertical		
12													J, sub-vertical, 60°		
13					5										
14															
15		100mm white silty sand seam at 15.35m													
16					6										
17		fractures have silty sand infill from 16.6m to 17.3m													
18		most fractures have trace silty sand infill from 17.38 to 20.38m													
19					7										

Unconfined Compressive Strength (Mpa): 50, 100, 150

FIELD/LABORATORY TESTING RESULTS
- ● Point Load Test Diametral
- ▲ Point Load Test Axial
- ⊠ Laboratory UCS Test

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Hill
CHECKED : MB

THURBER

ROCKM(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SI-OLD-006

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Ore Loading Dock
STARTED : August 10, 2011
COMPLETED : August 11, 2011
INCLINATION: AZIMUTH:
DRILLER: BOART LONGYEAR, LM-55
N 7 798 409 E 592 876
Project No. 19-1605-126
SHEET 2 OF 2
DATUM CGVD28

FR-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT J-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FO-FOLIATED UE-UNEVEN W-WAVY C-CURVED

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	SYMBOLIC LOG	ELEV. (m)	RUN No.	PENETRATION RATE (m/min)	FLUSH	COLOUR / % RETURN	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER .3 m	DISCONTINUITY DATA: DIP wrt Core Axis	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Unconfined Compressive Strength (Mpa)	FIELD/LABORATORY TESTING RESULTS
		GROUND SURFACE							80 60 40 20	80 60 40 20	80 60 40 20	5 10 15 20	0 30 60 90		50 100 150	
21																
22					8											
23																
24																
25					9											
26																
27																
28					10											
29																
30																
31					11											
32																
33																
34					12											
35																
36																
37					13											
38																
		END OF BOREHOLE AT 38.38m.		38.38												
39																

Field/Laboratory Testing Results:
- ● Point Load Test Diametral
- ▲ Point Load Test Axial
- ⊠ Laboratory UCS Test

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Hill
CHECKED : MB

THURBER

ROCKM(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SI-OLD-007

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Ore Loading Dock
STARTED : August 11, 2011
COMPLETED : August 11, 2011
INCLINATION: AZIMUTH:
DRILLER: BOART LONGYEAR, LM-55
N 7 798 424 E 592 840
Project No. 19-1605-126
SHEET 1 OF 2
DATUM CGVD28

FR-FRACTURE F-FAULT SM-SMOOTH FO-FOLIATED
CL-CLEAVAGE J-JOINT R-ROUGH UE-UNEVEN
SH-SHEAR P-POLISHED ST-STEPPED W-WAVY
VN-VEIN S-SLICKENSIDED PL-PLANAR C-CURVED

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	SYMBOLIC LOG	ELEV. (m)	RUN No.	PENETRATION RATE (m/min)	FLUSH	COLOUR / % RETURN	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER .3 m	DISCONTINUITY DATA: DIP wrt Core Axis	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Unconfined Compressive Strength (Mpa)	FIELD/LABORATORY TESTING RESULTS
		GROUND SURFACE		2.93												
1	NQ Diamond Drill	**GRANITIC GNEISS**, moderately weathered, closely spaced sub-horizontal foliation, strong, pinkish grey highly fractured at 0.45m to 0.64m			1									J, open, fresh (0.84 to 0.91m) J, closed, sub-vertical, white weathering (0.95 to 2.10m) J, closed, diagonal, fresh		
2																
3		highly fractured, some sand infill in open joints, sub-vertical joint running through 80% of run			2											
4																
5																
6														J, open, diagonal, black weathering J, open, diagonal, black weathering J, open, diagonal, black weathering		
7					3									J, closed, vertical, weathered (6.80 to 6.90m) J, closed, vertical, weathered (7.11 to 7.20m) J, open, vertical, weathering and infill (7.32 to 8.40m)		
8																
9		dark grey biotite schist zones, slightly weathered												J, closed, irregular, diagonal, weathered J, closed, irregular, diagonal, weathered J, closed, irregular, diagonal, weathered		
10					4											
11		highly fractured biotite schist at 10.43m to 10.56m														
12		becoming slightly weathered, moderately spaced foliation												J, closed, diagonal, brown weathering		
13					5									J, open, irregular, vertical, brown weathering (12.98 to 13.23m)		
14														J, closed, diagonal J, closed, sub-vertical, black weathering (14.29 to 14.40m)		
15														J, closed, planar, vertical, brown weathering (14.62 to 14.87m)		
16					6											
17														J, closed, diagonal, weathered		
18		becoming very coarse grained												J, closed, diagonal, weathered (17.52 to 17.78) J, closed, diagonal, black weathering		
19		biotite seam with diagonal closed joint at 18.74 to 18.89m			7									J, closed, diagonal, black weathering J, closed, sub-vertical, black weathering (19.50 to 19.60m)		

FIELD/LABORATORY TESTING RESULTS
● Point Load Test Diametral
▲ Point Load Test Axial
⊠ Laboratory UCS Test

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Dunstan
CHECKED : MB

THURBER

ROCKM(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SI-OLD-007

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Ore Loading Dock
STARTED : August 11, 2011
COMPLETED : August 11, 2011
INCLINATION: AZIMUTH:
DRILLER: BOART LONGYEAR, LM-55
N 7 798 424 E 592 840
Project No. 19-1605-126
SHEET 2 OF 2
DATUM CGVD28

FR-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT J-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FO-FOLIATED UE-UNEVEN W-WAVY C-CURVED

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	SYMBOLIC LOG	ELEV. (m)	RUN No.	PENETRATION RATE (m/min)	FLUSH / COLOUR % RETURN	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER .3 m	DISCONTINUITY DATA: DIP wrt Core Axis	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Unconfined Compressive Strength (Mpa)	FIELD/LABORATORY TESTING RESULTS
		GROUND SURFACE													
21	NQ Diamond Drill	white crystaline infill from 21.3m to 21.5m			8								J, closed, diagonal, black weathering J, closed, vertical, black weathering (20.40 to 20.48m) J, closed, horizontal, black weathering J, open, 3mm, white crystalline infill, weathered (21.34 to 21.55m)		
22		heavily fractured vertical joint from 22.3m to 22.6m											J, heavily fractured, vertical, black weathering (22.33 to 22.63m)		
23		becoming faintly weathered													
24					9								J, closed, planar, sub-vertical, red weathering (24.18 to 24.29m)		
25													J, closed, irregular, horizontal, fresh J, closed, irregular, horizontal, fresh		
26													J, closed, planar, sub-vertical, grey weathering (25.90 to 26.02m)		
27													J, closed, planar, sub-vertical, black weathering (26.82 to 27.04m) J, closed, irregular, horizontal, brown weathering		
28					10										
29		biotite schist banding (<300mm)													
30															
31					11								J, closed, irregular, horizontal, weathered J, closed, irregular, horizontal, weathered J, closed, sub-vertical, black weathering (31.30 to 31.62m)		
32															
		END OF BOREHOLE AT 32.40m.		32.40											
33															
34															
35															
36															
37															
38															
39															

Unconfined Compressive Strength (Mpa): 50 100 150

FIELD/LABORATORY TESTING RESULTS
- ● Point Load Test Diametral
- ▲ Point Load Test Axial
- ⊠ Laboratory UCS Test

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Dunstan
CHECKED : MB

THURBER

ROCKM(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SI-OLD-008

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Ore Loading Dock
STARTED : August 12, 2011
COMPLETED : August 12, 2011

INCLINATION: AZIMUTH:
DRILLER: BOART LONGYEAR, LM-55
N 7 798 489 E 592 891

Project No. 19-1605-126
SHEET 1 OF 2
DATUM CGVD28

FR-FRACTURE F-FAULT SM-SMOOTH FO-FOLIATED
CL-CLEAVAGE J-JOINT R-ROUGH UE-UNEVEN
SH-SHEAR P-POLISHED ST-STEPPED W-WAVY
VN-VEIN S-SLICKENSIDED PL-PLANAR C-CURVED

FIELD/LABORATORY TESTING RESULTS
● Point Load Test Diametral
▲ Point Load Test Axial
⊠ Laboratory UCS Test

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	SYMBOLIC LOG	ELEV. (m)	RUN No.	PENETRATION RATE (m/min)	FLUSH / COLOUR % RETURN	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER .3 m	DISCONTINUITY DATA: DIP wrt Core Axis	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Unconfined Compressive Strength (Mpa)
		GROUND SURFACE		5.80										
1	NQ Diamond Drill	**GRANITIC GNEISS**, moderately weathered, medium grained, closely spaced foliation, strong, pink with grey			1								J, closed, planar, sub-vertical, black weathering (0.00 to 0.34m)	
2		heavily weathered zones, frequent black biotite schist seams, frequent sub-vertical bands			2									
3														
4														
5		slightly weathered			3								J, closed, horizontal, black weathering	
6		dark grey biotite schist zones, highly fractured zones			4								J, closed, horizontal, black weathering J, heavily fractured, diagonal, weathered (5.80 to 6.15m) J, closed, diagonal, black weathering (6.52 to 6.71m)	
7													J, closed, sub-vertical, heavily weathered (6.77 to 6.86m)	
8													J, closed, horizontal, black weathering J, closed, horizontal, black weathering	
9													J, closed, irregular, horizontal J, closed, planar, diagonal, black weathering (9.31 to 9.47m)	
10					5									
11													J, open, 2mm, sub-vertical, dark brown weathering (10.75 to 11.11m)	
12													J, closed, planar, horizontal, red weathering	
13					6								J, closed, planar, horizontal, red weathering J, closed, irregular, heavily fractured, vertical, brown weathering (12.93 to 13.16m)	
14													J, closed, planar, diagonal, brown weathering (13.59 to 13.71m)	
15		dark grey biotite schist banding broken schist seam, irregular and horizontal											J, closed, diagonal, black weathering (14.73 to 14.86m)	
16					7									
17		fractured zone												
18		some coarse grained zones												
19					8								J, open, 2mm, stepped, diagonal, brown weathering	
													J, closed, irregular, vertical, grey weathering (19.57 to 20.49m)	

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Dunstan
CHECKED : MB

THURBER

ROCKM(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE SI-OLD-008

PROJECT : Mary River Project
LOCATION : Steensby Inlet - Ore Loading Dock
STARTED : August 12, 2011
COMPLETED : August 12, 2011
INCLINATION: AZIMUTH:
DRILLER: BOART LONGYEAR, LM-55
N 7 798 489 E 592 891
Project No. 19-1605-126
SHEET 2 OF 2
DATUM CGVD28

FR-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT J-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FO-FOLIATED UE-UNEVEN W-WAVY C-CURVED

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	SYMBOLIC LOG	ELEV. (m)	RUN No.	PENETRATION RATE (m/min)	FLUSH / COLOUR % RETURN	RECOVERY TOTAL CORE % (80 60 40 20)	RECOVERY SOLID CORE % (80 60 40 20)	R.Q.D. % (80 60 40 20)	FRACT. INDEX PER .3 m (5 10 15 20)	DISCONTINUITY DATA: DIP wrt Core Axis (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Unconfined Compressive Strength (Mpa) (50 100 150)	FIELD/LABORATORY TESTING RESULTS
		GROUND SURFACE													
21	NQ Diamond Drill	medium grained with dark grey diagonal foliations			9								J, closed, diagonal, red weathering J, closed, sub-vertical, red weathering (21.41 to 21.52m)		
22													J, closed, diagonal, red weathering		
23													J, closed, diagonal, red weathering		
24		coarse grained, massive, occasional biotite schist banding			10										
25															
26															
27		very coarse grained			11								J, closed, irregular, diagonal, black weathering (27.45 to 27.60m)		
28		300mm biotite schist band at 27.75m											J, closed, irregular, diagonal, black weathering (28.12 to 28.36m) J, closed, irregular, vertical, black weathering (28.54 to 29.12m)		
29															
30		medium grained, with fine seams of dark grey biotite schist bands			12								J, closed, planar, sub-vertical, fresh (30.04 to 31.34m)		
31															
32													J, closed, planar, diagonal, fresh (31.97 to 32.04m) J, closed, diagonal, black weathering (32.15 to 32.35m)		
33		dark grey biotite schist from 32.61m to 32.24m fractured zone, weathered at 33.20 to 33.90m			13								J, closed, diagonal, black and red weathering (33.37 to 33.50m)		
34													J, closed, sub-vertical, black weathering (34.45 to 34.80m)		
35															
		END OF BOREHOLE AT 35.61m.		35.61											
36															
37															
38															
39															

FIELD/LABORATORY TESTING RESULTS
- ● Point Load Test Diametral
- ▲ Point Load Test Axial
- ⊠ Laboratory UCS Test

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Dunstan
CHECKED : MB

THURBER

ROCKM(5126) 5126.GPJ 11/9/11

Borehole SI-OLD-004

Photo 1: Core Box #1 of 8 (Runs 1-2, 0.0m – 4.2m)

Photo 2: Core Box #2 of 8 (Runs 2-3, 4.2m – 8.2m)

Photo 3: Core Box #3 of 8 (Runs 4-5, 8.2m – 12.0m)

Borehole SI-OLD-004

Photo 4: Core Box #4 of 8 (Runs 5-6, 12.0m – 16.5m)

Photo 5: Core Box #5 of 8 (Runs 6-8, 16.5m – 20.9m)

Photo 6: Core Box #6 of 8 (Runs 8-9, 20.9m – 25.2m)

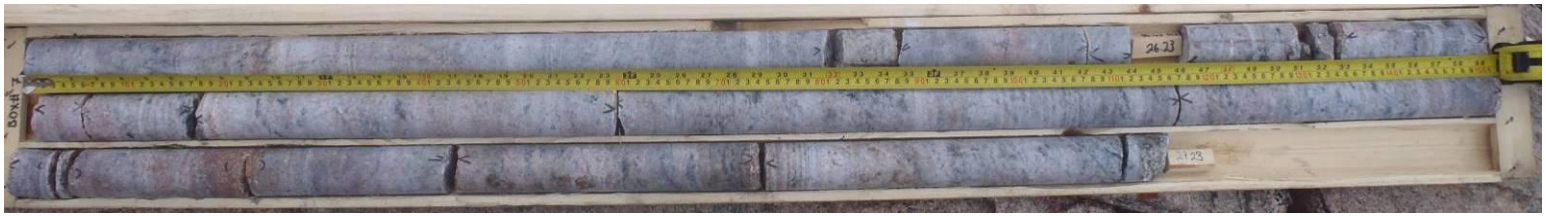


Photo 7: Core Box #7 of 8 (Runs 9-10, 25.2m – 29.2m)

Borehole SI-OLD-004

Photo 8: Core Box #8 of 8 (Run 11, 29.2m – 32.2m)

Borehole SI-OLD-005

Photo 1: Core Box #1 of 8 (Runs 1-2, 0.0m – 4.3m)

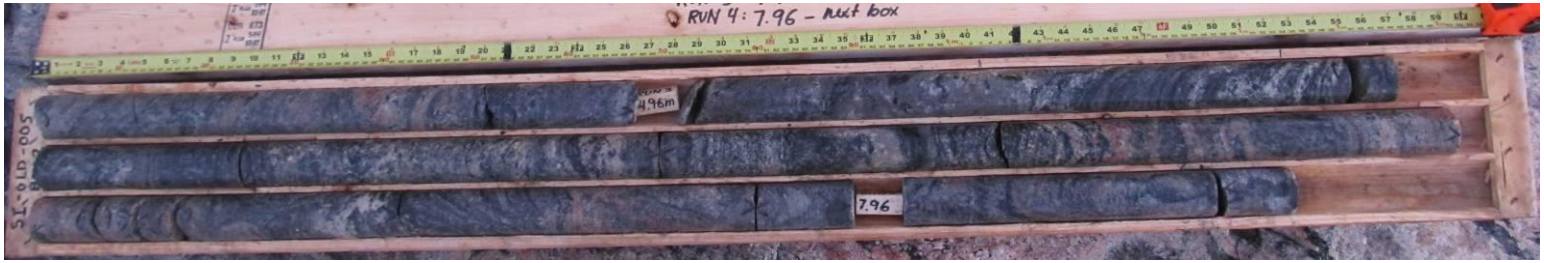


Photo 2: Core Box #2 of 8 (Runs 2-4, 4.3m – 8.4m)

Photo 3: Core Box #3 of 8 (Runs 4-5, 8.4m – 12.6m)

THURBER

Borehole SI-OLD-005

Photo 4: Core Box #4 of 8 (Runs 5-6, 12.6m – 16.9m)

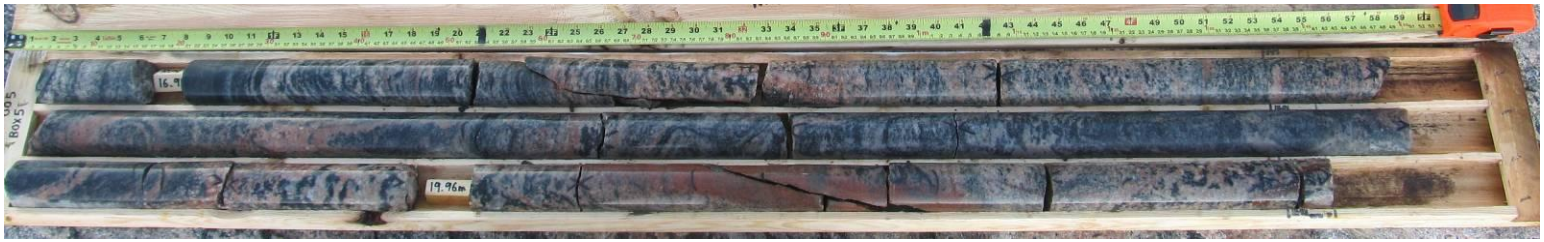


Photo 5: Core Box #5 of 8 (Runs 6-8, 16.9m – 20.8m)

Photo 6: Core Box #6 of 8 (Runs 8-9, 20.8m – 25.1m)

Borehole SI-OLD-005

Photo 7: Core Box #7 of 8 (Runs 9-10, 25.1m – 29.0m)

Photo 8: Core Box #8 of 8 (Run 11, 29.0m – 32.0m)

Borehole SI-OLD-006

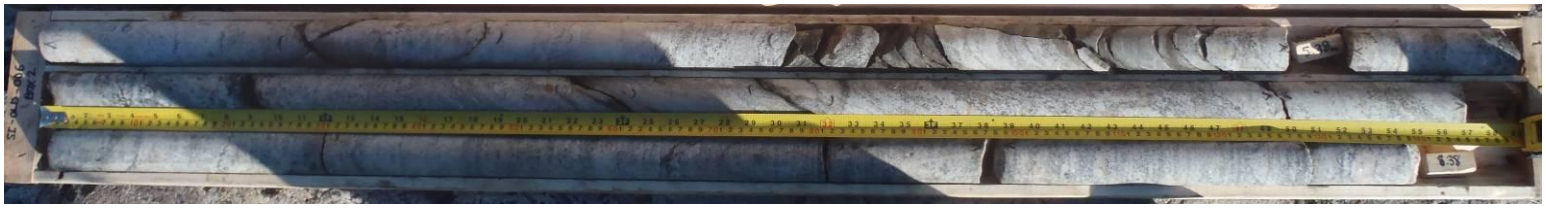


Photo 1: Core Box #2 of 9 (Runs 2-3, 4.1m – 8.4m)

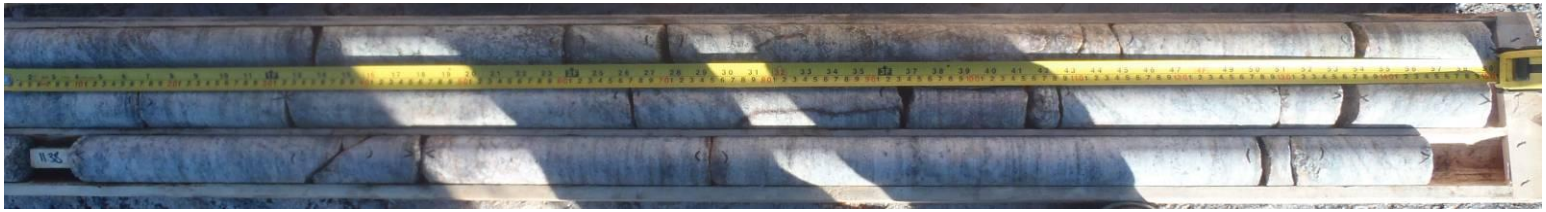


Photo 2: Core Box #3 of 9 (Runs 4-5, 8.4m – 12.7m)

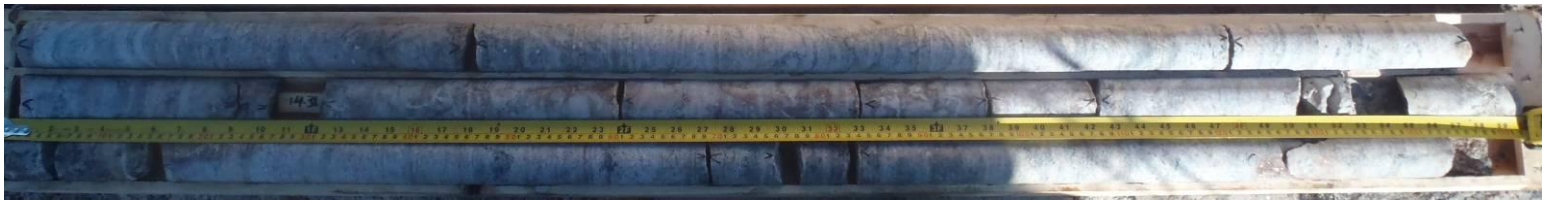


Photo 3: Core Box #4 of 9 (Runs 5-6, 12.7m – 16.9m)

Photo 4: Core Box #5 of 9 (Runs 6-8, 16.9m – 21.1m)

Borehole SI-OLD-006

Photo 5: Core Box #6 of 9 (Runs 8-9, 21.1m – 25.4m)

Photo 6: Core Box #7 of 9 (Runs 9-11, 25.4m – 29.7m)

Photo 7: Core Box #8 of 9 (Runs 11-12, 29.7m – 34.1m)

Photo 8: Core Box #9 of 9 (Runs 12-13, 34.1m – 38.4m)

Borehole SI-OLD-007

Photo 1: Core Box #1 of 8 (Runs 1-2, 0.0m – 3.9m)

Photo 2: Core Box #2 of 8 (Runs 2-3, 3.9m – 7.3m)

Photo 3: Core Box #3 of 8 (Runs 3-4, 7.3m – 11.4m)

Borehole SI-OLD-007

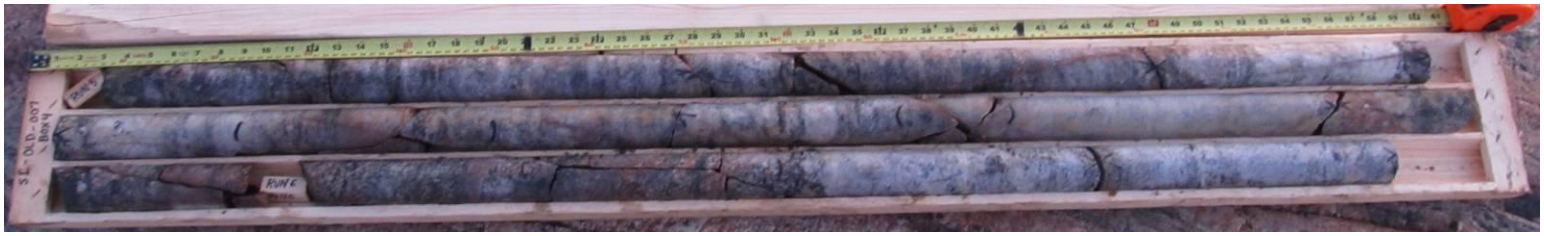


Photo 4: Core Box #4 of 8 (Runs 5-6, 11.4m – 15.6m)

Photo 5: Core Box #5 of 8 (Runs 6-7, 15.6m – 19.8m)

Photo 6: Core Box #6 of 8 (Runs 7-9, 19.8m – 24.0m)

Borehole SI-OLD-007

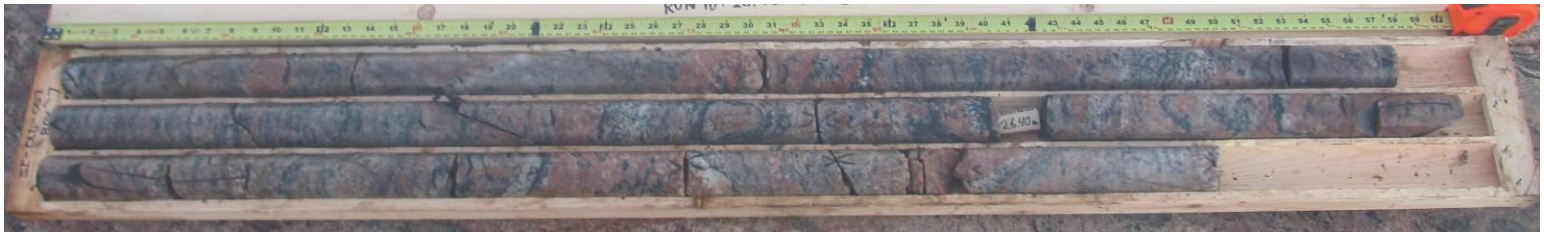


Photo 7: Core Box #7 of 8 (Runs 9-10, 24.0m – 28.1m)

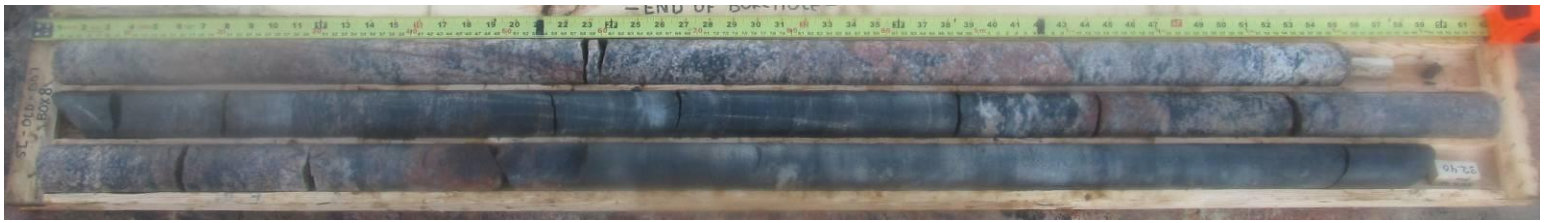


Photo 8: Core Box #8 of 8 (Runs 10-11, 28.1m – 32.4m)

Borehole SI-OLD-008

Photo 1: Core Box #1 of 9 (Run 1-2, 0.0m – 4.2m)


Photo 2: Core Box #2 of 9 (Runs 2-4, 4.2m – 8.5m)

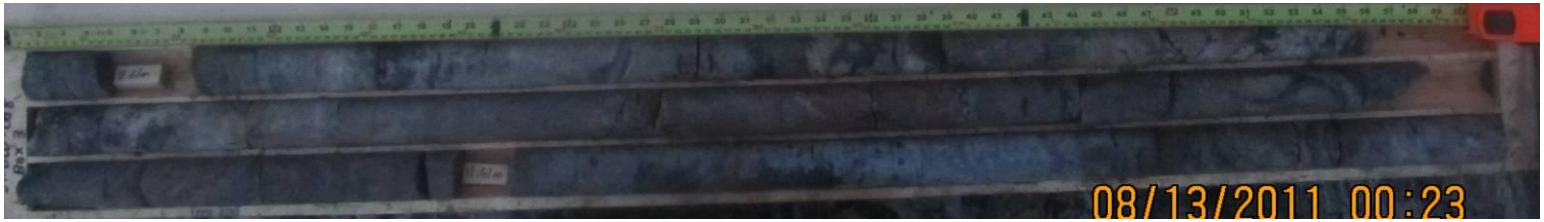


Photo 3: Core Box #3 of 9 (Runs 4-6, 8.5m – 12.6m)

Borehole SI-OLD-008

Photo 4: Core Box #4 of 9 (Runs 6-7, 12.6m – 17.0m)

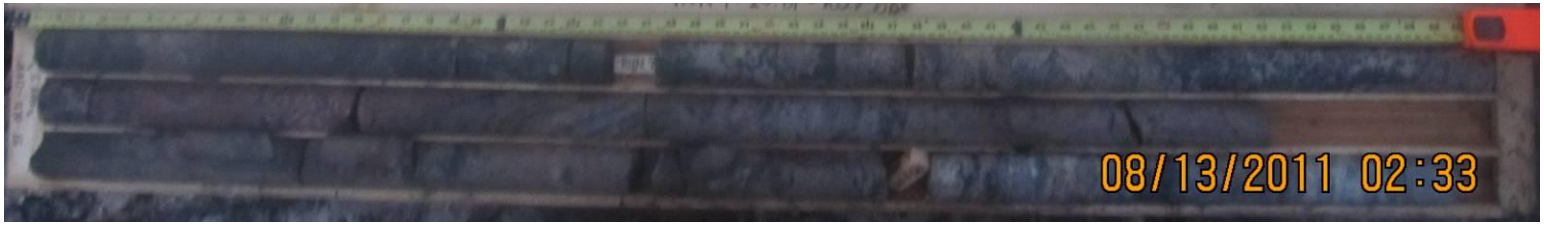


Photo 5: Core Box #5 of 9 (Runs 7-9, 17.0m – 21.2m)

Photo 6: Core Box #6 of 9 (Runs 9-10, 21.2m – 25.3m)

Borehole SI-OLD-008

Photo 7: Core Box #7 of 9 (Runs 10-11, 25.3m – 29.3m)

Photo 8: Core Box #8 of 9 (Runs 11-13, 29.3m – 33.7m)

Photo 9: Core Box #9 of 9 (Run 13, 33.7m – 35.6m)

MILNE INLET – FREIGHT DOCK

MMFD-A DCPT

MMFD-B DCPT

MMFD-C*

MMFD-D*

MMFD-D DCPT

MMFD-E*

MMFD-E DCPT

MMFD-F DCPT

MMFD-G DCPT

MMFD-H DCPT

MMFD-I DCPT

* Core photographs not available.

THURBER

RECORD OF BOREHOLE MMFD-A DCPT

PROJECT : Mary River Project
LOCATION : Milne Inlet - Freight Dock
STARTED : June 6, 2011
COMPLETED : June 6, 2011

DRILLER: WALKER DRILLING, D-50
N 7 976 759 E 503 911

Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-22.86								
		Start of DCPT at -22.86m.										
10		END OF DCPT AT -32.92m. Ice thickness = 1.60m		10.06								10.06

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Gilarski
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MMFD-B DCPT

PROJECT : Mary River Project
LOCATION : Milne Inlet - Freight Dock
STARTED : June 6, 2011
COMPLETED : June 6, 2011

Project No. 19-1605-126
DRILLER: WALKER DRILLING
N 7 976 737 E 504 075
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-23.39								
		Start of DCPT at -23.39m.										
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13				13.61								13.61
14		END OF DCPT AT -37.00m. Ice thickness = 1.75m										
15												
16												
17												
18												
19												

FROZEN
UNFROZEN
UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Santos
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MMFD-C

PROJECT : Mary River Project
LOCATION : Milne Inlet - Freight Dock
STARTED : June 3, 2011
COMPLETED : June 5, 2011

DRILLER: WALKER DRILLING
N 7 976 748 E 503 852

Project No. 19-1605-126
SHEET 1 OF 2
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-19.59								
		no recovery			1	SS	0	0				
1												
				1.62								
2		**SAND**, silty, fine to medium grained, trace gravel, compact, brown, wet			2	SS	11	77				
3				3.12								
		SAND and **GRAVEL**, coarse grained, compact, brown, wet			3	SS	14	25	Grain Size Analysis: Gr 66%/ Sa 33%/ Si & Cl 1% grinding			
4												
		medium to coarse grained, loose, brown to red			4	SS	9	17				
5												
6		compact			5	SS	10	25	grinding			
7												
				7.62								
8		**SAND**, fine to medium grained, some gravel, trace silt, compact, brown, wet			6	SS	17	75				
9				9.12								
	NW/NQ Casing/Coring	**SAND**, fine to medium grained, silty, trace gravel, compact, brown, wet			7	SS	12	17				
10				10.62								
		SAND, fine to coarse grained, trace silt, trace gravel, compact, brown, wet			8	SS	27	83	Grain Size Analysis: Gr 1%/ Sa 91%/ Si & Cl 8%			
11												
12		occasional cobbles			9	SS	14	0	casing grinding			
13												
14					10	SS	34	100				
15												
					11	SS	34	0	casing grinding			
16												
17		coarse grained, very dense			12	SS	59	67				
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Santos/Gilarski
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MMFD-C

PROJECT : Mary River Project
LOCATION : Milne Inlet - Freight Dock
STARTED : June 3, 2011
COMPLETED : June 5, 2011

DRILLER: WALKER DRILLING
N 7 976 748 E 503 852

Project No. 19-1605-126
SHEET 2 OF 2
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
20	NW/NQ Casing/Coring	fine grained sand			13	SS	43	33		○		
21												
22												
23					14	SS	54	0				
24												
25		dense		25.01	15	SS	34	25		○		25.01
		END OF BOREHOLE AT -44.60m. Ice thickness = 1.74m										
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Santos/Gilarski
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MMFD-D

PROJECT : Mary River Project
LOCATION : Milne Inlet - Freight Dock
STARTED : June 3, 2011
COMPLETED : June 3, 2011
DRILLER: WALKER DRILLING, D-50
N 7 976 728 E 504 004
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-20.39								
0	NW/NQ Casing/Coring	**SAND**, silty, some clay, trace gravel, very loose, dark grey to black			1	SS	5	100	Grain Size Analysis: Gr 3%/ Sa 47%/ Si 35%/ Cl 14%			
1				1.26								
		SAND, fine to medium grained, trace silt, trace gravel, very loose, grey, wet			2	SS	4	8	Grain Size Analysis: Gr 4%/ Sa 91%/ Si & Cl 6%			
2												
				2.76								
3		**SAND**, medium to coarse grained, trace to some gravel, very loose, grey, wet			3	SS	4	5	Grain Size Analysis: Gr 15%/ Sa 83%/ Si & Cl 2%			
4		loose			4	SS	9	67	Grain Size Analysis: Gr 9%/ Sa 90%/ Si & Cl 1%			
5												
6									-casing broke -borehole restarted			
7												
8												
9												
10												
11												
12												
13												
14									-sand heaving into casing, unable to sample			
				14.61								14.61
15		END OF BOREHOLE AT -35.00m. Ice thickness = 1.80m										
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Gilarski
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MMFD-D DCPT

PROJECT : Mary River Project
LOCATION : Milne Inlet - Freight Dock
STARTED : June 4, 2011
COMPLETED : June 4, 2011
DRILLER: WALKER DRILLING, D-50
N 7 976 728 E 504 004
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	SAMPLES: RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-19.52								
		Start of DCPT at -19.52m.										
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
				16.51								16.51
17		END OF DCPT AT -36.03m. Ice thickness = 1.81m										
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Santos
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MMFD-E

PROJECT : Mary River Project
LOCATION : Milne Inlet - Freight Dock
STARTED : June 5, 2011
COMPLETED : June 5, 2011
DRILLER: WALKER DRILLING, D-50
N 7 976 710 E 504 153
Project No. 19-1605-126
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-20.70								
0	NW/NQ Casing/Coring	**SAND**, coarse grained, loose to compact, brown, wet			1	SS	12	17		○		
1												
2					2	SS	10	0				
3												
4		medium grained, trace gravel, loose			3	SS	9	100		○		
5												
6												
7		coarse grained			4	SS	6	33		○		
8												
					5	SS	7	50		○		
9												
10		compact			6	SS	10	0				
11												
					7	SS	11	0				
12												
13					8	SS	12	0				
14												
15												
				15.80								15.80
16		END OF BOREHOLE AT -36.50m. Ice thickness = 1.50m							-casing broke			
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN ■ UNFROZEN ▨ UNCERTAIN □

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Gilarski
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MMFD-E DCPT

PROJECT : Mary River Project
LOCATION : Milne Inlet - Freight Dock
STARTED : June 6, 2011
COMPLETED : June 6, 2011

Project No. 19-1605-126
DRILLER: WALKER DRILLING
N 7 976 710 E 504 153
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	SOIL PROFILE: STRATA PLOT	SOIL PROFILE: ELEV. (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	SAMPLES: RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND. (FROZEN / UNFROZEN / UNCERTAIN)
		SEA FLOOR		-20.98								
0		Start of DCPT at -20.98m.										
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
				16.77								16.77
17		END OF DCPT AT -37.75m. Ice thickness = 1.79m										
18												
19												

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Santos
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MMFD-F DCPT

PROJECT : Mary River Project
LOCATION : Milne Inlet - Freight Dock
STARTED : June 6, 2011
COMPLETED : June 6, 2011

Project No. 19-1605-126
DRILLER: WALKER DRILLING
N 7 976 709 E 503 903
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-11.89								
		Start of DCPT at -11.89m.										
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13				13.64								13.64
14		END OF DCPT AT -25.53m. Ice thickness = 1.80m										
15												
16												
17												
18												
19												

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Gilarski
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MMFD-G DCPT

PROJECT : Mary River Project
LOCATION : Milne Inlet - Freight Dock
STARTED : June 6, 2011
COMPLETED : June 6, 2011

Project No. 19-1605-126
DRILLER: WALKER DRILLING
N 7 976 684 E 504 063
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-13.29								
		Start of DCPT at -13.29m.										
14				14.50								14.50
15		END OF DCPT AT -27.79m. Ice thickness = 1.65m										

FROZEN
UNFROZEN
UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Santos
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MMFD-H DCPT

PROJECT : Mary River Project
LOCATION : Milne Inlet - Freight Dock
STARTED : June 6, 2011
COMPLETED : June 6, 2011

Project No. 19-1605-126
DRILLER: WALKER DRILLING
N 7 976 657 E 503 892
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-1.59								
		Start of DCPT at -1.59m.										
15				15.33								15.33
		END OF DCPT AT -16.92m. Ice thickness = 1.59m										

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Gilarski
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

RECORD OF BOREHOLE MMFD-I DCPT

PROJECT : Mary River Project
LOCATION : Milne Inlet - Freight Dock
STARTED : June 6, 2011
COMPLETED : June 6, 2011

Project No. 19-1605-126
DRILLER: WALKER DRILLING
N 7 976 635 E 504 060
SHEET 1 OF 1
DATUM: CGVD28

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (50 100 150 200 250)	EXCESS ICE CONTENT, PERCENT (ice; 10 20 30 40) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	THERMISTER/ GROUND COND.
		SEA FLOOR		-1.84								
		Start of DCPT at -1.84m.										
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18				18.83								18.83
19		END OF DCPT AT -20.67m. Ice thickness = 1.68m										

THERMISTER/ GROUND COND.: FROZEN; UNFROZEN; UNCERTAIN

GROUNDWATER ELEVATIONS

SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : Gilarski
CHECKED : MB/SMS

THURBER

THURBER2S(5126) 5126.GPJ 11/9/11

THURBER

APPENDIX C

LABORATORY TEST RESULTS

Geotechnical Laboratory Test Results

Point Load Test Results

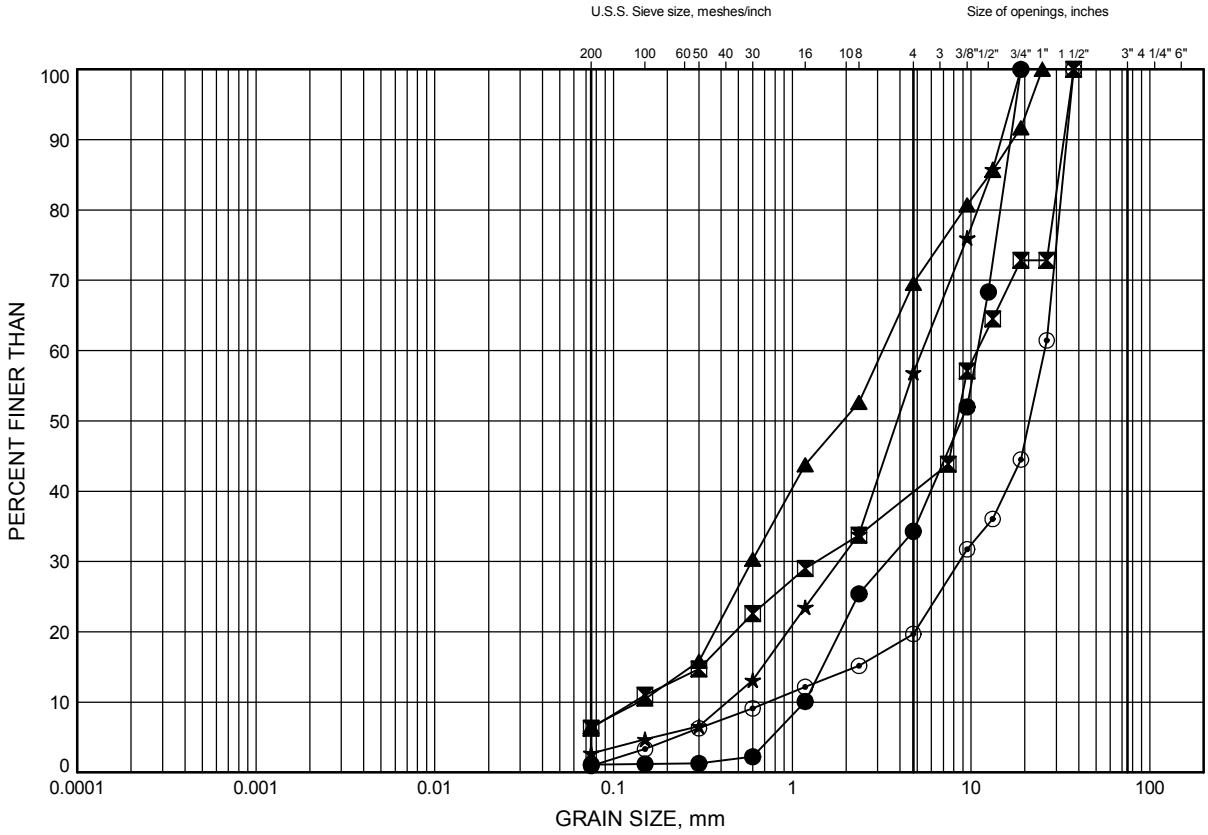
Analytical Laboratory Test Results (MSFD-P, SS#1)

Mary River Project

GRAIN SIZE DISTRIBUTION

FIGURE C1

Sand & Gravel



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	MMFD-C	3.42	-23.01
⊠	MSFD-M	4.41	-18.14
▲	MSFD-P	4.00	-28.46
★	MSFD-P	6.33	-30.79
⊙	MSIB-A2	3.96	-16.37

W.P.# 19-1605-126
Prepared By MFA
Checked By MTB

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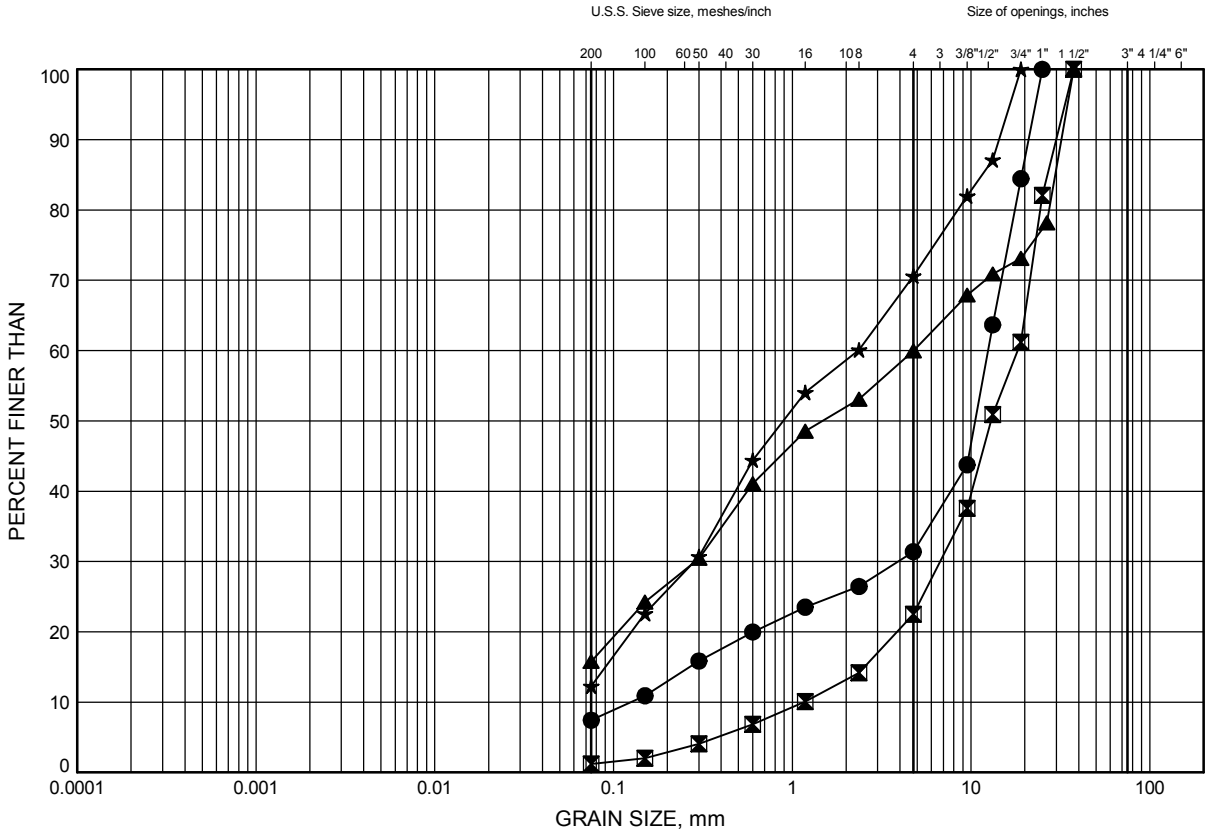
GRAIN SIZE DISTRIBUTION - THURBER 5126.GPJ 11/9/11

Mary River Project

GRAIN SIZE DISTRIBUTION

FIGURE C2

Sand & Gravel



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	MSIB-A2	5.49	-17.90
⊠	MSIB-A2	6.86	-19.27
▲	SMLCD-03A	5.65	-18.23
★	SMLCD-03A	9.57	-22.15

W.P.# 19-1605-126
Prepared By MFA
Checked By MTB

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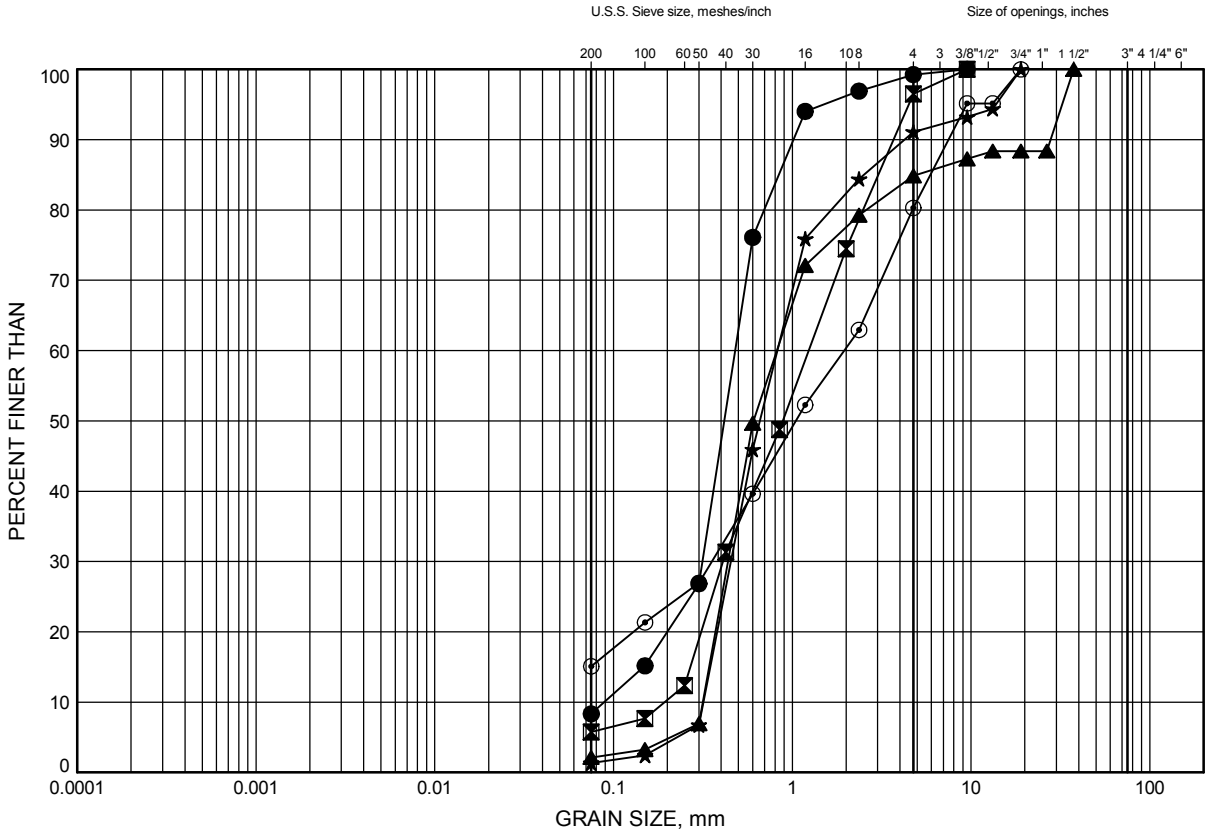
GRAIN SIZE DISTRIBUTION - THURBER 5126.GPJ 11/9/11

Mary River Project

GRAIN SIZE DISTRIBUTION

FIGURE C3

Sand



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	MMFD-C	10.92	-30.51
⊠	MMFD-D	1.56	-21.95
▲	MMFD-D	3.06	-23.45
★	MMFD-D	3.96	-24.35
⊙	SMLCD-03A	7.05	-19.63

W.P.# 19-1605-126
Prepared By MFA
Checked By MTB

THURBER

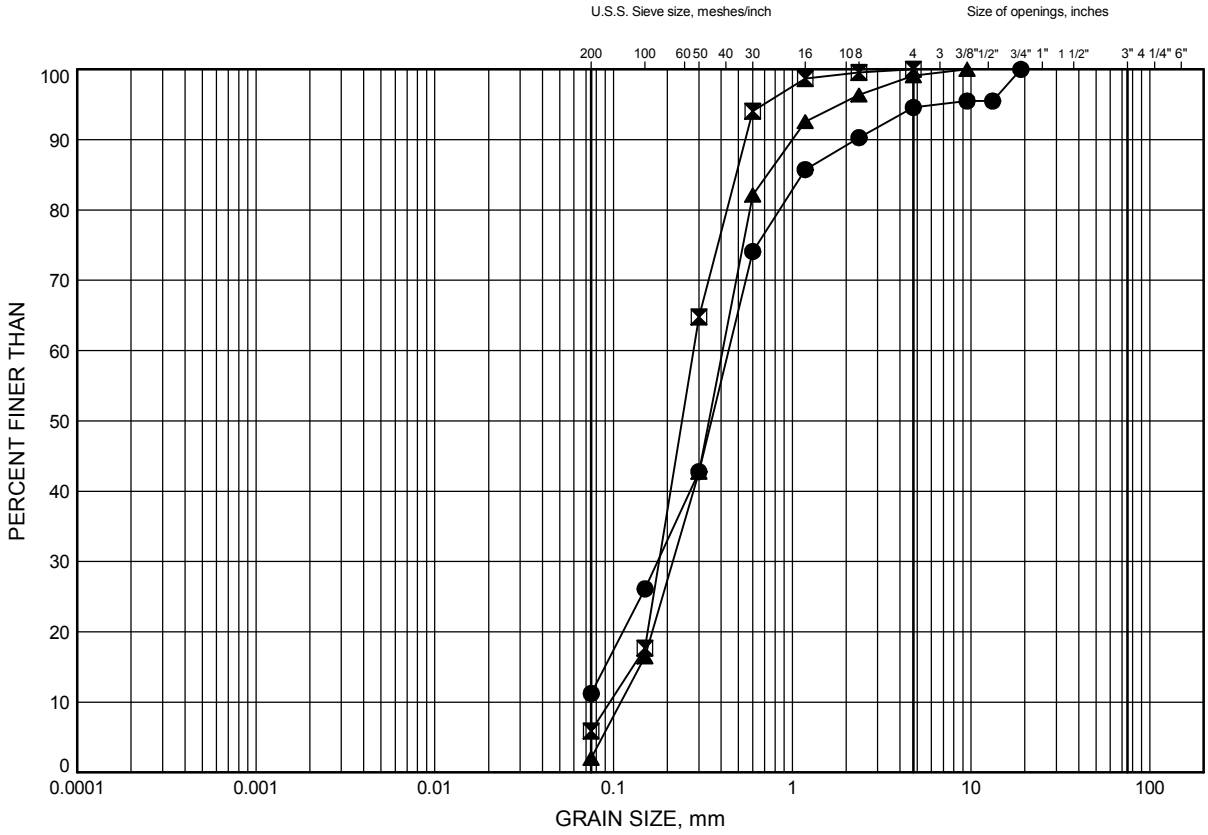
GRAIN SIZE DISTRIBUTION - THURBER 5126.GPJ 11/9/11

Mary River Project

GRAIN SIZE DISTRIBUTION

FIGURE C4

Sand



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	MSFD-P1	4.89	-30.19
⊠	MSIB-A2	0.42	-12.83
▲	MSIB-B	4.30	-13.50

W.P.# 19-1605-126
Prepared By MFA
Checked By MTB

THURBER

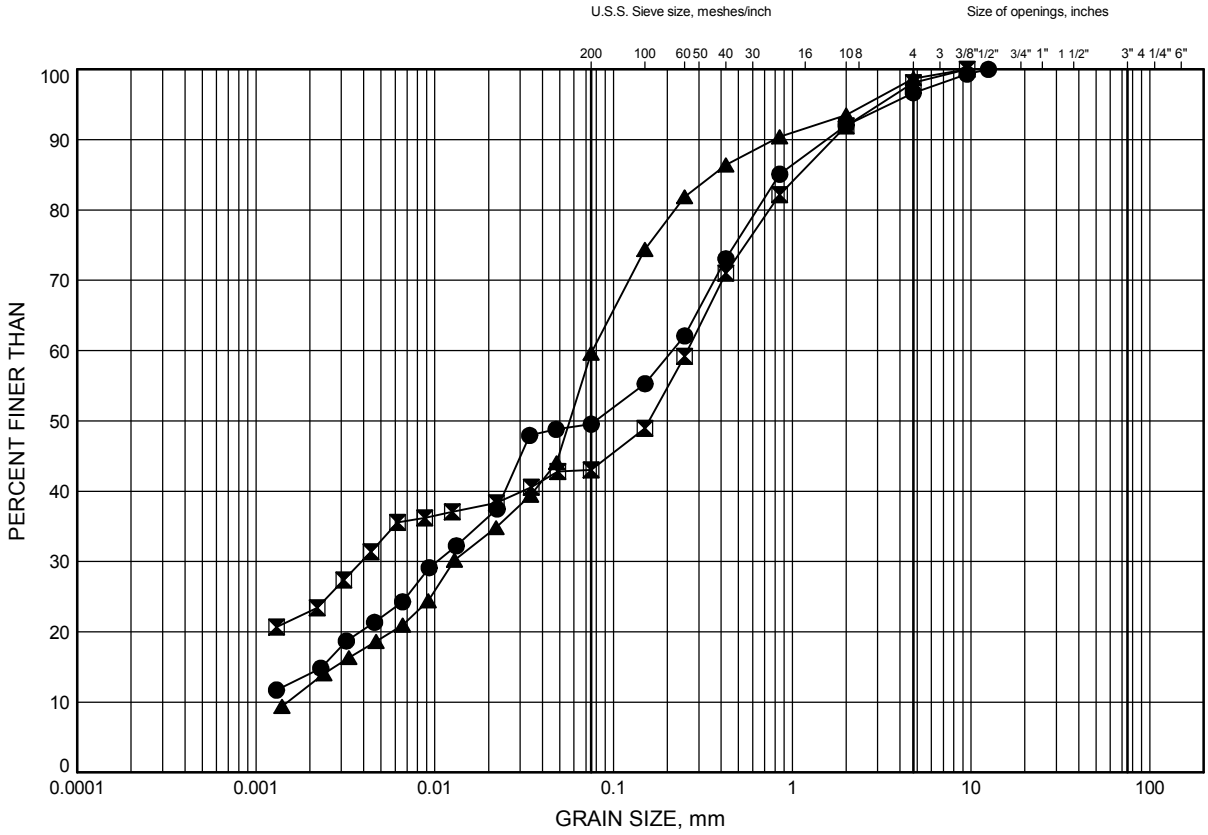
GRAIN SIZE DISTRIBUTION - THURBER 5126.GPJ 11/9/11

Mary River Project

GRAIN SIZE DISTRIBUTION

FIGURE C5

Sandy Silt to Silty Sand



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	MMFD-D	0.30	-20.69
⊠	MSOD-J DCPT	0.30	-28.50
▲	SMLCD-H	0.19	-6.47

W.P.# 19-1605-126
Prepared By MFA
Checked By MTB

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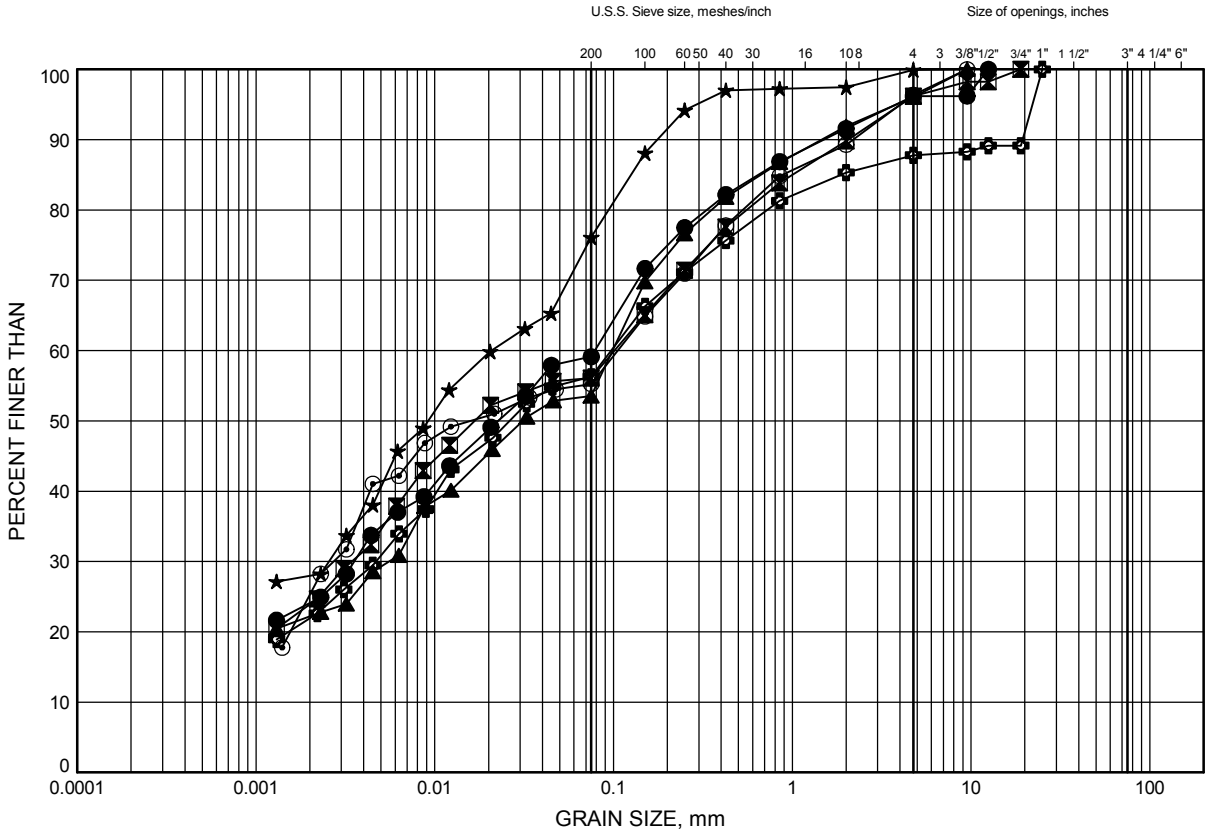
GRAIN SIZE DISTRIBUTION - THURBER 5126.GPJ 11/9/11

Mary River Project

GRAIN SIZE DISTRIBUTION

FIGURE C6

Silty Clay with Sand



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	MSFD-G	0.70	-18.93
⊠	MSFD-L	0.26	-18.09
▲	MSFD-M	2.65	-16.38
★	MSFD-P	0.30	-24.76
⊙	MSFD-P	1.18	-25.64
✿	MSOD-I	2.64	-33.70

W.P.# 19-1605-126

Prepared By MFA

Checked By MTB

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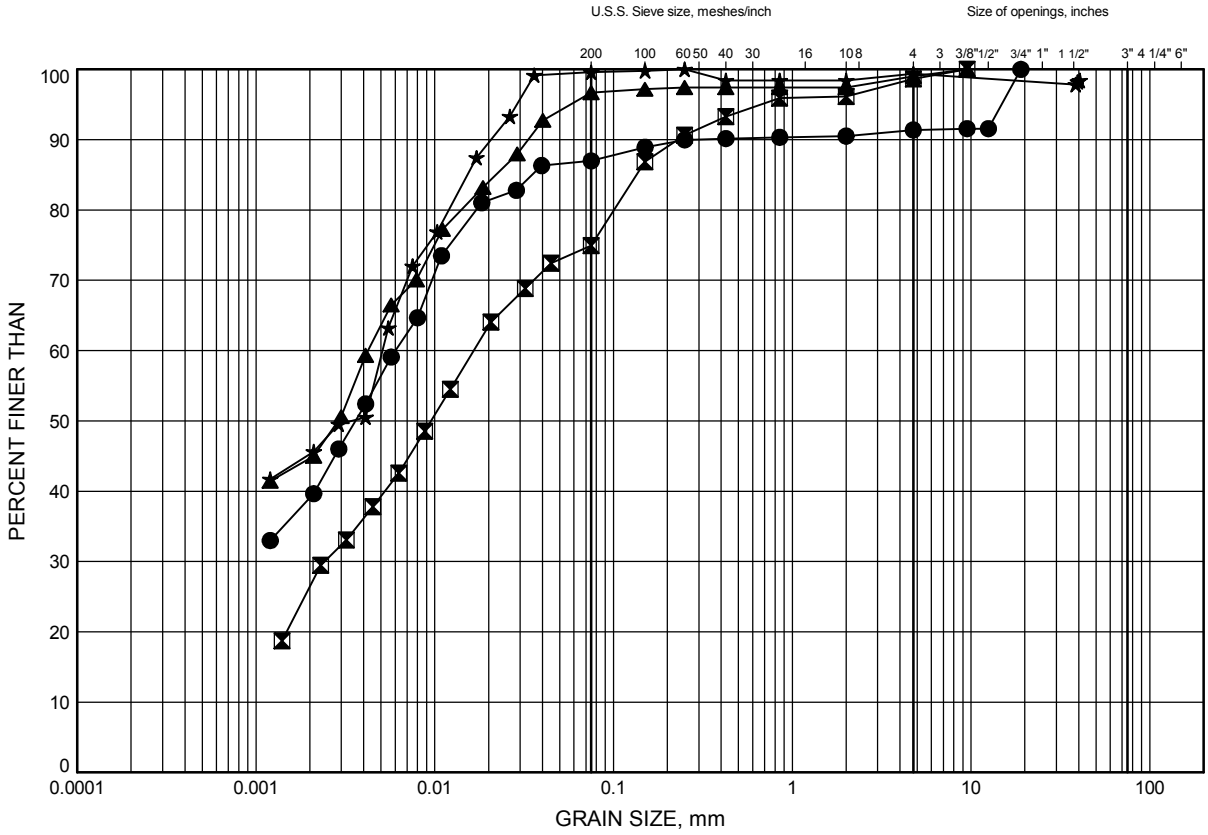
GRAIN SIZE DISTRIBUTION - THURBER 5126.GPJ 11/9/11

Mary River Project

GRAIN SIZE DISTRIBUTION

FIGURE C7

Silty Clay



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	MSFD-G	1.61	-19.84
⊠	MSFD-P	5.24	-29.70
▲	SMLCD-03A	1.98	-14.56
★	SMLCD-03A	3.74	-16.32

W.P.# 19-1605-126
Prepared By MFA
Checked By MTB

THURBER

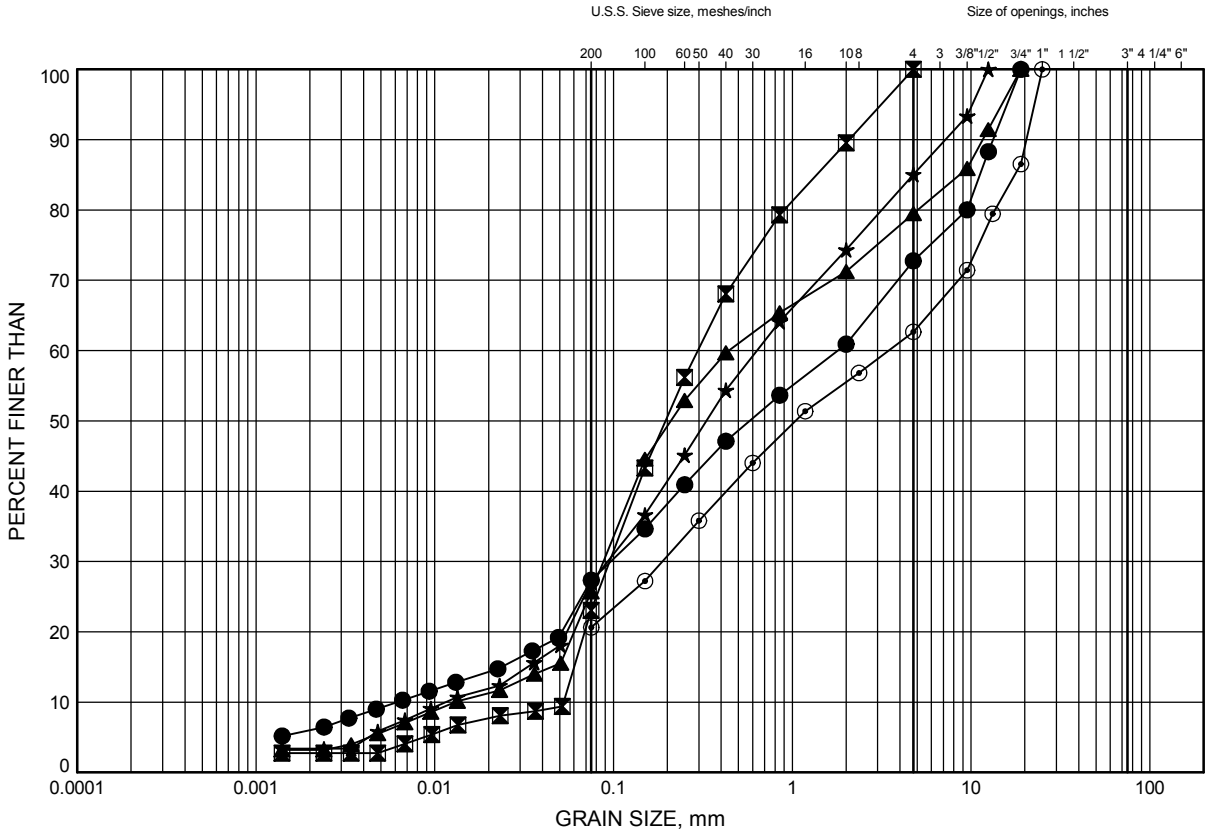
GRAIN SIZE DISTRIBUTION - THURBER 5126.GPJ 11/9/11

Mary River Project

GRAIN SIZE DISTRIBUTION

FIGURE C8

Silty Sand, Gravelly to some Gravel



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	MSOD-S DCPT	0.30	-23.74
⊠	SMLCD-G	0.30	-6.05
▲	SMLCD-G	1.20	-6.95
★	SMLCD-G	3.68	-9.43
⊙	SMLCD-H	8.81	-15.09

W.P.# 19-1605-126
Prepared By MFA
Checked By MTB

THURBER

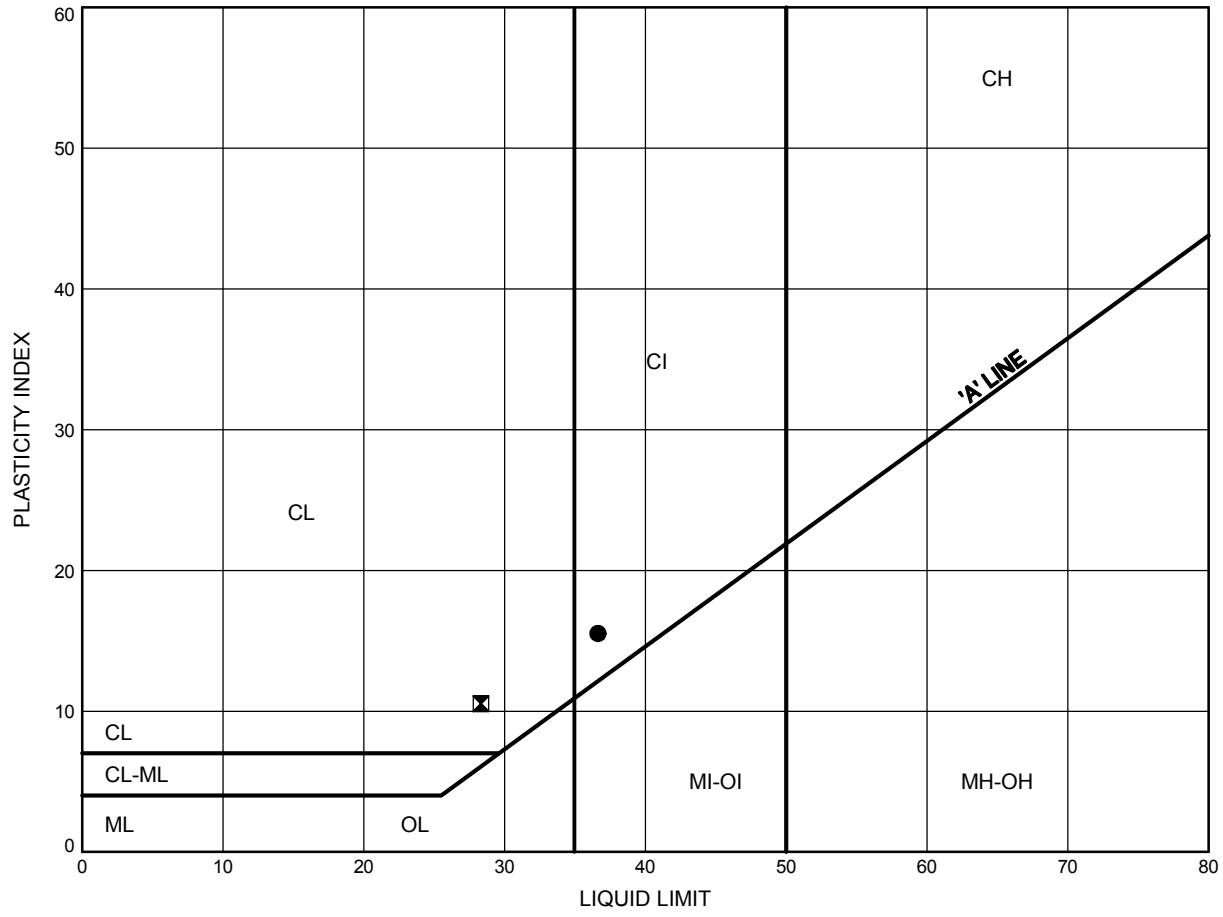
GRAIN SIZE DISTRIBUTION - THURBER 5126.GPJ 11/9/11

Mary River Project

ATTERBERG LIMITS TEST RESULTS

FIGURE C9

Silty Clay



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	MSFD-G	1.61	-19.84
⊠	MSFD-M	2.65	-16.38

Date November 2011

Project 19-1605-126

THURBER

Prep'd MFA

Chkd. MTB

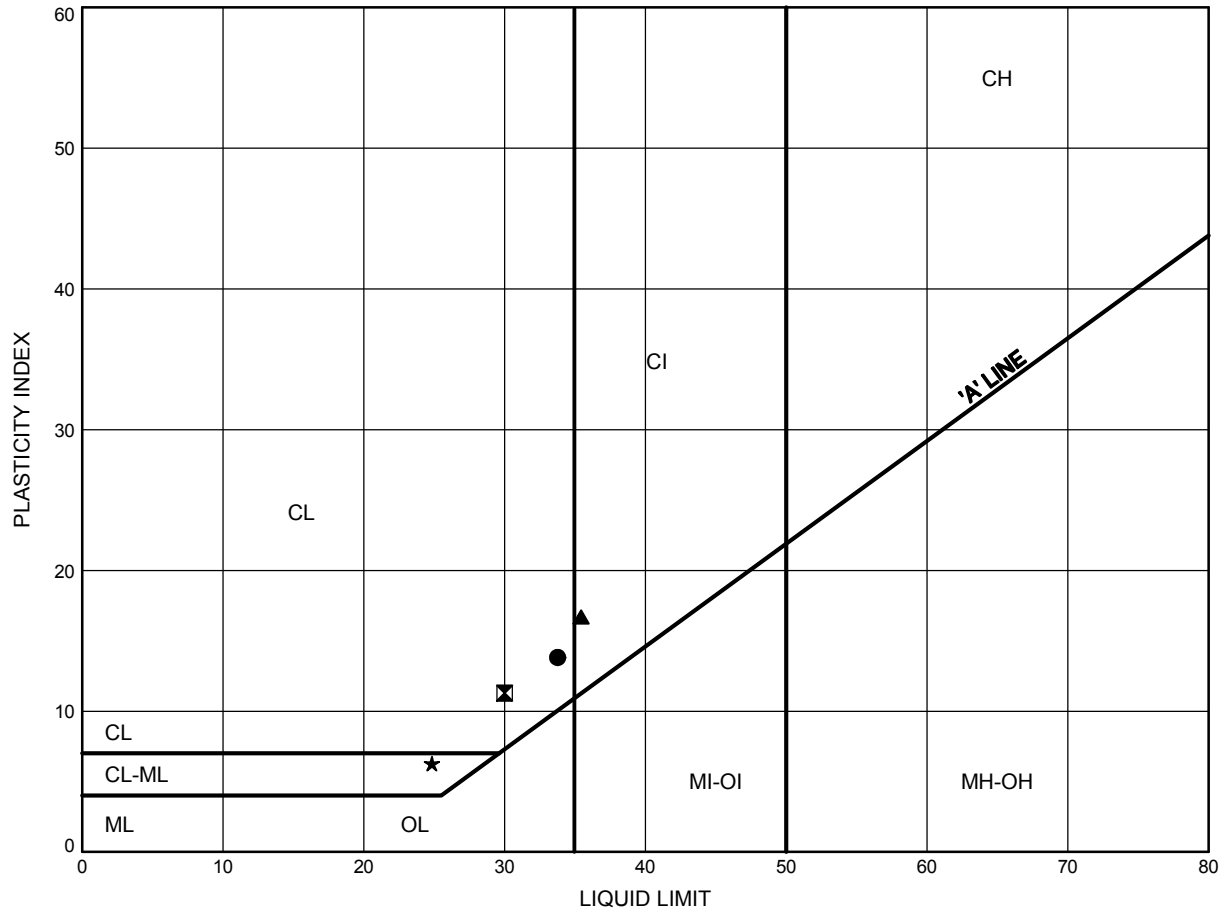
THURBALT 5126.GPJ 11/9/11

Mary River Project

ATTERBERG LIMITS TEST RESULTS

FIGURE C10

Silty Clay



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	MSFD-P	0.30	-24.76
⊠	MSFD-P	1.18	-25.64
▲	MSFD-P	3.50	-27.96
★	MSFD-P	5.24	-29.70

Date November 2011

Project 19-1605-126

THURBER

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Chkd. MTB

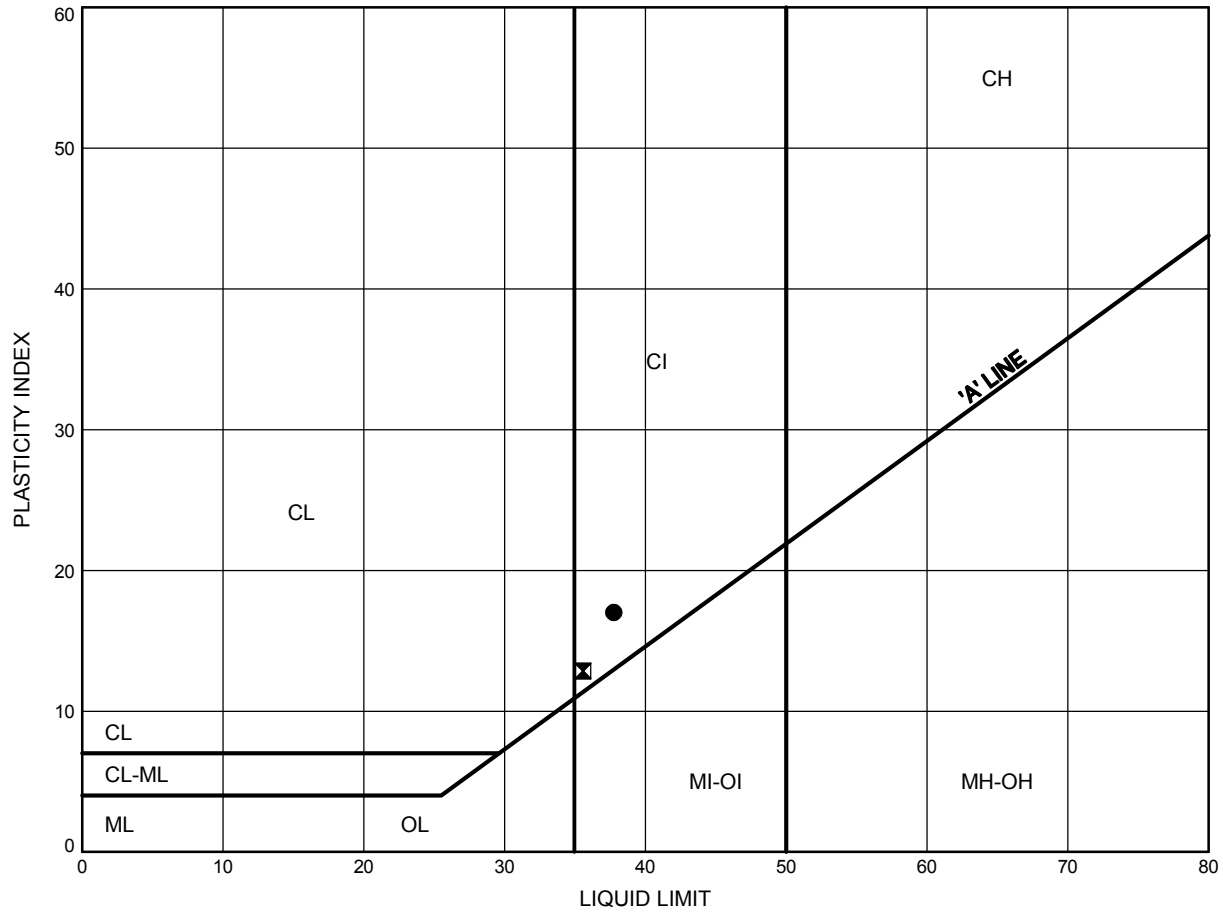
THURBALT 5126.GPJ 11/9/11

Mary River Project

ATTERBERG LIMITS TEST RESULTS

FIGURE C11

Silty Clay



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	SMLCD-03A	1.98	-14.56
⊠	SMLCD-03A	3.74	-16.32

Date November 2011

Project 19-1605-126

THURBER

Prep'd MFA

Chkd. MTB

THURBALT 5126.GPJ 11/9/11

THURBER ENGINEERING LTD.
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS

POINT LOAD TEST SHEET

Job No :	19-1605-126	**Client :**	HATCH
		Date Drilled :	5/15/2011
Project Name :	Mary River Project - Geotechnical Investigation	**Date Tested :**	8/29/2011
Core Size :	NQ3 **BH No :** MSFD-C	**Tester :**	AS/MD

Test No.	Run No.	Depth (m)	Axial or Diametral	Force (kN)	Diameter (mm)	Length (mm)	UCS (MPa)	Rock Type	Notes
1		12.1	D	1.0	47.3	100.9	10.5	gneiss	Weak
2		12.7	D	13.0	47.2	101.5	136.3	gneiss	Very Strong
3		13.7	D	18.0	47.2	112.0	189.3	gneiss	Very Strong
4		15.0	D	18.0	47.2	110.3	189.1	gneiss	Very Strong
5		15.5	D	3.0	47.2	164.0	31.5	gneiss	Medium Strong
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									

* It is ideal to perform axial test on core specimens with D/L ratio of 1.1 ± 0.1
  Long pieces of core can be tested diametrically to produce suitable lengths for axial testing
* Diametral Test should have 0.7 x D on either side of test point.

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POINT LOAD TEST SHEET

Job No :	19-1605-126	**Client :**	HATCH
		Date Drilled :	5/15/2011
Project Name :	Mary River Project - Geotechnical Investigation	**Date Tested :**	8/29/2011
Core Size :	NQ3 **BH No :** MSFD-D	**Tester :**	AS/MD

Test No.	Run No.	Depth (m)	Axial or Diametral	Force (kN)	Diameter (mm)	Length (mm)	UCS (MPa)	Rock Type	Notes
1	2	14.5	D	10.0	47.2	116.5	104.9	gneiss	Very Strong
2	2	14.6	D	18.5	47.3	151.2	193.6	gneiss	Very Strong
3	3	16.0	D	17.5	47.1	141.9	184.2	gneiss	Very Strong
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* It is ideal to perform axial test on core specimens with D/L ratio of 1.1 ± 0.1
Long pieces of core can be tested diametrically to produce suitable lengths for axial testing

* Diametral Test should have 0.7 x D on either side of test point.

THURBER ENGINEERING LTD.
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POINT LOAD TEST SHEET

Job No :	19-1605-126	**Client :**	HATCH
		Date Drilled :	5/4/2011
Project Name :	Mary River Project - Geotechnical Investigation	**Date Tested :**	5/28/2011
Core Size :	NQ **BH No :** MSIB-A1	**Tester :**	

Test No.	Run No.	Depth (m)	Axial or Diametral	Force (kN)	Diameter (mm)	Length (mm)	UCS (MPa)	Rock Type	Notes
1	2	8.8	D	29.5	47.0	87.0	311.7	granitic gneiss	Extremely Strong
2	3	11.0	A	19.5	47.0	48.0	168.1	granitic gneiss	Very Strong
3	3	11.1	D	29.0	47.0	71.0	306.4	granitic gneiss	Extremely Strong
4	3	11.9	D	18.5	47.0	95.0	195.5	granitic gneiss	Very Strong
5	4	12.9	D	24.0	47.0	119.0	253.6	granitic gneiss	Extremely Strong
6	5	13.8	D	25.0	47.0	73.0	264.2	granitic gneiss	Extremely Strong
7	5	14.1	A	25.0	47.0	48.0	215.5	granitic gneiss	Very Strong
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POINT LOAD TEST SHEET

Job No :	19-1605-126	**Client :**	Hatch
		Date Drilled :	5/2/2011
Project Name :	Baffinland	**Date Tested :**	5/28/2011
Core Size :	NQ **BH No :** MSIB-A	**Tester :**	BT

Test No.	Run No.	Depth (m)	Axial or Diametral	Force (kN)	Diameter (mm)	Length (mm)	UCS (MPa)	Rock Type	Notes
1	2	4.8	D	24.5	47.0	87.0	258.9	Granitic Gneiss	Extremely Strong
2	2	4.8	D	27.0	47.0	100.0	285.3	Granitic Gneiss	Extremely Strong
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POINT LOAD TEST SHEET

Job No :	19-1605-126	**Client :**	Hatch
		Date Drilled :	4/29/2011
Project Name :	Baffinland	**Date Tested :**	5/29/2011
Core Size :	NQ **BH No :** MSIB-B	**Tester :**	BT

Test No.	Run No.	Depth (m)	Axial or Diametral	Force (kN)	Diameter (mm)	Length (mm)	UCS (MPa)	Rock Type	Notes
1	1	11.5	D	25.0	47.0	85.0	264.2	Granitic Gneiss	Extremely Strong
2	1	11.5	A	23.0	47.0	47.0	201.5	Granitic Gneiss	Very Strong
3	1	11.8	D	31.0	47.0	90.0	327.6	Granitic Gneiss	Extremely Strong
4	2	13.6	D	24.0	47.0	80.0	253.6	Granitic Gneiss	Extremely Strong
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POINT LOAD TEST SHEET

Job No :	19-1605-126	**Client :**	HATCH
		Date Drilled :	5/1/2011
Project Name :	Mary River Project - Geotechnical Investigation	**Date Tested :**	8/26/2011
Core Size :	NQ3 **BH No :** MSIB-C	**Tester :**	AS

Test No.	Run No.	Depth (m)	Axial or Diametral	Force (kN)	Diameter (mm)	Length (mm)	UCS (MPa)	Rock Type	Notes
1	5	12.6	D	26.0	47.7	88.7	268.9	granitic gneiss	Extremely Strong
2	5	12.6	D	29.0	47.7	106.9	299.5	granitic gneiss	Extremely Strong
3	5	12.7	A	35.0	47.7	51.4	282.7	granitic gneiss	Extremely Strong
4	6	14.9	D	21.0	47.7	98.0	217.0	granitic gneiss	Very Strong
5	6	15.1	D	25.0	47.7	92.1	257.9	granitic gneiss	Extremely Strong
6	6	15.1	A	38.0	47.7	448.9	57.2	granitic gneiss	Strong
7	7	18.1	D	25.0	47.7	88.4	258.5	granitic gneiss	Extremely Strong
8	7	18.1	A	24.0	47.7	37.9	245.7	granitic gneiss	Very Strong
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POINT LOAD TEST SHEET

Job No :	19-1605-126	**Client :**	Hatch
		Date Drilled :	4/23/2011
Project Name :	Baffinland	**Date Tested :**	5/28/2011
Core Size :	NQ **BH No :** MSIB-D	**Tester :**	BT

Test No.	Run No.	Depth (m)	Axial or Diametral	Force (kN)	Diameter (mm)	Length (mm)	UCS (MPa)	Rock Type	Notes
1	5	8.8	A	21.5	47.0	47.0	188.4	Gneiss	Very Strong
2	5	8.8	D	15.0	47.0	100.0	158.5	Gneiss	Very Strong
3	5	9.4	D	17.0	47.0	83.0	179.6	Gneiss	Very Strong
4	5	9.4	A	19.5	47.0	47.0	170.9	Gneiss	Very Strong
5	5	9.5	D	8.0	47.0	90.0	84.5	Gneiss	Strong
6	6	10.0	D	14.5	47.0	80.0	153.2	Gneiss	Very Strong
7	6	10.0	A	16.0	47.0	50.0	133.6	Gneiss	Very Strong
8	6	11.0	D	23.5	47.0	102.0	248.3	Gneiss	Very Strong
9	6	11.0	D	24.5	47.0	117.0	258.9	Gneiss	Extremely Strong
10	6	12.0	A	30.0	47.0	47.0	262.9	Gneiss	Extremely Strong
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POINT LOAD TEST SHEET

Job No :	19-1605-126	**Client :**	Hatch
		Date Drilled :	5/7/2011
Project Name :	Baffinland	**Date Tested :**	5/30/2011
Core Size :	NQ **BH No :** MSIBP-1(2)	**Tester :**	BT

Test No.	Run No.	Depth (m)	Axial or Diametral	Force (kN)	Diameter (mm)	Length (mm)	UCS (MPa)	Rock Type	Notes
1	1	10.4	D	15.0	47.0	100.0	158.5	Quartz	Very Strong
2	1	10.5	A	6.5	47.0	50.0	54.3	Granitic Gneiss	Strong
3	2	11.5	A	16.0	47.0	50.0	133.6	Granitic Gneiss	Very Strong
4	2	12.7	D	12.0	47.0	68.0	126.8	Granitic Gneiss	Very Strong
5	3	13.5	A	25.5	47.0	49.0	216.3	Granitic Gneiss	Very Strong
6	3	14.1	D	14.0	47.0	72.0	147.9	Granitic Gneiss	Very Strong
7	4	14.8	D	19.5	47.0	88.0	206.0	Granitic Gneiss	Very Strong
8	5	15.9	A	16.5	47.0	48.0	142.2	Granitic Gneiss	Very Strong
9	5	16.5	A	27.5	47.0	42.0	262.9	Granitic Gneiss	Extremely Strong
10	5	17.0	D	26.5	47.0	53.0	280.0	Granitic Gneiss	Extremely Strong
11	5	17.7	D	20.0	47.0	62.0	211.3	Granitic Gneiss	Very Strong
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POINT LOAD TEST SHEET

Job No :	19-1605-126	**Client :**	HATCH
		Date Drilled :	8/14/2011
Project Name :	Mary River Project - Geotechnical Investigation	**Date Tested :**	8/27/2011
Core Size :	NQ3 **BH No :** SI-MHS-008	**Tester :**	AS

Test No.	Run No.	Depth (m)	Axial or Diametral	Force (kN)	Diameter (mm)	Length (mm)	UCS (MPa)	Rock Type	Notes
1	4	9.6	D	10.0	47.7	93.5	103.4	granitic gneiss	Very Strong
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POINT LOAD TEST SHEET

Job No :	19-1605-126	**Client :**	HATCH
		Date Drilled :	8/8/2011
Project Name :	Mary River Project - Geotechnical Investigation	**Date Tested :**	8/26/2011
Core Size :	NQ **BH No :** SI-OLD-004	**Tester :**	AS/TH/BW

Test No.	Run No.	Depth (m)	Axial or Diametral	Force (kN)	Diameter (mm)	Length (mm)	UCS (MPa)	Rock Type	Notes
1	1	0.4	D	17.0	47.3	170.0	178.0	granitic gneiss	Very Strong
2	2	2.2	D	19.0	47.3	160.0	198.5	granitic gneiss	Very Strong
3	2	5.1	D	25.0	47.2	130.0	262.1	granitic gneiss	Extremely Strong
4	3	7.8	D	19.0	47.5	163.0	197.8	granitic gneiss	Very Strong
5	5	11.3	D	15.0	46.9	185.0	159.0	granitic gneiss	Very Strong
6	6	14.1	D	0.5	47.4	190.0	5.2	granitic gneiss	Weak
7	7	15.7	D	17.0	47.5	195.0	177.0	granitic gneiss	Very Strong
8	10	23.4	D	17.0	47.5	115.0	176.5	granitic gneiss	Very Strong
9	11	28.7	D	16.0	47.5	190.0	166.2	granitic gneiss	Very Strong
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POINT LOAD TEST SHEET

Job No :	19-1605-126	**Client :**	HATCH
		Date Drilled :	8/9/2011
Project Name :	Mary River Project - Geotechnical Investigation	**Date Tested :**	8/26/2011
Core Size :	NQ3 **BH No :** SI-OLD-005	**Tester :**	AS/TH/BW

Test No.	Run No.	Depth (m)	Axial or Diametral	Force (kN)	Diameter (mm)	Length (mm)	UCS (MPa)	Rock Type	Notes
1	1	1.8	D	16.5	47.5	95.0	171.7	granitic gneiss	Very Strong
2	1	1.8	D	15.5	47.5	120.4	161.1	granitic gneiss	Very Strong
3	2	3.7	D	18.0	47.4	110.0	187.9	granitic gneiss	Very Strong
4	3	5.0	D	18.5	47.5	111.8	192.2	granitic gneiss	Very Strong
5	3	5.8	D	18.3	47.5	184.0	189.5	granitic gneiss	Very Strong
6	4	7.8	D	22.0	47.3	105.0	230.2	granitic gneiss	Very Strong
7	4	8.5	D	22.0	47.2	66.9	231.0	granitic gneiss	Very Strong
8	5	10.9	D	8.0	47.4	170.0	83.5	granitic gneiss	Strong
9	6	13.9	D	19.0	47.3	143.0	198.6	granitic gneiss	Very Strong
10	7	16.9	D	19.0	47.6	114.3	197.2	granitic gneiss	Very Strong
11	8	19.9	D	14.0	47.4	110.0	146.2	granitic gneiss	Very Strong
12	9	23.7	D	24.5	47.5	111.0	254.8	granitic gneiss	Extremely Strong
13	10	28.9	D	28.0	47.6	171.0	290.0	granitic gneiss	Extremely Strong
14	11	31.8	D	25.5	47.4	1050.0	266.0	granitic gneiss	Extremely Strong
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POINT LOAD TEST SHEET

Job No :	19-1605-126	**Client :**	HATCH
		Date Drilled :	8/11/2011
Project Name :	Mary River Project - Geotechnical Investigation	**Date Tested :**	8/26/2011
Core Size :	NQ3 **BH No :** SI-OLD-006	**Tester :**	AS/TH/BW

Test No.	Run No.	Depth (m)	Axial or Diametral	Force (kN)	Diameter (mm)	Length (mm)	UCS (MPa)	Rock Type	Notes
1	1	0.1	D	17.5	47.1	125.0	184.1	granitic gneiss	Very Strong
2	2	3.8	D	19.0	47.2	117.0	199.6	granitic gneiss	Very Strong
3	2	5.3	D	19.3	47.4	110.0	201.1	granitic gneiss	Very Strong
4	3	8.3	D	12.0	48.0	115.0	122.8	granitic gneiss	Very Strong
5	4	8.8	D	0.0	48.0	98.0	0.5	granitic gneiss	Extremely Weak
6	5	12.7	D	24.5	47.6	130.0	254.0	granitic gneiss	Extremely Strong
7	13	35.4	D	19.0	47.8	80.0	195.8	granitic gneiss	Very Strong
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POINT LOAD TEST SHEET

Job No :	19-1605-126	**Client :**	HATCH
		Date Drilled :	8/11/2011
Project Name :	Mary River Project - Geotechnical Investigation	**Date Tested :**	8/26/2011
Core Size :	NQ3 **BH No :** SI-OLD-007	**Tester :**	AS/TH/BW

Test No.	Run No.	Depth (m)	Axial or Diametral	Force (kN)	Diameter (mm)	Length (mm)	UCS (MPa)	Rock Type	Notes
1	1	0.0	D	17.5	47.5	145.0	182.2	granitic gneiss	Very Strong
2	2	5.0	D	26.0	47.5	135.0	270.5	granitic gneiss	Extremely Strong
3	3	5.4	D	19.0	47.6	110.0	196.9	granitic gneiss	Very Strong
4	4	8.4	D	15.5	47.6	70.0	160.4	granitic gneiss	Very Strong
5	4	11.8	D	15.0	47.5	120.0	155.9	granitic gneiss	Very Strong
6	5	14.0	D	11.5	47.4	150.0	119.8	granitic gneiss	Very Strong
7	6	15.3	D	22.5	47.7	155.0	232.4	granitic gneiss	Very Strong
8	6	16.9	D	20.0	47.5	116.0	208.1	granitic gneiss	Very Strong
9	7	17.4	D	30.0	47.9	85.2	308.1	granitic gneiss	Extremely Strong
10	9	23.0	D	22.5	47.4	130.0	234.6	granitic gneiss	Very Strong
11	9	23.8	D	19.0	47.5	87.9	197.5	granitic gneiss	Very Strong
12	10	26.4	D	18.0	47.6	107.4	186.6	granitic gneiss	Very Strong
13	10	26.7	D	23.0	47.4	135.0	239.7	granitic gneiss	Very Strong
14	10	29.0	D	14.0	47.4	86.0	146.2	granitic gneiss	Very Strong
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POINT LOAD TEST SHEET

Job No :	19-1605-126	**Client :**	HATCH
		Date Drilled :	8/12/2011
Project Name :	Mary River Project - Geotechnical Investigation	**Date Tested :**	8/26/2011
Core Size :	NQ3 **BH No :** SI-OLD-008	**Tester :**	AS/TH

Test No.	Run No.	Depth (m)	Axial or Diametral	Force (kN)	Diameter (mm)	Length (mm)	UCS (MPa)	Rock Type	Notes
1	2	2.4	D	1.5	47.1	99.0	15.8	granitic gneiss	Weak
2	2	3.9	D	25.0	47.1	170.0	263.3	granitic gneiss	Extremely Strong
3	4	8.5	D	23.2	47.1	105.0	244.3	granitic gneiss	Very Strong
4	6	14.5	D	14.4	47.1	111.0	151.7	granitic gneiss	Very Strong
5	8	17.6	D	22.5	49.1	240.0	222.2	granitic gneiss	Very Strong
6	9	22.8	D	23.5	47.1	134.0	247.5	granitic gneiss	Very Strong
7	10	26.5	D	24.1	47.1	180.0	253.8	granitic gneiss	Extremely Strong
8	13	32.6	D	15.2	47.1	125.0	160.1	granitic gneiss	Very Strong
9	13	35.6	D	22.5	47.1	101.0	237.0	granitic gneiss	Very Strong
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AGAT Laboratories

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FAX (905)712-5122
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CLIENT NAME: THURBER ENGINEERING LTD
SUITE 103, 2010 WINSTON PARK DRIVE
OAKVILLE, ON L6H5R7

ATTENTION TO: Mathew Boucher

PROJECT NO: 19-1605-126

AGAT WORK ORDER: 11T513778

SOIL ANALYSIS REVIEWED BY: Anthony Dapaah, PhD (Chem), Inorganic Lab Manager

TRACE ORGANICS REVIEWED BY: Jacky Takeuchi, BScH (Chem Eng), BSc (Bio), C.Chem, Laboratory Manager

DATE REPORTED: Aug 05, 2011

PAGES (INCLUDING COVER): 9

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712 5100, or at 1-800-856-6261

*NOTES

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

AGAT Laboratories

5835 COOPERS AVENUE
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Certificate of Analysis

AGAT WORK ORDER: 11T513778
PROJECT NO: 19-1605-126

CLIENT NAME: THURBER ENGINEERING LTD

ATTENTION TO: Mathew Boucher

O. Reg. 153 Metals & Inorganics in Soil

DATE SAMPLED: | DATE RECEIVED: Jul 27, 2011 | DATE REPORTED: Aug 05, 2011 | SAMPLE TYPE: Soil

Parameter	Unit	G / S	RDL	MSFD-P SS#1 2572051
Antimony	µg/g		0.8	<0.8
Arsenic	µg/g		1	5
Barium	µg/g		2	43
Beryllium	µg/g		0.5	<0.5
Boron	µg/g		5	22
Boron (Hot Water Extractable)	µg/g		0.10	6.16
Cadmium	µg/g		0.5	<0.5
Chromium	µg/g		2	24
Cobalt	µg/g		0.5	4.6
Copper	µg/g		1	8
Lead	µg/g		1	7
Molybdenum	µg/g		0.5	2.0
Nickel	µg/g		1	12
Selenium	µg/g		0.4	0.6
Silver	µg/g		0.2	<0.2
Thallium	µg/g		0.4	<0.4
Uranium	ug/g		0.5	1.5
Vanadium	µg/g		1	36
Zinc	µg/g		5	46
Chromium VI	µg/g		0.2	<0.2
Cyanide	µg/g		0.05	<0.05
Mercury	µg/g		0.01	<0.01
Electrical Conductivity	mS/cm		0.002	10.3
Sodium Adsorption Ratio	N/A		N/A	24.1
pH, 2:1 CaCl2 Extraction	pH Units			7.81

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

2572051 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Certified By:

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AGAT WORK ORDER: 11T513778

PROJECT NO: 19-1605-126

CLIENT NAME: THURBER ENGINEERING LTD

ATTENTION TO: Mathew Boucher

Soil Analysis - Total Organic Carbon (W-B Wet Oxidation)

DATE SAMPLED: | DATE RECEIVED: Jul 27, 2011 | DATE REPORTED: Aug 05, 2011 | SAMPLE TYPE: Soil

Parameter	Unit	G / S	RDL	MSFD-P SS#1 2572051
Total Organic Carbon	%		0.15	0.64

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

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 11T513778
PROJECT NO: 19-1605-126

CLIENT NAME: THURBER ENGINEERING LTD

ATTENTION TO: Mathew Boucher

O. Reg. 153 - PAHs in Soil

DATE SAMPLED: | DATE RECEIVED: Jul 27, 2011 | DATE REPORTED: Aug 05, 2011 | SAMPLE TYPE: Soil

Parameter	Unit	G / S	RDL	MSFD-P SS#1 2572051
Naphthalene	µg/g		0.03	<0.03
Acenaphthylene	µg/g		0.02	<0.02
Acenaphthene	µg/g		0.03	<0.03
Fluorene	µg/g		0.02	<0.02
Phenanthrene	µg/g		0.02	<0.02
Anthracene	µg/g		0.02	<0.02
Fluoranthene	µg/g		0.02	<0.02
Pyrene	µg/g		0.02	<0.02
Benzo(a)anthracene	µg/g		0.02	<0.02
Chrysene	µg/g		0.02	<0.02
Benzo(b)fluoranthene	µg/g		0.02	<0.02
Benzo(k)fluoranthene	µg/g		0.02	<0.02
Benzo(a)pyrene	µg/g		0.02	<0.02
Indeno(1,2,3-cd)pyrene	µg/g		0.02	<0.02
Dibenz(a,h)anthracene	µg/g		0.02	<0.02
Benzo(g,h,i)perylene	µg/g		0.02	<0.02
2-and 1-methyl Naphthalene	µg/g		0.05	<0.05
Moisture Content	%		0.1	25.7
Surrogate	**Unit**	**Acceptable Limits**		
Chrysene-d12	%	60-130		75

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard
2572051 Results are based on the dry weight of the soil.

Certified By: Jordy Takewaki

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 11T513778
PROJECT NO: 19-1605-126

CLIENT NAME: THURBER ENGINEERING LTD

ATTENTION TO: Mathew Boucher

PCBs (soil)

DATE SAMPLED: | DATE RECEIVED: Jul 27, 2011 | DATE REPORTED: Aug 05, 2011 | SAMPLE TYPE: Soil

Parameter	Unit	G / S	RDL	MSFD-P SS#1 2572051
PCBs	µg/g		0.1	<0.1
Surrogate	**Unit**	**Acceptable Limits**		
Decachlorobiphenyl	%	60-130		122

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard
2572051 Results are based on the dry weight of soil extracted.

Certified By: Jordy Takewaki

AGAT Laboratories

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Quality Assurance

CLIENT NAME: THURBER ENGINEERING LTD

AGAT WORK ORDER: 11T513778

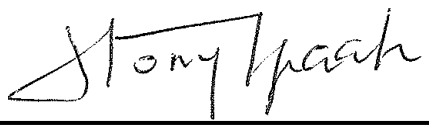
PROJECT NO: 19-1605-126

ATTENTION TO: Mathew Boucher

Soil Analysis

RPT Date: Aug 05, 2011			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153 Metals & Inorganics in Soil															
Antimony	1		< 0.8	< 0.8	0.0%	< 0.8	110%	90%	110%	91%	90%	110%	91%	70%	130%
Arsenic	1		2	2	0.0%	< 1	109%	90%	110%	98%	90%	110%	98%	70%	130%
Barium	1		56	54	3.6%	< 2	105%	90%	110%	101%	90%	110%	103%	70%	130%
Beryllium	1		< 0.5	< 0.5	0.0%	< 0.5	99%	90%	110%	94%	90%	110%	92%	70%	130%
Boron	1		7	6	15.4%	< 5	74%	70%	130%	98%	90%	110%	97%	70%	130%
Boron (Hot Water Extractable)	1		0.17	0.17	0.0%	< 0.10	109%	80%	120%	105%	90%	110%	102%	70%	130%
Cadmium	1		< 0.5	< 0.5	0.0%	< 0.5	99%	90%	110%	104%	90%	110%	95%	70%	130%
Chromium	1		14	14	0.0%	< 2	100%	90%	110%	99%	90%	110%	97%	70%	130%
Cobalt	1		5.2	5.1	1.9%	< 0.5	104%	90%	110%	96%	90%	110%	93%	70%	130%
Copper	1		12	12	0.0%	< 1	100%	90%	110%	99%	90%	110%	91%	70%	130%
Lead	1		5	5	0.0%	< 1	103%	90%	110%	100%	90%	110%	92%	70%	130%
Molybdenum	1		< 0.5	< 0.5	0.0%	< 0.5	99%	90%	110%	94%	90%	110%	98%	70%	130%
Nickel	1		10	10	0.0%	< 1	106%	90%	110%	96%	90%	110%	91%	70%	130%
Selenium	1		< 0.4	< 0.4	0.0%	< 0.4	113%	80%	120%	95%	90%	110%	95%	70%	130%
Silver	1		< 0.2	< 0.2	0.0%	< 0.2	85%	80%	120%	97%	90%	110%	94%	70%	130%
Thallium	1		< 0.4	< 0.4	0.0%	< 0.4	94%	90%	110%	94%	90%	110%	89%	70%	130%
Uranium	1		< 0.5	< 0.5	0.0%	< 0.5	102%	90%	110%	99%	90%	110%	94%	70%	130%
Vanadium	1		22	22	0.0%	< 1	105%	90%	110%	95%	90%	110%	94%	70%	130%
Zinc	1		26	26	0.0%	< 5	94%	90%	110%	101%	90%	110%	95%	70%	130%
Chromium VI	1		< 0.2	< 0.2	0.0%	< 0.2	103%	80%	120%	106%	90%	110%	114%	70%	130%
Cyanide	1		< 0.05	< 0.05	0.0%	< 0.05	95%	80%	120%	110%	90%	110%	92%	70%	130%
Mercury	1		0.03	0.03	0.0%	< 0.01	96%	80%	120%	98%	90%	110%	100%	70%	130%
Electrical Conductivity	1		0.244	0.216	12.2%	< 0.002	99%	80%	120%						
Sodium Adsorption Ratio	1		0.786	0.734	6.8%	N/A									
pH, 2:1 CaCl2 Extraction	1		6.74	7.66	12.8%	<	97%	90%	110%						
Soil Analysis - Total Organic Carbon (W-B Wet Oxidation)															
Total Organic Carbon	6577	5178	1.01	1.12	10.3%	< 0.15	88%	80%	120%				116%	80%	120%

Certified By:



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Quality Assurance

CLIENT NAME: THURBER ENGINEERING LTD

AGAT WORK ORDER: 11T513778

PROJECT NO: 19-1605-126

ATTENTION TO: Mathew Boucher

Trace Organics Analysis

RPT Date: Aug 05, 2011			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153 - PAHs in Soil															
Naphthalene	1		< 0.03	< 0.03	0.0%	< 0.03	110%	60%	130%	87%	60%	130%	83%	60%	130%
Acenaphthylene	1		< 0.02	< 0.02	0.0%	< 0.02	112%	60%	130%	88%	60%	130%	83%	60%	130%
Acenaphthene	1		< 0.03	< 0.03	0.0%	< 0.03	113%	60%	130%	90%	60%	130%	85%	60%	130%
Fluorene	1		< 0.02	< 0.02	0.0%	< 0.02	106%	60%	130%	88%	60%	130%	83%	60%	130%
Phenanthrene	1		< 0.02	< 0.02	0.0%	< 0.02	100%	60%	130%	86%	60%	130%	83%	60%	130%
Anthracene	1		< 0.02	< 0.02	0.0%	< 0.02	99%	60%	130%	85%	60%	130%	81%	60%	130%
Fluoranthene	1		< 0.02	< 0.02	0.0%	< 0.02	108%	60%	130%	90%	60%	130%	94%	60%	130%
Pyrene	1		< 0.02	< 0.02	0.0%	< 0.02	110%	60%	130%	90%	60%	130%	94%	60%	130%
Benzo(a)anthracene	1		< 0.02	< 0.02	0.0%	< 0.02	102%	60%	130%	87%	60%	130%	94%	60%	130%
Chrysene	1		< 0.02	< 0.02	0.0%	< 0.02	108%	60%	130%	87%	60%	130%	90%	60%	130%
Benzo(b)fluoranthene	1		< 0.02	< 0.02	0.0%	< 0.02	109%	60%	130%	97%	60%	130%	98%	60%	130%
Benzo(k)fluoranthene	1		< 0.02	< 0.02	0.0%	< 0.02	98%	60%	130%	85%	60%	130%	84%	60%	130%
Benzo(a)pyrene	1		< 0.02	< 0.02	0.0%	< 0.02	98%	60%	130%	86%	60%	130%	87%	60%	130%
Indeno(1,2,3-cd)pyrene	1		< 0.02	< 0.02	0.0%	< 0.02	90%	60%	130%	89%	60%	130%	90%	60%	130%
Dibenz(a,h)anthracene	1		< 0.02	< 0.02	0.0%	< 0.02	95%	60%	130%	85%	60%	130%	89%	60%	130%
Benzo(g,h,i)perylene	1		< 0.02	< 0.02	0.0%	< 0.02	96%	60%	130%	84%	60%	130%	88%	60%	130%
2-and 1-methyl Naphthalene	1		< 0.05	< 0.05	0.0%	< 0.05	113%	60%	130%	90%	60%	130%	84%	60%	130%
PCBs (soil)															
PCBs	1		< 0.1	< 0.1	0.0%	< 0.1	117%	60%	140%	96%	60%	140%	90%	60%	140%

Certified By:

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Method Summary

CLIENT NAME: THURBER ENGINEERING LTD

AGAT WORK ORDER: 11T513778

PROJECT NO: 19-1605-126

ATTENTION TO: Mathew Boucher

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Extractable)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET-93-1003	EPA SW 846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium VI	INOR-93-6029	SM 3500 B; MSA Part 3, Ch. 25	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6101	EPA SW 846 7471A 245.5	CVAAS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010C	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Total Organic Carbon	SOIL 0480; SOIL 0110; SOIL 0120	NELSON 1996; SHEPPARD 2007	COLOR

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Method Summary

CLIENT NAME: THURBER ENGINEERING LTD

AGAT WORK ORDER: 11T513778

PROJECT NO: 19-1605-126

ATTENTION TO: Mathew Boucher

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Naphthalene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Acenaphthylene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Acenaphthene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Fluorene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Phenanthrene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Anthracene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Fluoranthene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Pyrene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Benzo(a)anthracene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Chrysene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Benzo(b)fluoranthene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Benzo(k)fluoranthene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Benzo(a)pyrene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Indeno(1,2,3-cd)pyrene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Dibenz(a,h)anthracene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Benzo(g,h,i)perylene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
2-and 1-methyl Naphthalene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Moisture Content	Org 5506	EPA SW-846 3540 & 8270	BALANCE
Chrysene-d12	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
PCBs	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD
Decachlorobiphenyl	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD

AGAT Laboratories

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CHAIN OF CUSTODY RECORD

LABORATORY USE ONLY
Arrival Condition: ☑ Good ☐ Poor (complete "notes")
Arrival Temperature: 20°C AGAT WO #: 11T513778
Notes:

Client Information
Company: Thurber Engineering
Contact: Matthew Boucher
Address: #103-2010 Winston Park Dr.
Oakville L6H 5R7
Phone: 905-829-8666 Fax: 905 829-1166
Project: 19-1605-126 PO:
AGAT Quotation #:
Please note, if quotation number is not provided, client will be billed full price for analysis.

Invoice To Same as Above? Yes/No (circle)
Company:
Contact:
Address:
Phone: Fax:

Report Information - reports to be sent to:
1. Name: Matthew Boucher
Email: mboucher@thurber.ca
2. Name:
Email:

Regulatory Requirements
☐ Regulation 153 Table ____ (Indicate one) ☐ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture (check one) ☐ Coarse ☐ Med/Fine
☐ Sewer Use Region ____ (Indicate one) ☐ Sanitary ☐ Storm
☐ Regulation 558 ☐ CCME ☐ Other (indicate) ____
☐ Prov. Water Quality Objectives (PWQO)
☐ Drinking Water (circle one) 170/243/252

Is this a drinking water sample (potable water intended for human consumption)? ☐ Yes ☐ No (If "Yes" please use the Drinking Water Chain of Custody Record)

Report Format
☐ Single Sample per page
☐ Multiple Samples per page
☐ Results by fax

Turnaround Time (TAT) Required*
Regular TAT:
☒ 5 to 7 Working Days
Rush TAT: (please provide prior notification)
Rush Surcharges Apply
☐ 3 to 5 Working Days
☐ 1 to 3 Working Days
☐ 1 Working Day
OR
DATE REQUIRED (Rush surcharges may apply):
*TAT is exclusive of weekends and statutory holidays

Sample Identification	Date Sampled	Time Sampled	Sample Matrix	# of Containers	Comments Site/ Sample Information	Metals and Inorganics	Metal Scan (exclud. Hg, B, Cr6)	CCME Fractions 1 to 4	VOCs	PAHs	PCBs	TCLP Metals/Inorganics	TCLP	Storm Sewer Use	Sanitary Sewer Use	TAT	LABORATORY USE ONLY LAB SAMPLE ID
MSED-P SS#1			Soil	3			X			X	X					X	

Samples Relinquished By (print name & sign)	Date/Time	Samples Received By (print name & sign)	Date/Time
Matthew Boucher MB.	July 27/11	Mamreau	July 27 1:10
Samples Relinquished By (print name & sign)	Date/Time	Samples Received By (print name & sign)	Date/Time

Pink Copy - Client
Yellow Copy - AGAT
White Copy - AGAT

PAGE 1 of 1
NO: 112889