

Geotechnical Data Report Highway 7 over Nicomen Slough Dewdney Bridge 00596 Replacement Project Dewdney, BC



PRESENTED TO

British Columbia Ministry of Transportation and Infrastructure

MARCH 25, 2020
ISSUED FOR USE
FILE: ENG.VGEO03551-01

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TABLE OF CONTENTS

1.0 INTRODUCTION	1
2.0 PROJECT DESCRIPTION	1
3.0 INFORMATION REVIEWED	1
4.0 GEOTECHNICAL SITE EXPLORATION	2
4.1 General	2
4.2 Solid Stem Auger	2
4.3 Sonic Drilling	2
4.4 Cone Penetration Testing and Seismic Cone Penetration Testing	3
4.5 Logging and Sampling	3
4.6 Laboratory Testing	3
5.0 SUBSURFACE CONDITIONS	4
5.1 Surficial Geology	4
5.2 Soil Stratigraphy	4
5.3 Groundwater	4
6.0 CLOSURE	6
REFERENCES	7

LIST OF TABLES IN TEXT

Table 5-1: Summary of Water Level and Depth Measurements Within the Slough	5
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APPENDIX SECTIONS

FIGURES

- Figure 1 Site Plan
- Figure 2 Testhole Location Plan

APPENDICES

- Appendix A Tetra Tech’s Limitations on the Use of this Document
- Appendix B Testhole Logs and CPT Data
- Appendix C Laboratory Test Results

LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of British Columbia Ministry of Transportation and Infrastructure and their agents. Tetra Tech Canada Inc. (Tetra Tech) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than BC Ministry of Transportation and Infrastructure, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this document is subject to the Limitations on the Use of this Document attached in the Appendix or Contractual Terms and Conditions executed by both parties.

1.0 INTRODUCTION

Tetra Tech Canada Inc. (Tetra Tech) was retained by the British Columbia Ministry of Transportation and Infrastructure (BC MoTI) under Contract No. 860-CS-0955 to provide geotechnical engineering services for the Highway 7 over Nicomen Slough Dewdney Bridge No. 00596 Replacement Project. The site is located along Highway 7 in Dewdney, BC, approximately 12 km east of Mission, BC.

This report presents the findings of our geotechnical exploration program conducted in September 2019.

The Limitations on the Use of this Document, attached in Appendix A, forms an integral part of this report.

2.0 PROJECT DESCRIPTION

This project involves the replacement of the existing Dewdney Bridge with a two-lane bridge. The three conceptual options include a five-span prestressed I-girder option, a long span truss, or a shorter span option which allows for top down construction (approximately 11 spans).

We understand that the existing bridge was constructed in the late 1950s comprising a 19.8 m main steel I-girder span and 15 “inverted bathtub” concrete spans approximately 8.5 m each, founded on timber piles. Available drawings for the bridge suggest that the timber piles extend to approximately 15 m below mudline, however pile installation or driving logs were not made available. We understand that the existing bridge has required numerous repairs in recent years and is in poor condition.

At this time, the five-span prestressed concrete I-girder option is the most likely replacement for the existing bridge. This bridge will be supported on piles at each abutment; with four in-slough piers. The bridge will be supported on piles at each abutment. The proposed bridge will likely require additional fills to raise the road grade along Highway 7 as well as the approaches. The bridge approaches may tie into the existing dikes or span overtop of the existing dikes.

The objective of our geotechnical subsurface exploration was to obtain information along the alignment of the existing bridge abutments, approach fills and within the Nicomen Slough at possible pier locations, for the purposes of conceptual design. The contents of this report therefore include the following:

- A description of the scope of work;
- A description of the methodology and equipment used;
- Results and factual data collected during the geotechnical site investigation; and
- A site plan figure showing the testhole locations.

3.0 INFORMATION REVIEWED

The following information sources were reviewed as part of a desktop study completed early in the project:

- Information provided by BC MoTI, including existing structural drawings and site photos;
- Published water well logs from the BC Water Resources Atlas (<http://maps.gov.bc.ca/ess/hm/wrbc>);
- Fraser Valley Regional District Geographical Information System data; and
- Relevant geological maps and papers published by the Geological Survey of Canada, BC Geological Survey and other information sources.

4.0 GEOTECHNICAL SITE EXPLORATION

4.1 General

The geotechnical site exploration was completed between September 3 and 27, 2019 and consisted of the following:

- Sixteen (16) Solid Stem Auger testholes located along Highway 7 and the dikes;
- Two (2) Sonic testholes located at the north and south bridge approaches;
- Three (3) Sonic testholes located within the slough, drilled atop the bridge deck;
- Two (2) Seismic Cone Penetration Test (SCPT) soundings located at the north and south bridge approaches; and
- Two (2) Cone Penetration Test (CPT) soundings located within the slough, drilled from the bridge deck through sonic casing.

A site plan and testhole locations plan are shown on Figures 1 and 2, respectively.

Testholes in the slough were advanced through the bridge deck from a truck mount sonic rig positioned on the bridge. The testholes were located with structural input from McElhanney and out of the wheelpaths.

Prior to coring through the bridge deck the concrete was removed down to the deck rebar by chipping out the deck concrete in an area approximately 305 mm (12") square at each testhole location. This area was sufficient to expose two bars in the bridge girder. The core hole was then positioned such that the core hole cut through only one of the bars. A larger, shallower area 356 by 356 mm (14" by 14") was sawcut to a depth adequate to allow a similar sized road plate to be bolted to the deck. The road plate surfaces were roughly flush with the road surface and with the road plates bolted in place when drilling was not occurring. Finally, 229 mm (9") diameter holes were cored through the bridge deck by SureCore Concrete Coring. The drill casing diameter for the testholes on the bridge was 178 mm (7") diameter.

The testhole logs and a summary report containing CPT data are provided in Appendix B.

4.2 Solid Stem Auger

The Solid Stem Auger testholes were carried out by Downrite Drilling Ltd. Four (4) testholes were completed in the Dewdney Area Improvement District dike, to depths of 6.1 m to 7.6 m. Four (4) testholes were completed in the Nicomen Island Improvement District dike, to depths of 9.1 m. Eight (8) testholes were completed on Highway 7, with practical refusal at approximately 1 m, and three (3) reaching target depths of 6.1 m. Upon completion, testholes in the dikes were backfilled to surface with grout in accordance with the *Dike Maintenance Act*. Testholes located on the roadway were backfilled to surface with auger cuttings and bentonite chips in accordance with the *BC Water Sustainability Act*.

4.3 Sonic Drilling

The sonic testholes were carried out by Mud Bay Drilling Co. Ltd. One (1) testhole was completed on the approach on each side of the bridge (for a total of two (2) testholes), at the intersection of the dikes and the roadway. Three (3) testholes were completed in the slough, from the bridge deck.

The testholes in the dikes (on the approaches) were advanced 102 mm (4") core followed by 152 mm (6") casing. Testholes were backfilled to surface with grout in accordance with the *Dike Maintenance Act*.

Testholes in the slough were cased with 178 mm (7") casing from the rectangular hole in the bridge deck to approximately 1.5 m below mudline and cleaned out. Then 152 mm (6") casing was lowered, and advanced following drilling with 102 mm (4") core. Testholes in the slough were backfilled to surface with bentonite chip plugs and slough in accordance with the *BC Water Sustainability Act*. Core was photographed after logging.

4.4 Cone Penetration Testing and Seismic Cone Penetration Testing

The Cone Penetration Testing (CPT) / Seismic Cone Penetration Testing (SCPT) soundings were carried out by Conetec Investigations Ltd. Two (2) SCPT's were completed adjacent to the sonic testholes on the bridge approaches. Two (2) CPT's were completed at two of the three sonic testhole locations in the slough, and were advanced through the casing prior to sonic drilling. The CPT and SCPT soundings were completed using a 15 cm² seismic piezocone for detailed stratigraphic profiling and measurement of in situ soil properties. The testing was carried out in general accordance with ASTM D5778. SCPT19-01 and SCPT19-02 were pre-drilled to depths of approximately 4 m and 3 m (respectively) below ground surface due to the widespread occurrence of gravels and cobbles in the upper part of the soil profile. Measurements of the shear wave velocity (V_s) of the soil were obtained using a manual surface hammer shear wave source. Seismic testing was not performed at CPT19-03 and CPT19-04 on the bridge deck. A series of pore pressure dissipation (PPD) tests were also carried out to measure static groundwater levels and to estimate the permeability of the soil layers. Further details of the CPT / SCPT testing, including the cone dimensions, load cell specifications and data plots can be found in the attached report in Appendix B.

4.5 Logging and Sampling

A Tetra Tech field engineer was on site during advancement of the testholes to log and sample the material encountered, as well as to direct the in-situ testing, termination depths and backfilling. During the drilling, Tetra Tech's field engineer also monitored the drill advancement rates, soil recovery, bit wear, etc. and periodically sampled the soil cuttings to document the subsurface conditions. Soil samples recovered from both auger and sonic testholes were retained for geotechnical index laboratory testing.

4.6 Laboratory Testing

Soil samples recovered from the testholes were sent to Tetra Tech's laboratory for geotechnical index classification. The following tests were conducted on selected samples:

- Water Content (ASTM D2216);
- Atterberg Limits (ASTM D4318);
- Particle Size Distribution (ASTM D7928);
- Grain Size Analysis of material finer than 75 µm (ASTM D1140 and ASTM C117);
- Soluble Sulphate Ion Content of Soil (CSA A23.2-3B); and
- Water Soluble Chloride Ion Content (CSA A23.2-4B)

Laboratory test results are presented on the testhole logs and in Appendix C.

5.0 SUBSURFACE CONDITIONS

5.1 Surficial Geology

Based on Geological Survey of Canada (GSC) surficial geology Map 1485A (Armstrong 1976), subsurface soils within the slough are likely to consist of normally consolidated Fraser River Sediments comprising silts and sands, with potential for clay layers based on a review of water well logs. The Fraser River Sediments are underlain by glaciomarine sediments, glacial till and bedrock. Glacial till and bedrock are expected to be on the order of 100 m depth or more in this area.

5.2 Soil Stratigraphy

The results of the geotechnical site exploration are generally consistent with the soil conditions anticipated from the published surficial geology mapping. The interpreted soil stratigraphy is described below.

- **Asphalt Concrete:** Testholes conducted along Highway 7 (SH19-01, SH19-02, and BH19-09 to BH19-16) encountered approximately 130 mm to 150 mm of asphalt concrete at the north approach, and 150 mm to 260 mm of asphalt concrete at the south approach. BH19-01 conducted on River Road South encountered 80 mm of asphalt concrete.
- **Granular Fill (Road Base):** Along Highway 7 north of the existing bridge, the asphalt concrete was underlain by granular fill generally comprising gravel, some sand, some cobbles, between approximately 1.05 m and 2.85 m thick. Along Highway 7 south of the bridge, granular fill generally comprised sandy gravel, trace to some silt, between approximately 0.75 m and 2.52 m thick. Granular fill thickness increased towards the bridge deck approaches at both ends along Highway 7.
- **Fill (Dike):** Dike fill at the north side of the bridge (BH19-01 to BH19-04) generally comprised compact gravel and sand, some cobbles, some boulders, with traces of silt up to 3.5 m thick. Dike fill at the south side of the bridge (BH19-05 to BH19-08) generally comprised compact / firm, silty sand to sandy silt, up to 4.6 m thick.
- **Interbedded Sand and Silt:** Below the dike fill, as observed within testholes conducted at the approaches and dikes north and south of the bridge, as well as below the mudline, as observed within testholes conducted along the existing bridge, interbedded sand and silt was encountered down to approximately 64.3 m below existing road grade. Intermittent wood layers, wood inclusions and debris, as well as organic silt layers about 0.4 m thick were also encountered within the top 10 m below mudline. Based on the CPT data, the measured cone tip resistance (q_t) generally ranged between 10 to 20 MPa (100 to 200 bar).

Neither glacial till nor bedrock were encountered during drilling. The depth to bedrock recorded at a water well approximately 200 m to the south of the existing bridge was 118 m. This has been used as the depth to firm ground for the purposes of this report.

5.3 Groundwater

Based on porewater pressure readings and dissipation data obtained at SCPT19-01 and SCPT19-02 at either approach, groundwater levels were measured at approximately 7.8 m and 9.7 m below existing road grade, respectively on the existing bridge approach fills. After completion of the bridge deck coreholes, water level and mudline measurements were also obtained with respect to the top of the bridge deck; this information is summarized in the table below.

Table 5-1: Summary of Water Level and Depth Measurements Within the Slough

Date	Testhole Location	Location on Bridge	Depth to Water Level Below Bridge Deck Surface (m)	Depth to Mudline (m)
September 16, 2019	SH19-03	Centre	10.6	11.6
September 16, 2019	SH19-04	North Side	9.3	10.5
September 16, 2019	SH19-05	South Side	10.9	12.8

This information indicates that the depth of water in the slough was 1.0 m to 1.9 m at the three testhole locations advanced through the existing bridge deck. We anticipate that seasonal fluctuations in the Fraser River, seasonal runoff from Dewdney Peak and Nicomen Mountain, as well as periods of wet weather, will have an influence on groundwater levels and water levels within the slough.

6.0 CLOSURE

We trust this data report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech Canada Inc.

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BRITISH COLUMBIA
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March 25, 2020

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REFERENCES

Armstrong, J E; Geological Survey of Canada, "A" Series Map 1485A, 1980, 1 sheet,
<https://doi.org/10.4095/108875> (Open Access)

FIGURES

- Figure 1 Site Plan
- Figure 2 Testhole Location Plan

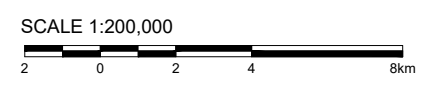


Q:\Vancouver\Drafting\Engineering\VGEO03551-01\ENG.VGEO03551-01 TH Plan Rob.dwg [FIGURE 1] November 14, 2019 - 9:00:10 am (BY: HALL, ROBERT J)

LEGEND
 - - Site location

NOTES
 1. Imagery from Google Earth Pro.

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 **TETRA TECH**

**DEWDNEY BRIDGE REPLACEMENT PROJECT
 DEWDNEY, BC**

KEY PLAN

PROJECT NO. ENG.VGEO03551-01	DWN RH	CKD CL	REV 0
OFFICE VANC	DATE November 14, 2019		

Figure 1

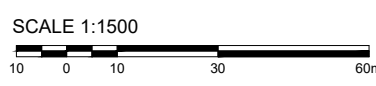


Q:\Vancouver\Drafting\Engineering\VGEO03551-01\ENG.VGEO03551-01 TH Plan Rob.dwg [FIGURE 2] November 14, 2019 - 8:59:50 am (BY: HALL, ROBERT J)

- LEGEND**
- Auger Testholes
 - Sonic Testholes
 - Legal lot lines
 - Watermain
 - Approximate dike alignment

- NOTES**
1. Imagery from Google Earth Pro.
 2. Property lines based on Fraser Valley Regional District Regional Information Map.
 3. Water Line based on BC One Call figure.
 4. Dike alignments based on BC Lower Mainland Dike Inventory Maps for Dewdney Area Improvement District/Norish Creek (Map 24) and Nicomen Island Improvement District; North Nicomen Dyking District (Map 27)

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DEWDNEY BRIDGE REPLACEMENT PROJECT DEWDNEY, BC				
TESTHOLE LOCATION PLAN				
PROJECT NO. ENG.VGEO03551-01	DWN RH	CKD CL	REV 0	Figure 2
OFFICE VANC	DATE November 14, 2019			

APPENDIX A

TETRA TECH'S LIMITATIONS ON THE USE OF THIS DOCUMENT

LIMITATIONS ON USE OF THIS DOCUMENT

GEOTECHNICAL

1.1 USE OF DOCUMENT AND OWNERSHIP

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Both electronic file and/or hard copy versions of TETRA TECH's Instruments of Professional Service shall not, under any circumstances, be altered by any party except TETRA TECH. TETRA TECH's Instruments of Professional Service will be used only and exactly as submitted by TETRA TECH.

Electronic files submitted by TETRA TECH have been prepared and submitted using specific software and hardware systems. TETRA TECH makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

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Services performed by TETRA TECH for the Professional Document have been conducted in accordance with the Contract, in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Professional judgment has been applied in developing the conclusions and/or recommendations provided in this Professional Document. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of the Professional Document.

If any error or omission is detected by the Client or an Authorized Party, the error or omission must be immediately brought to the attention of TETRA TECH.

1.4 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with TETRA TECH with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client further acknowledges that in order for TETRA TECH to properly provide the services contracted for in the Contract, TETRA TECH has relied upon the Client with respect to both the full disclosure and accuracy of any such information.

1.5 INFORMATION PROVIDED TO TETRA TECH BY OTHERS

During the performance of the work and the preparation of this Professional Document, TETRA TECH may have relied on information provided by third parties other than the Client.

While TETRA TECH endeavours to verify the accuracy of such information, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

1.6 GENERAL LIMITATIONS OF DOCUMENT

This Professional Document is based solely on the conditions presented and the data available to TETRA TECH at the time the data were collected in the field or gathered from available databases.

The Client, and any Authorized Party, acknowledges that the Professional Document is based on limited data and that the conclusions, opinions, and recommendations contained in the Professional Document are the result of the application of professional judgment to such limited data.

The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present, or variation in assumed conditions which might form the basis of design or recommendations as outlined in this document, at or on the development proposed as of the date of the Professional Document requires a supplementary exploration, investigation, and assessment.

TETRA TECH is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

1.7 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, TETRA TECH has not been retained to explore, address or consider and has not explored, addressed or considered any environmental or regulatory issues associated with development on the subject site.

1.8 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems, methods and standards employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. TETRA TECH does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

1.9 LOGS OF TESTHOLES

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

1.10 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historical environment. TETRA TECH does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional exploration and review may be necessary.

1.11 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

1.12 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

1.13 INFLUENCE OF CONSTRUCTION ACTIVITY

Construction activity can impact structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques, and construction sequence are known.

1.14 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, and the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

1.15 DRAINAGE SYSTEMS

Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function. Where temporary or permanent drainage systems are installed within or around a structure, these systems must protect the structure from loss of ground due to mechanisms such as internal erosion and must be designed so as to assure continued satisfactory performance of the drains. Specific design details regarding the geotechnical aspects of such systems (e.g. bedding material, surrounding soil, soil cover, geotextile type) should be reviewed by the geotechnical engineer to confirm the performance of the system is consistent with the conditions used in the geotechnical design.

1.16 DESIGN PARAMETERS

Bearing capacities for Limit States or Allowable Stress Design, strength/stiffness properties and similar geotechnical design parameters quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition used in this report. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions considered in this report in fact exist at the site.

1.17 SAMPLES

TETRA TECH will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

1.18 APPLICABLE CODES, STANDARDS, GUIDELINES & BEST PRACTICE

This document has been prepared based on the applicable codes, standards, guidelines or best practice as identified in the report. Some mandated codes, standards and guidelines (such as ASTM, AASHTO Bridge Design/Construction Codes, Canadian Highway Bridge Design Code, National/Provincial Building Codes) are routinely updated and corrections made. TETRA TECH cannot predict nor be held liable for any such future changes, amendments, errors or omissions in these documents that may have a bearing on the assessment, design or analyses included in this report.

APPENDIX B

TESTHOLE LOGS AND CPT DATA

TESTHOLE LOGS



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SUMMARY LOG

Drill Hole #: **BH19-01**

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

Project: **Bridge Replacement**
Location: River Road S, NE-bound lane

Date(s) Drilled: September 3, 2019
Company: Downrite Drilling

Datum: WGS 1984
Northing/Easting: 5445887, 558693

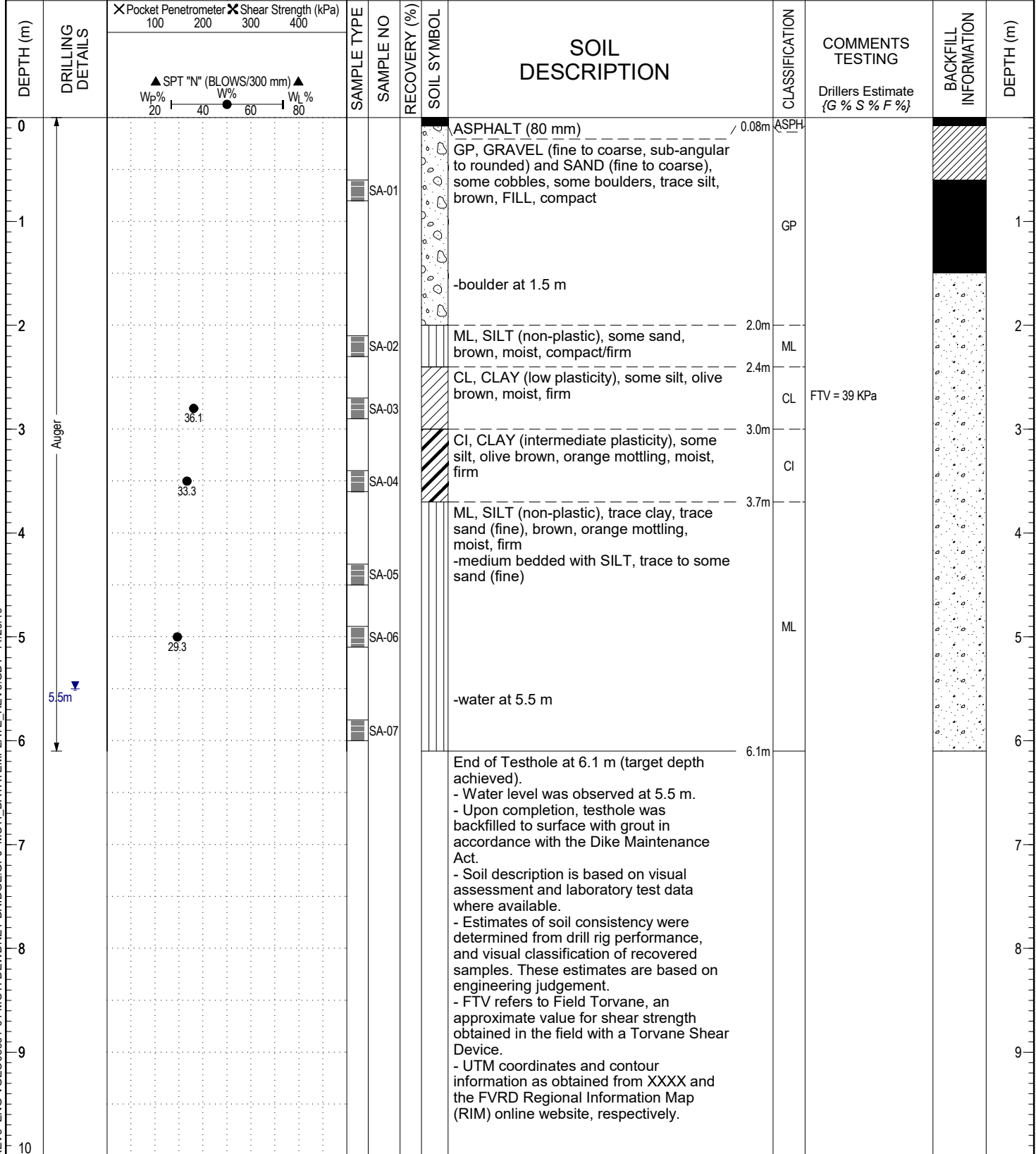
Alignment:
Station/Offset:

Driller: Jonathan Goode
Drill Make/Model:

Logged by: CL Reviewed by: DR

Elevation:

Drilling Method: Auger



MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19

Legend Sample Type: L#-Lab Sample S-Split Spoon O-Odex (air rotary) W-Wash (mud return) T-Shelby Tube	Legend Installation: Sand Grout Cement Bentonite Drill Cuttings Slotted Slough Piezometer	Final Depth of Hole: 6.1 m Depth to Top of Rock: N/A Page 1 of 1
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SUMMARY LOG

Drill Hole #: **BH19-02**

Project: **Bridge Replacement**
Location: Dewdney Area Improvement District dike

Date(s) Drilled: September 3, 2019
Company: Downrite Drilling

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

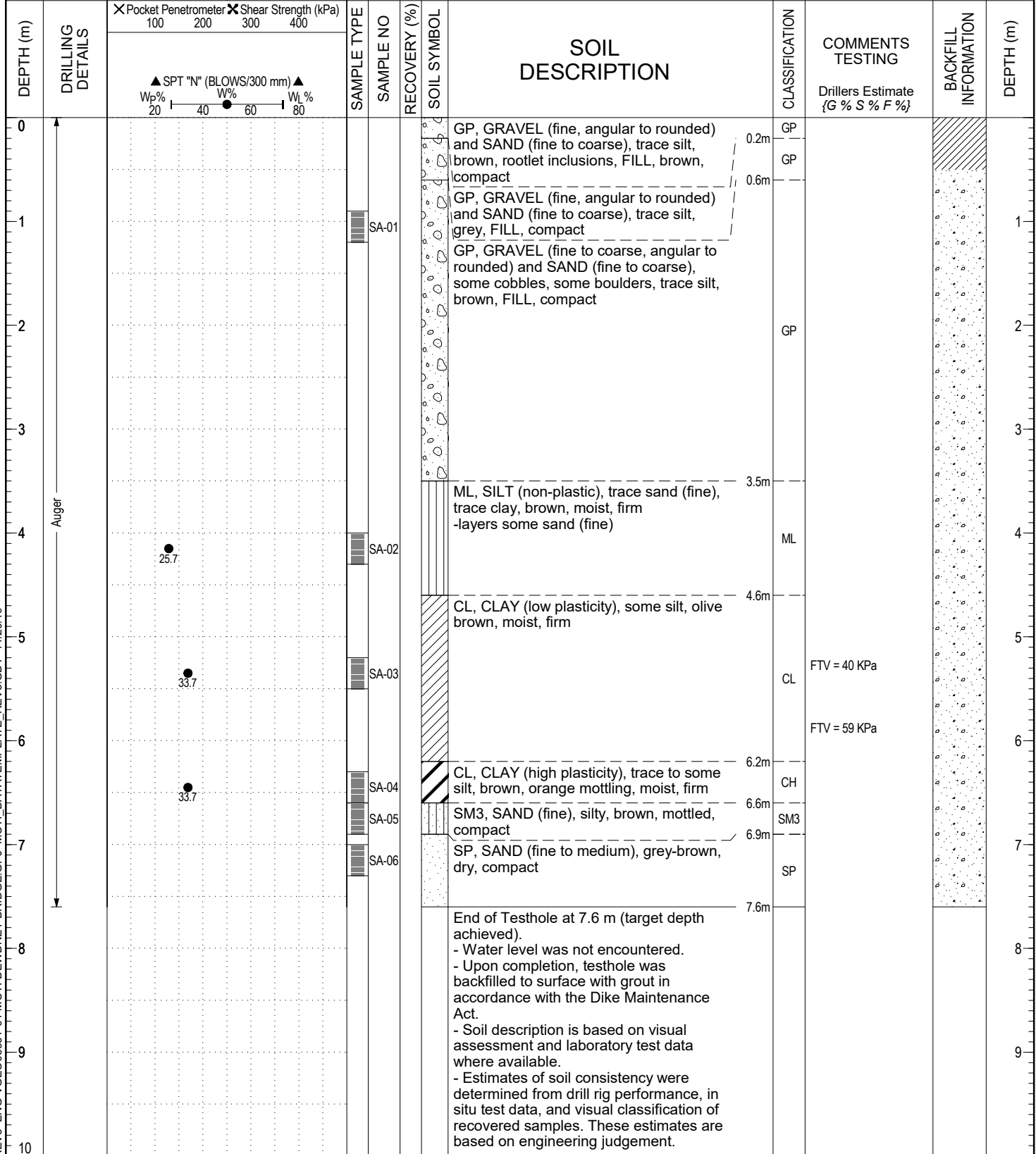
Datum: WGS 1984
Northing/Easting: 5445950, 558723

Alignment:
Station/Offset:

Driller: Jonathan Goode
Drill Make/Model:
Drilling Method: Auger

Logged by: CL Reviewed by: DR

Elevation:



MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI DATATEMPLATE REV3.GDT 11/20/19

Legend Sample Type:	A-Auger B-Becker C-Core G-Grab V-Vane L#-Lab Sample S-Split Spoon O-Odex (air rotary) W-Wash (mud return) T-Shelby Tube	Legend Installation:	Sand Grout Cement Bentonite Drill Cuttings Slotted Slough Piezometer
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Final Depth of Hole: 7.6 m
Depth to Top of Rock: N/A
Page 1 of 2



Ministry of
Transportation
and Infrastructure

SUMMARY LOG

Drill Hole #: **BH19-02**

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

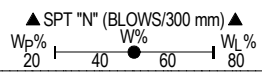
Project: **Bridge Replacement**
Location: Dewdney Area Improvement District dike

Date(s) Drilled: September 3, 2019
Company: Downrite Drilling
Driller: Jonathan Goode
Drill Make/Model:
Drilling Method: Auger

Logged by: CL Reviewed by: DR

Datum: WGS 1984
Northing/Easting: 5445950 , 558723
Elevation:

DEPTH (m)	DRILLING DETAILS	<input checked="" type="checkbox"/> Pocket Penetrometer <input checked="" type="checkbox"/> Shear Strength (kPa)				SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		100	200	300	400									
10										- FTV refers to Field Torvane, an approximate value for shear strength obtained in the field with a Torvane Shear Device. - UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.				10
11														11
12														12
13														13
14														14
15														15
16														16
17														17
18														18
19														19
20													20	



MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19

Legend
Sample Type:

- A-Auger
- B-Becker
- C-Core
- G-Grab
- V-Vane
- L#-Lab Sample
- S-Split Spoon
- O-Odex (air rotary)
- W-Wash (mud return)
- T-Shelby Tube

Legend
Installation:

- Sand
- Grout
- Cement
- Bentonite
- Drill Cuttings
- Slotted
- Slough
- Piezometer

Final Depth of Hole: 7.6 m
Depth to Top of Rock: N/A
Page 2 of 2



Ministry of Transportation and Infrastructure

SUMMARY LOG

Drill Hole #: **BH19-03**

Project: **Bridge Replacement**
Location: Dewdney Area Improvement District dike

Date(s) Drilled: September 3, 2019

Company: Downrite Drilling

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

Datum: WGS 1984
Northing/Easting: 5445966, 558735

Alignment:
Station/Offset:

Driller: Jonathan Goode

Drill Make/Model:

Logged by: CL Reviewed by: DR

Elevation:

Drilling Method: Auger

DEPTH (m)	DRILLING DETAILS	<input checked="" type="checkbox"/> Pocket Penetrometer 100 200 300 400		<input checked="" type="checkbox"/> Shear Strength (kPa) 300 400		SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		<input checked="" type="checkbox"/> SPT "N" (BLOWS/300 mm) Wp% 20 40 60 80												
0	Auger									GP, GRAVEL (fine, angular to rounded) and SAND (fine to coarse), trace silt, brown, rootlet inclusions, FILL, compact	GP		[Hatched Backfill]	0
1						SA-01				GP, GRAVEL (fine to coarse, angular to rounded) and SAND (fine to coarse), some cobbles, some boulders, trace silt, brown, FILL, compact	GP			1
2											GP			2
3														3
4										ML, SILT (low plasticity), trace to some sand (fine), trace clay, brown, firm, moist -occasional sandy SILT and silty SAND lenses	ML			4
5														5
6										CH, CLAY (medium-high plasticity), some silt, light brown, orange/dark grey mottling, moist, firm	CH	FTV = 44 KPa		6
7										End of Testhole at 6.1 m (target depth achieved). - Water level was not observed. - Upon completion, testhole was backfilled to surface with grout in accordance with the Dike Maintenance Act. - Soil description is based on visual assessment and laboratory test data where available. - Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement. - FTV refers to Field Torvane, an approximate value for shear strength obtained in the field with a Torvane Shear Device. - UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.				7
8														8
9														9
10														10

MOTI-SOIL-REV3-ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19

Legend Sample Type:	[Symbol] A-Auger	[Symbol] B-Becker	[Symbol] C-Core	[Symbol] G-Grab	[Symbol] V-Vane
[Symbol] L#-Lab Sample	[Symbol] S-Split Spoon	[Symbol] O-Odex (air rotary)	[Symbol] W-Wash (mud return)	[Symbol] T-Shelby Tube	

Legend Installation:	[Symbol] Sand	[Symbol] Grout	[Symbol] Cement	[Symbol] Bentonite
[Symbol] Drill Cuttings	[Symbol] Slotted	[Symbol] Slough	[Symbol] Piezometer	

Final Depth of Hole: 6.1 m
Depth to Top of Rock: N/A
Page 1 of 1



Ministry of
Transportation
and Infrastructure

SUMMARY LOG

Drill Hole #: **BH19-04**

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

Project: **Bridge Replacement**
Location: Dewdney Area Improvement District dike

Date(s) Drilled: September 3, 2019
Company: Downrite Drilling

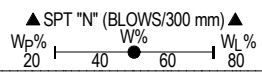
Logged by: CL Reviewed by: DR

Datum: WGS 1984
Northing/Easting: 5445990, 558754
Elevation:

Alignment:
Station/Offset:

Driller: Jonathan Goode
Drill Make/Model:
Drilling Method: Auger

DEPTH (m)	DRILLING DETAILS	<input checked="" type="checkbox"/> Pocket Penetrometer <input checked="" type="checkbox"/> Shear Strength (kPa)				SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		100	200	300	400									
0										GP, GRAVEL (fine, angular to rounded) and SAND (fine to coarse), trace silt, grey, rootlet inclusions, FILL, compact	GP			0
0.9						SA-01				GP, GRAVEL (fine to coarse, angular to rounded) and SAND (fine to coarse), some cobbles, some boulders, trace silt, brown, FILL, compact	GP			0.9
3.4										ML, SILT (non-plastic), some sand (fine), brown, moist, firm	ML			3.4
4.6						SA-02				CH, CLAY (high plasticity), some silt, light brown, orange/dark grey mottling, moist, firm	CH			4.6
5.5						SA-03				ML, SILT, trace to some sand (fine), trace clay, brown, rust/orange mottling, moist, firm	ML			5.5
6.1						SA-04				SP, SAND (fine to medium), trace silt, brown, dry, compact	SP			6.1
7.6						SA-05				End of Testhole at 7.6 m (target depth achieved). - Water level was not encountered. - Upon completion, testhole was backfilled to surface with grout in accordance with the Dike Maintenance Act. - Soil description is based on visual assessment and laboratory test data where available. - Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement.				7.6



MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI DATATEMPLATE REV3.GDT 11/20/19

Legend

A-Auger	B-Becker	C-Core	G-Grab	V-Vane	Sand	Grout	Cement	Bentonite
L#-Lab Sample	S-Split Spoon	O-Odex (air rotary)	W-Wash (mud return)	T-Shelby Tube	Drill Cuttings	Slotted	Slough	Piezometer

Final Depth of Hole: 7.6 m
Depth to Top of Rock: N/A
Page 1 of 2



Ministry of
Transportation
and Infrastructure

SUMMARY LOG

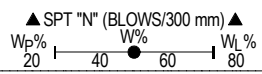
Drill Hole #: **BH19-04**

Project: **Bridge Replacement**
Location: Dewdney Area Improvement District dike
Prepared by: 704-ENG.VGEO03551-01
Tetra Tech
Logged by: CL Reviewed by: DR

Datum: WGS 1984
Northing/Easting: 5445990 , 558754
Elevation:
Alignment:
Station/Offset:

Date(s) Drilled: September 3, 2019
Company: Downrite Drilling
Driller: Jonathan Goode
Drill Make/Model:
Drilling Method: Auger

DEPTH (m)	DRILLING DETAILS	<input checked="" type="checkbox"/> Pocket Penetrometer <input checked="" type="checkbox"/> Shear Strength (kPa)				SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		100	200	300	400									
10										- UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.				10
11														11
12														12
13														13
14														14
15														15
16														16
17														17
18														18
19														19
20														20



MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19

Legend Sample Type:	<input type="checkbox"/> A-Auger	<input type="checkbox"/> B-Becker	<input type="checkbox"/> C-Core	<input type="checkbox"/> G-Grab	<input type="checkbox"/> V-Vane	Legend Installation:	<input type="checkbox"/> Sand	<input type="checkbox"/> Grout	<input type="checkbox"/> Cement	<input type="checkbox"/> Bentonite
	<input type="checkbox"/> L#-Lab Sample	<input type="checkbox"/> S-Split Spoon	<input type="checkbox"/> O-Odex (air rotary)	<input type="checkbox"/> W-Wash (mud return)	<input type="checkbox"/> T-Shelby Tube		<input type="checkbox"/> Drill Cuttings	<input type="checkbox"/> Slotted	<input type="checkbox"/> Slough	<input type="checkbox"/> Piezometer

Final Depth of Hole: 7.6 m
Depth to Top of Rock: N/A
Page 2 of 2



Ministry of
Transportation
and Infrastructure

SUMMARY LOG

Drill Hole #: **BH19-05**

Project: **Bridge Replacement**

Date(s) Drilled: September 4, 2019

Location: McIntyre Road

Company: Downrite Drilling

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

Datum: WGS 1984

Alignment:

Driller: Jonathan Goode

Northing/Easting: 5445802, 558849

Station/Offset:

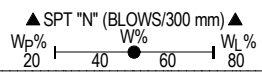
Drill Make/Model:

Logged by: CL Reviewed by: DR

Elevation:

Drilling Method: Auger

DEPTH (m)	DRILLING DETAILS	X Pocket Penetrometer		X Shear Strength (kPa)		SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		100	200	300	400									
0										GP, GRAVEL (fine, angular to sub-rounded), sandy (fine to coarse), grey-brown, FILL (19 mm minus crush), dry, compact	GP			0
0.3m														
1							SA-01			SM3, SAND (fine), silty, brown, FILL, moist, compact	SM3			1
1.5										-some gravel at 1.5 m				
2														2
2.9m														
3										ML, SILT (non-plastic), some sand (fine), trace clay, dark greyish-brown, moist, firm				3
3.5										-some SILT, sandy pockets				
4							SA-03				ML	FTV = 30 KPa		4
4.6m														
5										SM3, SAND (fine), silty, brown, moist, compact				5
5.5										-some SILT, sandy layers				
6														6
6.1m														
6.1m							SA-05			SM1, SAND (fine), some silt, brown, wet, compact	SM1			6.1
7														7
7.2m										SM3, SAND (fine), silty, wet	SM3			7.2
8														8
7.9m										ML, SILT, some sand, some clay, grey, orange oxidization, firm	ML			7.9
8.1m										SP, SAND (fine to medium), trace silt, grey-brown, wet, compact	SP			8.1
9							SA-06							9
9.1m										End of Testhole at 9.1 m (target depth achieved). - Water level was observed at 6.1 m. - Upon completion, testhole was backfilled to surface with grout in				9.1



MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI DATATEMPLATE REV3.GDT 11/20/19

Legend Sample Type: A-Auger B-Becker C-Core G-Grab V-Vane L#-Lab Sample S-Split Spoon O-Odex (air rotary) W-Wash (mud return) T-Shelby Tube	Legend Installation: Sand Grout Cement Bentonite Drill Cuttings Slotted Slough Piezometer	Final Depth of Hole: 9.1 m Depth to Top of Rock: N/A Page 1 of 2
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Ministry of Transportation and Infrastructure

SUMMARY LOG

Drill Hole #: **BH19-05**

Project: **Bridge Replacement**

Date(s) Drilled: September 4, 2019

Location: McIntyre Road

Company: Downrite Drilling

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

Datum: WGS 1984
Northing/Easting: 5445802, 558849

Alignment:
Station/Offset:

Driller: Jonathan Goode

Logged by: CL Reviewed by: DR

Elevation:

Drill Make/Model:

Drilling Method: Auger

DEPTH (m)	DRILLING DETAILS	<input checked="" type="checkbox"/> Pocket Penetrometer 100 200 300 400				SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		<input checked="" type="checkbox"/> Shear Strength (kPa) 100 200 300 400												
10		▲ SPT "N" (BLOWS/300 mm) ▲ Wp% 20 40 60 80 Wl%								<p>accordance with the Dike Maintenance Act.</p> <p>- Soil description is based on visual assessment and laboratory test data where available.</p> <p>- Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement.</p> <p>- FTV refers to Field Torvane, an approximate value for shear strength obtained in the field with a Torvane Shear Device.</p> <p>- UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.</p>				10
11														11
12														12
13														13
14														14
15														15
16														16
17														17
18														18
19														19
20														20

MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19

Legend

Sample Type:

- A-Auger
- B-Becker
- C-Core
- G-Grab
- V-Vane
- L#-Lab Sample
- S-Split Spoon
- O-Odex (air rotary)
- W-Wash (mud return)
- T-Shelby Tube

Legend

Installation:

- Sand
- Grout
- Cement
- Bentonite
- Drill Cuttings
- Slotted
- Slough
- Piezometer

Final Depth of Hole: 9.1 m
Depth to Top of Rock: N/A
Page 2 of 2



Ministry of
Transportation
and Infrastructure

SUMMARY LOG

Drill Hole #: **BH19-06**

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

Project: **Bridge Replacement**
Location: Nicomen Island Improvement District Dike

Date(s) Drilled: September 4, 2019
Company: Downrite Drilling
Driller: Jonathan Goode
Drill Make/Model:
Drilling Method: Auger

Logged by: CL Reviewed by: DR

Datum: WGS 1984
Northing/Easting: 5445859, 558891
Elevation:
Alignment:
Station/Offset:

DEPTH (m)	DRILLING DETAILS	X Pocket Penetrometer		X Shear Strength (kPa)		SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		100	200	300	400									
0										Topsoil	TS			
0.05m										SW, SAND (fine to coarse) and GRAVEL (fine), trace to some silt, brown, FILL (19 mm minus crush), dense	SW			
0.4m							SA-01			SM3, SAND (fine), silty, brown, FILL, moist, loose				1
1										-becomes some silt for 0.3 m				
2							SA-02				SM3			2
3														3
4														4
5							SA-03			ML, SILT, sandy (fine), medium bedded with SAND, silty, mottled brown, moist, loose/firm				5
6							SA-04				ML			6
6.5m	Auger									-becomes wet				
7							SA-05							7
7.2m										SM1, SAND (fine), some silt, brown, wet	SM1			
7.8m							SA-06			SP, SAND (fine to medium), dark grey-brown, compact	SP			8
8														
8.6m										ML, SILT (non-plastic), sandy (fine), dark grey, firm	ML			
8.8m														
8.8m										SM1, SAND (fine), some silt, compact	SM1			
9														9
9.1m										End of Testhole at 9.1 m (target depth achieved). - Water level was observed at 6.5 m. - Upon completion, testhole was backfilled to surface with grout in				

MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI DATATEMPLATE REV3.GDT 11/20/19

- Legend**
Sample Type:
- A-Auger
 - B-Becker
 - C-Core
 - G-Grab
 - V-Vane
 - L#-Lab Sample
 - S-Split Spoon
 - O-Odex (air rotary)
 - W-Wash (mud return)
 - T-Shelby Tube

- Legend**
Installation:
- Sand
 - Grout
 - Cement
 - Bentonite
 - Drill Cuttings
 - Slotted
 - Slough
 - Piezometer

Final Depth of Hole: 9.1 m
Depth to Top of Rock: N/A
Page 1 of 2



Ministry of
Transportation
and Infrastructure

SUMMARY LOG

Drill Hole #: **BH19-06**

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

Project: **Bridge Replacement**
Location: Nicomen Island Improvement District Dike

Date(s) Drilled: September 4, 2019

Company: Downrite Drilling

Driller: Jonathan Goode

Drill Make/Model:

Drilling Method: Auger

Logged by: CL Reviewed by: DR

Datum: WGS 1984
Northing/Easting: 5445859 , 558891
Elevation:

Alignment:
Station/Offset:

DEPTH (m)	DRILLING DETAILS	<input checked="" type="checkbox"/> Pocket Penetrometer <input checked="" type="checkbox"/> Shear Strength (kPa) 100 200 300 400				SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		▲ SPT "N" (BLOWS/300 mm) ▲ Wp% 20 40 60 80 Wl%												
10										<p>accordance with the Dike Maintenance Act.</p> <p>- Soil description is based on visual assessment and laboratory test data where available.</p> <p>- Estimates of soil consistency were determined from drill rig performance, in situ test data, and visual classification of recovered samples. These estimates are based on engineering judgement.</p> <p>- FTV refers to Field Torvane, an approximate value for shear strength obtained in the field with a Torvane Shear Device.</p> <p>- UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.</p>				10
11														11
12														12
13														13
14														14
15														15
16														16
17														17
18														18
19														19
20														20

MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19

Legend
Sample Type:

- A-Auger
- B-Becker
- C-Core
- G-Grab
- V-Vane
- L#-Lab Sample
- S-Split Spoon
- O-Odex (air rotary)
- W-Wash (mud return)
- T-Shelby Tube

Legend
Installation:

- Sand
- Grout
- Cement
- Bentonite
- Drill Cuttings
- Slotted
- Slough
- Piezometer

Final Depth of Hole: 9.1 m
Depth to Top of Rock: N/A
Page 2 of 2



Ministry of
Transportation
and Infrastructure

SUMMARY LOG

Drill Hole #: **BH19-07**

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

Project: **Bridge Replacement**
Location: Nicomen Island Improvement District Dike

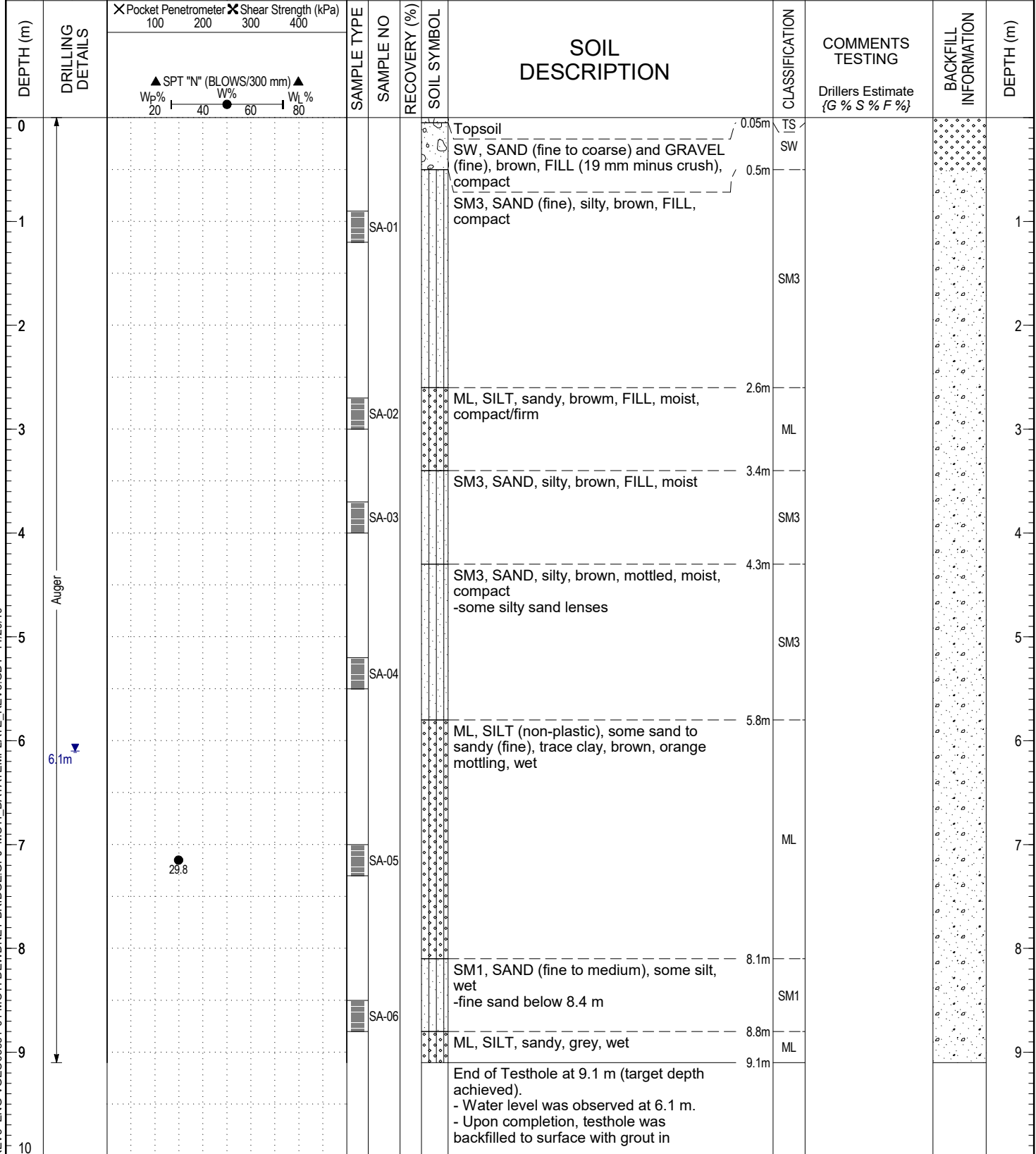
Date(s) Drilled: September 4, 2019
Company: Downrite Drilling

Logged by: CL Reviewed by: DR

Datum: WGS 1984
Northing/Easting: 5445878, 558902
Elevation:

Alignment:
Station/Offset:

Driller: Jonathan Goode
Drill Make/Model:
Drilling Method: Auger



MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19

- Legend**
Sample Type:
- A-Auger
 - B-Becker
 - C-Core
 - G-Grab
 - V-Vane
 - L#-Lab Sample
 - S-Split Spoon
 - O-Odex (air rotary)
 - W-Wash (mud return)
 - T-Shelby Tube

- Legend**
Installation:
- Sand
 - Grout
 - Cement
 - Bentonite
 - Drill Cuttings
 - Slotted
 - Slough
 - Piezometer

Final Depth of Hole: 9.1 m
Depth to Top of Rock: N/A
Page 1 of 2



Ministry of Transportation and Infrastructure

SUMMARY LOG

Drill Hole #: **BH19-07**

Project: **Bridge Replacement**
 Location: Nicomen Island Improvement District Dike
 Prepared by: 704-ENG.VGEO03551-01 Tetra Tech
 Logged by: CL Reviewed by: DR

Date(s) Drilled: September 4, 2019
 Company: Downrite Drilling
 Driller: Jonathan Goode
 Drill Make/Model:
 Drilling Method: Auger
 Datum: WGS 1984
 Northing/Easting: 5445878 , 558902
 Alignment:
 Station/Offset:
 Elevation:

DEPTH (m)	DRILLING DETAILS	<input checked="" type="checkbox"/> Pocket Penetrometer 100 200 300 400				SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		<input checked="" type="checkbox"/> Shear Strength (kPa) 100 200 300 400												
10										<p>accordance with the Dike Maintenance Act.</p> <p>- Soil description is based on visual assessment and laboratory test data where available.</p> <p>- Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement.</p> <p>- UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.</p>				10
11														11
12														12
13														13
14														14
15														15
16														16
17														17
18														18
19														19
20														20

MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI DATATEMPLATE REV3.GDT 11/20/19

Legend Sample Type: <input checked="" type="checkbox"/> A-Auger <input checked="" type="checkbox"/> B-Becker <input checked="" type="checkbox"/> C-Core <input checked="" type="checkbox"/> G-Grab <input checked="" type="checkbox"/> V-Vane <input checked="" type="checkbox"/> L#-Lab Sample <input checked="" type="checkbox"/> S-Split Spoon <input checked="" type="checkbox"/> O-Odex (air rotary) <input checked="" type="checkbox"/> W-Wash (mud return) <input checked="" type="checkbox"/> T-Shelby Tube	Legend Installation: <input checked="" type="checkbox"/> Sand <input checked="" type="checkbox"/> Grout <input checked="" type="checkbox"/> Cement <input checked="" type="checkbox"/> Bentonite <input checked="" type="checkbox"/> Drill Cuttings <input checked="" type="checkbox"/> Slotted <input checked="" type="checkbox"/> Slough <input checked="" type="checkbox"/> Piezometer
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Final Depth of Hole: 9.1 m
 Depth to Top of Rock: N/A
 Page 2 of 2



Ministry of Transportation and Infrastructure

SUMMARY LOG

Drill Hole #: **BH19-08**

Prepared by: 704-ENG.VGEO03551-01 Tetra Tech

Project: **Bridge Replacement**
 Location: Nicomen Island Improvement District Dike
 Datum: WGS 1984
 Northing/Easting: 5445897, 558915
 Elevation:

Alignment:
 Station/Offset:

Date(s) Drilled: September 4, 2019
 Company: Downrite Drilling
 Driller: Jonathan Goode
 Drill Make/Model:
 Drilling Method: Auger

Logged by: CL Reviewed by: DR

DEPTH (m)	DRILLING DETAILS	X Pocket Penetrometer		X Shear Strength (kPa)		SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		100	200	300	400									
0										Topsoil 0.05m GP, GRAVEL, sandy, FILL (road base) 0.35m SM3, SAND (fine), silty, brown, FILL, compact	TP GP			
1							SA-01				SM3			
2										SM4, SAND (fine) and SILT, brown, FILL, compact 2.1m ML, SILT (non-plastic), trace clay, trace sand (fine), brown, FILL, moist, compact 2.4m	SM4 ML			
3		27.5					SA-02			SM3, SAND, silty, FILL 3.0m	SM3			
4							SA-03			SM3, SAND (fine), silty, brown, mottled, compact 3.7m	SM3			
5										-becomes some silt from 4.6 m to 5.2 m -some SILT, sandy lenses below 5.2 m	SM3			
6		29.9					SA-04			ML, SILT (non-plastic), trace to some sand (fine), trace clay, brown, mottled orange, moist 5.6m	ML			
7							SA-05			SM3, SAND (fine), silty, brown, moist -lenses of SILT, lenses of some silt 6.1m	SM3			
8										SM3, SAND, silty, brown, wet 7.0m -becomes some silt	SM3			
9		39					SA-06			ML, SILT (non-plastic), some sand (fine), trace wood fibres, very dark grey, wet -medium bedded with SAND (fine), silty 8.4m SP, SAND (fine to medium), trace silt, grey/brown 8.7m	ML SP			
10										End of Testhole at 9.1 m (target depth achieved). - Water level was observed at 7.0 m. - Upon completion, testhole was				

MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI DATATEMPLATE REV3.GDT 11/20/19

- Legend**
 Sample Type:
 A-Auger, B-Becker, C-Core, G-Grab, V-Vane, L#-Lab Sample, S-Split Spoon, O-Odex (air rotary), W-Wash (mud return), T-Shelby Tube

- Legend**
 Installation:
 Sand, Grout, Cement, Bentonite, Drill Cuttings, Slotted, Slough, Piezometer

Final Depth of Hole: 9.1 m
 Depth to Top of Rock: N/A
 Page 1 of 2



Ministry of Transportation and Infrastructure

SUMMARY LOG

Drill Hole #: **BH19-08**

Project: **Bridge Replacement**
 Location: Nicomen Island Improvement District Dike
 Prepared by: 704-ENG.VGEO03551-01 Tetra Tech
 Logged by: CL Reviewed by: DR

Date(s) Drilled: September 4, 2019
 Company: Downrite Drilling
 Driller: Jonathan Goode
 Drill Make/Model:
 Drilling Method: Auger
 Datum: WGS 1984
 Northing/Easting: 5445897, 558915
 Alignment:
 Station/Offset:
 Elevation:

DEPTH (m)	DRILLING DETAILS	<input checked="" type="checkbox"/> Pocket Penetrometer 100 200 300 400				SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		<input checked="" type="checkbox"/> Shear Strength (kPa) 100 200 300 400												
10		▲ SPT "N" (BLOWS/300 mm) ▲ Wp% 20 40 60 80 Wl%								backfilled to surface with grout in accordance with the Dike Maintenance Act. - Soil description is based on visual assessment and laboratory test data where available. - Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement. - UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.				10
11														11
12														12
13														13
14														14
15														15
16														16
17														17
18														18
19														19
20														20

MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19

Legend Sample Type: <input checked="" type="checkbox"/> A-Auger <input checked="" type="checkbox"/> B-Becker <input checked="" type="checkbox"/> C-Core <input checked="" type="checkbox"/> G-Grab <input checked="" type="checkbox"/> V-Vane <input checked="" type="checkbox"/> L#-Lab Sample <input checked="" type="checkbox"/> S-Split Spoon <input checked="" type="checkbox"/> O-Odex (air rotary) <input checked="" type="checkbox"/> W-Wash (mud return) <input checked="" type="checkbox"/> T-Shelby Tube	Legend Installation: <input checked="" type="checkbox"/> Sand <input checked="" type="checkbox"/> Grout <input checked="" type="checkbox"/> Cement <input checked="" type="checkbox"/> Bentonite <input checked="" type="checkbox"/> Drill Cuttings <input checked="" type="checkbox"/> Slotted <input checked="" type="checkbox"/> Slough <input checked="" type="checkbox"/> Piezometer
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Final Depth of Hole: 9.1 m
 Depth to Top of Rock: N/A
 Page 2 of 2



Ministry of Transportation and Infrastructure

SUMMARY LOG

Drill Hole #: **BH19-09**

Project: **Bridge Replacement**
 Location: Highway 7 WB, 1.3 m from fog line
 Date(s) Drilled: September 5, 2019
 Company: Downrite Drilling
 Prepared by: 704-ENG.VGEO03551-01 Tetra Tech
 Datum: WGS 1984
 Alignment:
 Northing/Easting: 5446037, 558609
 Station/Offset:
 Logged by: CL Reviewed by: DR
 Elevation:
 Driller: Jonathan Goode
 Drill Make/Model:
 Drilling Method: Auger

DEPTH (m)	DRILLING DETAILS	X Pocket Penetrometer		X Shear Strength (kPa)		SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		100	200	300	400									
0	Auger	▲ SPT "N" (BLOWS/300 mm) ▲		Wp% W% Wl%						Asphalt (150 mm thick)	ASPH			
0.15										SP, SAND (fine to coarse), gravelly (fine to coarse, sub-rounded to rounded), FILL (road base)	SP			
0.9										End of Testhole at 0.9 m (auger refusal). - Water level was not encountered. - Upon completion, testhole was backfilled to surface with auger cuttings and bentonite chips in accordance with the BC Water Sustainability Act. - Soil description is based on visual assessment and laboratory test data where available. - Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement. - UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.				1
2														2
3														3
4														4
5														5
6														6
7														7
8														8
9														9
10														10

MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI DATATEMPLATE REV3.GDT 11/20/19

Legend Sample Type: A-Auger B-Becker C-Core G-Grab V-Vane L#-Lab Sample S-Split Spoon O-Odex (air rotary) W-Wash (mud return) T-Shelby Tube	Legend Installation: Sand Grout Cement Bentonite Drill Cuttings Slotted Slough Piezometer	Final Depth of Hole: 0.9 m Depth to Top of Rock: N/A Page 1 of 1
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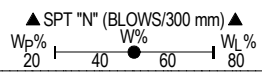
Ministry of
Transportation
and Infrastructure

SUMMARY LOG

Drill Hole #: **BH19-10**

Project: **Bridge Replacement**
 Location: Highway 7 WB, 1.65 m from fog line
 Date(s) Drilled: September 5, 2019
 Company: Downrite Drilling
 Prepared by: 704-ENG.VGEO03551-01 Tetra Tech
 Datum: WGS 1984
 Alignment:
 Northing/Easting: 5446000, 558636
 Station/Offset:
 Logged by: CL Reviewed by: DR
 Elevation:
 Driller: Jonathan Goode
 Drill Make/Model:
 Drilling Method: Auger

DEPTH (m)	DRILLING DETAILS	<input checked="" type="checkbox"/> Pocket Penetrometer 100 200 300 400				SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		<input checked="" type="checkbox"/> Shear Strength (kPa) 300 400												
0									Asphalt (150 mm thick)	ASPH				
0.15m						SA-01			SP, SAND (fine to coarse), gravelly (fine to coarse, sub-rounded to rounded), FILL (road base)	SP				
1.2m						SA-02			MI, SILT (intermediate plasticity), some clay, occasional coarse sand, brown, moist, stiff	MI				
2.1m						SA-03			CL, CLAY (low plasticity), silty, brown, moist, firm	CL				
3.2m						SA-04			-mottling at 3 m SM3, SAND (fine), silty, orangey-brown, compact -occasional black organic seams	SM3				
3.8m						SA-05			SP, SAND (fine), trace silt, grey-brown					
6.1m						SA-06			-becomes fine to medium sand, wet	SP				
6.1m									End of Testhole at 6.1 m (target depth achieved). - Water level was observed at 5.6 m. - Upon completion, testhole was backfilled to surface with auger cuttings and bentonite chips in accordance with the BC Water Sustainability Act. - Soil description is based on visual assessment and laboratory test data where available. - Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement. - UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.					



MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19

Legend Sample Type: <input checked="" type="checkbox"/> A-Auger <input checked="" type="checkbox"/> B-Becker <input checked="" type="checkbox"/> C-Core <input checked="" type="checkbox"/> G-Grab <input checked="" type="checkbox"/> V-Vane <input checked="" type="checkbox"/> L#-Lab Sample <input checked="" type="checkbox"/> S-Split Spoon <input checked="" type="checkbox"/> O-Odex (air rotary) <input checked="" type="checkbox"/> W-Wash (mud return) <input checked="" type="checkbox"/> T-Shelby Tube	Legend Installation: <input checked="" type="checkbox"/> Sand <input checked="" type="checkbox"/> Grout <input checked="" type="checkbox"/> Cement <input checked="" type="checkbox"/> Bentonite <input checked="" type="checkbox"/> Drill Cuttings <input checked="" type="checkbox"/> Slotted <input checked="" type="checkbox"/> Slough <input checked="" type="checkbox"/> Piezometer	Final Depth of Hole: 6.1 m Depth to Top of Rock: N/A Page 1 of 1
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Ministry of
Transportation
and Infrastructure

SUMMARY LOG

Drill Hole #: **BH19-11**

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

Project: **Bridge Replacement**
Location: Highway 7 WB, 1.3 m from fog line

Date(s) Drilled: September 5, 2019
Company: Downrite Drilling

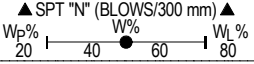
Logged by: CL Reviewed by: DR

Datum: WGS 1984
Northing/Easting: 5445976, 558652
Elevation:

Alignment:
Station/Offset:

Driller: Jonathan Goode
Drill Make/Model:
Drilling Method: Auger

DEPTH (m)	DRILLING DETAILS	X Pocket Penetrometer		X Shear Strength (kPa)		SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		100	200	300	400									
0										Asphalt (130 mm thick)	ASPH			0.13m
0.13										SP, SAND (fine to coarse) and GRAVEL (fine to coarse, angular to rounded), trace silt, brown-grey, FILL -becoming coarser with depth	SP			
1.5										(transition) CL, CLAY, silty, some sand (coarse), some gravel (fine)	CL			1.5m
1.7										Cl, CLAY (intermediate plasticity), some silt, greyish brown, orange mottling, some dark grey laminations, moist, soft	Cl	Atterberg (Sa#SA-02): PL:24% LL:38%		1.7m
3.4										ML, SILT (non-plastic), some sand (fine, trace medium), brown, orange mottling, moist, soft	ML			3.4m
4.3										SM3, SAND (fine), silty to some silt, brown, lensed with clean grey fine sand	SM3			4.3m
4.6										SP, SAND (fine), trace silt, brown	SP			4.6m
6.1										End of Testhole at 6.1 m (target depth achieved). - Water level was not encountered. - Upon completion, testhole was backfilled to surface with auger cuttings and bentonite chips in accordance with the BC Water Sustainability Act. - Soil description is based on visual assessment and laboratory test data where available. - Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement. - UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.				6.1m



MOTI-SOIL-REV3-ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19

Legend Sample Type: A-Auger B-Becker C-Core G-Grab V-Vane L#-Lab Sample S-Split Spoon O-Odex (air rotary) W-Wash (mud return) T-Shelby Tube	Legend Installation: Sand Grout Cement Bentonite Drill Cuttings Slotted Slough Piezometer	Final Depth of Hole: 6.1 m Depth to Top of Rock: N/A Page 1 of 1
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Ministry of
Transportation
and Infrastructure

SUMMARY LOG

Drill Hole #: **BH19-12**

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

Project: **Bridge Replacement**
Location: Highway 7 WB, 1.35 m from fog line

Date(s) Drilled: September 5, 2019
Company: Downrite Drilling

Logged by: CL Reviewed by: DR

Datum: WGS 1984
Northing/Easting: 5445953, 558672
Elevation:

Alignment:
Station/Offset:

Driller: Jonathan Goode
Drill Make/Model:
Drilling Method: Auger

DEPTH (m)	DRILLING DETAILS	X Pocket Penetrometer X Shear Strength (kPa)		SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		100 200	300 400									
0	Auger	 ▲ SPT "N" (BLOWS/300 mm) ▲ Wp% 20 40 60 80 Wl%						Asphalt (130 mm thick) GP, SAND and GRAVEL, some cobbles, max size 15 cm, FILL	ASPH GP			0
1												1
1.5					SA-01			End of Testhole at 1.5 m (auger refusal). - Water level was not encountered. - Upon completion, testhole was backfilled to surface with auger cuttings and bentonite chips in accordance with the BC Water Sustainability Act. - Soil description is based on visual assessment and laboratory test data where available. - Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement. - UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.				1.5
2												2
3												3
4												4
5												5
6												6
7												7
8												8
9												9
10												10

MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI DATATEMPLATE REV3.GDT 11/20/19

Legend
Sample Type:

- A-Auger
- B-Becker
- C-Core
- G-Grab
- V-Vane
- L#-Lab Sample
- S-Split Spoon
- O-Odex (air rotary)
- W-Wash (mud return)
- T-Shelby Tube

Legend
Installation:

- Sand
- Grout
- Cement
- Bentonite
- Drill Cuttings
- Slotted
- Slough
- Piezometer

Final Depth of Hole: 1.5 m
Depth to Top of Rock: N/A
Page 1 of 1



Ministry of Transportation and Infrastructure

SUMMARY LOG

Drill Hole #: **BH19-13**

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

Project: **Bridge Replacement**
Location: Highway 7 WB, 1.3 m from fog line

Date(s) Drilled: September 5, 2019
Company: Downrite Drilling

Logged by: CL Reviewed by: DR

Datum: WGS 1984
Northing/Easting: 5445812, 558910
Elevation:

Alignment:
Station/Offset:

Driller: Jonathan Goode
Drill Make/Model:
Drilling Method: Auger

DEPTH (m)	DRILLING DETAILS	X Pocket Penetrometer X Shear Strength (kPa)		SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		100	200									
0	Auger							Asphalt (180 mm thick)	ASPH			
0.18								GP, SAND and GRAVEL (rounded to sub-rounded), some cobbles, grey-brown, FILL, moist	GP			
0.8								End of Testhole at 0.8 m (auger refusal). - Water level was not encountered. - Upon completion, testhole was backfilled to surface with auger cuttings and bentonite chips in accordance with the BC Water Sustainability Act. - Soil description is based on visual assessment and laboratory test data where available. - Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement. - UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.				1
1												2
2												3
3												4
4												5
5												6
6												7
7												8
8												9
9												10

MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI DATATEMPLATE REV3.GDT 11/20/19

Legend Sample Type: A-Auger B-Becker C-Core G-Grab V-Vane L#-Lab Sample S-Split Spoon O-Odex (air rotary) W-Wash (mud return) T-Shelby Tube	Legend Installation: Sand Grout Cement Bentonite Drill Cuttings Slotted Slough Piezometer
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Final Depth of Hole: 0.8 m
Depth to Top of Rock: N/A
Page 1 of 1



Ministry of
Transportation
and Infrastructure

SUMMARY LOG

Drill Hole #: **BH19-14**

Project: **Bridge Replacement**
 Location: Highway 7 WB, 1.3 m from fog line
 Prepared by: 704-ENG.VGEO03551-01
 Tetra Tech
 Logged by: CL Reviewed by: DR

Date(s) Drilled: September 5, 2019
 Company: Downrite Drilling
 Driller: Jonathan Goode
 Drill Make/Model:
 Drilling Method: Auger
 Datum: WGS 1984
 Northing/Easting: 5445793, 558945
 Alignment:
 Station/Offset:
 Elevation:

DEPTH (m)	DRILLING DETAILS	X Pocket Penetrometer X Shear Strength (kPa)		SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		100 200	300 400									
0	Auger	 Wp% 20 40 60 80 Wl%						Asphalt (180 mm thick) 0.18m GP, SAND and GRAVEL (rounded to sub-rounded), some cobbles, grey-brown, FILL, moist	ASPH GP			0
1								End of Testhole at 0.9 m (auger refusal). - Water level was not encountered. - Upon completion, testhole was backfilled to surface with auger cuttings and bentonite chips in accordance with the BC Water Sustainability Act. - Soil description is based on visual assessment and laboratory test data where available. - Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement. - UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.				1
2												2
3												3
4												4
5												5
6												6
7												7
8												8
9												9
10												10

MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19

Legend

A-Auger	B-Becker	C-Core	G-Grab	V-Vane	Sand	Grout	Cement	Bentonite
L#-Lab Sample	S-Split Spoon	O-Odex (air rotary)	W-Wash (mud return)	T-Shelby Tube	Drill Cuttings	Slotted	Slough	Piezometer

Legend Installation:

Final Depth of Hole: 0.9 m
 Depth to Top of Rock: N/A
 Page 1 of 1



Ministry of
Transportation
and Infrastructure

SUMMARY LOG

Drill Hole #: **BH19-15**

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

Project: **Bridge Replacement**
Location: Highway 7 WB, 1.4 m from fog line

Date(s) Drilled: September 5, 2019
Company: Downrite Drilling

Logged by: CL Reviewed by: DR

Datum: WGS 1984
Northing/Easting: 5445777, 558979
Elevation:

Alignment:
Station/Offset:

Driller: Jonathan Goode
Drill Make/Model:
Drilling Method: Auger

DEPTH (m)	DRILLING DETAILS	X Pocket Penetrometer X Shear Strength (kPa)		SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)	
		100	200										300
0	Auger	▲ SPT "N" (BLOWS/300 mm) ▲						Asphalt (260 mm thick)	ASPH			0	
0.26m		Wp% 20 40 60 80	Wl% 20 40 60 80					GP, SAND and GRAVEL (rounded to sub-rounded), some cobbles, grey-brown, FILL, moist	GP			0.26m	
1					SA-01							1	
1.2m								End of Testhole at 1.2 m (auger refusal). - Water level was not encountered. - Upon completion, testhole was backfilled to surface with auger cuttings and bentonite chips in accordance with the BC Water Sustainability Act. - Soil description is based on visual assessment and laboratory test data where available. - Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement. - UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.					1.2m

MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI DATATEMPLATE REV3.GDT 11/20/19

Legend
Sample Type:

- A-Auger
- B-Becker
- C-Core
- G-Grab
- V-Vane
- L#-Lab Sample
- S-Split Spoon
- O-Odex (air rotary)
- W-Wash (mud return)
- T-Shelby Tube

Legend
Installation:

- Sand
- Grout
- Cement
- Bentonite
- Drill Cuttings
- Slotted
- Slough
- Piezometer

Final Depth of Hole: 1.2 m
Depth to Top of Rock: N/A
Page 1 of 1



Ministry of
Transportation
and Infrastructure

SUMMARY LOG

Drill Hole #: **BH19-16**

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

Project: **Bridge Replacement**
Location: Highway 7 WB, 0.9 m from fog line

Date(s) Drilled: September 5, 2019
Company: Downrite Drilling

Datum: WGS 1984
Northing/Easting: 5445767, 559015

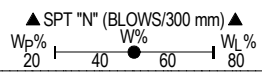
Alignment:
Station/Offset:

Driller: Jonathan Goode
Drill Make/Model:
Drilling Method: Auger

Logged by: CL Reviewed by: DR

Elevation:

DEPTH (m)	DRILLING DETAILS	X Pocket Penetrometer		X Shear Strength (kPa)		SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		100	200	300	400									
0										Asphalt (150 mm thick)	ASPH			
0.15m							SA-01			SP, SAND (fine to coarse) and GRAVEL (fine to coarse, rounded, trace angular), brown-grey, FILL (max size 5 cm), moist	SP			
0.9m							SA-02			SM2, SAND (fine), some silt, brown, FILL	SM2			1
2.0m							SA-03			CH, CLAY (high plasticity), some silt, dark greyish-brown, mottled orange, moist, firm	CH			2
2.4m							SA-04			SM2, SAND (fine), some silt, brown, mottled, moist, compact	SM2			
3.0m							SA-05			SP, SAND (fine), trace silt, grey-brown, moist, compact	SP			3
4.0m							SA-06			-becomes some silt, mottled ML, SILT (non-plastic), trace to some sand (fine), trace clay, olive brown, orange mottling, wet, soft to firm	ML			4
4.6m							SA-07			SP, SAND (fine to medium), trace silt, grey-brown, wet, compact	SP			5
6.1m										End of Testhole at 6.1 m (target depth achieved). - Water level was not encountered. - Upon completion, testhole was backfilled to surface with auger cuttings and bentonite chips in accordance with the BC Water Sustainability Act. - Soil description is based on visual assessment and laboratory test data where available. - Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement. - UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.				6



MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19

Legend
Sample Type: A-Auger, B-Becker, C-Core, G-Grab, V-Vane, L#-Lab Sample, S-Split Spoon, O-Odex (air rotary), W-Wash (mud return), T-Shelby Tube

Legend
Installation: Sand, Grout, Cement, Bentonite, Drill Cuttings, Slotted, Slough, Piezometer

Final Depth of Hole: 6.1 m
Depth to Top of Rock: N/A
Page 1 of 1



Ministry of
Transportation
and Infrastructure

SUMMARY LOG

Drill Hole #: **SH19-01**

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

Project: **Bridge Replacement**
Location: NW of bridge at dike intersection

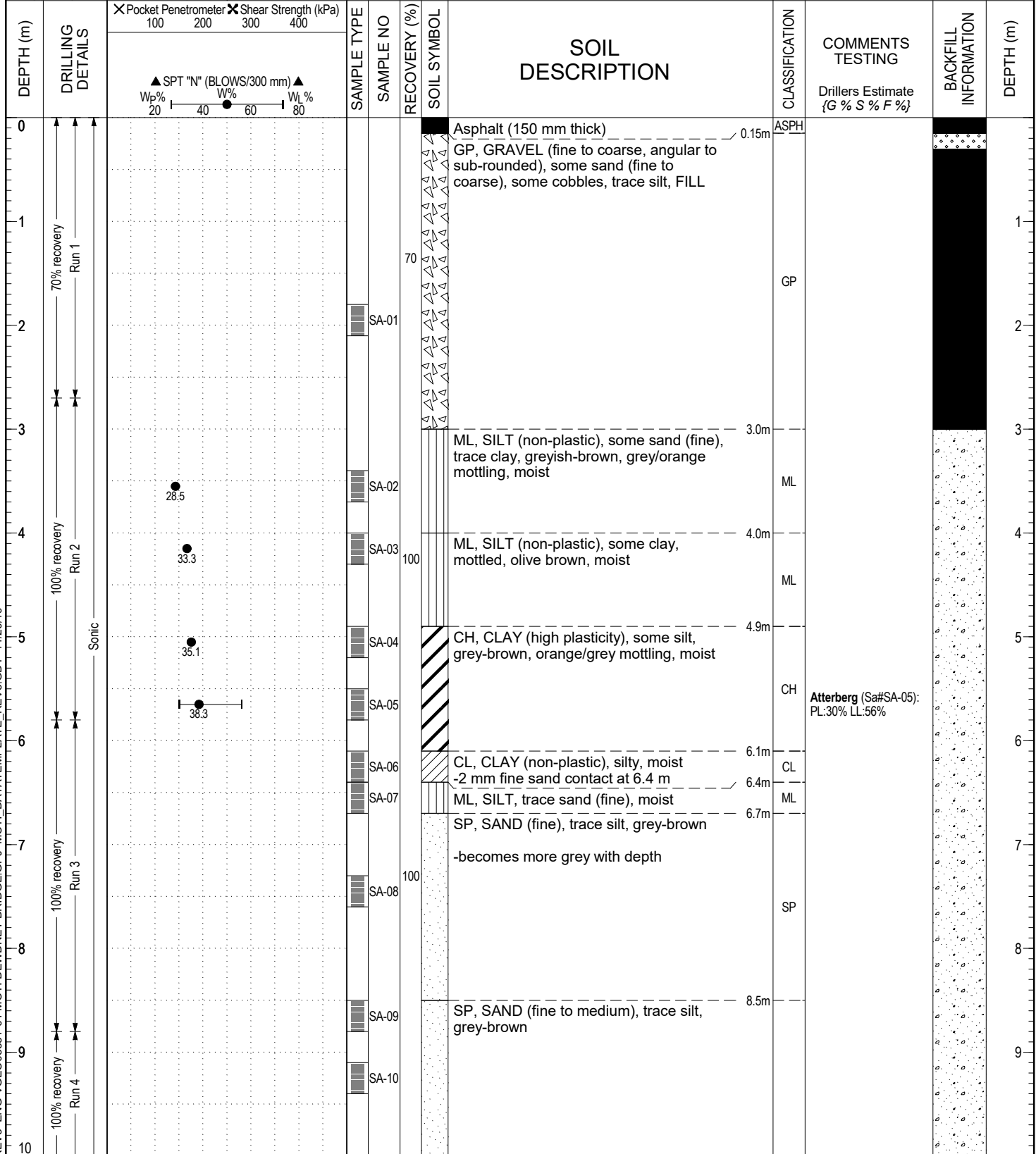
Date(s) Drilled: September 26-27, 2019
Company: Mud Bay Drilling

Logged by: CL Reviewed by: DR

Datum: WGS 1984
Northing/Easting: 5445926, 558706
Elevation:

Alignment:
Station/Offset:
Coordinates taken with GPS

Driller: Bryan
Drill Make/Model: Boart DeltaBase 320
Drilling Method: Sonic



MOTI-SOIL-REV3-ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE_REV3.GDT 11/20/19

- Legend Sample Type:**
- A-Auger
 - B-Becker
 - C-Core
 - G-Grab
 - V-Vane
 - L#-Lab Sample
 - S-Split Spoon
 - O-Odex (air rotary)
 - W-Wash (mud return)
 - T-Shelby Tube

- Legend Installation:**
- Sand
 - Grout
 - Cement
 - Bentonite
 - Drill Cuttings
 - Slotted
 - Slough
 - Piezometer

Final Depth of Hole: 30.2 m
 Depth to Top of Rock: N/A
 Page 1 of 4



Ministry of
Transportation
and Infrastructure

SUMMARY LOG

Drill Hole #: **SH19-01**

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

Project: **Bridge Replacement**
Location: NW of bridge at dike intersection

Date(s) Drilled: September 26-27, 2019
Company: Mud Bay Drilling

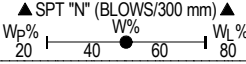
Logged by: CL Reviewed by: DR

Datum: WGS 1984
Northing/Easting: 5445926, 558706
Elevation:

Alignment:
Station/Offset:
Coordinates taken with GPS

Driller: Bryan
Drill Make/Model: Boart DeltaBase 320
Drilling Method: Sonic

DEPTH (m)	DRILLING DETAILS	X Pocket Penetrometer X Shear Strength (kPa)		SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		100 200	300 400									
10						100		SP, SAND (fine to medium), trace silt, grey-brown (continued)				10
11	100% recovery Run 4											11
12					SA-11					Sieve (Sa#SA-11) G:0% S:98% F:2%		12
13	100% recovery Run 5					100						13
14					SA-12				SP			14
15	100% recovery Run 6											15
16						100						16
17	100% recovery Run 7				SA-13							17
18												18
19	80% recovery Run 7											19
20					SA-14			SP, SAND (fine to medium), grey (distinct colour change at 19.2 m)				20



MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19

Legend Sample Type: A-Auger B-Becker C-Core G-Grab V-Vane L#-Lab Sample S-Split Spoon O-Odex (air rotary) W-Wash (mud return) T-Shelby Tube	Legend Installation: Sand Grout Cement Bentonite Drill Cuttings Slotted Slough Piezometer	Final Depth of Hole: 30.2 m Depth to Top of Rock: N/A Page 2 of 4
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Ministry of
Transportation
and Infrastructure

SUMMARY LOG

Drill Hole #: **SH19-01**

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

Project: **Bridge Replacement**
Location: NW of bridge at dike intersection

Date(s) Drilled: September 26-27, 2019
Company: Mud Bay Drilling

Logged by: CL Reviewed by: DR

Datum: WGS 1984
Northing/Easting: 5445926 , 558706
Elevation:

Alignment:
Station/Offset:
Coordinates taken with GPS

Driller: Bryan
Drill Make/Model: Boart DeltaBase 320
Drilling Method: Sonic

DEPTH (m)	DRILLING DETAILS	X Pocket Penetrometer X Shear Strength (kPa)				SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		100	200	300	400									
20	80% recovery Run 7								SP, SAND (fine to medium), grey (distinct colour change at 19.2 m) (continued)				20	
21													21	
22													22	
23	70% recovery Run 8					SA-15	70						23	
24													24	
25	0% recovery Run 9						0						25	
26													26	
27													27	
28													28	
29	100% recovery Run 10					SA-16							29	
30													30	

MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19

- Legend**
Sample Type:
- A-Auger
 - B-Becker
 - C-Core
 - G-Grab
 - V-Vane
 - L#-Lab Sample
 - S-Split Spoon
 - O-Odex (air rotary)
 - W-Wash (mud return)
 - T-Shelby Tube

- Legend**
Installation:
- Sand
 - Grout
 - Cement
 - Bentonite
 - Drill Cuttings
 - Slotted
 - Slough
 - Piezometer

Final Depth of Hole: 30.2 m
Depth to Top of Rock: N/A
Page 3 of 4



Ministry of Transportation and Infrastructure

SUMMARY LOG

Drill Hole #: **SH19-01**

Prepared by: 704-ENG.VGEO03551-01 Tetra Tech

Project: **Bridge Replacement**
Location: NW of bridge at dike intersection

Date(s) Drilled: September 26-27, 2019
Company: Mud Bay Drilling

Logged by: CL Reviewed by: DR

Datum: WGS 1984
Northing/Easting: 5445926, 558706
Elevation:

Alignment:
Station/Offset:
Coordinates taken with GPS

Driller: Bryan
Drill Make/Model: Boart DeltaBase 320
Drilling Method: Sonic

DEPTH (m)	DRILLING DETAILS	X Pocket Penetrometer (100, 200) X Shear Strength (kPa) (300, 400)				SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		▲ SPT "N" (BLOWS/300 mm) ▲ Wp% 20 40 60 80 Wl%												
30	↓ ↓ ↓					SA-17			GP, GRAVEL (fine to coarse, rounded), trace to some sand (fine to coarse) (continued)	GP			30	
31									End of Testhole at 30.2 m (target depth achieved). - Upon completion, testhole was backfilled to surface with grout in accordance with the Dike Maintenance Act. - Soil description is based on visual assessment and laboratory test data where available. - Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement. - UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.				31	
32													32	
33													33	
34													34	
35													35	
36													36	
37													37	
38													38	
39													39	
40													40	

MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19

Legend Sample Type:

- A-Auger
- B-Becker
- C-Core
- G-Grab
- V-Vane
- L#-Lab Sample
- S-Split Spoon
- O-Odex (air rotary)
- W-Wash (mud return)
- T-Shelby Tube

Legend Installation:

- Sand
- Grout
- Cement
- Bentonite
- Drill Cuttings
- Slotted
- Slough
- Piezometer

Final Depth of Hole: 30.2 m
Depth to Top of Rock: N/A
Page 4 of 4



Ministry of
Transportation
and Infrastructure

SUMMARY LOG

Drill Hole #: **SH19-02**

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

Project: **Bridge Replacement**
Location: SE of bridge (Nicomen Island) at dike

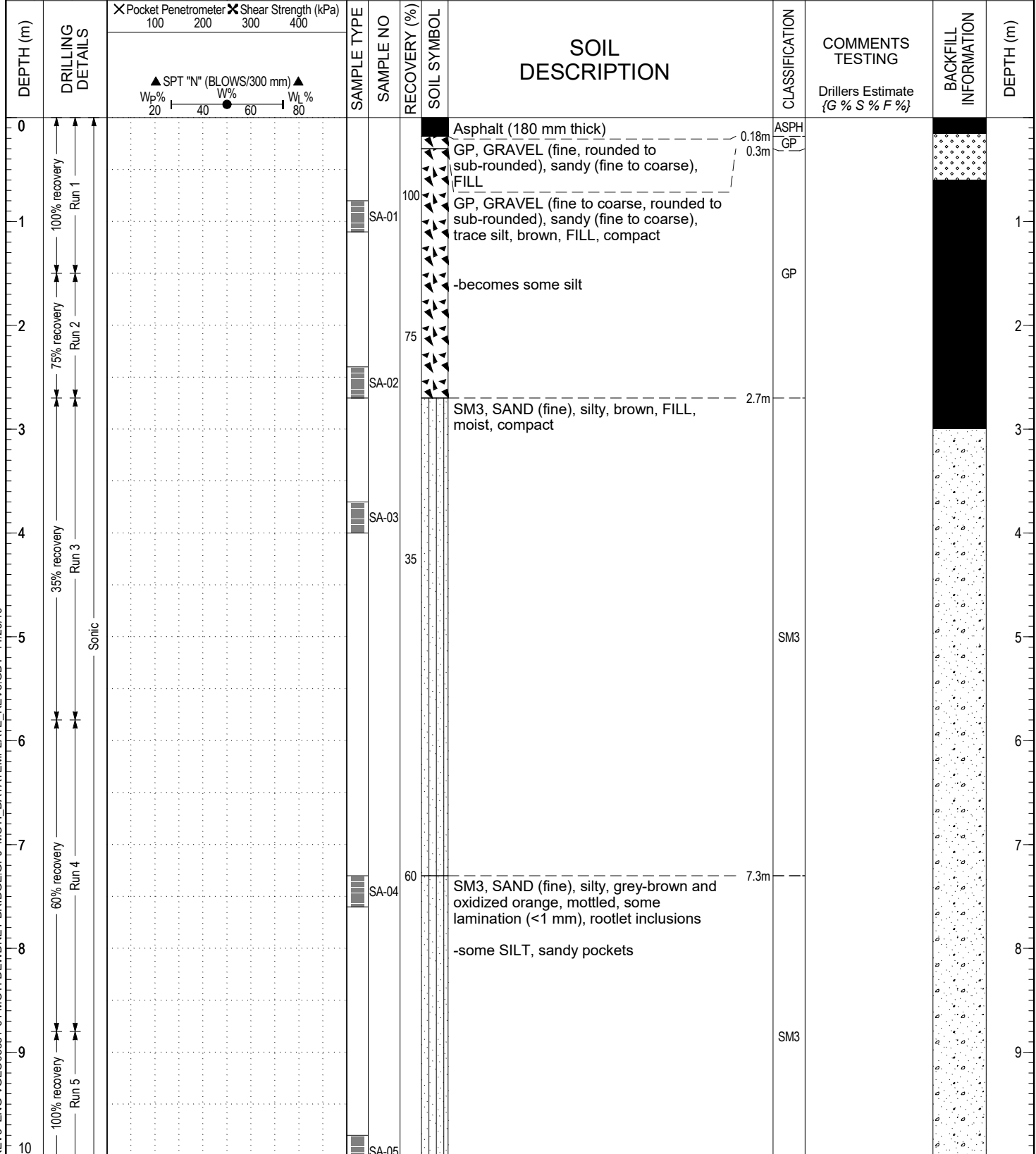
Date(s) Drilled: September 17-23, 2019
Company: Mud Bay Drilling

Logged by: CL Reviewed by: DR

Datum: WGS 1984
Northing/Easting: 5445833, 558872
Elevation:

Alignment:
Station/Offset:
Coordinates taken with GPS

Driller: Bryan
Drill Make/Model: Boart DeltaBase 320
Drilling Method: Sonic



MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19

- Legend Sample Type:**
- A-Auger
 - B-Becker
 - C-Core
 - G-Grab
 - V-Vane
 - L#-Lab Sample
 - S-Split Spoon
 - O-Odex (air rotary)
 - W-Wash (mud return)
 - T-Shelby Tube

- Legend Installation:**
- Sand
 - Grout
 - Cement
 - Bentonite
 - Drill Cuttings
 - Slotted
 - Slough
 - Piezometer

Final Depth of Hole: 30.2 m
Depth to Top of Rock: N/A
Page 1 of 4



Ministry of
Transportation
and Infrastructure

SUMMARY LOG

Drill Hole #: **SH19-02**

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

Project: **Bridge Replacement**
Location: SE of bridge (Nicomen Island) at dike

Date(s) Drilled: September 17-23, 2019

Company: Mud Bay Drilling

Driller: Bryan

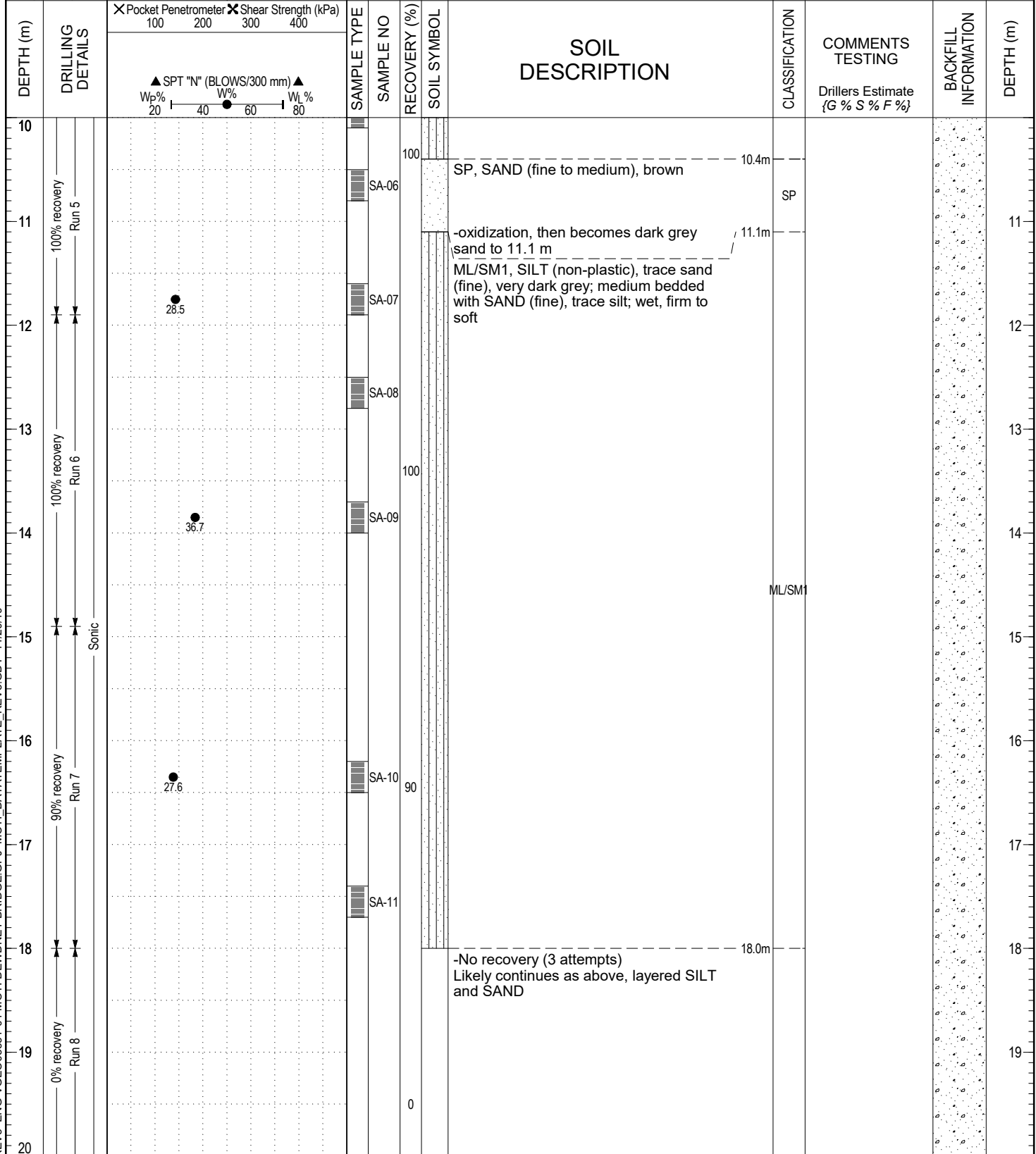
Drill Make/Model: Boart DeltaBase 320

Drilling Method: Sonic

Logged by: CL Reviewed by: DR

Datum: WGS 1984
Northing/Easting: 5445833, 558872
Elevation:

Alignment:
Station/Offset:
Coordinates taken with GPS



MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19

Legend

- Sample Type:
 - A-Auger
 - B-Becker
 - C-Core
 - G-Grab
 - V-Vane
- L#-Lab Sample
 - S-Split Spoon
 - O-Odex (air rotary)
 - W-Wash (mud return)
 - T-Shelby Tube

Legend

- Installation:
 - Sand
 - Grout
 - Cement
 - Bentonite
 - Drill Cuttings
 - Slotted
 - Slough
 - Piezometer

Final Depth of Hole: 30.2 m
Depth to Top of Rock: N/A
Page 2 of 4



Ministry of
Transportation
and Infrastructure

SUMMARY LOG

Drill Hole #: **SH19-02**

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

Project: **Bridge Replacement**
Location: SE of bridge (Nicomen Island) at dike

Date(s) Drilled: September 17-23, 2019
Company: Mud Bay Drilling
Driller: Bryan
Drill Make/Model: Boart DeltaBase 320
Drilling Method: Sonic

Logged by: CL Reviewed by: DR

Datum: WGS 1984
Northing/Easting: 5445833, 558872
Elevation:

Alignment:
Station/Offset:
Coordinates taken with GPS

DEPTH (m)	DRILLING DETAILS	X Pocket Penetrometer 100 200 300 400 ▲ SPT "N" (BLOWS/300 mm) ▲ Wp% 20 40 60 80 Wl%	X Shear Strength (kPa) 300 400	SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
20	0% recovery Run 8							-No recovery (3 attempts) Likely continues as above, layered SILT and SAND (continued)				
21								ML, SILT, some sand, dark grey, moist	ML			21
22								SP, SAND (fine to medium), trace silt, dark grey, 3 cm decayed wood inclusion, moist				22
23	75% recovery Run 9				SA-12	75				Sieve (S#SA-12) G:0% S:92% F:8%		23
24												24
25												25
26	40% recovery Run 10				SA-13	40		-15 cm wood piece	SP			26
27												27
28												28
29	40% recovery Run 11				SA-14	40						29
30												30

MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19

- Legend**
Sample Type:
- A-Auger
 - B-Becker
 - C-Core
 - G-Grab
 - V-Vane
 - L#-Lab Sample
 - S-Split Spoon
 - O-Odex (air rotary)
 - W-Wash (mud return)
 - T-Shelby Tube

- Legend**
Installation:
- Sand
 - Grout
 - Cement
 - Bentonite
 - Drill Cuttings
 - Slotted
 - Slough
 - Piezometer

Final Depth of Hole: 30.2 m
Depth to Top of Rock: N/A
Page 3 of 4



Ministry of
Transportation
and Infrastructure

SUMMARY LOG

Drill Hole #: **SH19-02**

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

Project: **Bridge Replacement**
Location: SE of bridge (Nicomen Island) at dike

Date(s) Drilled: September 17-23, 2019
Company: Mud Bay Drilling
Driller: Bryan
Drill Make/Model: Boart DeltaBase 320
Drilling Method: Sonic

Logged by: CL Reviewed by: DR

Datum: WGS 1984
Northing/Easting: 5445833, 558872
Elevation:

Alignment:
Station/Offset:
Coordinates taken with GPS

DEPTH (m)	DRILLING DETAILS	X Pocket Penetrometer (100, 200) X Shear Strength (kPa) (300, 400)				SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		▲ SPT "N" (BLOWS/300 mm) ▲ Wp% 20 40 60 80 Wl%												
30	↓ ↓ ↓									End of Testhole at 30.2 m (target depth achieved). - Upon completion, testhole was backfilled to surface with grout in accordance with the Dike Maintenance Act. - Soil description is based on visual assessment and laboratory test data where available. - Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement. - UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.			30.2m	
31													31	
32													32	
33													33	
34													34	
35													35	
36													36	
37													37	
38													38	
39													39	
40													40	

MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19

Legend
Sample Type:

- A-Auger
- B-Becker
- C-Core
- G-Grab
- V-Vane
- L#-Lab Sample
- S-Split Spoon
- O-Odex (air rotary)
- W-Wash (mud return)
- T-Shelby Tube

Legend
Installation:

- Sand
- Grout
- Cement
- Bentonite
- Drill Cuttings
- Slotted
- Slough
- Piezometer

Final Depth of Hole: 30.2 m
Depth to Top of Rock: N/A
Page 4 of 4



Ministry of
Transportation
and Infrastructure

SUMMARY LOG

Drill Hole #: **SH19-03**

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

Project: **Bridge Replacement**

Location: Dewdney Bridge, centre hole

Date(s) Drilled: September 24, 2019

Company: Mud Bay Drilling

Datum: WGS 1984

Northing/Easting: 5445881, 558784

Alignment:

Station/Offset:

Driller: Devon Whyte

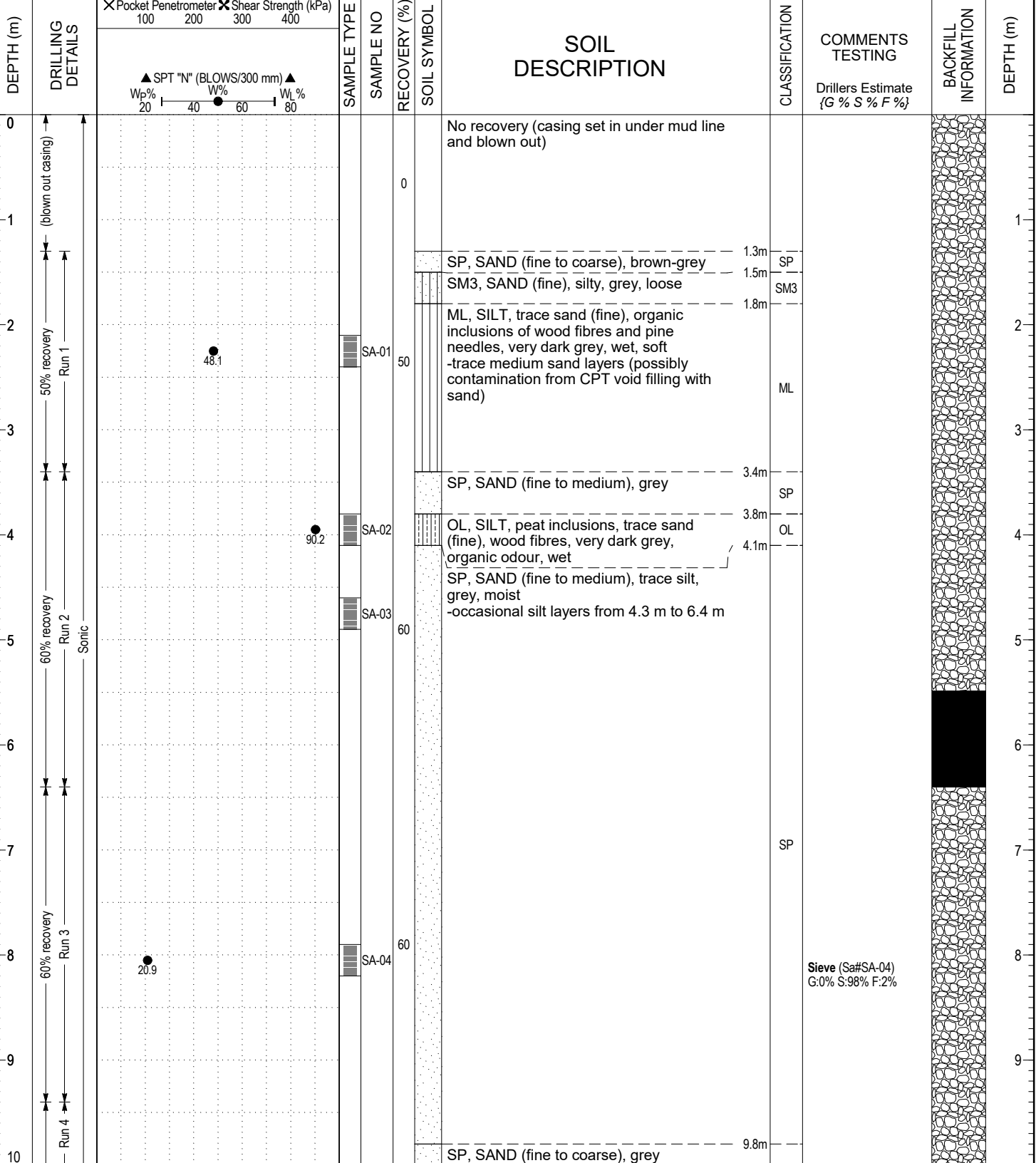
Drill Make/Model: Boart DeltaBase 320

Logged by: CL Reviewed by: DR

Elevation:

Coordinates taken with GPS

Drilling Method: Sonic



- Legend**
Sample Type:
- A-Auger
 - B-Becker
 - C-Core
 - G-Grab
 - V-Vane
 - L#-Lab Sample
 - S-Split Spoon
 - O-Odex (air rotary)
 - W-Wash (mud return)
 - T-Shelby Tube

- Legend**
Installation:
- Sand
 - Grout
 - Cement
 - Bentonite
 - Drill Cuttings
 - Slotted
 - Slough
 - Piezometer

Final Depth of Hole: 18.6 m
Depth to Top of Rock: N/A
Page 1 of 3

MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19



Ministry of
Transportation
and Infrastructure

SUMMARY LOG

Drill Hole #: **SH19-03**

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

Project: **Bridge Replacement**
Location: Dewdney Bridge, centre hole

Date(s) Drilled: September 24, 2019
Company: Mud Bay Drilling
Driller: Devon Whyte
Drill Make/Model: Boart DeltaBase 320
Drilling Method: Sonic

Logged by: CL Reviewed by: DR

Datum: WGS 1984
Northing/Easting: 5445881, 558784
Elevation:

Alignment:
Station/Offset:
Coordinates taken with GPS

DEPTH (m)	DRILLING DETAILS	X Pocket Penetrometer X Shear Strength (kPa)				SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		100	200	300	400									
10									SP, SAND (fine to coarse), grey <i>(continued)</i>	SP				
11	80% recovery Run 4					SA-05	80							
12						SA-06			-100 mm thick lense of SILT, sandy, firm, wood inclusions at 11.3 m depth SP, SAND (fine to medium), grey					
13														
14	100% recovery Run 5						100							
15	Sonic					SA-07				SP				
16														
17	90% recovery Run 6						90							
18						SA-08			-100 mm thick lense of SAND (fine), silty, woody organic inclusions at 17.4 m					
19						SA-09								
20									End of Testhole at 18.6 m (target depth achieved). - Upon completion, testhole was backfilled to surface with bentonite chip plugs and sluff in accordance with the BC Water Sustainability Act. - Soil description is based on visual assessment and laboratory test data where available.					

MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19

Legend
Sample Type:

- A-Auger
- B-Becker
- C-Core
- G-Grab
- V-Vane
- L#-Lab Sample
- S-Split Spoon
- O-Odex (air rotary)
- W-Wash (mud return)
- T-Shelby Tube

Legend
Installation:

- Sand
- Grout
- Cement
- Bentonite
- Drill Cuttings
- Slotted
- Slough
- Piezometer

Final Depth of Hole: 18.6 m
Depth to Top of Rock: N/A
Page 2 of 3



Ministry of
Transportation
and Infrastructure

SUMMARY LOG

Drill Hole #: **SH19-03**

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

Project: **Bridge Replacement**
Location: Dewdney Bridge, centre hole

Date(s) Drilled: September 24, 2019
Company: Mud Bay Drilling
Driller: Devon Whyte
Drill Make/Model: Boart DeltaBase 320
Drilling Method: Sonic

Logged by: CL Reviewed by: DR

Datum: WGS 1984
Northing/Easting: 5445881 , 558784
Elevation:

Alignment:
Station/Offset:
Coordinates taken with GPS

DEPTH (m)	DRILLING DETAILS	X Pocket Penetrometer (100, 200) X Shear Strength (kPa) (300, 400)				SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		▲ SPT "N" (BLOWS/300 mm) ▲ Wp% 20 40 60 80 Wl%												
20										- Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement. - UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.			20	
21											21			
22											22			
23											23			
24											24			
25											25			
26											26			
27											27			
28											28			
29											29			
30										30				

MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19

Legend
Sample Type:

- A-Auger
- B-Becker
- C-Core
- G-Grab
- V-Vane
- L#-Lab Sample
- S-Split Spoon
- O-Odex (air rotary)
- W-Wash (mud return)
- T-Shelby Tube

Legend
Installation:

- Sand
- Grout
- Cement
- Bentonite
- Drill Cuttings
- Slotted
- Slough
- Piezometer

Final Depth of Hole: 18.6 m
Depth to Top of Rock: N/A
Page 3 of 3



Ministry of
Transportation
and Infrastructure

SUMMARY LOG

Drill Hole #: **SH19-04**

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

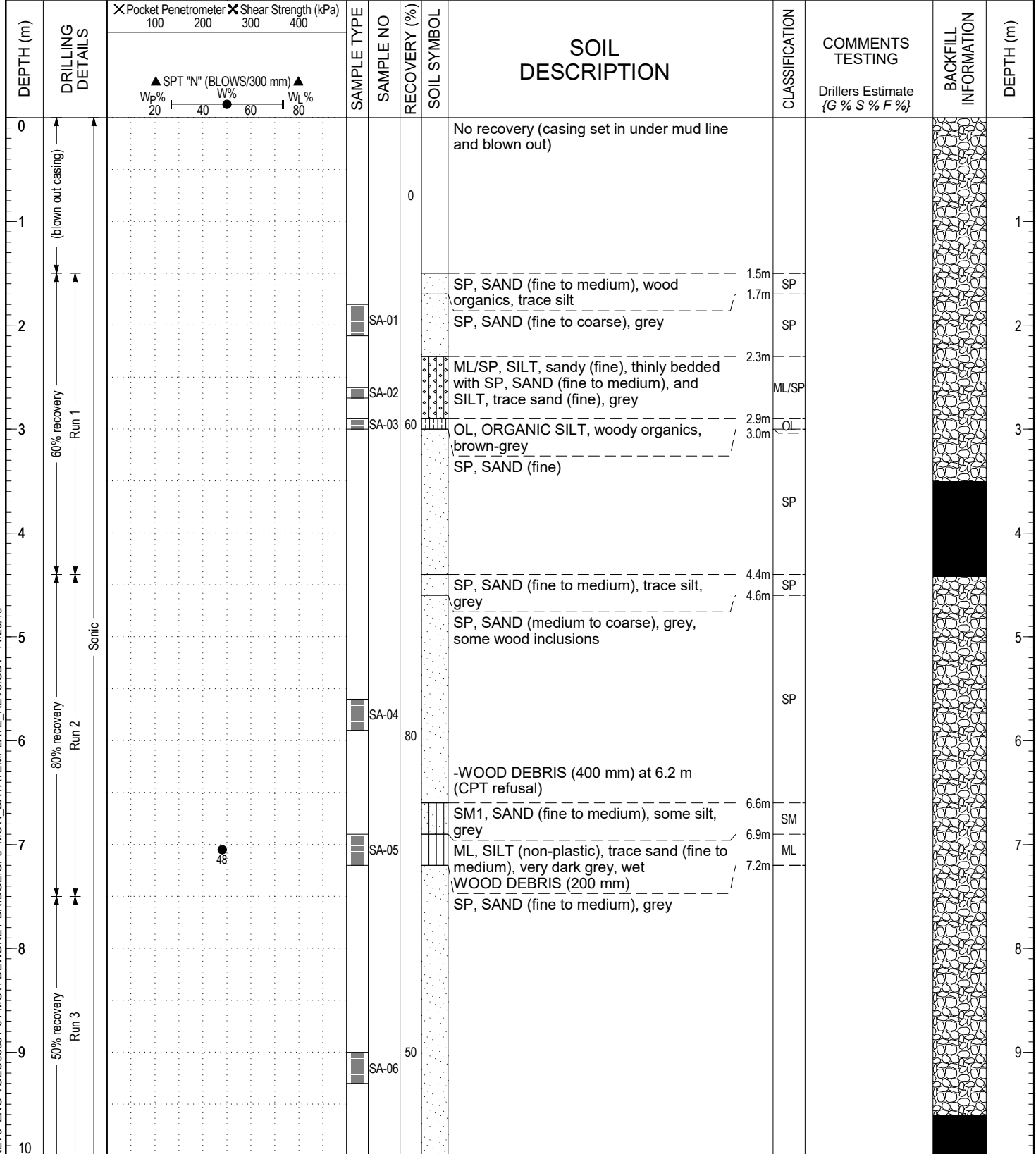
Project: **Bridge Replacement**
Location: Dewdney Bridge, NW hole

Date(s) Drilled: September 25, 2019
Company: Mud Bay Drilling
Driller: Devon Whyte
Drill Make/Model: Boart DeltaBase 320
Drilling Method: Sonic

Logged by: CL Reviewed by: DR

Datum: WGS 1984
Northing/Easting: 5445902, 558749
Elevation:

Alignment:
Station/Offset:
Coordinates taken with GPS



MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19

- Legend Sample Type:**
- A-Auger
 - B-Becker
 - C-Core
 - G-Grab
 - V-Vane
 - L#-Lab Sample
 - S-Split Spoon
 - O-Odex (air rotary)
 - W-Wash (mud return)
 - T-Shelby Tube

- Legend Installation:**
- Sand
 - Grout
 - Cement
 - Bentonite
 - Drill Cuttings
 - Slotted
 - Slough
 - Piezometer

Final Depth of Hole: 16.6 m
Depth to Top of Rock: N/A
Page 1 of 2



Ministry of Transportation and Infrastructure

SUMMARY LOG

Drill Hole #: **SH19-04**

Prepared by: 704-ENG.VGEO03551-01 Tetra Tech

Project: **Bridge Replacement**
Location: Dewdney Bridge, NW hole

Date(s) Drilled: September 25, 2019

Company: Mud Bay Drilling

Driller: Devon Whyte

Drill Make/Model: Boart DeltaBase 320

Drilling Method: Sonic

Logged by: CL Reviewed by: DR

Datum: WGS 1984
Northing/Easting: 5445902, 558749

Alignment:

Station/Offset:

Elevation:

Coordinates taken with GPS

DEPTH (m)	DRILLING DETAILS	X Pocket Penetrometer (100, 200) X Shear Strength (kPa) (300, 400)				SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		▲ SPT "N" (BLOWS/300 mm) ▲ Wp% 20 40 60 80 W% Wl%												
10	Run 3									SP, SAND (fine to medium), grey (continued)				
11														
12	90% recovery Run 4					SA-07	90				sp			
13														
14														
15	60% recovery Run 5						60							
16	Sonic					SA-08				-single coarse gravel inclusion (3 cm)	16.6m			
17										End of Testhole at 16.6 m (target depth achieved). - Upon completion, testhole was backfilled to surface with bentonite chip plugs and sluff in accordance with the BC Water Sustainability Act. - Soil description is based on visual assessment and laboratory test data where available. - Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement. - UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.				
18														
19														
20														

MOTI-SOIL-REV3-ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19

Legend

Sample Type: A-Auger, B-Becker, C-Core, G-Grab, V-Vane, L#-Lab Sample, S-Split Spoon, O-Odex (air rotary), W-Wash (mud return), T-Shelby Tube

Legend

Installation: Sand, Grout, Cement, Bentonite, Drill Cuttings, Slotted, Slough, Piezometer

Final Depth of Hole: 16.6 m
Depth to Top of Rock: N/A
Page 2 of 2



Ministry of
Transportation
and Infrastructure

SUMMARY LOG

Drill Hole #: **SH19-05**

Prepared by: 704-ENG.VGEO03551-01
Tetra Tech

Project: **Bridge Replacement**
Location: Dewdney Bridge, SE hole

Date(s) Drilled: September 26, 2019
Company: Mud Bay Drilling
Driller: Devon Whyte
Drill Make/Model: Boart DeltaBase 320
Drilling Method: Sonic

Logged by: CL Reviewed by: DR

Datum: WGS 1984
Northing/Easting: 5445859, 558825
Elevation:

Alignment:
Station/Offset:

DEPTH (m)	DRILLING DETAILS	X Pocket Penetrometer X Shear Strength (kPa)		SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		100 200	300 400									
0								WOOD, some sand (medium to coarse), light brown	OR			
0.2								WOOD, some sand (fine to medium), grey	OR			
0.4								SP, SAND (fine to coarse), some wood, light brown-grey				
1.0	60% recovery Run 1				SA-01	60		-10 cm layer of clean light brown medium to coarse sand				
2.0								-becomes fine to medium, grey				
3.0					SA-02			-becomes fine to coarse, light brown-grey				
3.5					SA-03							
4.0	80% recovery Run 2				SA-04	80		-becomes fine, trace silt, layered with organics and decayed wood				
4.5								-becomes fine to medium, wood inclusions, grey				
5.0	Sonic											
6.0												
7.0	50% recovery Run 3				SA-05	50						
8.0												
9.0	50% recovery Run 4				SA-06							
10.0					SA-07	50		WOOD DEBRIS (300 mm)				

MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19

- Legend**
Sample Type:
- A-Auger
 - B-Becker
 - C-Core
 - G-Grab
 - V-Vane
 - L#-Lab Sample
 - S-Split Spoon
 - O-Odex (air rotary)
 - W-Wash (mud return)
 - T-Shelby Tube

- Legend**
Installation:
- Sand
 - Grout
 - Cement
 - Bentonite
 - Drill Cuttings
 - Slotted
 - Slough
 - Piezometer

Final Depth of Hole: 17.4 m
Depth to Top of Rock: N/A
Page 1 of 3



Ministry of Transportation and Infrastructure

SUMMARY LOG

Drill Hole #: **SH19-05**

Prepared by: 704-ENG.VGEO03551-01 Tetra Tech

Project: **Bridge Replacement**
Location: Dewdney Bridge, SE hole

Date(s) Drilled: September 26, 2019

Company: Mud Bay Drilling

Datum: WGS 1984
Northing/Easting: 5445859, 558825

Alignment:
Station/Offset:

Driller: Devon Whyte

Drill Make/Model: Boart DeltaBase 320

Logged by: CL Reviewed by: DR

Elevation:

Drilling Method: Sonic

DEPTH (m)	DRILLING DETAILS	X Pocket Penetrometer (100, 200) X Shear Strength (kPa) (300, 400)				SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		▲ SPT "N" (BLOWS/300 mm) ▲ Wp% 20 40 60 80 W%												
10	50% recovery Run 4 80% recovery Run 5 60% recovery Run 6 Sonic									SP, SAND (fine to coarse), some wood, light brown-grey (continued)				10
11														11
12						SA-08								12
13							80			-becomes fine				13
14						SA-09								14
15														15
16						60							16	
17					SA-10								17	
18					End of Testhole at 17.4 m (target depth achieved). - Upon completion, testhole was backfilled to surface with bentonite chip plugs and sluff in accordance with the BC Water Sustainability Act. - Soil description is based on visual assessment and laboratory test data where available. - Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement. - UTM coordinates and contour information as obtained from XXXX and					17.4m			18	
19													19	
20													20	

MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19

- Legend Sample Type:**
- A-Auger
 - B-Becker
 - C-Core
 - G-Grab
 - V-Vane
 - L#-Lab Sample
 - S-Split Spoon
 - O-Odex (air rotary)
 - W-Wash (mud return)
 - T-Shelby Tube

- Legend Installation:**
- Sand
 - Grout
 - Cement
 - Bentonite
 - Drill Cuttings
 - Slotted
 - Slough
 - Piezometer

Final Depth of Hole: 17.4 m
Depth to Top of Rock: N/A
Page 2 of 3



Ministry of Transportation and Infrastructure

SUMMARY LOG

Drill Hole #: **SH19-05**

Project: **Bridge Replacement**
 Location: Dewdney Bridge, SE hole
 Prepared by: 704-ENG.VGEO03551-01 Tetra Tech
 Logged by: CL Reviewed by: DR

Date(s) Drilled: September 26, 2019
 Company: Mud Bay Drilling
 Driller: Devon Whyte
 Drill Make/Model: Boart DeltaBase 320
 Drilling Method: Sonic
 Datum: WGS 1984
 Northing/Easting: 5445859, 558825
 Alignment:
 Station/Offset:
 Elevation:

DEPTH (m)	DRILLING DETAILS	<input checked="" type="checkbox"/> Pocket Penetrometer 100 200 300 400				SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		<input checked="" type="checkbox"/> Shear Strength (kPa) 300 400												
20										the FVRD Regional Information Map (RIM) online website, respectively.				20
21														21
22														22
23														23
24														24
25														25
26														26
27														27
28														28
29														29
30														30

MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE REV3.GDT 11/20/19

Legend

A-Auger	B-Becker	C-Core	G-Grab	V-Vane	Sand	Grout	Cement	Bentonite
L#-Lab Sample	S-Split Spoon	O-Odex (air rotary)	W-Wash (mud return)	T-Shelby Tube	Drill Cuttings	Slotted	Slough	Piezometer

Legend Installation:

Final Depth of Hole: 17.4 m
 Depth to Top of Rock: N/A
 Page 3 of 3

CPT DATA

Cone Penetration Test Summary and Standard Cone Penetration Test Plots

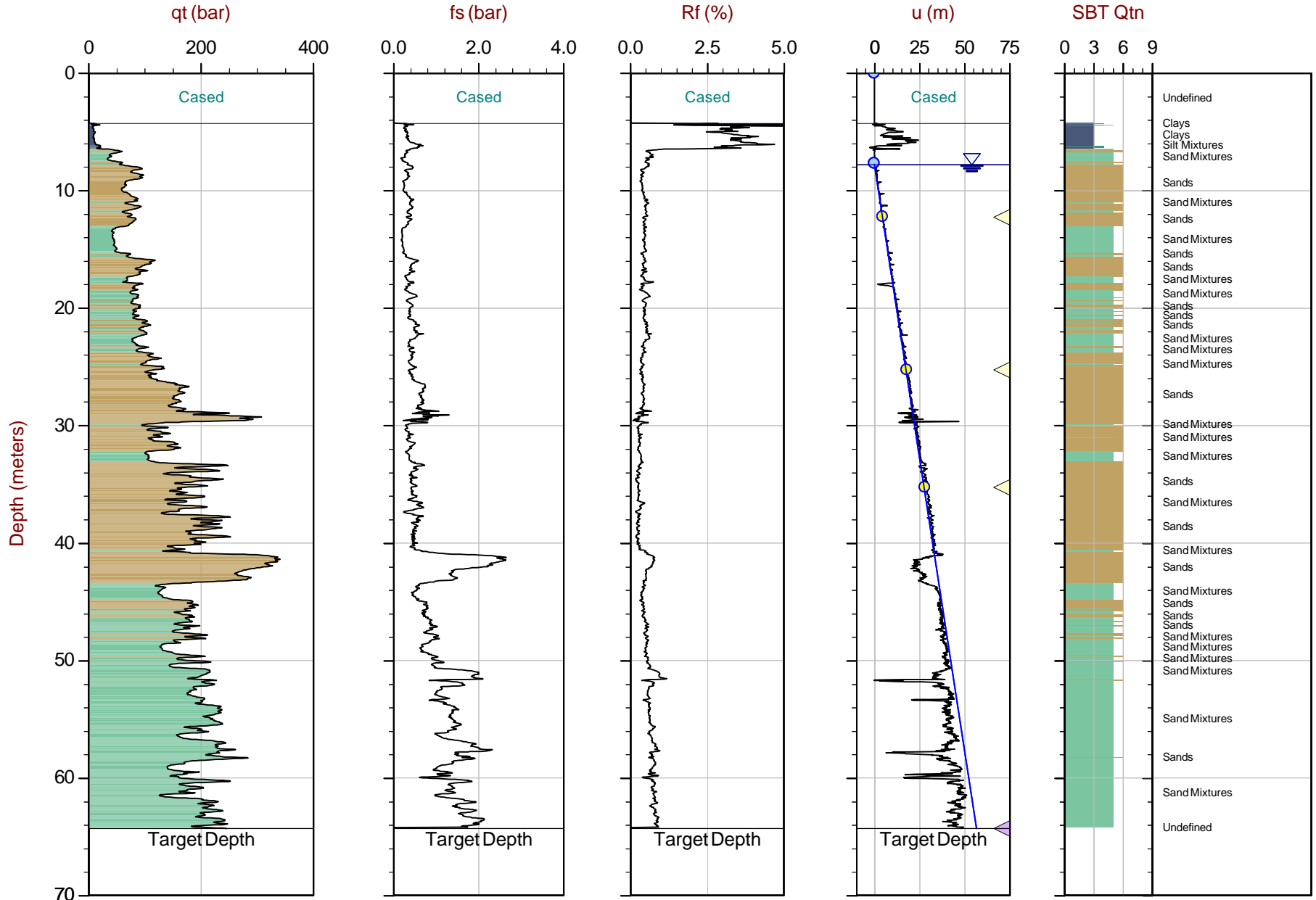


Job No: 19-0200868
Client: Tetra Tech
Project: Dewdney Bridge
Start Date: 16-Sep-2019
End Date: 25-Sep-2019

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface ¹ (m)	Mudline Depth ² (m)	Final Depth ³ (m)	Northing ⁴ (m)	Easting ⁴ (m)
19-0200868_SP01	SCPT19-01	17-Sep-2019	159:T1500F15U500	7.8		64.325	5445926	558706
19-0200868_SP02	SCPT19-02	16-Sep-2019	519:T1500F15U500 159:T1500F15U500	9.7		60.000	5445833	558872
19-0200868_CP03	CPT19-03	24-Sep-2019	630:T1500F15U500	10.5	13.0	43.150	5445881	558784
19-0200868_CP04	CPT19-04	25-Sep-2019	630:T1500F15U500	9.2	10.5	42.125	5445902	558749

1. The assumed phreatic surface was based on pore pressure dissipation test. Hydrostatic conditions were assumed for the calculated parameters.
2. The mudline depth was measured from the bridge deck.
3. The penetration depths are referenced to the existing bridge deck at the time of sounding.
4. Coordinates were acquired using a consumer grade GPS. Datum: WGS 1984 / UTM Zone 10 North



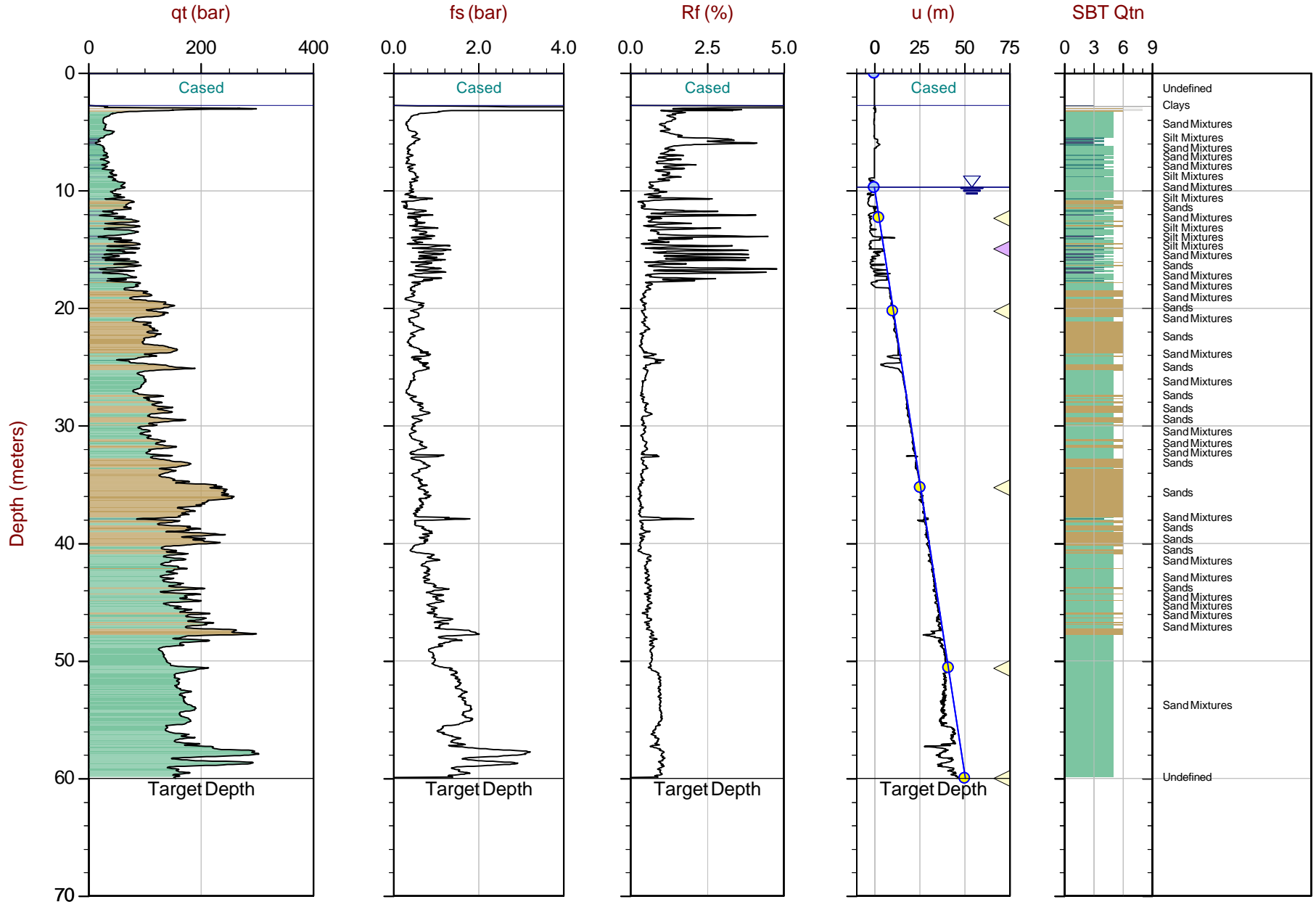
Max Depth: 64.325 m / 211.04 ft
 Depth Inc: 0.025 m / 0.082 ft
 Avg Int: Every Point

File: 19-0200868_SP01.DR4
 Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
 Coords: UTM 10N N: 5445926m E: 558706m
 Sheet No: 1 of 1

● Equilibrium Pore Pressure (Ueq)
 ● Assumed Ueq
 ◁ Dissipation, Ueq achieved
 ◁ Dissipation, Ueq not achieved
 ◁ Dissipation, Ueq assumed
 — Hydrostatic Line

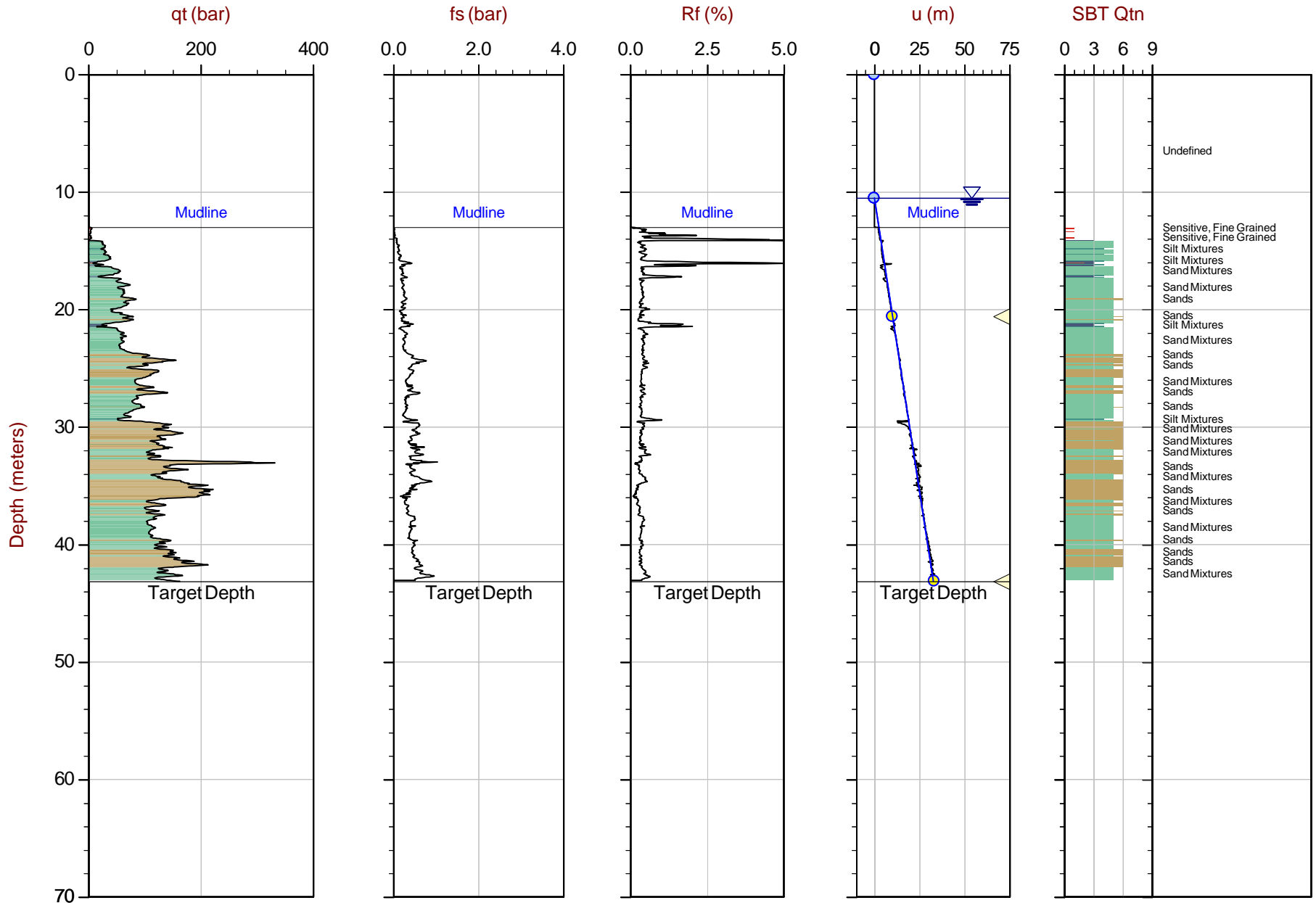
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



Max Depth: 60.000 m / 196.85 ft
 Depth Inc: 0.025 m / 0.082 ft
 Avg Int: Every Point

File: 19-0200868_SP02.DR4
 Unit Wt: SBTQtn (PKR2009)

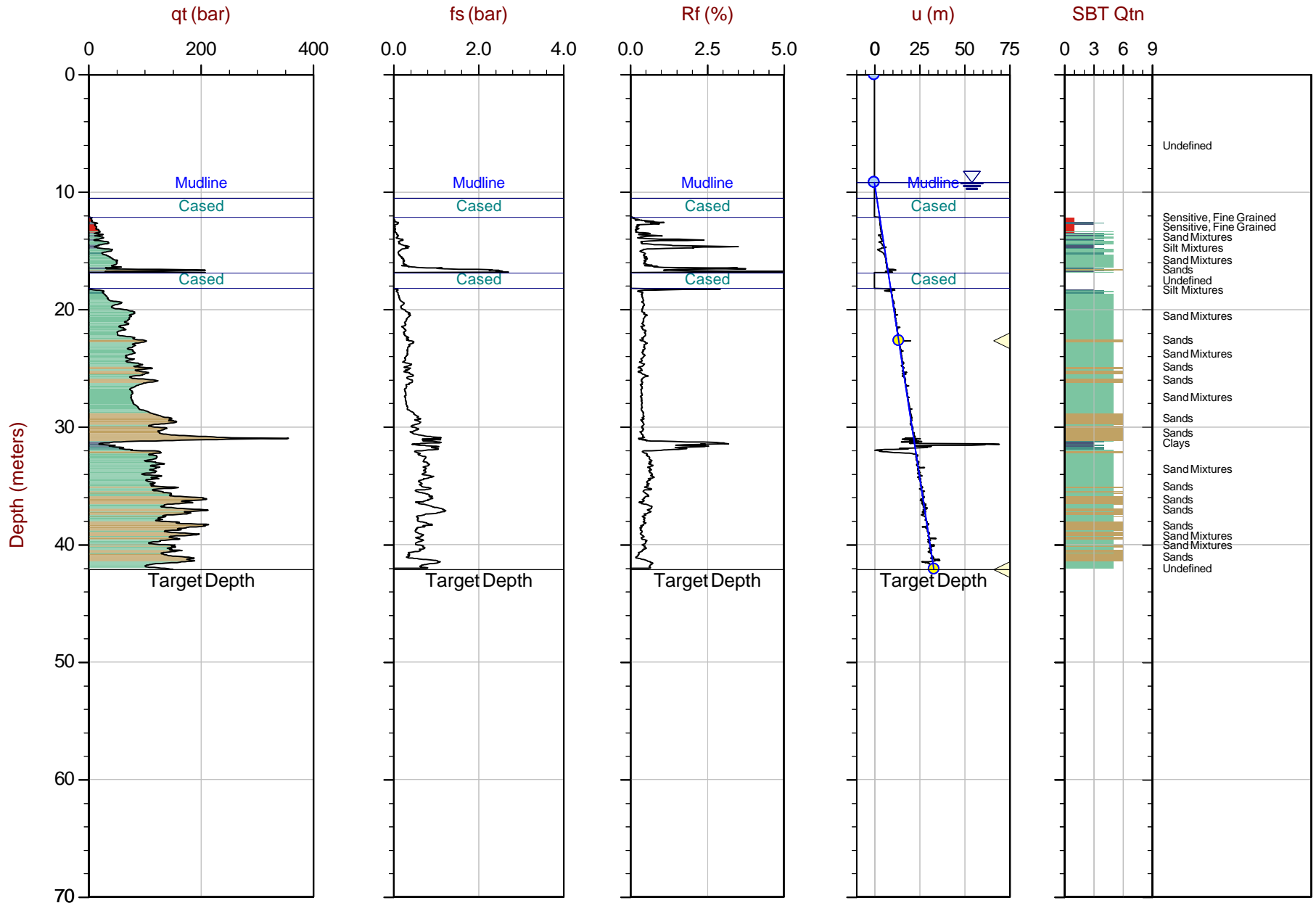
SBT: Robertson, 2009 and 2010
 Coords: UTM 10N N: 5445833m E: 558872m
 Sheet No: 1 of 1



Max Depth: 43.150 m / 141.57 ft
 Depth Inc: 0.025 m / 0.082 ft
 Avg Int: EveryPoint

File: 19-0200868_CP03.DR4
 Unit Wt: SBTQtn(PKR2009)

SBT: Robertson, 2009 and 2010
 Coords: UTM10N N:5445881m E:558784m
 SheetNo: 1 of 1



Max Depth: 42.125 m / 138.20 ft
 Depth Inc: 0.025 m / 0.082 ft
 Avg Int: EveryPoint

File: 19-0200868_CP04.DR4
 Unit Wt: SBTQtn(PKR2009)

SBT: Robertson, 2009 and 2010
 Coords: UTM10N N: 5445902m E: 558749m
 SheetNo: 1 of 1

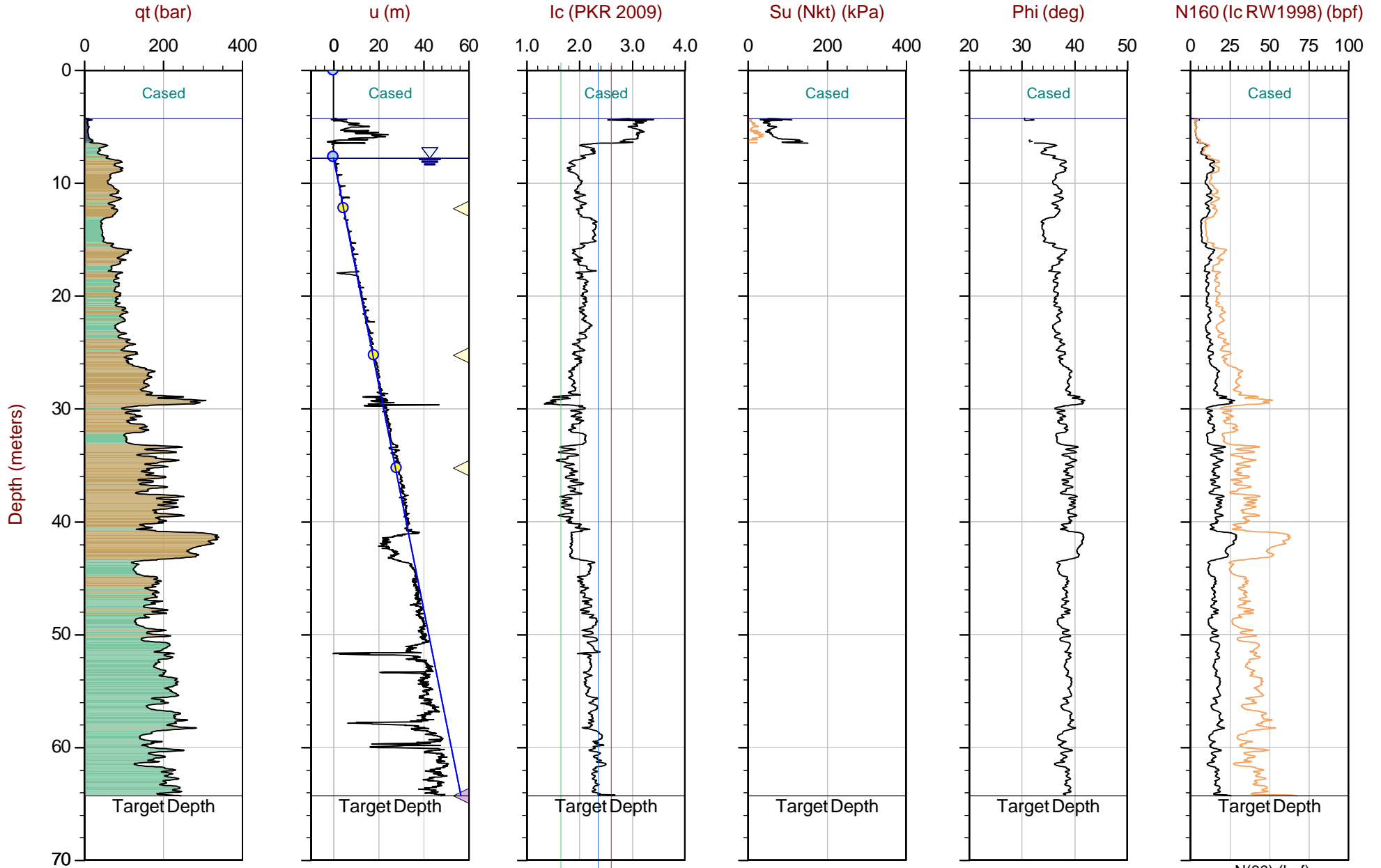
Advanced Cone Penetration Plots with I_c , $S_u(N_{kt})$, Φ and $N1(60)I_c$



Tetra Tech

Job No: 19-0200868
Date: 2019-09-17 10:31
Site: Dewdney Bridge

Sounding: SCPT19-01
Cone: 159:T1500F15U500



Max Depth: 64.325 m / 211.04 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: EveryPoint

File: 19-0200868_SP01.DR4
Unit Wt: SBTQtn(PKR2009)
SuNkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: UTM10N N: 5445926m E: 558706m
Sheet No: 1 of 1

● Equilibrium Pore Pressure (Ueq)
 ● Assumed Ueq
 ◀ Dissipation, Ueq achieved
 ◀ Dissipation, Ueq not achieved
 ◀ Dissipation, Ueq assumed
 — Hydrostatic Line

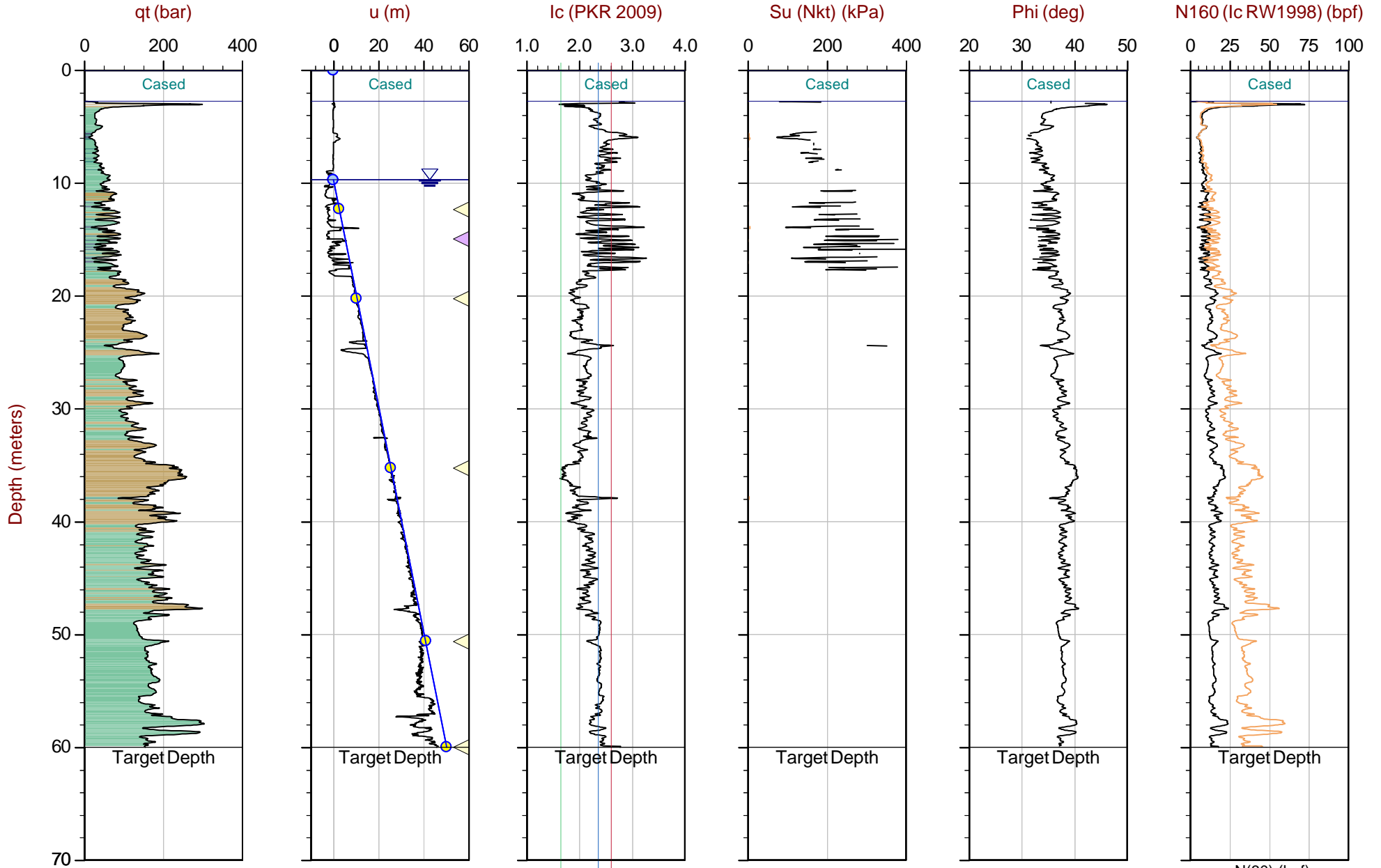
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



Tetra Tech

Job No: 19-0200868
Date: 2019-09-16 09:41
Site: Dewdney Bridge

Sounding: SCPT19-02
Cone: 519:T1500F15U500
159:T1500F15U500



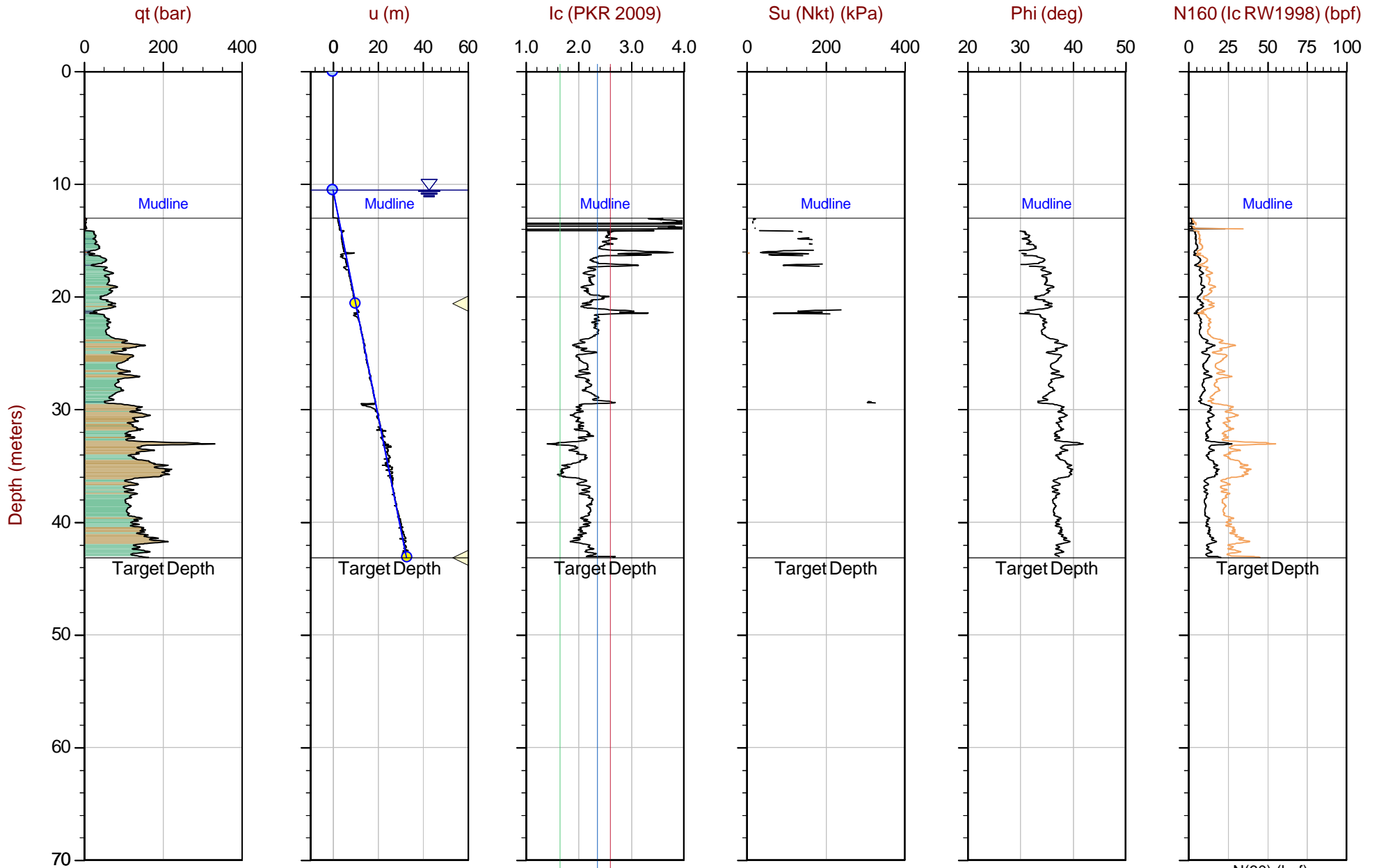
Max Depth: 60.000 m / 196.85 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: EveryPoint

File: 19-0200868_SP02.DR4
Unit Wt: SBTQtn(PKR2009)
SuNkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: UTM10N N: 5445833m E: 558872m
Sheet No: 1 of 1

● Equilibrium Pore Pressure (Ueq)
 ● Assumed Ueq
 ◀ Dissipation, Ueq achieved
 ◀ Dissipation, Ueq not achieved
 ◀ Dissipation, Ueq assumed
 — Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



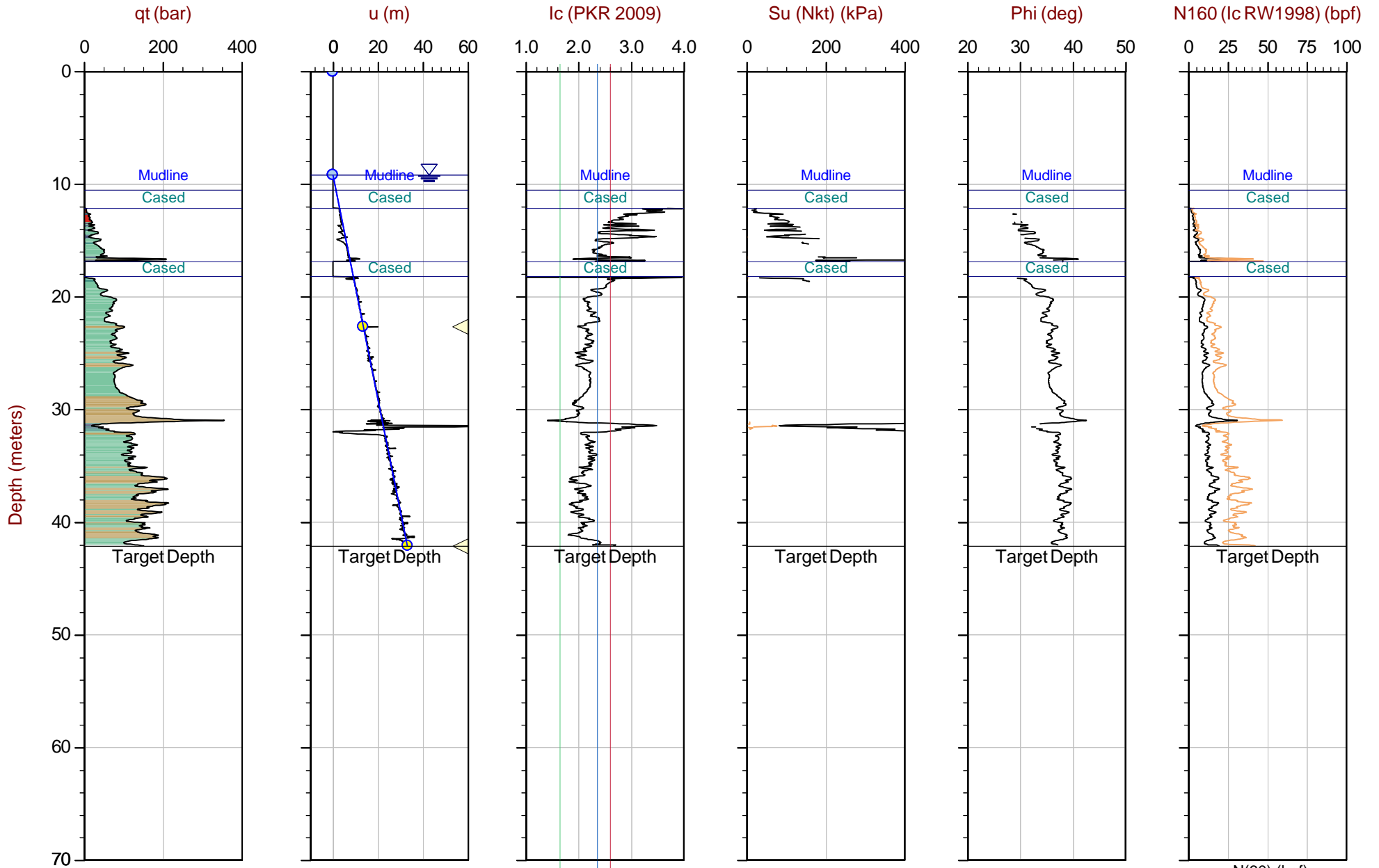
Max Depth: 43.150 m / 141.57 ft
 Depth Inc: 0.025 m / 0.082 ft
 Avg Int: EveryPoint

File: 19-0200868_CP03.DR4
 Unit Wt: SBTQtn(PKR2009)
 SuNkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
 Coords: UTM10N N: 5445881m E: 558784m
 Sheet No: 1 of 1

● Equilibrium Pore Pressure (Ueq) ● Assumed Ueq ◁ Dissipation, Ueq achieved ▷ Dissipation, Ueq not achieved ◁ Dissipation, Ueq assumed — Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



Max Depth: 42.125 m / 138.20 ft
 Depth Inc: 0.025 m / 0.082 ft
 Avg Int: EveryPoint

File: 19-0200868_CP04.DR4
 Unit Wt: SBTQtn(PKR2009)
 SuNkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
 Coords: UTM10N N: 5445902m E: 558749m
 Sheet No: 1 of 1

● Equilibrium Pore Pressure (Ueq)
 ● Assumed Ueq
 ◁ Dissipation, Ueq achieved
 ◁ Dissipation, Ueq not achieved
 ◁ Dissipation, Ueq assumed
 — Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

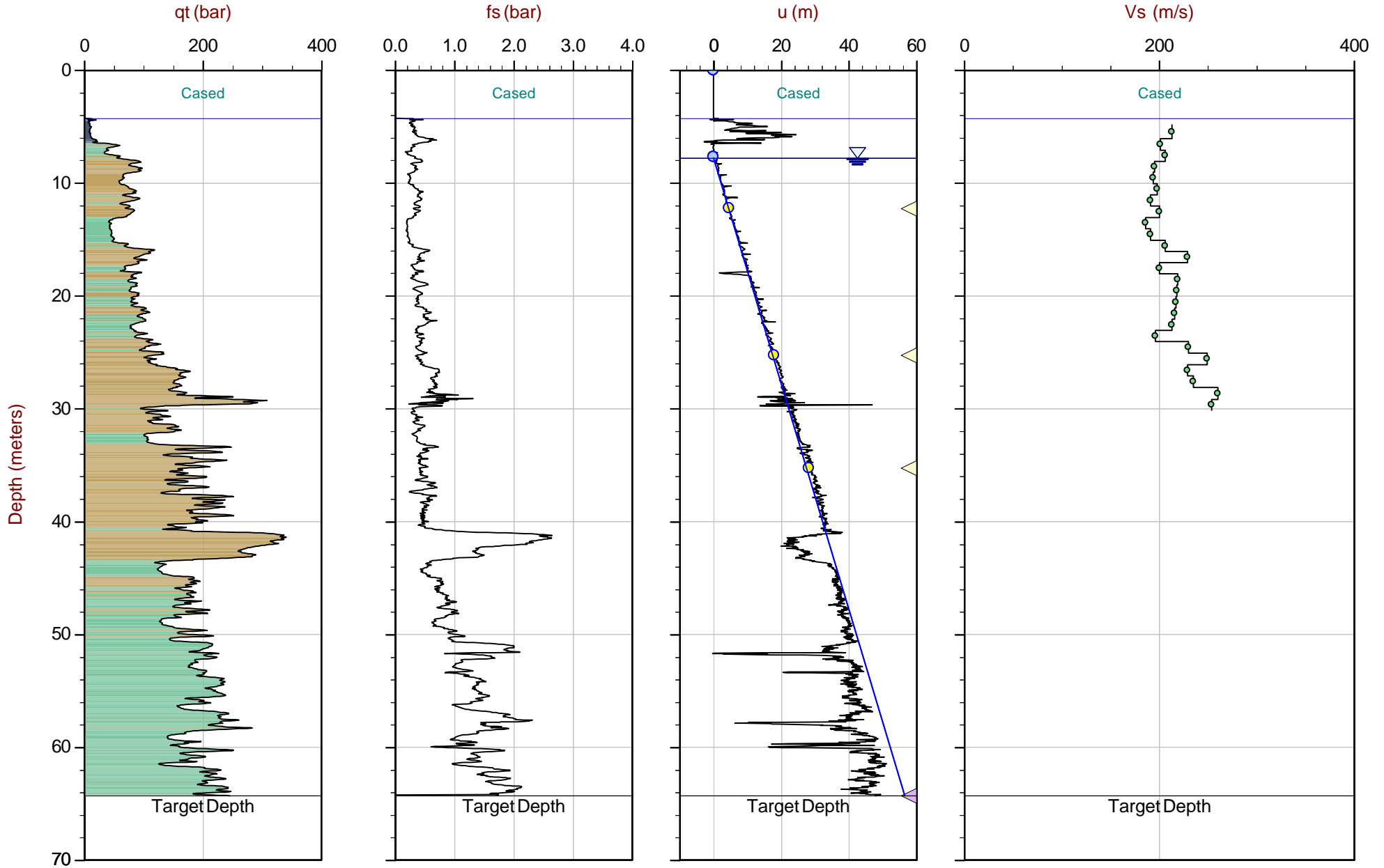
Seismic Cone Penetration Test Plots



Tetra Tech

Job No: 19-0200868
Date: 2019-09-17 10:31
Site: Dewdney Bridge

Sounding: SCPT19-01
Cone: 159:T1500F15U500



Max Depth: 64.325 m / 211.04 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-0200868_SP01.DR4
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 5445926m E: 558706m
Sheet No: 1 of 1

● Equilibrium Pore Pressure (Ueq)
 ● Assumed Ueq
 ◀ Dissipation, Ueq achieved
 ◀ Dissipation, Ueq not achieved
 ◀ Dissipation, Ueq assumed
 — Hydrostatic Line

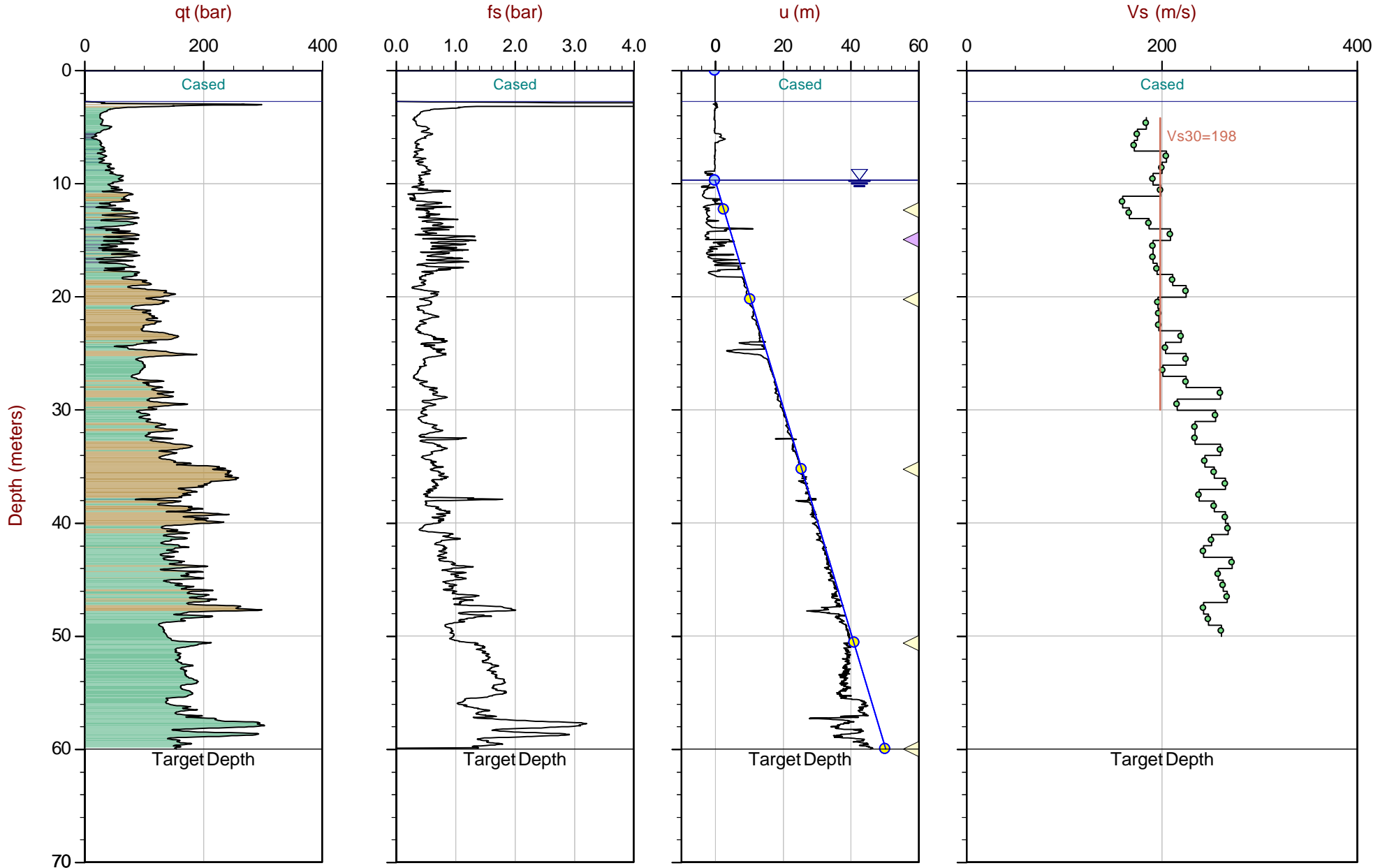
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



Tetra Tech

Job No: 19-0200868
Date: 2019-09-16 09:41
Site: Dewdney Bridge

Sounding: SCPT19-02
Cone: 519:T1500F15U500
159:T1500F15U500



Max Depth: 60.000 m / 196.85 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-0200868_SP02.DR4
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 5445833m E: 558872m
Sheet No: 1 of 1

● Equilibrium Pore Pressure (Ueq) ● Assumed Ueq ◀ Dissipation, Ueq achieved ◀ Dissipation, Ueq not achieved ◀ Dissipation, Ueq assumed — Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Seismic Cone Penetration Test Tabular Results



Job No: 19-0200868
Client: Tetra Tech
Project: Dewdney Bridge
Sounding ID: SCPT19-01
Date: 17-Sep-2019

Seismic Source: Beam
Source Offset (m): 0.40
Source Depth (m): 0.00
Geophone Offset (m): 0.20

SCPT_u SHEAR WAVE VELOCITY TEST RESULTS - V_s

Tip Depth (m)	Geophone Depth (m)	Ray Path (m)	Ray Path Difference (m)	Travel Time Interval (ms)	Interval Velocity (m/s)
5.05	4.85	4.87			
6.28	6.08	6.09	1.23	5.68	216
7.28	7.08	7.09	1.00	4.91	203
8.28	8.08	8.09	1.00	4.82	207
9.25	9.05	9.06	0.97	4.95	196
10.25	10.05	10.06	1.00	5.12	195
11.25	11.05	11.06	1.00	5.04	198
12.25	12.05	12.06	1.00	5.21	192
13.25	13.05	13.06	1.00	4.99	200
14.25	14.05	14.06	1.00	5.37	186
15.28	15.08	15.09	1.03	5.37	192
16.27	16.07	16.07	0.99	4.80	206
17.27	17.07	17.07	1.00	4.36	229
18.25	18.05	18.05	0.98	4.90	200
19.23	19.03	19.03	0.98	4.46	220
20.27	20.07	20.07	1.04	4.77	218
21.27	21.07	21.07	1.00	4.61	217
22.27	22.07	22.07	1.00	4.63	216
23.27	23.07	23.07	1.00	4.70	213
24.27	24.07	24.07	1.00	5.11	196
25.27	25.07	25.07	1.00	4.35	230
26.32	26.12	26.12	1.05	4.21	249
27.30	27.10	27.10	0.98	4.28	229
28.32	28.12	28.12	1.02	4.34	235
29.40	29.20	29.20	1.08	4.15	260
30.32	30.12	30.12	0.92	3.62	254



Job No: 19-0200868
Client: Tetra Tech
Project: Dewdney Bridge
Sounding ID: SCPT19-02
Date: 16-Sep-2019

Seismic Source: Beam
Source Offset (m): 0.40
Source Depth (m): 0.00
Geophone Offset (m): 0.20

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (m)	Geophone Depth (m)	Ray Path (m)	Ray Path Difference (m)	Travel Time Interval (ms)	Interval Velocity (m/s)
4.38	4.18	4.20			
5.38	5.18	5.20	1.00	5.30	188
6.38	6.18	6.19	1.00	5.64	177
7.33	7.13	7.14	0.95	5.47	173
8.32	8.12	8.13	0.99	4.79	207
9.32	9.12	9.13	1.00	4.96	201
10.32	10.12	10.13	1.00	5.21	192
11.32	11.12	11.13	1.00	5.00	200
12.35	12.15	12.16	1.03	6.41	160
13.30	13.10	13.11	0.95	5.68	167
14.20	14.00	14.01	0.90	4.79	188
15.22	15.02	15.03	1.02	4.87	209
16.25	16.05	16.05	1.03	5.39	191
17.25	17.05	17.05	1.00	5.21	192
18.25	18.05	18.05	1.00	5.13	195
19.23	19.03	19.03	0.98	4.64	211
20.25	20.05	20.05	1.02	4.54	225
21.23	21.03	21.03	0.98	4.98	197
22.23	22.03	22.03	1.00	5.07	197
23.23	23.03	23.03	1.00	5.07	197
24.25	24.05	24.05	1.02	4.63	220
25.25	25.05	25.05	1.00	4.89	204
26.25	26.05	26.05	1.00	4.45	225
27.25	27.05	27.05	1.00	4.98	201
28.25	28.05	28.05	1.00	4.45	225
29.27	29.07	29.07	1.02	3.91	261
30.25	30.05	30.05	0.98	4.54	216
31.25	31.05	31.05	1.00	3.91	255
32.25	32.05	32.05	1.00	4.27	234
33.25	33.05	33.05	1.00	4.27	234



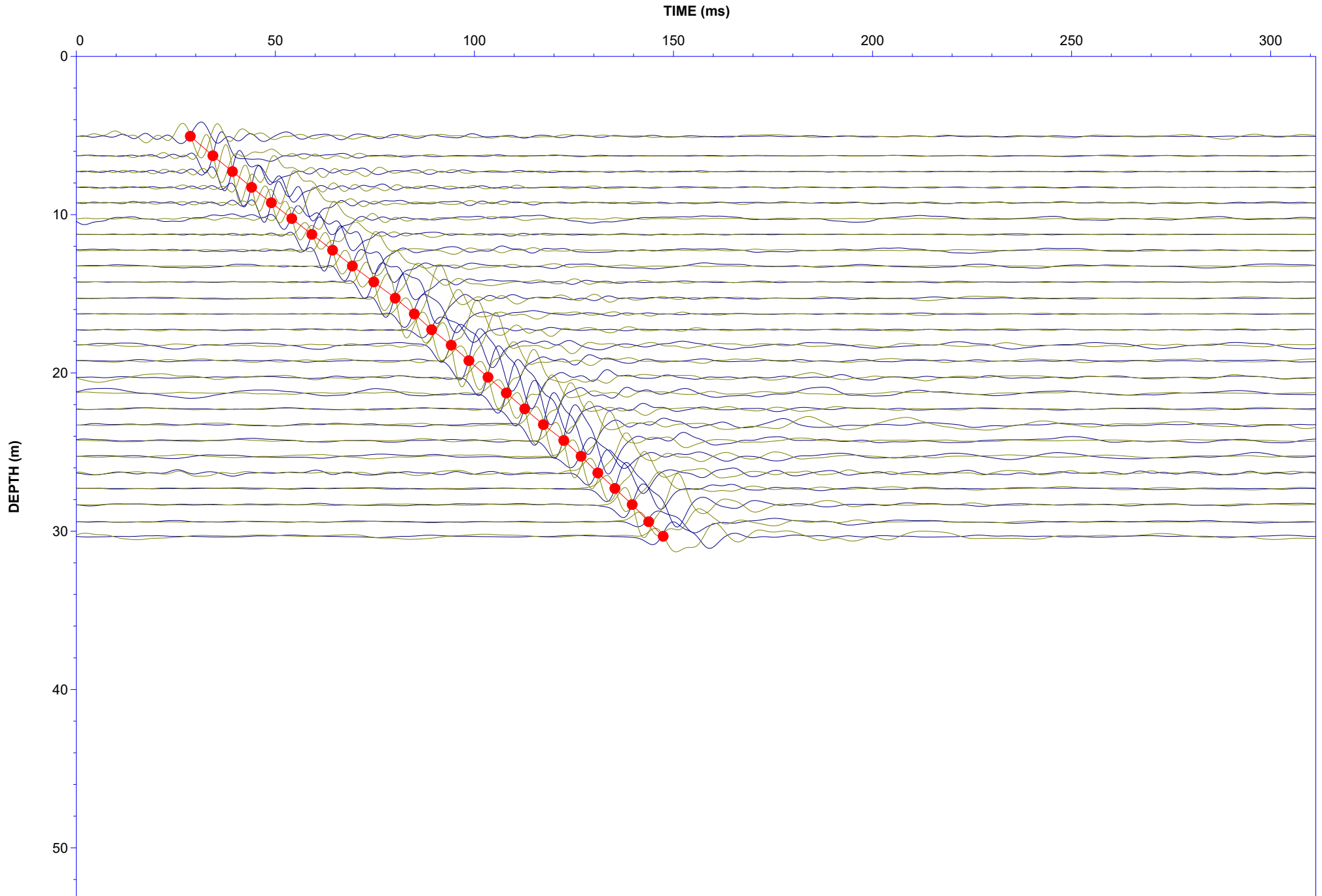
Job No: 19-0200868
Client: Tetra Tech
Project: Dewdney Bridge
Sounding ID: SCPT19-02
Date: 16-Sep-2019

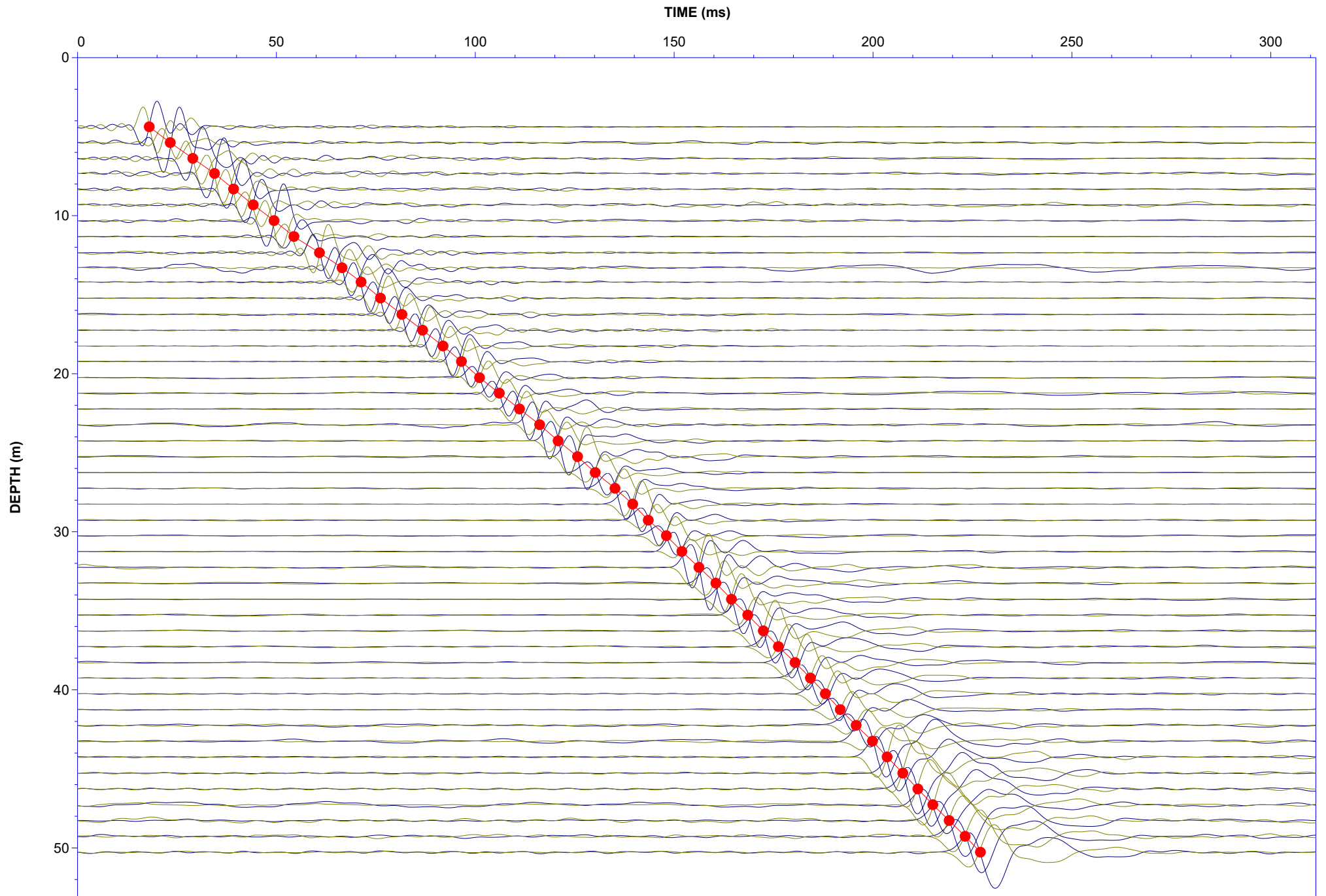
Seismic Source: Beam
Source Offset (m): 0.40
Source Depth (m): 0.00
Geophone Offset (m): 0.20

SCPT_u SHEAR WAVE VELOCITY TEST RESULTS - Vs

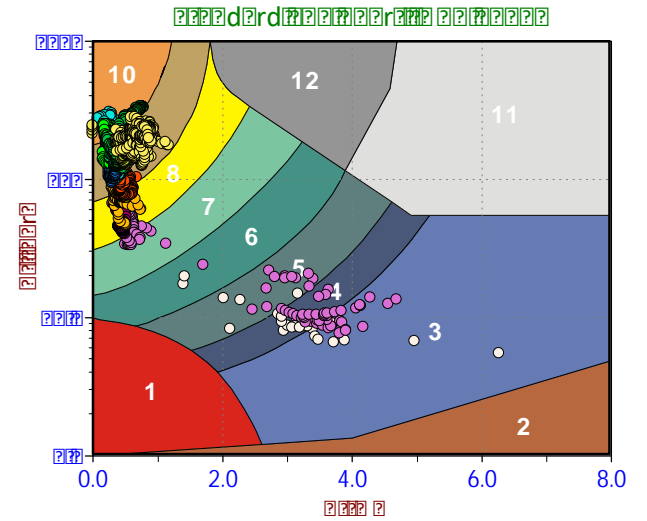
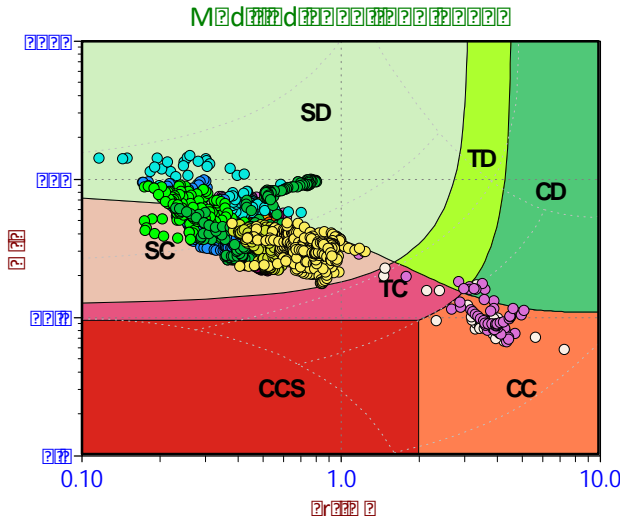
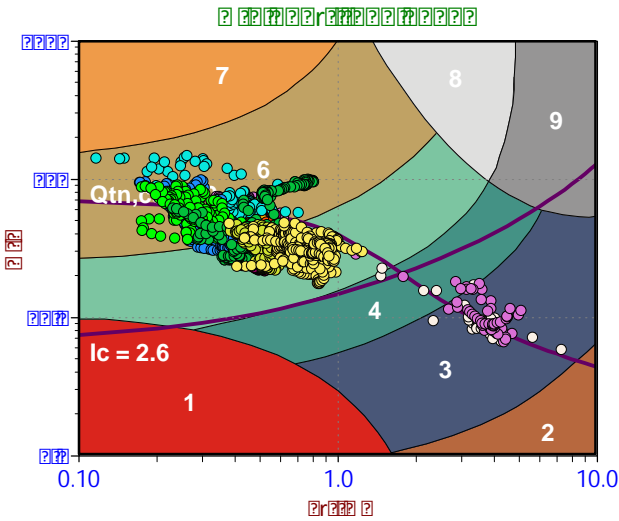
Tip Depth (m)	Geophone Depth (m)	Ray Path (m)	Ray Path Difference (m)	Travel Time Interval (ms)	Interval Velocity (m/s)
34.27	34.07	34.07	1.02	3.91	261
35.27	35.07	35.07	1.00	4.09	244
36.27	36.07	36.07	1.00	3.94	254
37.27	37.07	37.07	1.00	3.77	265
38.27	38.07	38.07	1.00	4.20	238
39.25	39.05	39.05	0.98	3.86	254
40.25	40.05	40.05	1.00	3.77	265
41.25	41.05	41.05	1.00	3.73	268
42.25	42.05	42.05	1.00	3.98	251
43.25	43.05	43.05	1.00	4.11	243
44.25	44.05	44.05	1.00	3.68	272
45.27	45.07	45.07	1.02	3.95	258
46.27	46.07	46.07	1.00	3.80	263
47.27	47.07	47.07	1.00	3.75	267
48.27	48.07	48.07	1.00	4.11	243
49.27	49.07	49.07	1.00	4.03	248
50.27	50.07	50.07	1.00	3.83	261

Seismic Cone Penetration Test Shear Wave (V_s) Traces





Soil Behaviour Type (SBT) Scatter Plots



Depth Ranges

- >0.0 to 5.0 m
- >5.0 to 10.0 m
- >10.0 to 15.0 m
- >15.0 to 20.0 m
- >20.0 to 25.0 m
- >25.0 to 30.0 m
- >30.0 to 35.0 m
- >35.0 to 40.0 m
- >40.0 to 45.0 m
- >45.0 to 50.0 m
- >50.0 m

Legend

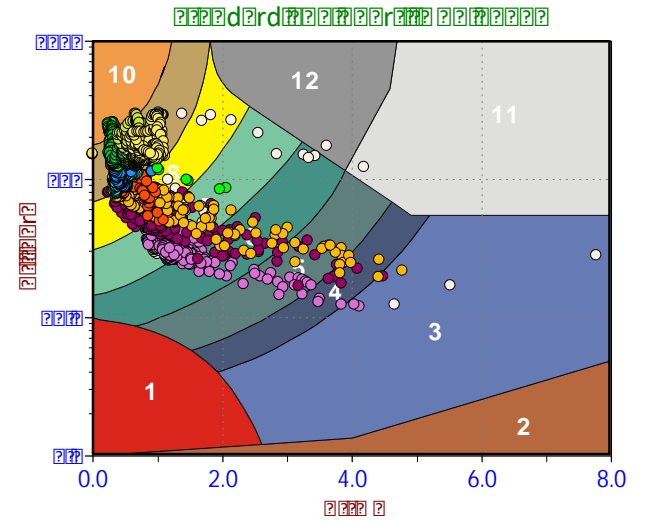
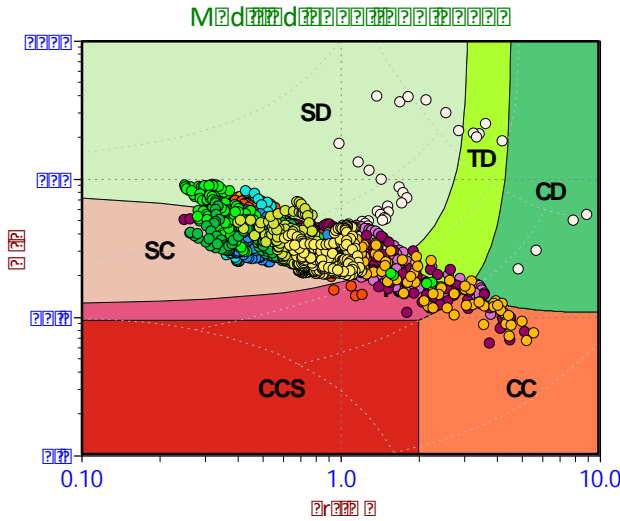
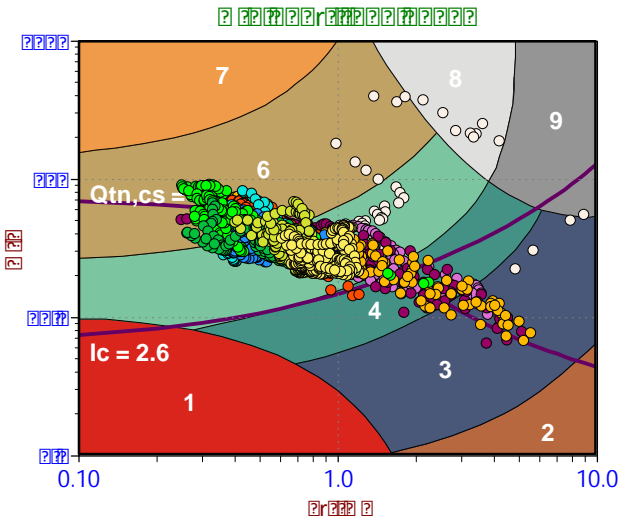
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand



Depth Ranges

- >0.0 to 5.0 m
- >5.0 to 10.0 m
- >10.0 to 15.0 m
- >15.0 to 20.0 m
- >20.0 to 25.0 m
- >25.0 to 30.0 m
- >30.0 to 35.0 m
- >35.0 to 40.0 m
- >40.0 to 45.0 m
- >45.0 to 50.0 m
- >50.0 m

Legend

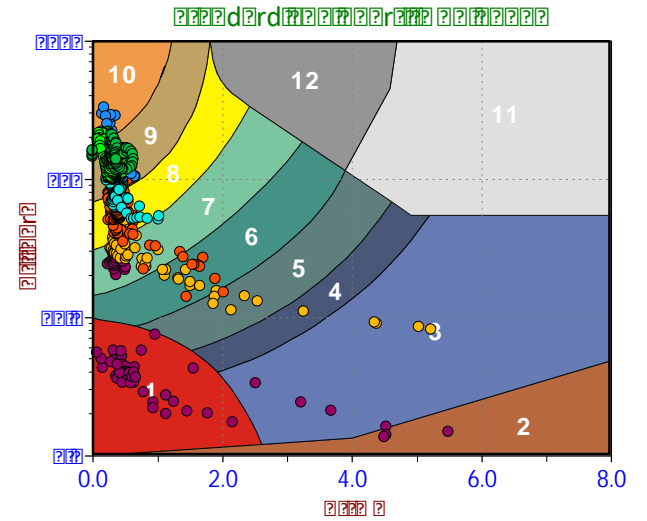
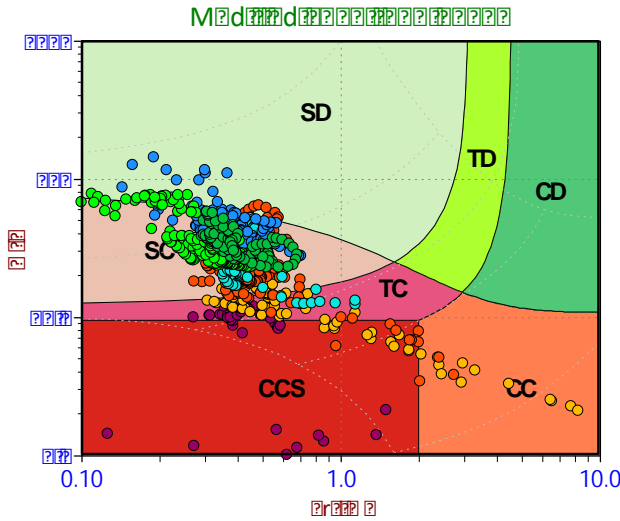
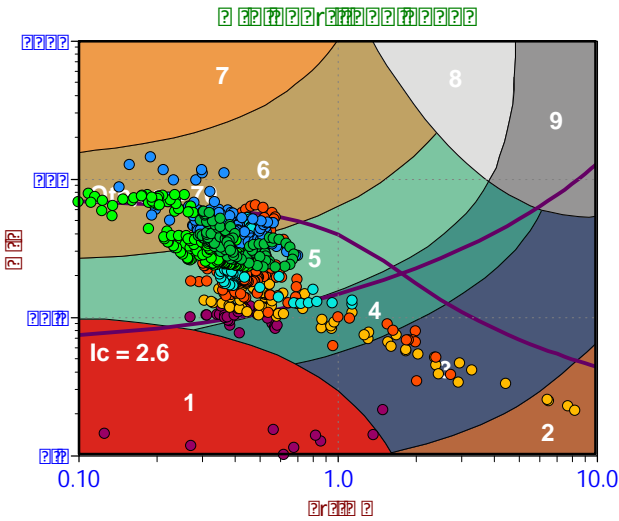
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

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Legend

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- >5.0 to 10.0 m
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- >15.0 to 20.0 m
- >20.0 to 25.0 m
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- >30.0 to 35.0 m
- >35.0 to 40.0 m
- >40.0 to 45.0 m
- >45.0 to 50.0 m
- >50.0 m

Legend

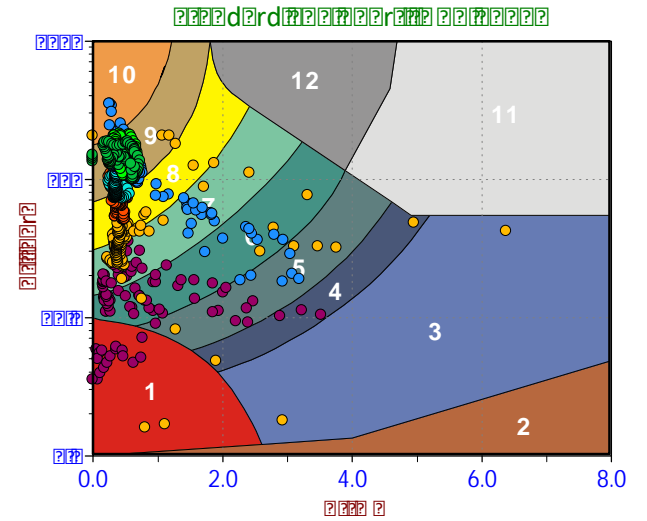
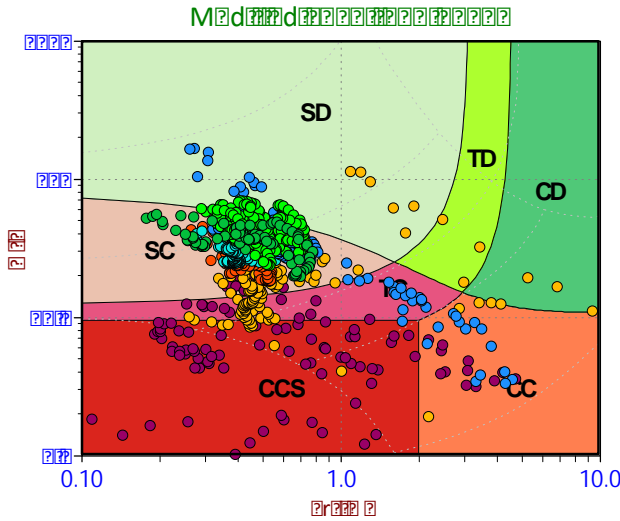
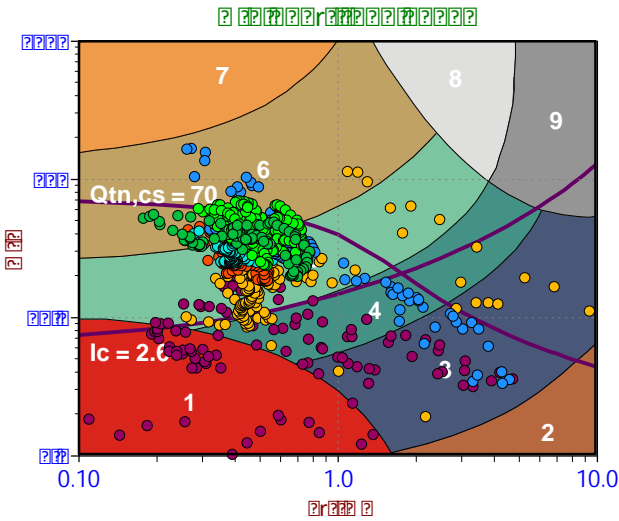
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
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- TD (Dil. transitional)
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Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
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Depth Ranges

- >0.0 to 5.0 m
- >5.0 to 10.0 m
- >10.0 to 15.0 m
- >15.0 to 20.0 m
- >20.0 to 25.0 m
- >25.0 to 30.0 m
- >30.0 to 35.0 m
- >35.0 to 40.0 m
- >40.0 to 45.0 m
- >45.0 to 50.0 m
- >50.0 m

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots



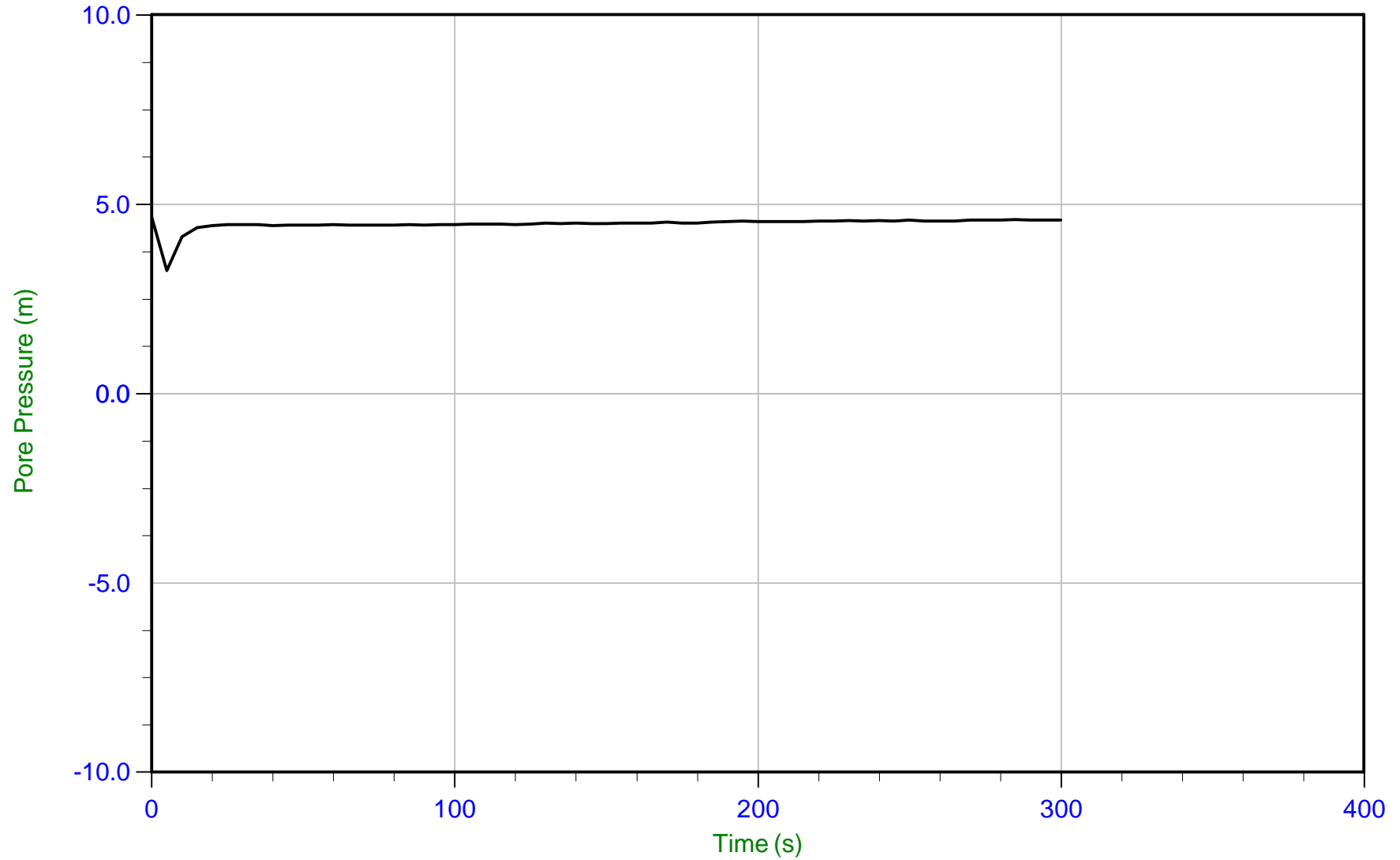
Job No: 19-0200868
 Client: Tetra Tech
 Project: Dewdney Bridge
 Start Date: 16-Sep-2019
 End Date: 25-Sep-2019

CPT_u PORE PRESSURE DISSIPATION SUMMARY

Sounding ID	File Name	Cone Area (cm ²)	Duration (s)	Test Depth (m)	Estimated Equilibrium Pore Pressure U _{eq} (m)	Calculated Phreatic Surface (m)	Estimated Phreatic Surface (m)	t ₅₀ ^a (s)	Assumed Rigidity Index (I _r)	C _h ^b (cm ² /min)
SCPT19-01	19-0200868_SP01	15	300	12.250	4.6	7.7				
SCPT19-01	19-0200868_SP01	15	600	25.275	17.9	7.3				
SCPT19-01	19-0200868_SP01	15	605	35.275	28.1	7.2				
SCPT19-01	19-0200868_SP01	15	300	64.325	Not Achieved					
SCPT19-02	19-0200868_SP02	15	600	12.325	2.6	9.7				
SCPT19-02	19-0200868_SP02	15	540	14.950	Not Achieved					
SCPT19-02	19-0200868_SP02	15	300	20.250	10.3	9.9				
SCPT19-02	19-0200868_SP02	15	500	35.275	25.5	9.7				
SCPT19-02	19-0200868_SP02	15	600	50.625	41.1	9.5				
SCPT19-02	19-0200868_SP02	15	300	60.000	50.2	9.8				
CPT19-03	19-0200868_CP03	15	500	20.600	10.1	10.5				
CPT19-03	19-0200868_CP03	15	600	43.150	33.1	10.4				
CPT19-04	19-0200868_CP04	15	350	22.650	13.5	9.2				
CPT19-04	19-0200868_CP04	15	500	42.125	33.3	8.9				

a. Time is relative to where u_{max} occurred.

b. Houlsby and Teh, 1991.

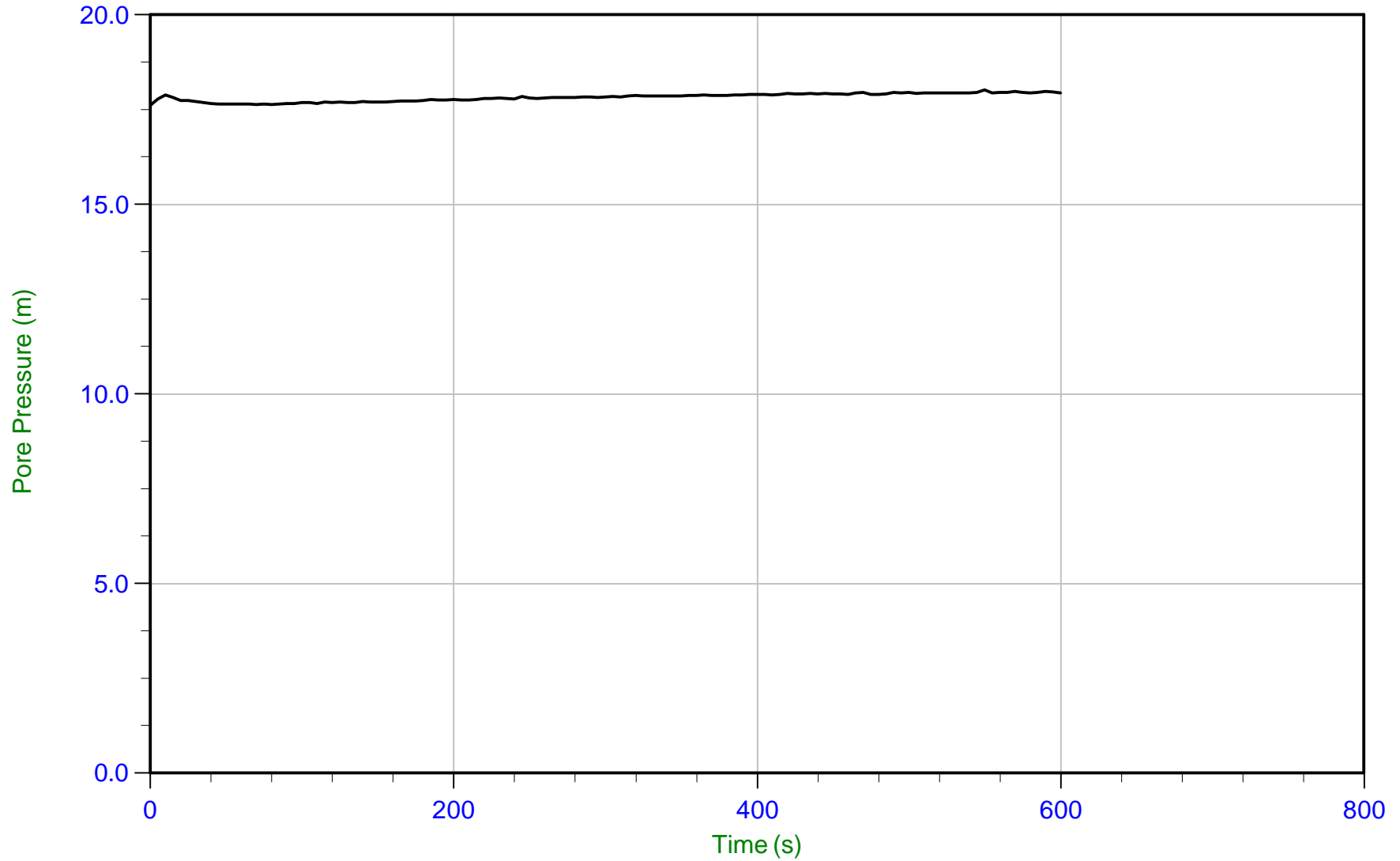


Trace Summary:

Filename: 19-0200868_SP01.PP4
Depth: 12.250 m / 40.190 ft
Duration: 300.0 s

u Min: 3.2 m
u Max: 4.7 m
u Final: 4.6 m

WT: 7.671 m / 25.167 ft
Ueq: 4.6 m

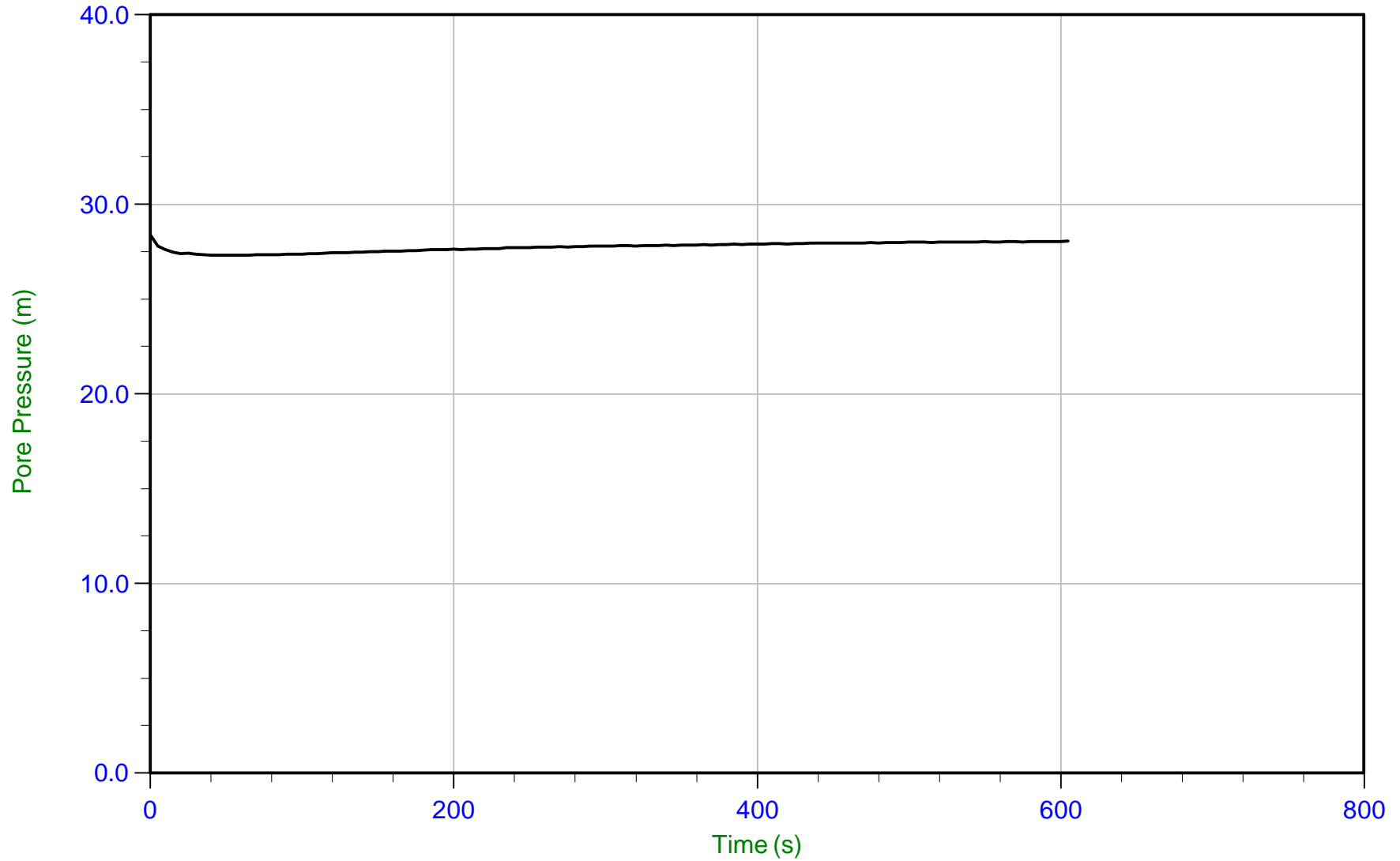


Trace Summary:

Filename: 19-0200868_SP01.PP4
Depth: 25.275 m / 82.922 ft
Duration: 600.0 s

u Min: 17.6 m
u Max: 18.0 m
u Final: 17.9 m

WT: 7.328 m / 24.042 ft
Ueq: 17.9 m

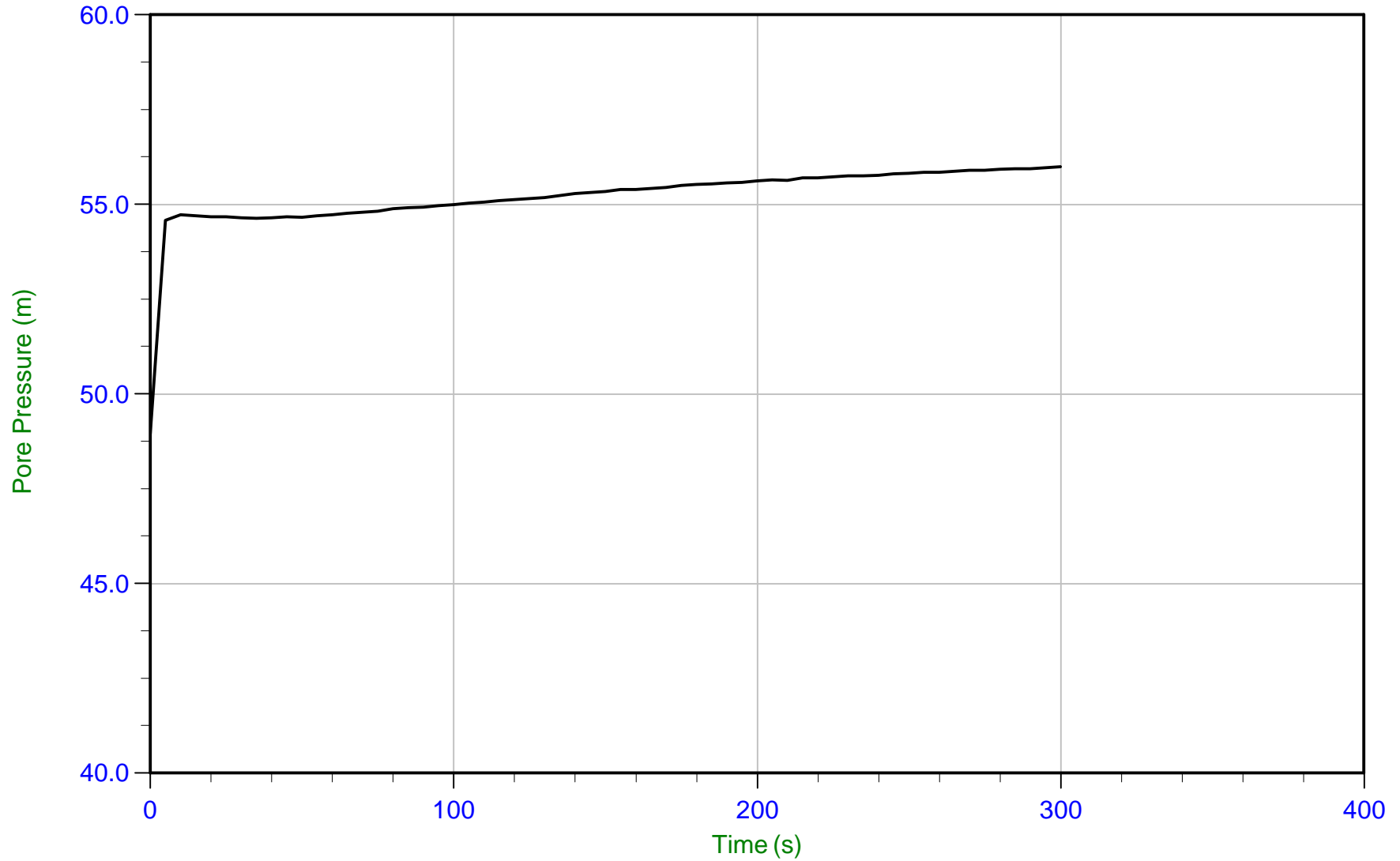


Trace Summary:

Filename: 19-0200868_SP01.PP4
Depth: 35.275 m / 115.730 ft
Duration: 605.0 s

u Min: 27.3 m
u Max: 28.4 m
u Final: 28.1 m

WT: 7.170 m / 23.523 ft
Ueq: 28.1 m



Trace Summary:

Filename: 19-0200868_SP01.PP4
Depth: 64.325 m / 211.037 ft
Duration: 300.0 s

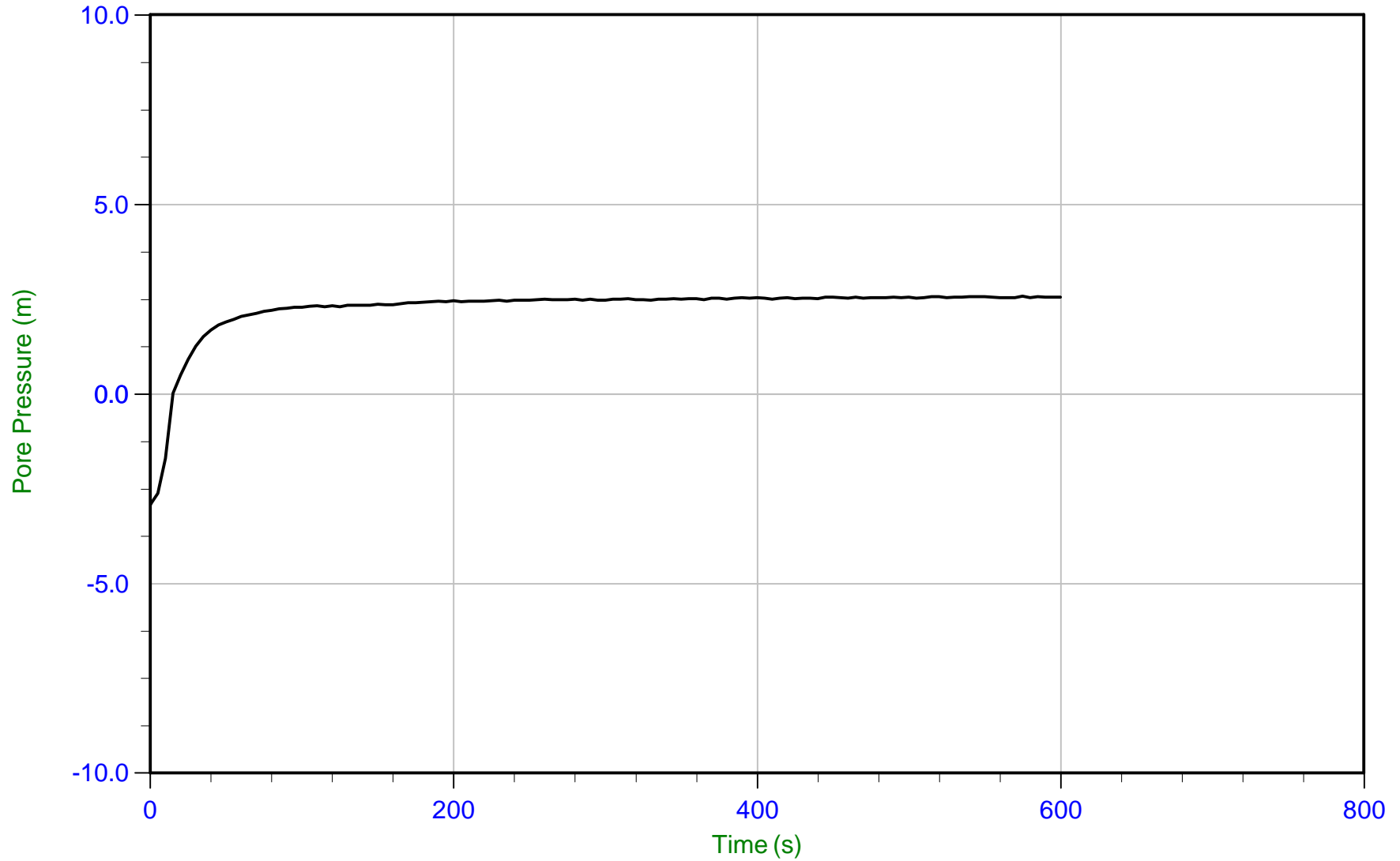
u Min: 48.9 m
u Max: 56.0 m
u Final: 56.0 m



Tetra Tech

Job No: 19-0200868
Date: 09/16/2019 09:41
Site: Dewdney Bridge

Sounding: SCPT19-02
Cone: 519:T1500F15U500 Area=15 cm²



Trace Summary:

Filename: 19-0200868_SP02.PP4
Depth: 12.325 m / 40.436 ft
Duration: 600.0 s

u Min: -2.9 m
u Max: 2.6 m
u Final: 2.5 m

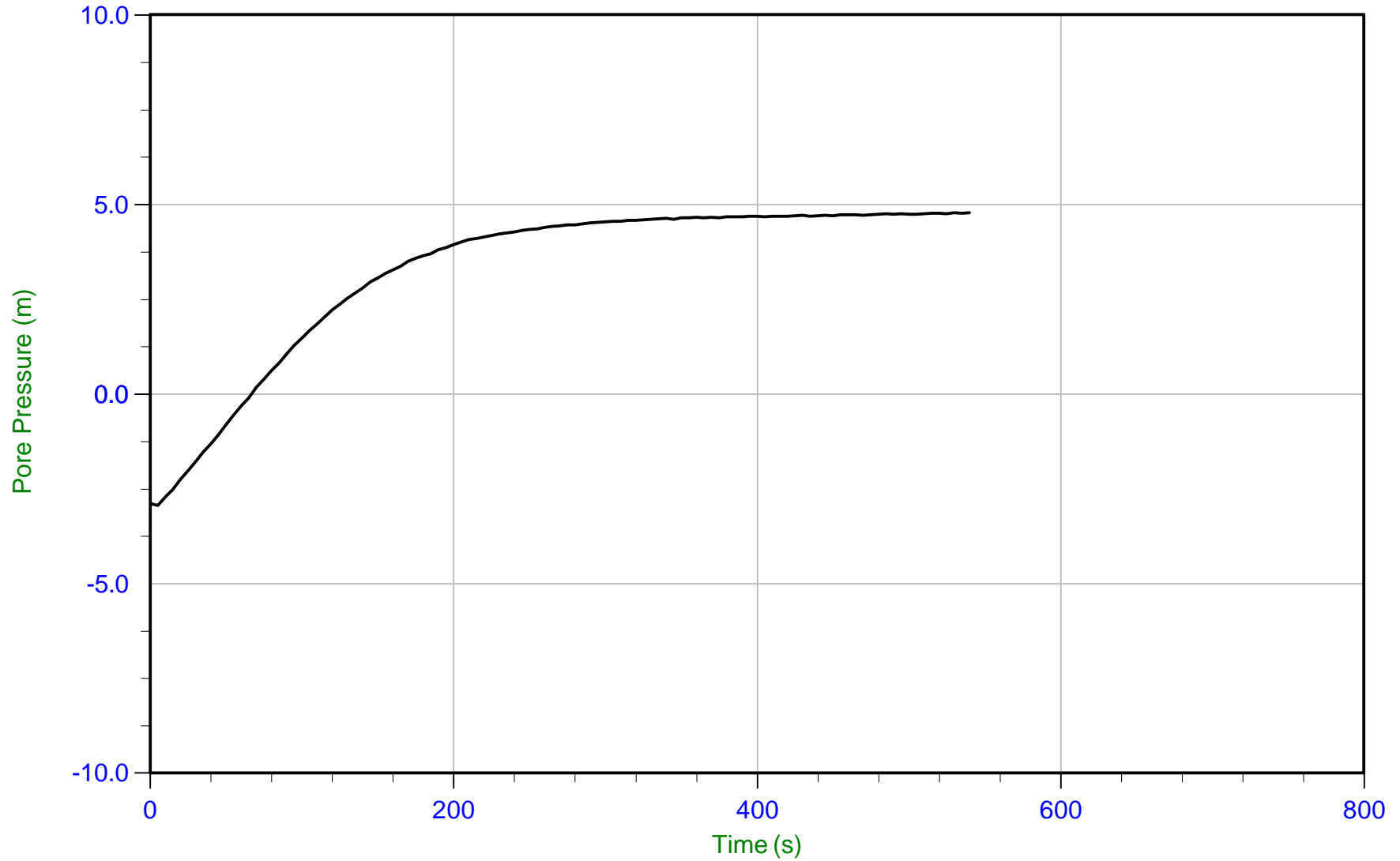
WT: 9.746 m / 31.975 ft
Ueq: 2.6 m



Tetra Tech

Job No: 19-0200868
Date: 09/16/2019 09:41
Site: Dewdney Bridge

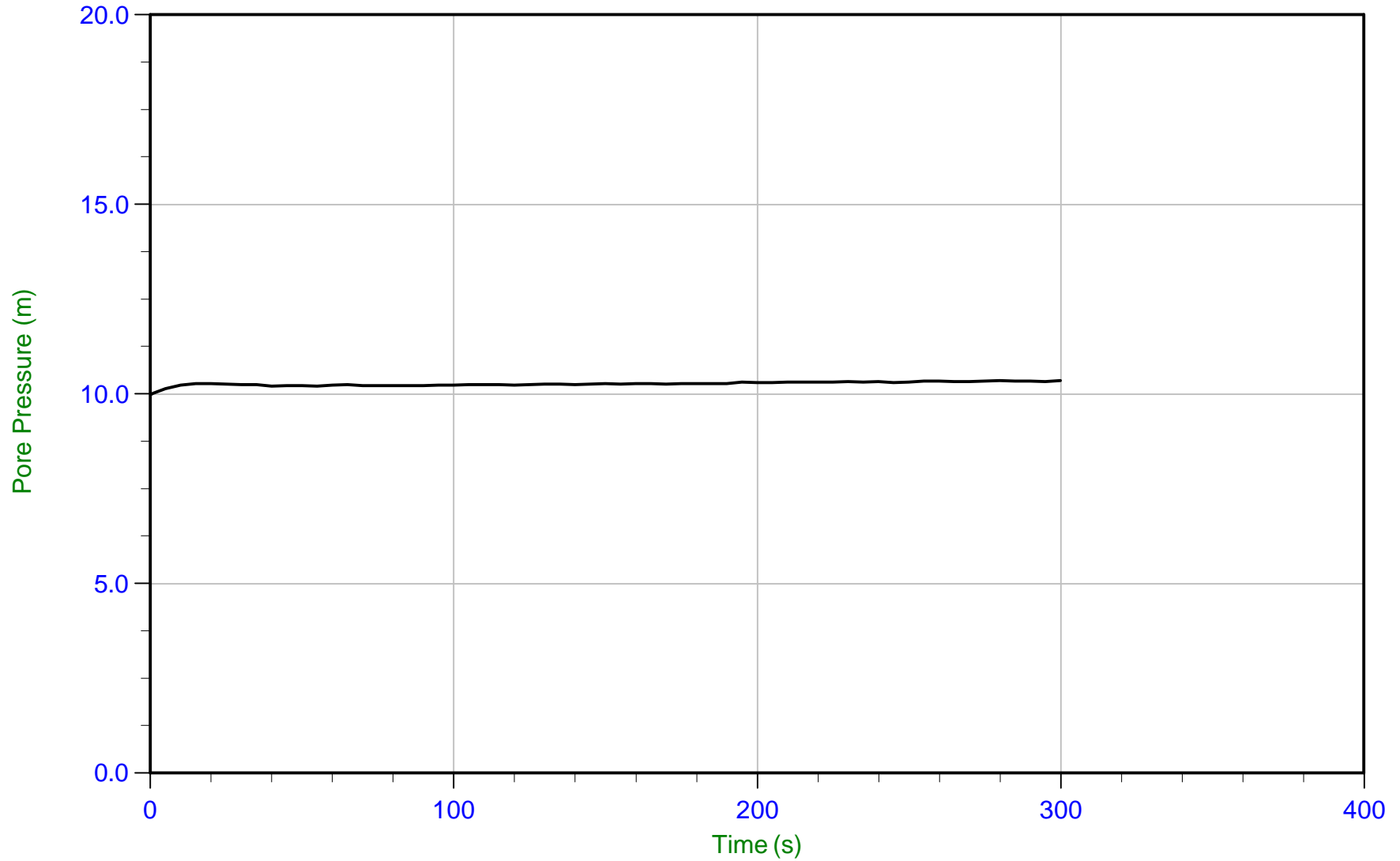
Sounding: SCPT19-02
Cone: 519:T1500F15U500 Area=15 cm²



Trace Summary:

Filename: 19-0200868_SP02.PP4
Depth: 14.950 m / 49.048 ft
Duration: 540.0 s

u Min: -2.9 m
u Max: 4.8 m
u Final: 4.8 m

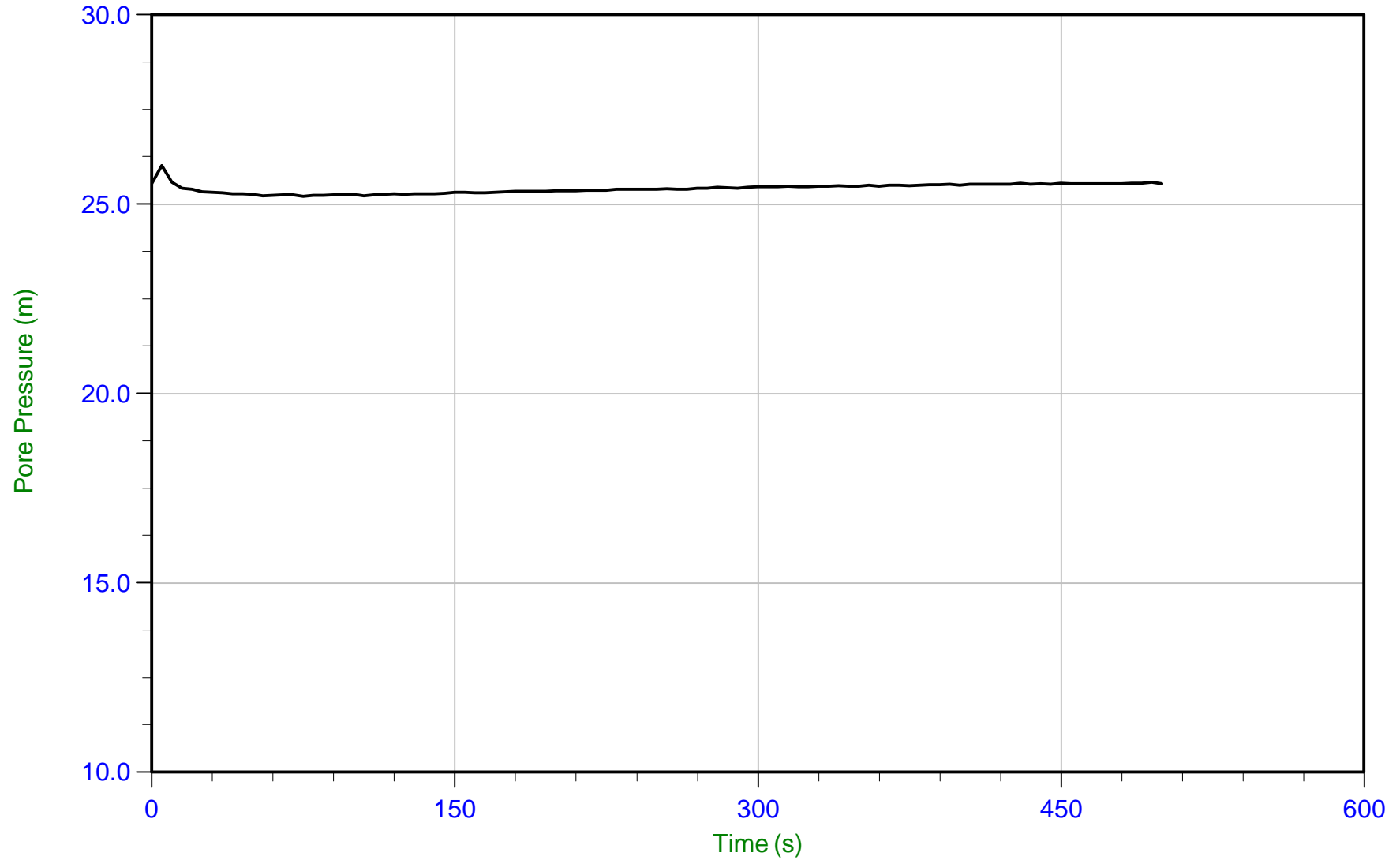


Trace Summary:

Filename: 19-0200868_SP02.PP4
Depth: 20.250 m / 66.436 ft
Duration: 300.0 s

u Min: 10.0 m
u Max: 10.4 m
u Final: 10.4 m

WT: 9.934 m / 32.591 ft
Ueq: 10.3 m

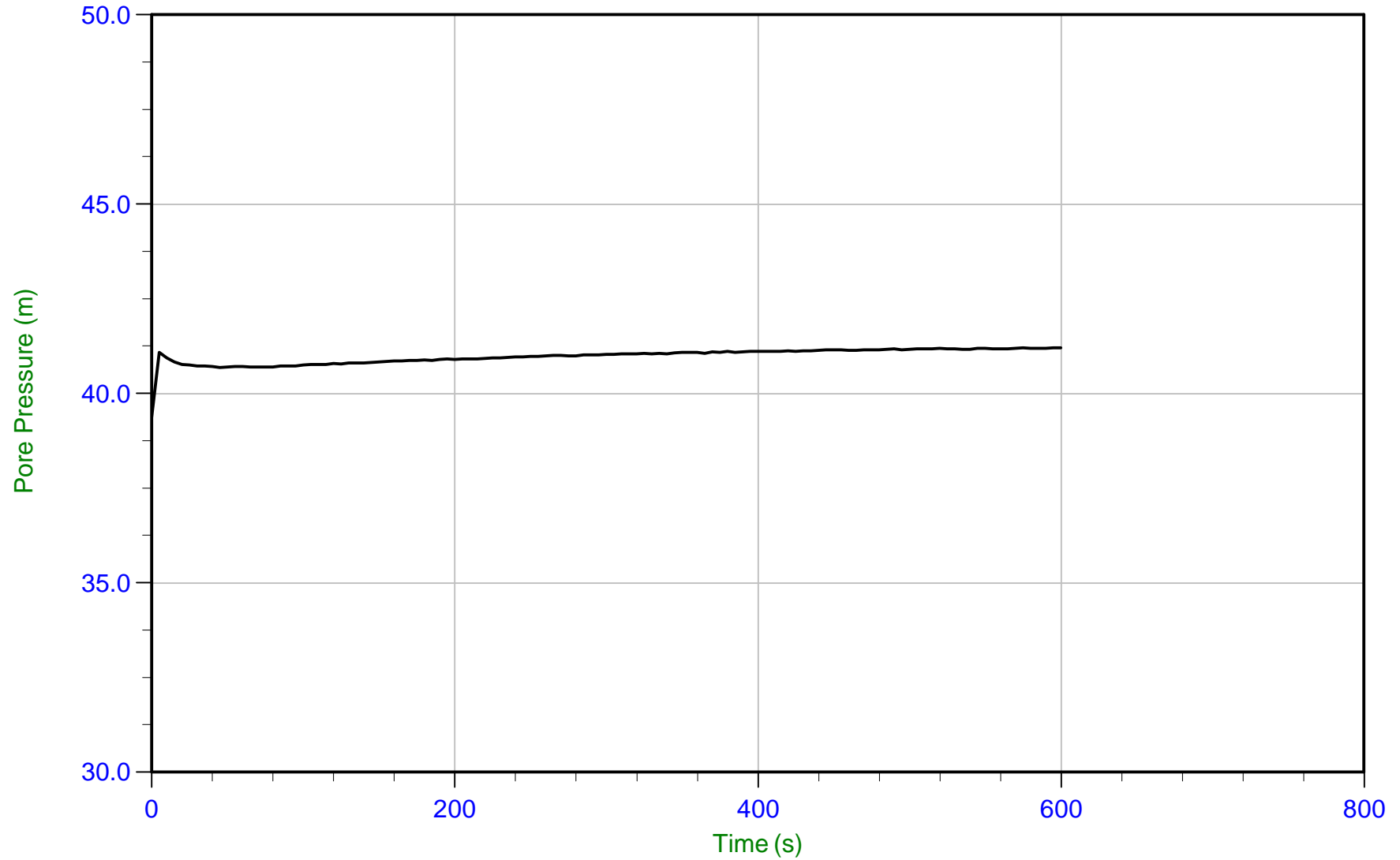


Trace Summary:

Filename: 19-0200868_SP02.PP4
Depth: 35.275 m / 115.730 ft
Duration: 500.0 s

u Min: 25.2 m
u Max: 26.0 m
u Final: 25.5 m

WT: 9.749 m / 31.985 ft
Ueq: 25.5 m

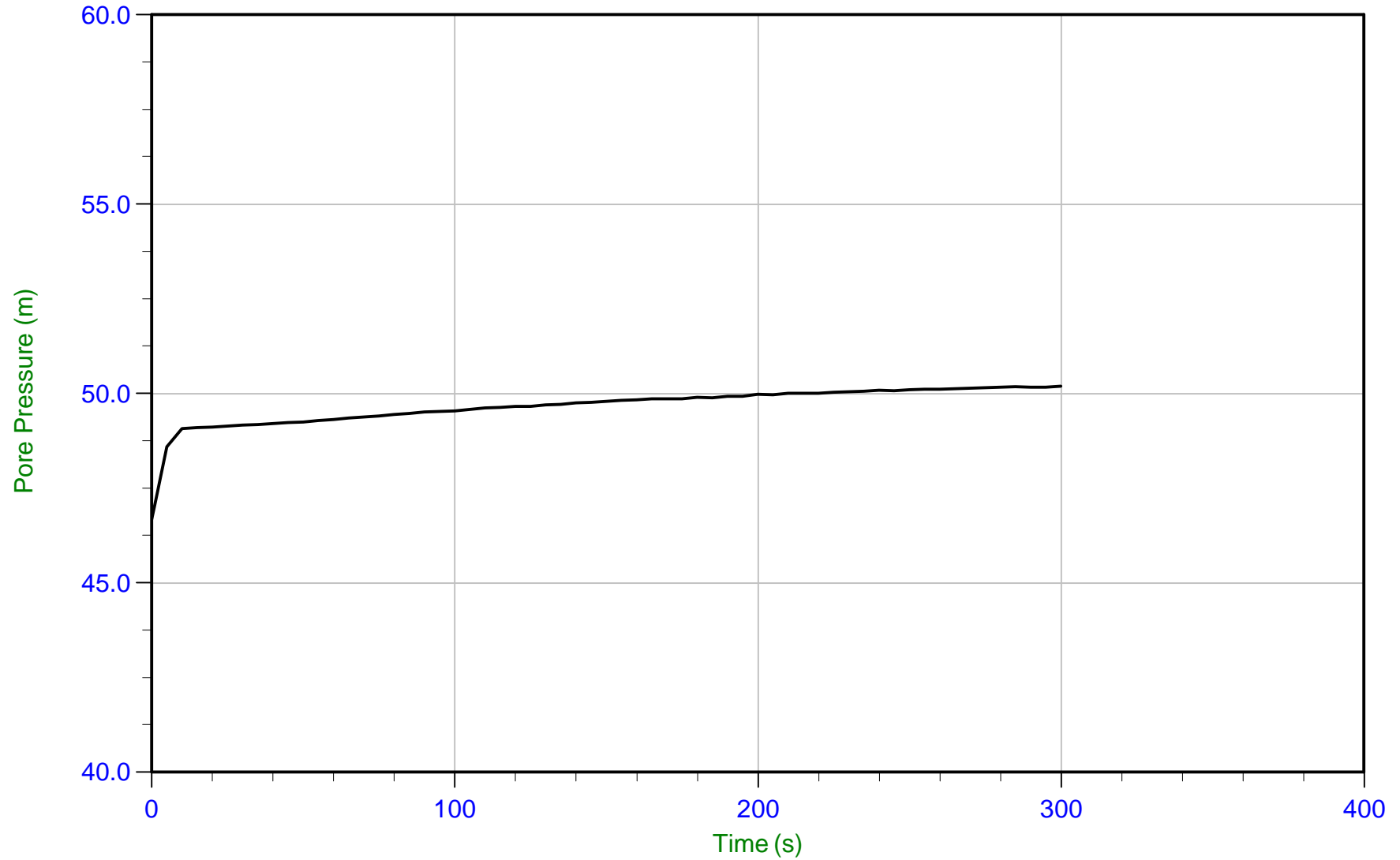


Trace Summary:

Filename: 19-0200868_SP02.PP4
Depth: 50.625 m / 166.091 ft
Duration: 600.0 s

u Min: 39.4 m
u Max: 41.2 m
u Final: 41.2 m

WT: 9.520 m / 31.233 ft
Ueq: 41.1 m

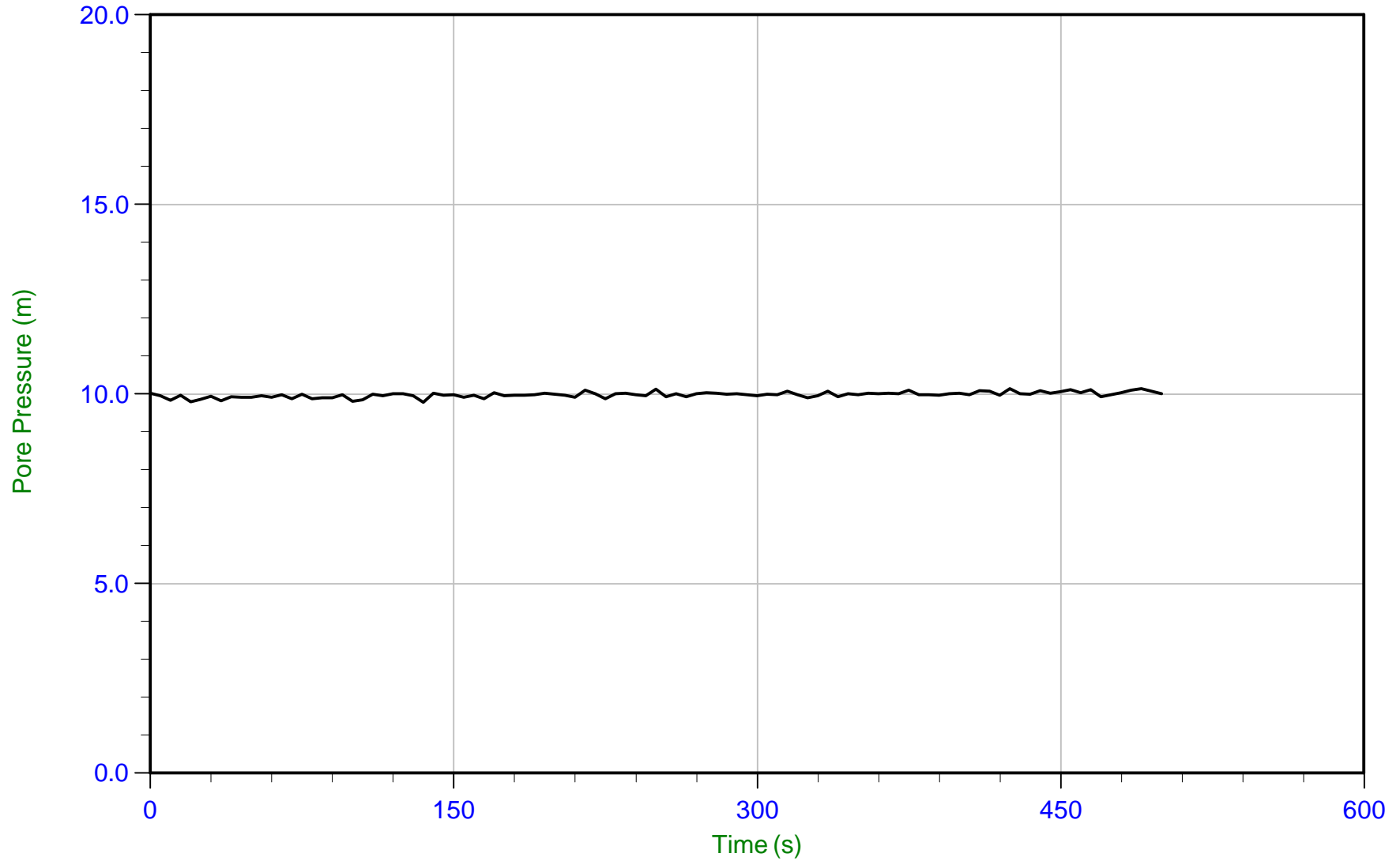


Trace Summary:

Filename: 19-0200868_SP02.PP4
Depth: 60.000 m / 196.848 ft
Duration: 300.0 s

u Min: 46.7 m
u Max: 50.2 m
u Final: 50.2 m

WT: 9.842 m / 32.290 ft
Ueq: 50.2 m



Trace Summary:

Filename: 19-0200868_CP03.PP4
Depth: 20.600 m / 67.584 ft
Duration: 500.0 s

u Min: 9.8 m
u Max: 10.1 m
u Final: 10.0 m

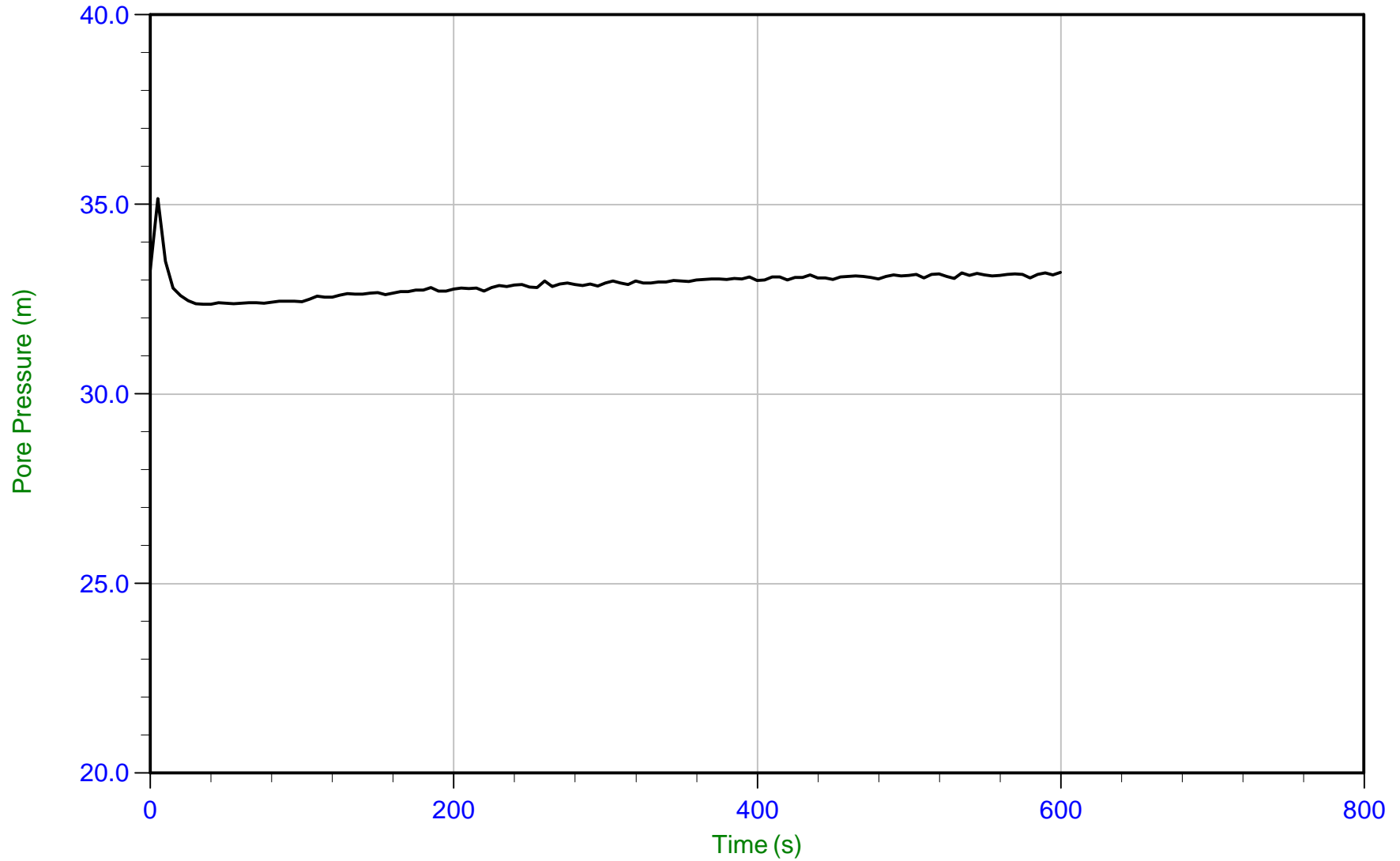
WT: 10.547 m / 34.603 ft
Ueq: 10.1 m



Tetra Tech

Job No: 19-0200868
Date: 09/24/2019 10:08
Site: Dewdney Bridge

Sounding: CPT19-03
Cone: 630:T1500F15U500 Area=15 cm²

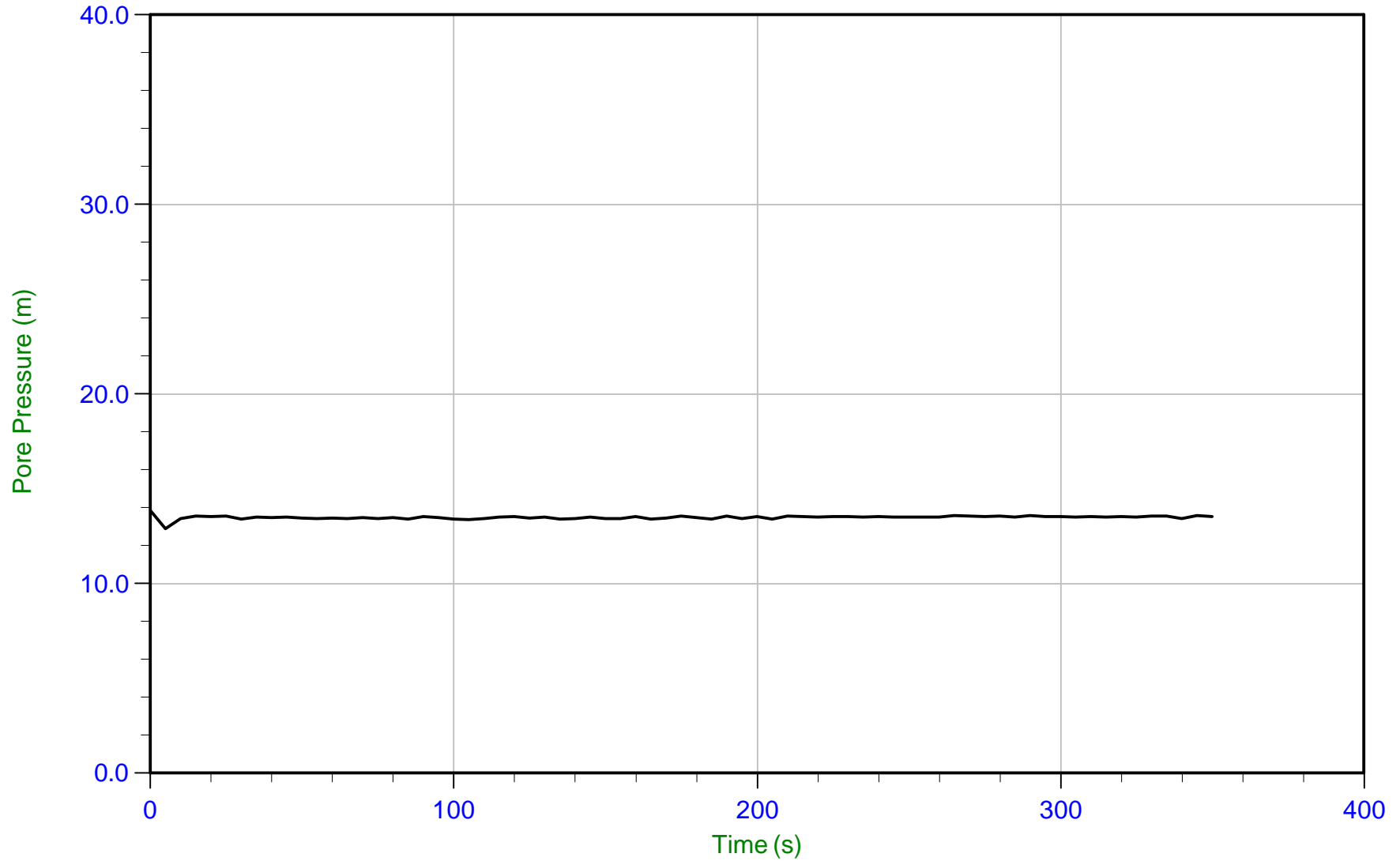


Trace Summary:

Filename: 19-0200868_CP03.PP4
Depth: 43.150 m / 141.567 ft
Duration: 600.0 s

u Min: 32.4 m
u Max: 35.2 m
u Final: 33.2 m

WT: 10.045 m / 32.956 ft
Ueq: 33.1 m

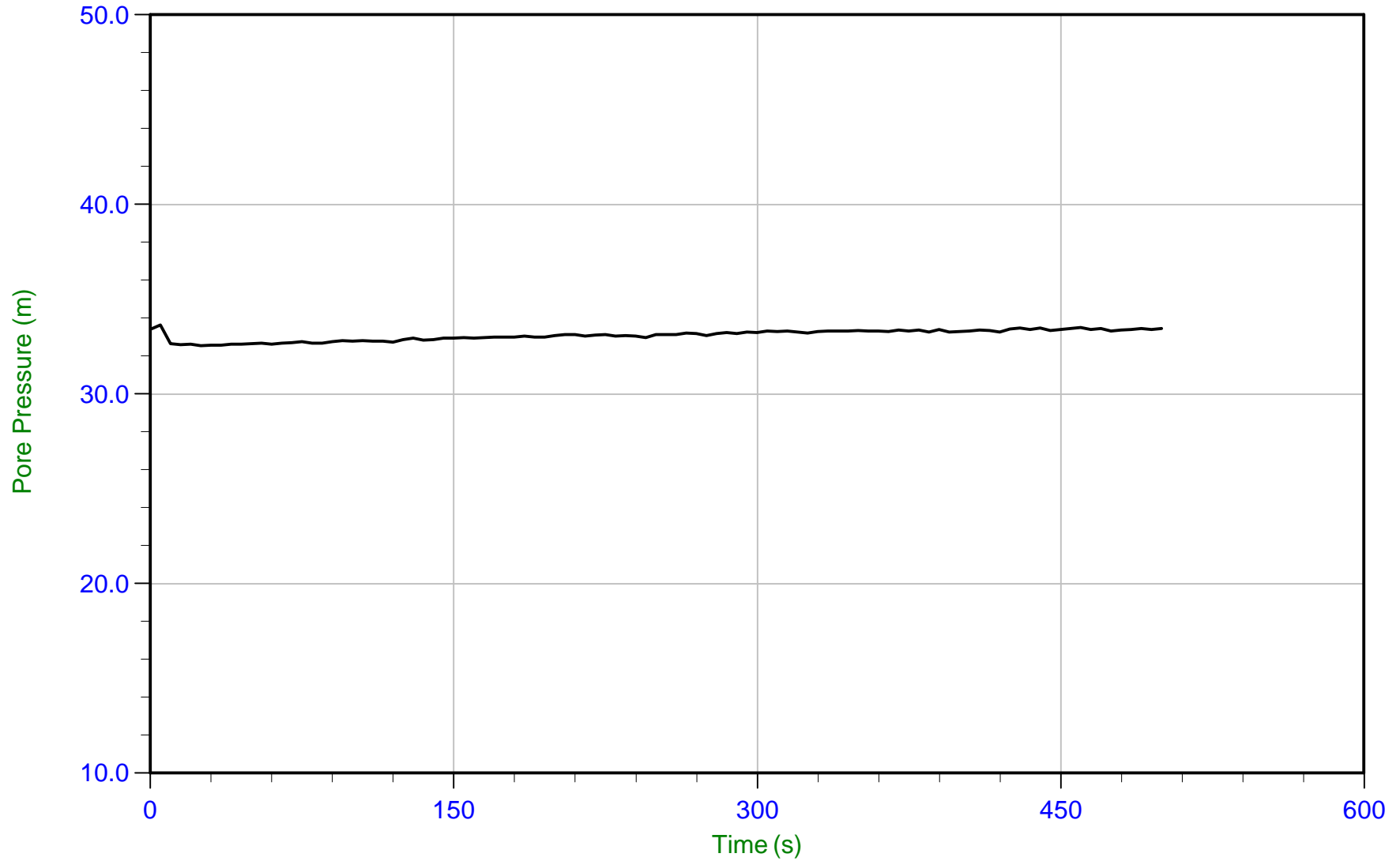


Trace Summary:

Filename: 19-0200868_CP04.PP4
Depth: 22.650 m / 74.310 ft
Duration: 350.0 s

u Min: 12.9 m
u Max: 13.9 m
u Final: 13.5 m

WT: 9.176 m / 30.105 ft
Ueq: 13.5 m



Trace Summary:

Filename: 19-0200868_CP04.PP4
Depth: 42.125 m / 138.204 ft
Duration: 500.0 s

u Min: 32.5 m
u Max: 33.6 m
u Final: 33.5 m

WT: 8.862 m / 29.074 ft
Ueq: 33.3 m

APPENDIX C

LABORATORY TEST RESULTS

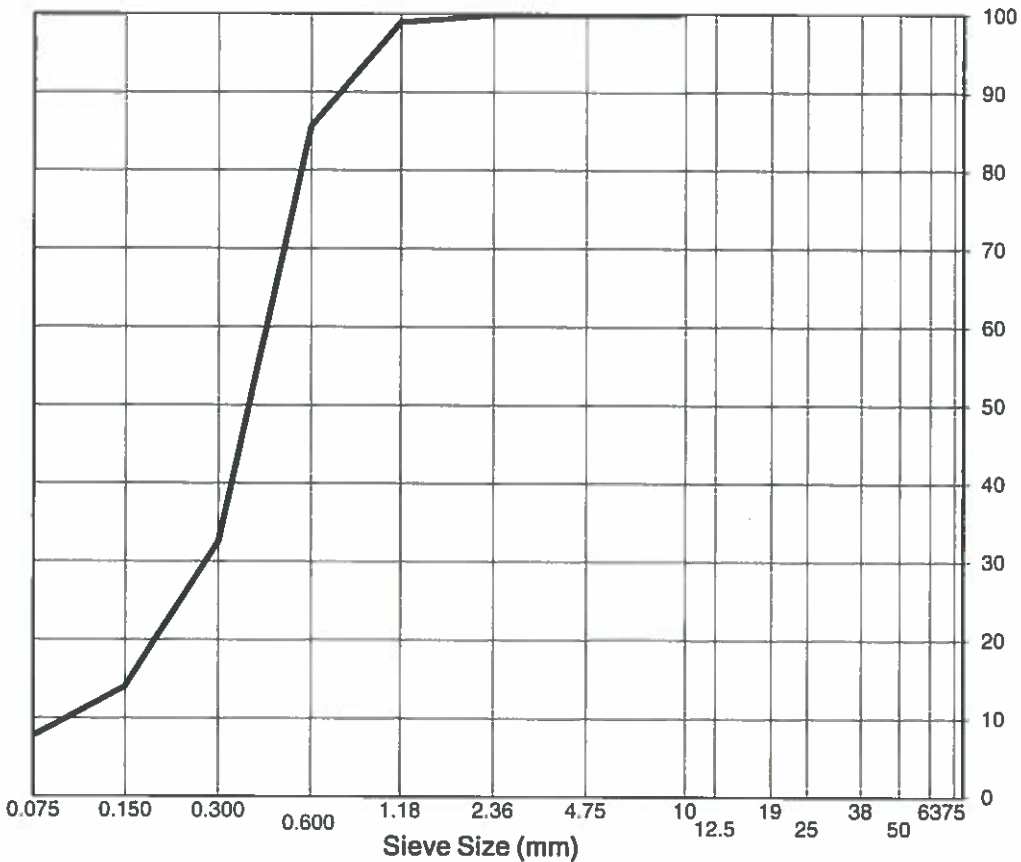
SIEVE ANALYSIS REPORT

Washed Sieve: ASTM C136 and C117

Project No.: Dewdney Bridge Replacement
 Project: 704-ENG.VGEO03551-01
 Client: BC MOTI
 Attention: _____
 Email: _____
 Description: SAND, trace silt, moist, grey-brown.
 Source: SH19-02
 Supplier: _____
 Sample Location: 22.8 - 23.2
 Specification: _____

Sample No.: S12
 Date Received: _____
 Sampled by: CL
 Date Tested: October 12, 2019
 Tested by: CL/BG Office: Nanaimo
 Moisture Content (as received): 17.7%
 No. Crushed Faces: Two (2) or Three (3)
 By Particle Mass: _____

Sieve Size	Percent Passing
9.5	100
4.75	100
2.36	100
1.18	99
0.600	86
0.300	32
0.150	14
0.075	7.7



Remarks: _____

Reviewed By: *CL* P.Eng.

Data presented hereon is for the sole use of the stipulated client. Tetra Tech is not responsible, nor can be held liable, for use made of this report by any other party, with or without the knowledge of Tetra Tech. The testing services reported herein have been performed to recognized industry standards, unless noted. No other warranty is made. These data do not include or represent any interpretation or opinion of specification compliance or material suitability. Should engineering interpretation be required, Tetra Tech will provide it upon written request.



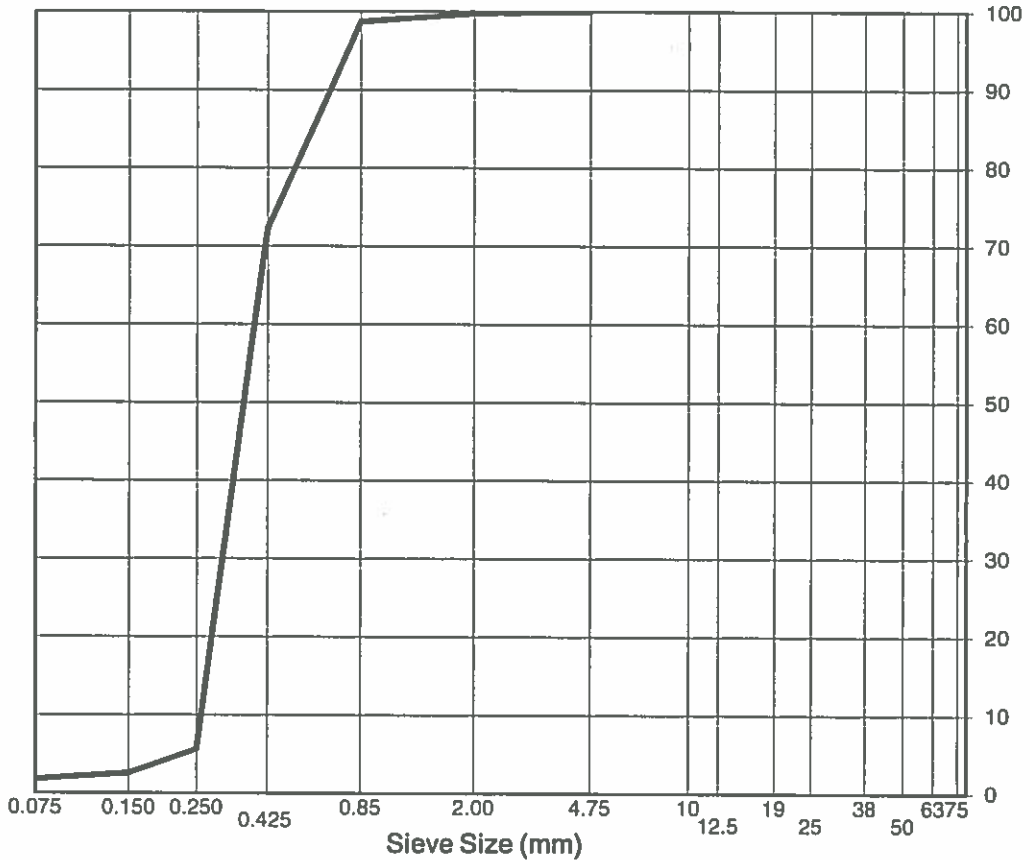
SIEVE ANALYSIS REPORT

Washed Sieve: ASTM C136 and C117

Project No.: Dewdney Bridge Replacement
 Project: 704-ENG.VGEO03551-01
 Client: BC MOTI
 Attention: _____
 Email: _____
 Description: SAND, trace silt, moist, brown.
 Source: SH19-03
 Supplier: _____
 Sample Location: 19.5 - 19.8
 Specification: _____

Sample No.: S4
 Date Received: _____
 Sampled by: CL
 Date Tested: October 12, 2019
 Tested by: CL/BG Office: Nanaimo
 Moisture Content (as received): 20.9%
 No. Crushed Faces: Two (2) or Three (3)
 By Particle Mass: _____

Sieve Size	Percent Passing
4.75	100
2.00	100
0.85	99
0.425	72
0.250	6
0.150	3
0.075	1.8



Remarks: _____

Reviewed By: *[Signature]* P.Eng.

Data presented hereon is for the sole use of the stipulated client. Tetra Tech is not responsible, nor can be held liable, for use made of this report by any other party, with or without the knowledge of Tetra Tech. The testing services reported herein have been performed to recognized industry standards, unless noted. No other warranty is made. These data do not include or represent any interpretation or opinion of specification compliance or material suitability. Should engineering interpretation be required, Tetra Tech will provide it upon written request.



SOLUBLE SULPHATE ION CONTENT OF SOIL

(CSA Designation A23.2-2B & A23.2-3B)

Project:	Dewdney Bridge Replacement	Date Tested:	October 16, 2019
Project No.:	704-ENG.VGEO03551-01	Tested By:	EM
Client:	Ministry of Transportation and Infrastructure	Sample Source:	SH19-01, SH19-02
Location:	Highway 7, Dewdney, BC	Laboratory:	Calgary

Sample Number	SA-07	SA-04				
Borehole Number	SH19-01	SH19-02				
Depth (m)	6.4-6.7	7.3-7.6				
Sulphate Content %	0.07	0.07				
Degree of Exposure (Class)	Negligible	Negligible				

Class of exposure	Degree of exposure	Water-soluble sulphate (SO ₄) [†] in soil sample, %	Sulphate (SO ₄) in groundwater samples, mg/L [‡]	Water soluble sulphate (SO ₄) in recycled aggregate sample, %	Cementing materials to be used [§]
S-1	Very severe	> 2.0	> 10 000	> 2.0	HS or HSb
S-2	Severe	0.20-2.0	1500-10 000	0.60-2.0	HS or HSb
S-3	Moderate	0.10-0.20	150-1500	0.20-0.60	MS, MSb, LH, HS, or HSb

*For sea water exposure, see Clause 4.1.1.5.

[†]In accordance with CSA A23.2-3B.

[‡]In accordance with CSA A23.2-2B.

[§]Cementing material combinations with equivalent performance may be used (see Clauses 4.2.1.2, 4.2.1.3, and 4.2.1.4). Type HS cement shall not be used in reinforced concrete exposed to both chlorides and sulphates. Refer to Clause 4.1.1.6.3.

Limitations:

- i) The degree of exposure class included herein are valid only if drainage and weeping systems meet the requirements of the site conditions.
- ii) The degree exposure class should be re-verified if backfill soils for foundation walls originate from an unknown source.

Remarks:

Reviewed By:  P.Eng.

WATER SOLUBLE CHLORIDE ION CONTENT IN CONCRETE

(CSA Designation A23.2-4B)

Project: Dewdney Bridge Replacement Date Received: 11-Oct-19 By: EM
 Project No.: 704-ENG.VGEO03551-01 Date Tested: 16-Oct-19 By: EM
 Client: Ministry of Transportation and Infrastructure Laboratory: Calgary

Borehole Number	SH19-01	Borehole Number	SH19-02
Sample Number	SA-08	Sample Number	SA-05
Sample Location	Highway 7, Dewdney, BC	Sample Location	Highway 7, Dewdney, BC
Depth: (m)	7.3-7.6	Depth: (m)	9.8-10.1
Chloride Content by Mass of Sample, %	0.014	Chloride Content by Mass of Sample, %	0.006

Borehole Number		Borehole Number	
Sample Number		Sample Number	
Sample Location		Sample Location	
Depth: (m)		Depth: (m)	
Chloride Content by Mass of Sample, %		Chloride Content by Mass of Sample, %	

Borehole Number		Borehole Number	
Sample Number		Sample Number	
Sample Location		Sample Location	
Depth: (m)		Depth: (m)	
Chloride Content by Mass of Sample, %		Chloride Content by Mass of Sample, %	

Remarks: _____

Reviewed By: *Quarles* P.Eng.