

July 17, 2019

ISSUED FOR USE  
FILE: ENG.VGEO03082-01

Summit Earthworks Inc.  
#109 – 32885 Mission Way  
Mission, BC V2V 6E4

**Attention:** Mr. Myles Hargrove

**Subject:** Derwent Way Soil Transfer and Barge Facility  
Geotechnical Report – Revision 5

## 1.0 INTRODUCTION

Tetra Tech Canada Inc. (Tetra Tech) was retained by Summit Earthworks Inc. to undertake a geotechnical exploration and provide a geotechnical report for the proposed Derwent Way transfer station located on a vacant lot adjacent to Derwent Way in New Westminster, British Columbia (BC). The purpose of this report is to address the requirements of the Port Metro Vancouver (PMV) Project and Environmental Review Application Submission Requirements.

This revision includes recommendations that were previously provided in our Technical Memo dated September 29, 2017, which included responses to comments provided by the Port of Vancouver. In addition, this report has been revised to reflect a new barge loading conveyor to replace the previous barge access ramp.

## 2.0 PROJECT DESCRIPTION

The proposed transfer station is approximately 2,600 m<sup>2</sup> in area and is bounded by Derwent Way to the west, Salter Street to the north, an access road and an industrial site to the east, and the Fraser River to the south. An existing SRY rail line is located on the west side of the site with a spur line that extends through the northern portion of the site. The site is currently covered with shrubs, grass, and some trees. The proposed development will include a weigh station, a temporary scale house, conveyor structure, and material stockpile area that is underlain by a liner to prevent migration of contamination, surrounded with a Lock-Block wall, and covered with a light-weight roof structure to prevent rainwater from saturating the stockpile. The stockpile area will be excavated approximately 1.5 m below existing site grades and the Lock-Block wall will extend approximately 3.25 m above existing site grades to allow for the temporary storage of stockpiles up to 5 m high until the material is transferred to a barge which will transport the material to a reclamation site. The current layout of the site is shown on Figure 1.

## 3.0 DESIGN CRITERIA

We understand that the proposed facility is under the jurisdiction of the federal government, and as such, the design of the transfer station will be undertaken based on the following:

- **Permanent Buildings (if needed):** Designed in accordance with the 2015 National Building Code of Canada (NBCC).
- **Conveyor Structure:** Designed in accordance with the Canadian Highway Bridge Design Code CAN/CSA-S6-14 (CHBDC CAN/CSA-S6-14).

The 2015 NBCC requires design of the structures for a seismic event with a return period of 2,475 years. The CHBDC CAN/CSA-S6-14 specifies several return periods (475, 975, and 2,475 years) with various Performance Levels depending on the classification of the structure, which should be determined by the structural engineer. The Performance Levels range from life safety to immediate service and from probable replacement to minimal damage. (Refer to CHBDC CAN/CSA-S6-14 Clause 4.4.6.1 and Table 4.15 for further information.)

## **4.0 SITE DEVELOPMENT HISTORY**

Tetra Tech completed a review of historic aerial photographs taken between 1949 and 2014. Review of the photographs indicate that the historic shoreline in 1949 was approximately 60 m north of the current shoreline. Filling of the shoreline began sometime between 1974 and 1979. The filling operations appear to have been almost complete as of 1984. The shoreline remains unchanged since 2001. The fill appears to be comprised of sand material, possibly sourced from dredging of the Fraser River.

Based on the above, we expect that the southern 60 m of the site is covered with fill. The thickness of the fill likely increases towards the south.

## **5.0 GEOTECHNICAL EXPLORATION PROGRAM**

Tetra Tech completed a geotechnical exploration on May 25, 2016 that included 5 solid-stem auger test holes with Dynamic Cone Penetration Tests (DCPT), 1 Cone Penetration Test (CPT), and 1 Seismic CPT (SCPT). The solid-stem auger holes advanced to depths ranging from 9.2 m to 12.2 m below existing grades while the DCPT tests advanced to depths ranging from 12.2 m to 13.4 m below existing grades. The CPT and SCPT were advanced to 30 m to 50 m below existing grade, respectively.

Tetra Tech personnel was on site during completion of the geotechnical exploration to log the soil stratigraphy and to collect disturbed soil samples. The test holes were backfilled with excavated material and bentonite seals in accordance with the British Columbia Groundwater Protection Regulations (2004).

Soil samples collected during the site exploration program were sent to Tetra Tech's soils laboratory in Nanaimo, BC for natural water content testing, Atterberg Limits, and additional visual classification. The results of the laboratory testing are provided on the test hole logs in Appendix B.

## **6.0 SUBSURFACE CONDITIONS**

### **6.1 Surficial Geology**

According to the Geological Survey of Canada Map 1484A, the soil conditions in the general area of the project site are anticipated to consist of Fraser River Sediments comprised of overbank silty to silty clay loam normally up to 2 m thick overlying deltaic channel fill consisting of sandy to silt loam, underlain by 10 m to 40 m thick interbedded fine to medium sand and minor silt beds. This stratigraphy does not include the fill material placed in the recent decades near the shoreline.

## 6.2 Interpreted Soil Stratigraphy

The soil conditions encountered during the May 25, 2016 geotechnical exploration are generally consistent with the anticipated surficial geology discussed in Section 5.1, and are summarized as follows:

- **FILL:** Fill material was encountered in all of the auger holes. The upper 0.2 m to 0.5 m of fill consisted of compact to dense sand and gravel. Below this layer, the fill consists of loose to compact sand that extends to depths ranging from 2.1 m to 5.3 m below existing grade. The fill generally increases in thickness from north to south. At TH16-05, the sand fill was underlain with a 0.3 m thick layer of silt with sand and then a 1.2 m thick layer of organics with gravel, sand, silt, and clay.
- **SILT and CLAY:** The fill is underlain by layers of silt and clay that extend to depths ranging from approximately 6 m to 13 m below existing site grades. The silt and clay is generally firm to stiff; however, some localized soft layers were also observed. The water content of the silt and clay generally ranges from 25% to 60%, except for one sample collected at TH16-05 at a depth of 5.7 m where the water content was 85%, which is likely due to organics in the sample.
- **SAND:** The CPTs encountered sand with variable fines content extending from a depth of approximately 14 m to approximately 34 m below existing site grades.
- **INTERBEDDED SAND AND SILT:** The CPTs encountered interbedded sand and silt from 34 m depth to the target (maximum) depth of the test hole, i.e. 50 m. However, based on previous explorations in the vicinity, it is expected that this layer is underlain by a layer of marine clay and then glacial till-like soils at depths in the order of 100 m (or greater).

## 6.3 Groundwater

Groundwater was encountered within each of the solid-stem auger test holes and measured in the CPT test holes at depths ranging from approximately 5 m to 6 m below existing grade. Due to the proximity of the Fraser River, and the soil conditions that underlie the site, groundwater levels are expected to vary seasonally and are likely strongly influenced by Fraser River.

## 7.0 GEOTECHNICAL CONSIDERATIONS

Based on the results of the geotechnical exploration and subsequent engineering analysis, we consider that the development of the proposed transfer facility is feasible from a geotechnical perspective if measures are taken to improve the site and design the structures according to the applicable Codes. The following sections provide the key geotechnical considerations for the development of the project site.

### 7.1 Settlement and Static Instability due to Surcharge

The soil conditions at the project site include layers of fine-grained soils that are normally consolidated. These soils are susceptible to long-term consolidation settlement and slope instability when subject to surcharge loads (i.e. building loads, permanent fill to raise site grades, and stockpiles).

### **7.1.1 Consolidation Settlement of Building Areas**

Without preloading building areas, total and differential post-construction settlements could be significant and may result in serviceability issues such as cracking of building facades and windows, door jambs out of plumb, doors not being able to close, etc. As such, any permanent building areas (if considered) should be preloaded with surcharge loads at least equal to the permanent building load. The preload should be left in place until the consolidation settlement of the fine-grained soils has sufficiently completed such that post-construction settlement of the building area is tolerable. The height and duration of the preloading will depend on the building size and loading. Detailed preloading plan and survey monitoring requirements will be prepared if permanent buildings are designed for the site.

### **7.1.2 Potential Settlement Due to Stockpile Surcharge**

The application of the stockpile surcharge, which we expect will have a maximum height of 5 m, will result in consolidation settlement of the underlying fine-grained soils. The total settlement of the fine-grained soil is expected to be in the order of 450 mm under the stockpile and in the order of 150 mm at the edge of the stockpile / containment berm.

Tetra Tech has reviewed the SRY settlement criteria outlined in the Railway Association of Canada Rules Respecting Track Safety document, which has several settlement requirements that when exceeded, the rail line will need to be re-leveled. The most stringent of the requirements is when differential settlement exceeds approximately 75 mm over a 20-m horizontal distance. The calculated maximum differential settlement as a result of the stockpile surcharge load is in the order of 30 mm to 40 mm over a horizontal distance of 10 m, which may exceed the requirements and could require that the rail line will have to be re-leveled at some point. We note that the document does not provide a limit to the total settlement, however, the expected maximum total settlement is in the order of 150 mm.

Since the expected settlement due to the stockpile surcharge may exceed the SRY settlement limit, Summit Earthworks should implement a settlement monitoring plan that includes the installation of several survey monitoring points on the containment berm, vegetated area between the berm and the rail line, the rail line (both rails), and the shoulder of Derwent Way. The monitoring points should be surveyed before any stockpile is placed to establish a baseline reading and then on a regular basis (approximately every 2 to 4 weeks) for the first 3 to 5 months to establish the rate of settlement. Tetra Tech will provide recommendations on the frequency of future monitoring depending on the initial survey monitoring results.

### **7.1.3 Static Slope Instability Due to Permanent Fill and Stockpiles**

The application of surcharge loading from permanent fill and stockpiles is expected to result in static slope instability at the shoreline. In order to prevent a slope failure, the surcharge loading will need to be applied in a staged manner such that the underlying fine-grained soils are consolidated and the strength improved before applying additional surcharge.

The height of each stage will depend on the setback of the surcharge from the top of the slope at the shoreline. However, we expect that the surcharge stages will range from approximately 1 m to 3 m in height for setbacks ranging from approximately 15 m to 10 m from the slope, respectively.

In order to monitor each stage to confirm when additional surcharge stages can be applied, survey monitoring and pore pressure measurements in the fine-grained soils (using vibrating wire piezometers) will need to be completed.

## 7.2 Seismic Liquefaction and Post-Liquefaction Ground Displacements

Liquefaction susceptibility of the subsurface soils was assessed using the procedures given by Idriss and Boulanger (2008) for CPT data. The assessment was completed based on the 1:2475-year design earthquake event, which is required by the 2015 NBCC and CHBDC CAN/CSA-S6-14. The analysis indicates that the sand material that underlies the site is susceptible to liquefaction to depths in the order of 20 m to 30 m below existing site grade.

Post-liquefaction ground displacements in the form of settlement, lateral spreading and flow slide are expected to occur as a result of the earthquake-induced liquefaction. Without completing ground improvement at the site, post-liquefaction settlements are expected to be in the order of 300 mm to 500 mm and are expected to be differential by approximately 75% of the total. In addition, lateral spreading and flow slide are expected to occur, which would result in very large displacements (in the order of several meters) toward the Fraser River. The magnitude of these displacements is expected to increase toward the shoreline.

## 7.3 Foundation Options

### 7.3.1 Permanent Buildings (if necessary)

The underlying soil conditions include a relatively thick “crust” layer of fine-grained silts and clays that will maintain sufficient shear strength to prevent punching failure. As such, lightly loaded temporary buildings may be supported on grade; however, permanent occupied buildings should be designed on a raft/mat foundation capable of tolerating the post-liquefaction displacements.

In addition to the preloading for permanent buildings discussed in Section 7.1.1, the organic fill material encountered in the northern portion of the site should be removed and replaced with structural fill and the existing sand fill should be compacted. The extent of this site preparation will depend on the size of any permanent building and the magnitude of the structural loads, however, at a minimum, the site preparation should extend at least 3 m beyond the permanent building lines.

### 7.3.2 Conveyor Structure

The conveyor structure should be supported on piles. Pile length and diameter depend on the structural loads and the expected performance level of the structure as per CHBDC CAN/CSA-S6-14. At this time, a conceptual design of the barge loading facility has been completed. Further analysis will be required to provide geotechnical recommendations and a foundation design.

Post-liquefaction displacement proximate to the shore line is expected for the 1:2475-year design earthquake event. As such, ground improvement (densification by vibro-replacement/vibro-floatation, deep mixing, etc.) may be required to reduce the magnitude of post-liquefaction displacements to within tolerable limits for structural design of the conveyor structure / pile foundations. Alternatively, soil-structure interaction (e.g. LPILE) analyses can be completed to develop a pile design that can accommodate loss of confinement due to flow slide liquefaction.

### 7.3.3 Roof Structure

The proposed roof structure has yet to be chosen, however, the roof is expected to be a pre-fabricated dome-like structure with relatively light loads. The roof will be supported on closely spaced supports that are founded on either the Lock-Block walls or shallow footings that are embedded at least 450 mm into the underlying sand fill. The sand fill will be compacted to provide suitable bearing support for the Lock-Block walls and shallow foundations. With proper site preparation, the Serviceability Limit State bearing resistance will be 100 kPa and the Ultimate Limit State bearing pressure will be 150 kPa, which will be suitable to support the proposed roof. The foundations will also be designed to be heavy enough, or deep enough, to resist uplift loads from wind.

## 7.4 Liner

As previously discussed, ground deformations are expected under surcharge loading (consolidation settlement) and under seismic conditions. The liner should be selected to resist the displacement demands.

## 8.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Summit Earthworks Inc. 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 Summit Earthworks Inc., 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. Tetra Tech's General Conditions are provided in Appendix A of this report.

## 9.0 CLOSURE

We trust this 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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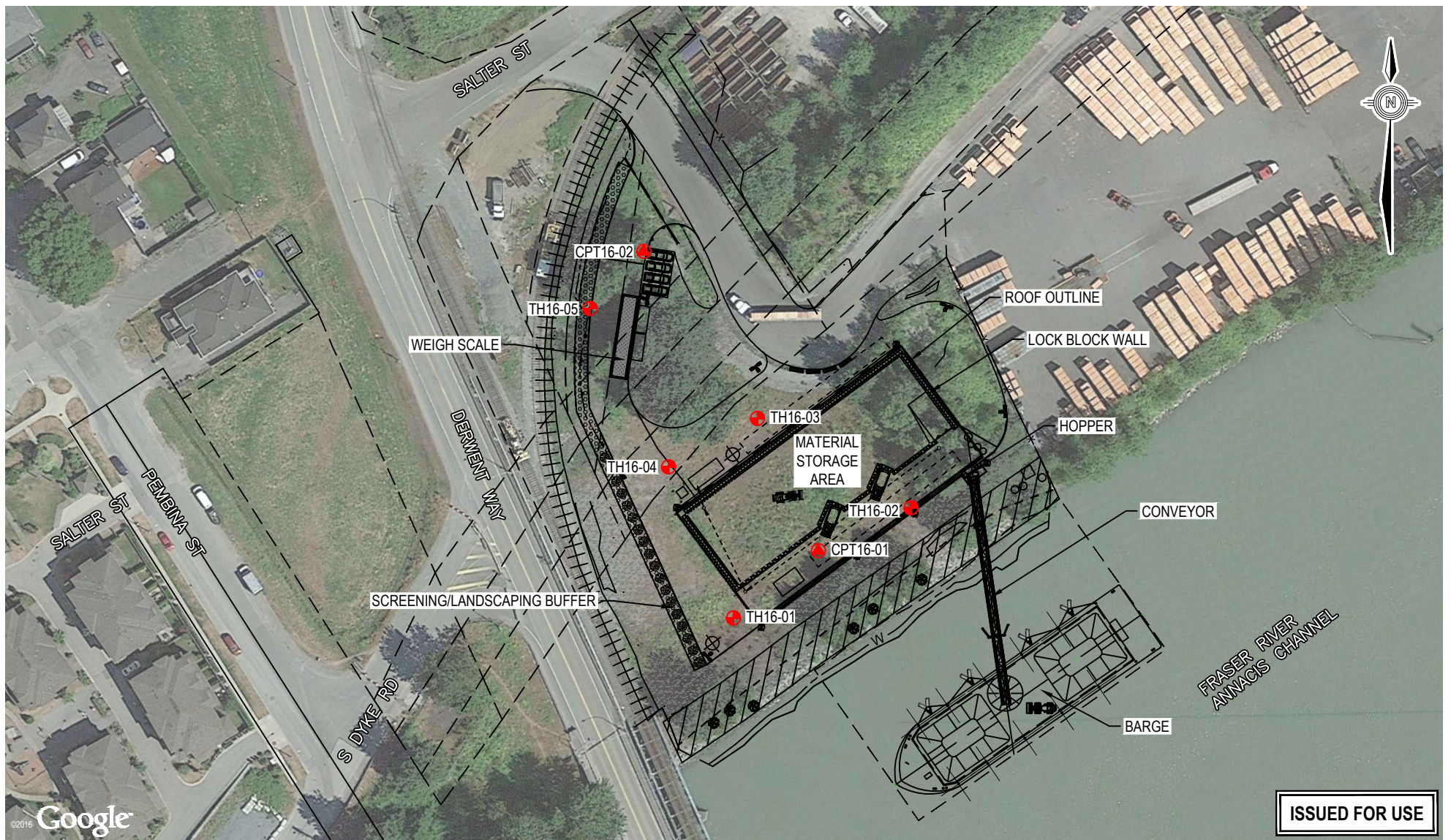
CT/AA

Attachments: Figure (1)  
Appendix A – Tetra Tech's General Conditions  
Appendix B – 2016 Tetra Tech Test Hole Logs

# FIGURES

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Figure 1      Geotechnical Subsurface Exploration Locations



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**LEGEND**

- Approximate Testhole Location
- ⊕ Approximate CPT Location

**NOTES**

1. Imagery from Google Earth Pro.
2. Based on Dwg. 03082-04 and 03082-100.
3. Refer to Vegetation plan.

SCALE 1:1250



CLIENT



**DERWENT WAY SOIL TRANSFER AND BARGE FACILITY  
ENVIRONMENTAL AIR ASSESSMENT  
FOR PORT METRO VANCOUVER**

**GEOTECHNICAL SUBSURFACE  
EXPLORATION LOCATIONS**

PROJECT NO. ENG.VGEO03082-01	DWN RH	CKD CT	REV 3
OFFICE VANC	DATE July 17, 2019		

**Figure 1**



# APPENDIX A

## TETRA TECH'S LIMITATIONS ON THE USE OF THIS DOCUMENT

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# LIMITATIONS ON USE OF THIS DOCUMENT

## GEOTECHNICAL

### 1.1 USE OF DOCUMENT AND OWNERSHIP

This document pertains to a specific site, a specific development, and a specific scope of work. The document may include plans, drawings, profiles and other supporting documents that collectively constitute the document (the "Professional Document").

The Professional Document is intended for the sole use of TETRA TECH's Client (the "Client") as specifically identified in the TETRA TECH Services Agreement or other Contractual Agreement entered into with the Client (either of which is termed the "Contract" herein). TETRA TECH does not accept any responsibility for the accuracy of any of the data, analyses, recommendations or other contents of the Professional Document when it is used or relied upon by any party other than the Client, unless authorized in writing by TETRA TECH.

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The Professional Document and any other form or type of data or documents generated by TETRA TECH during the performance of the work are TETRA TECH's professional work product and shall remain the copyright property of TETRA TECH.

The Professional Document is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of TETRA TECH. Additional copies of the Document, if required, may be obtained upon request.

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Where TETRA TECH submits electronic file and/or hard copy versions of the Professional Document or any drawings or other project-related documents and deliverables (collectively termed TETRA TECH's "Instruments of Professional Service"), only the signed and/or sealed versions shall be considered final. The original signed and/or sealed electronic file and/or hard copy version archived by TETRA TECH shall be deemed to be the original. TETRA TECH will archive a protected digital copy of the original signed and/or sealed version for a period of 10 years.

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.

### 1.3 STANDARD OF CARE

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

## 2016 TETRA TECH TEST HOLE LOGS

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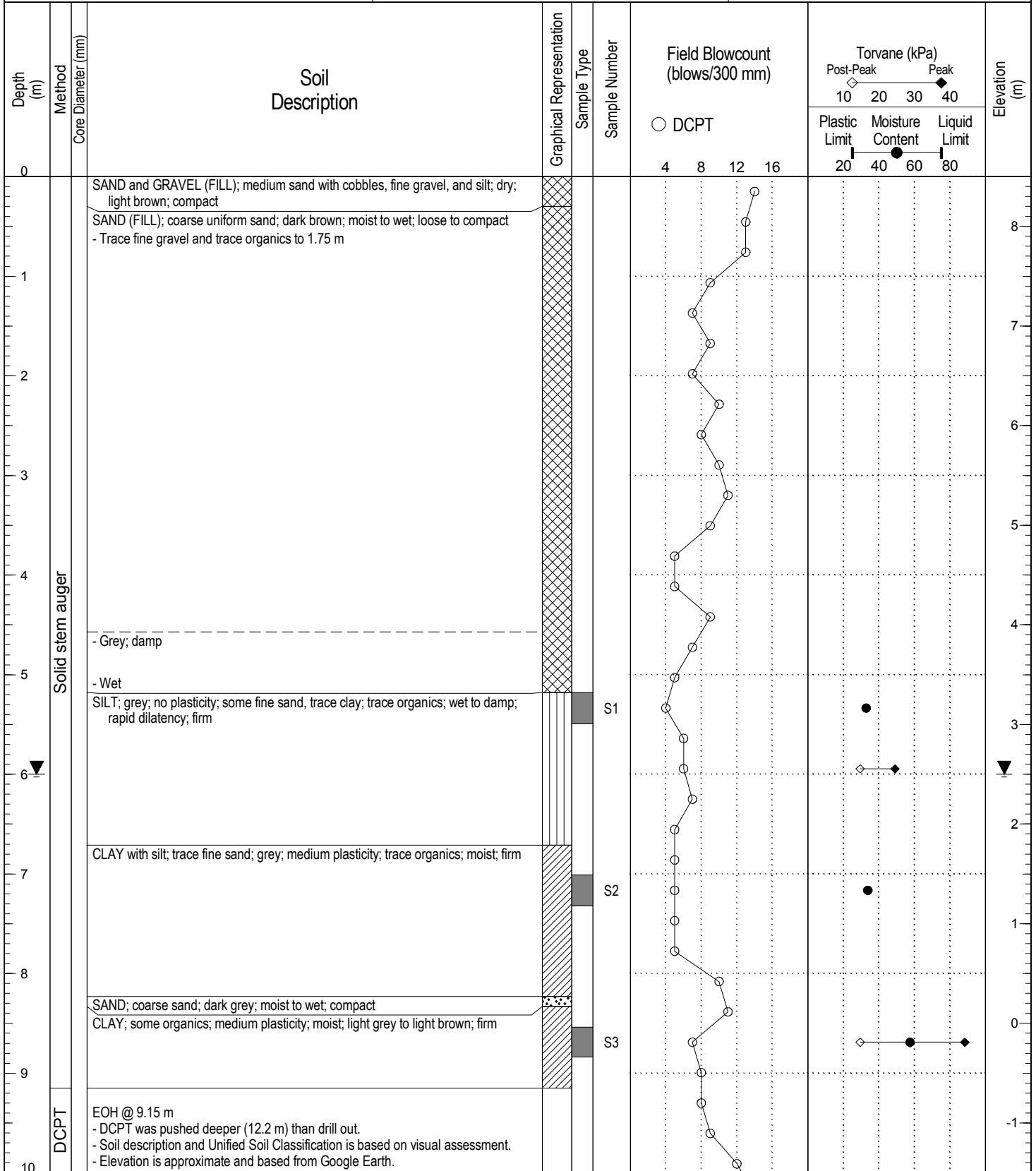


**SUMMIT**  
RECYCLING INC.

# Borehole No: TH15-01

Project: Contaminated Soils Transfer Facility  
Location: Derwent Way and Salter St  
New Westminster, BC

Project No: VGEO03082  
Ground Elev: 8.5 m



Contractor: Downrite Drilling	Completion Depth: 12.2 m
Drilling Rig Type: Auger Tracked	Start Date: May 25, 2016
Logged By: CMrak	Completion Date: May 25, 2016
Reviewed By:	Page 1 of 2



**SUMMIT**  
RECYCLING INC.

# Borehole No: TH15-01

Project: Contaminated Soils Transfer Facility

Project No: VGEO03082

Location: Derwent Way and Salter St

Ground Elev: 8.5 m

New Westminster, BC

Depth (m)	Method Core Diameter (mm)	Soil Description	Graphical Representation	Sample Type	Sample Number	Field Blowcount (blows/300 mm)	Torvane (kPa)			Elevation (m)	
							Post-Peak	Moisture Content	Peak		
10						○ DCPT 4    8    12    16	10	20	30	40	
11	DCPT	- Estimates of soil consistency were made from in situ test results and visual classification of samples. Estimates are based on engineering judgement.									-2
12						26					-3
13											-4
14											-5
15											-6
16											-7
17											-8
18											-9
19											-10
20											-11



**TETRA TECH EBA**

Contractor: Downrite Drilling

Completion Depth: 12.2 m

Drilling Rig Type: Auger Tracked

Start Date: May 25, 2016

Logged By: CMrak

Completion Date: May 25, 2016

Reviewed By:

Page 2 of 2

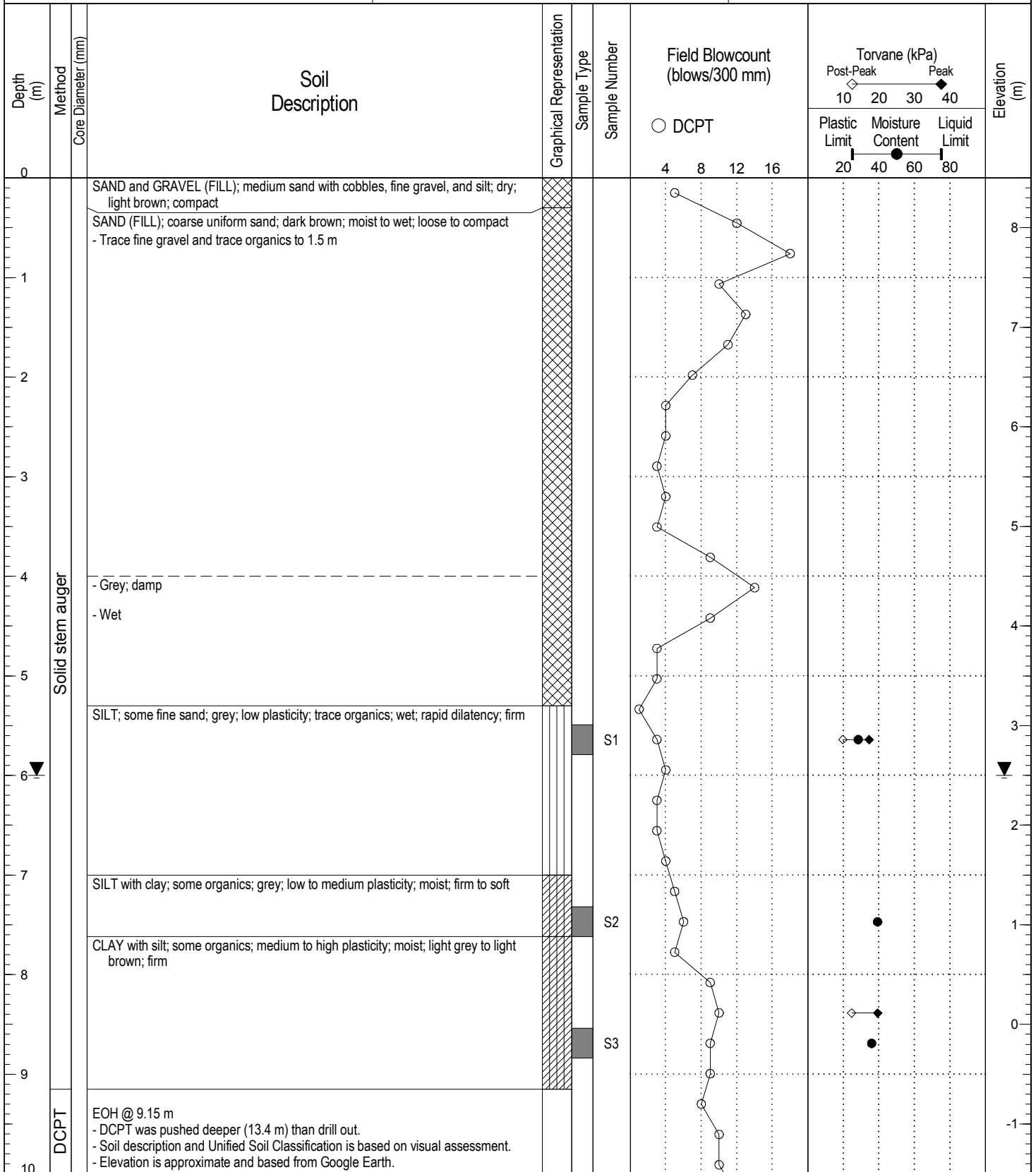


**SUMMIT**  
RECYCLING INC.

# Borehole No: TH15-02

Project: Contaminated Soils Transfer Facility  
Location: Derwent Way and Salter St  
New Westminster, BC

Project No: VGEO03082  
Ground Elev: 8.5 m



Contractor: Downrite Drilling  
Drilling Rig Type: Auger Tracked  
Logged By: CMrak  
Reviewed By:

Completion Depth: 13.4 m  
Start Date: May 25, 2016  
Completion Date: May 25, 2016  
Page 1 of 2



**SUMMIT**  
RECYCLING INC.

# Borehole No: TH15-02

Project: Contaminated Soils Transfer Facility

Project No: VGEO03082

Location: Derwent Way and Salter St

Ground Elev: 8.5 m

New Westminster, BC

Depth (m)	Method Core Diameter (mm)	Soil Description	Graphical Representation	Sample Type	Sample Number	Field Blowcount (blows/300 mm)	Torvane (kPa)			Elevation (m)	
							Post-Peak	Moisture Content	Peak		
10						○ DCPT	10	20	30	40	
		- Estimates of soil consistency were made from in situ test results and visual classification of samples. Estimates are based on engineering judgement.						Plastic Limit	Moisture Content	Liquid Limit	
	DCPT					4 8 12 16		20	40 60 80		
11											-2
12											-3
13											-4
											-5
14											-6
15											-7
16											-8
17											-9
18											-10
19											-11
20											



**TETRA TECH EBA**

Contractor: Downrite Drilling

Completion Depth: 13.4 m

Drilling Rig Type: Auger Tracked

Start Date: May 25, 2016

Logged By: CMrak

Completion Date: May 25, 2016

Reviewed By:

Page 2 of 2



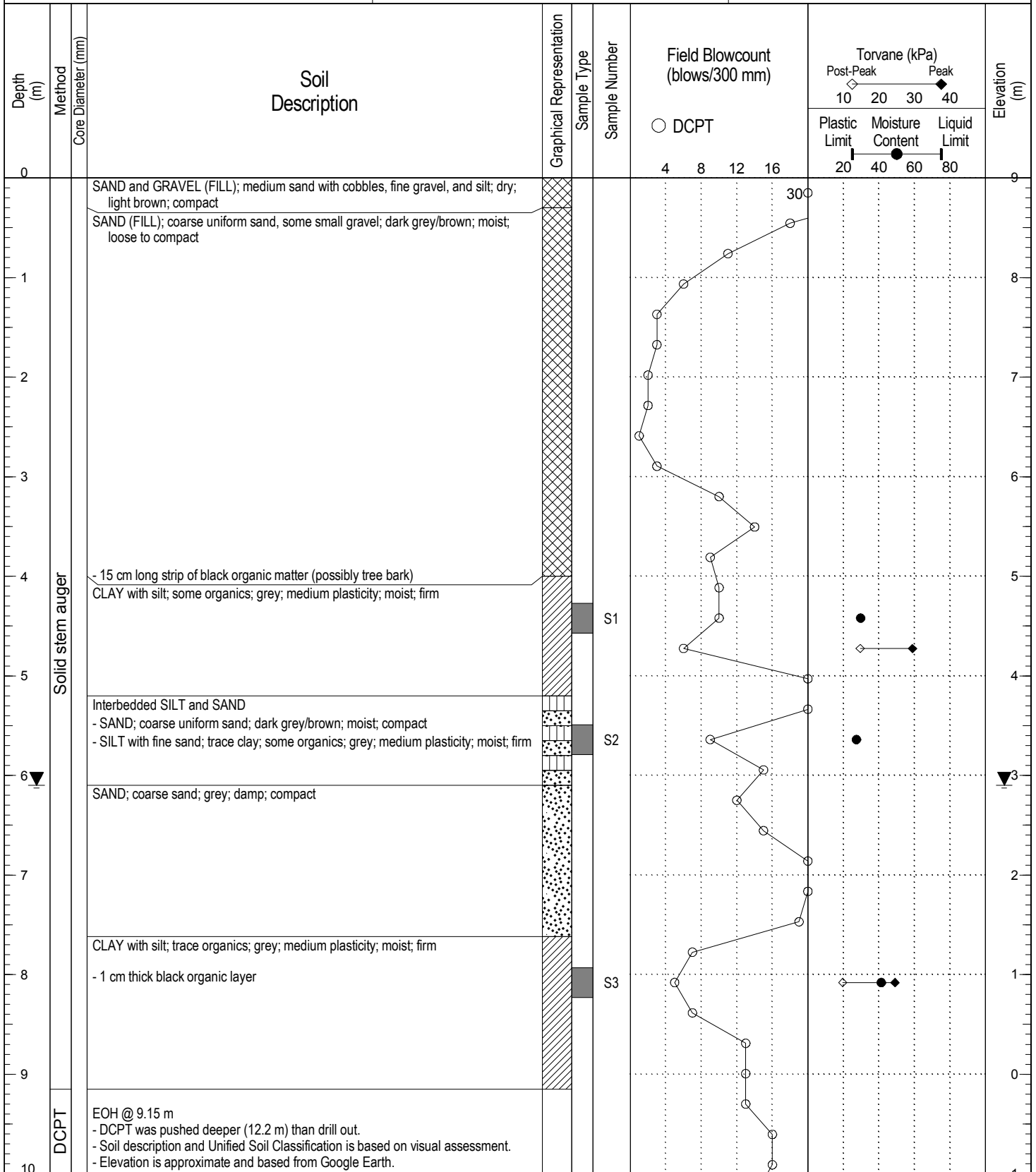


**SUMMIT**  
RECYCLING INC.

# Borehole No: TH15-03

Project: Contaminated Soils Transfer Facility  
Location: Derwent Way and Salter St  
New Westminster, BC

Project No: VGEO03082  
Ground Elev: 9 m



**TETRA TECH EBA**

Contractor: Downrite Drilling  
Drilling Rig Type: Auger Tracked  
Logged By: CMrak  
Reviewed By:

Completion Depth: 12.2 m  
Start Date: May 25, 2016  
Completion Date: May 25, 2016  
Page 1 of 2



**SUMMIT**  
RECYCLING INC.

# Borehole No: TH15-03

Project: Contaminated Soils Transfer Facility

Project No: VGEO03082

Location: Derwent Way and Salter St

Ground Elev: 9 m

New Westminster, BC

Depth (m)	Method Core Diameter (mm)	Soil Description	Graphical Representation	Sample Type	Sample Number	Field Blowcount (blows/300 mm)	Torvane (kPa)			Elevation (m)
							Post-Peak	Moisture Content	Peak	
10	DCPT	- Estimates of soil consistency were made from in situ test results and visual classification of samples. Estimates are based on engineering judgement.				○ DCPT 4 8 12 16	10	40		-1
11							20	60		-2
12										-3
13										-4
14										-5
15										-6
16										-7
17										-8
18										-9
19										-10
20										-11



**TETRA TECH EBA**

Contractor: Downrite Drilling

Completion Depth: 12.2 m

Drilling Rig Type: Auger Tracked

Start Date: May 25, 2016

Logged By: CMrak

Completion Date: May 25, 2016

Reviewed By:

Page 2 of 2

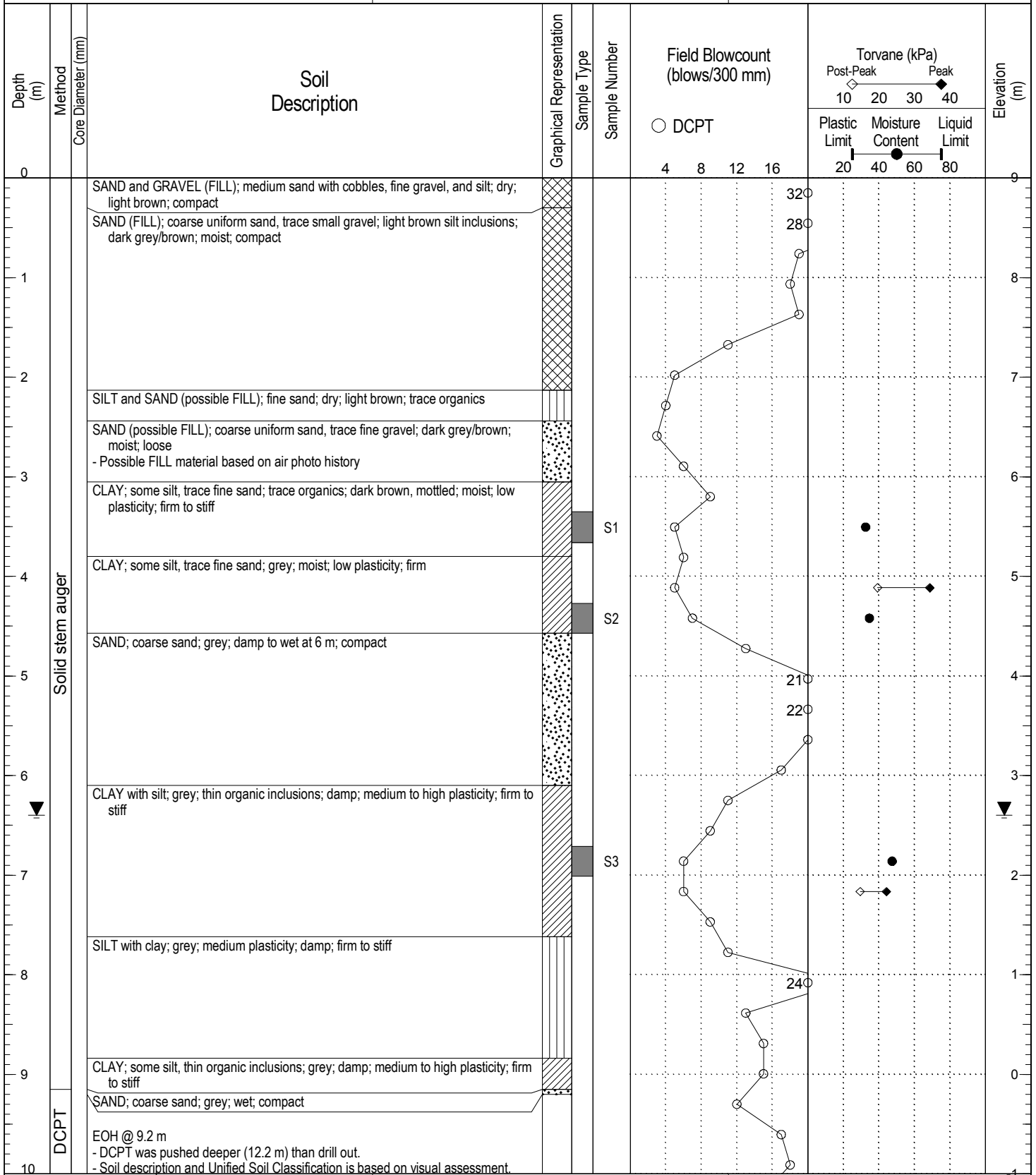


**SUMMIT**  
RECYCLING INC.

# Borehole No: TH15-04

Project: Contaminated Soils Transfer Facility  
Location: Derwent Way and Salter St  
New Westminster, BC

Project No: VGEO03082  
Ground Elev: 9 m



**TETRA TECH EBA**

Contractor: Downrite Drilling  
Drilling Rig Type: Auger Tracked  
Logged By: CMrak  
Reviewed By:

Completion Depth: 12.2 m  
Start Date: May 25, 2016  
Completion Date: May 25, 2016  
Page 1 of 2



**SUMMIT**  
RECYCLING INC.

# Borehole No: TH15-04

Project: Contaminated Soils Transfer Facility

Project No: VGEO03082

Location: Derwent Way and Salter St

Ground Elev: 9 m

New Westminster, BC

Depth (m)	Method Core Diameter (mm)	Soil Description	Graphical Representation	Sample Type	Sample Number	Field Blowcount (blows/300 mm)	Torvane (kPa)			Elevation (m)
							Post-Peak	Moisture Content	Peak	
10										
11	DCPT	- Elevation is approximate and based from Google Earth. - Estimates of soil consistency were made from in situ test results and visual classification of samples. Estimates are based on engineering judgement.								
12						21 28				
13										
14										
15										
16										
17										
18										
19										
20										



**TETRA TECH EBA**

Contractor: Downrite Drilling

Completion Depth: 12.2 m

Drilling Rig Type: Auger Tracked

Start Date: May 25, 2016

Logged By: CMrak

Completion Date: May 25, 2016

Reviewed By:

Page 2 of 2



**SUMMIT**  
RECYCLING INC.

# Borehole No: TH15-05

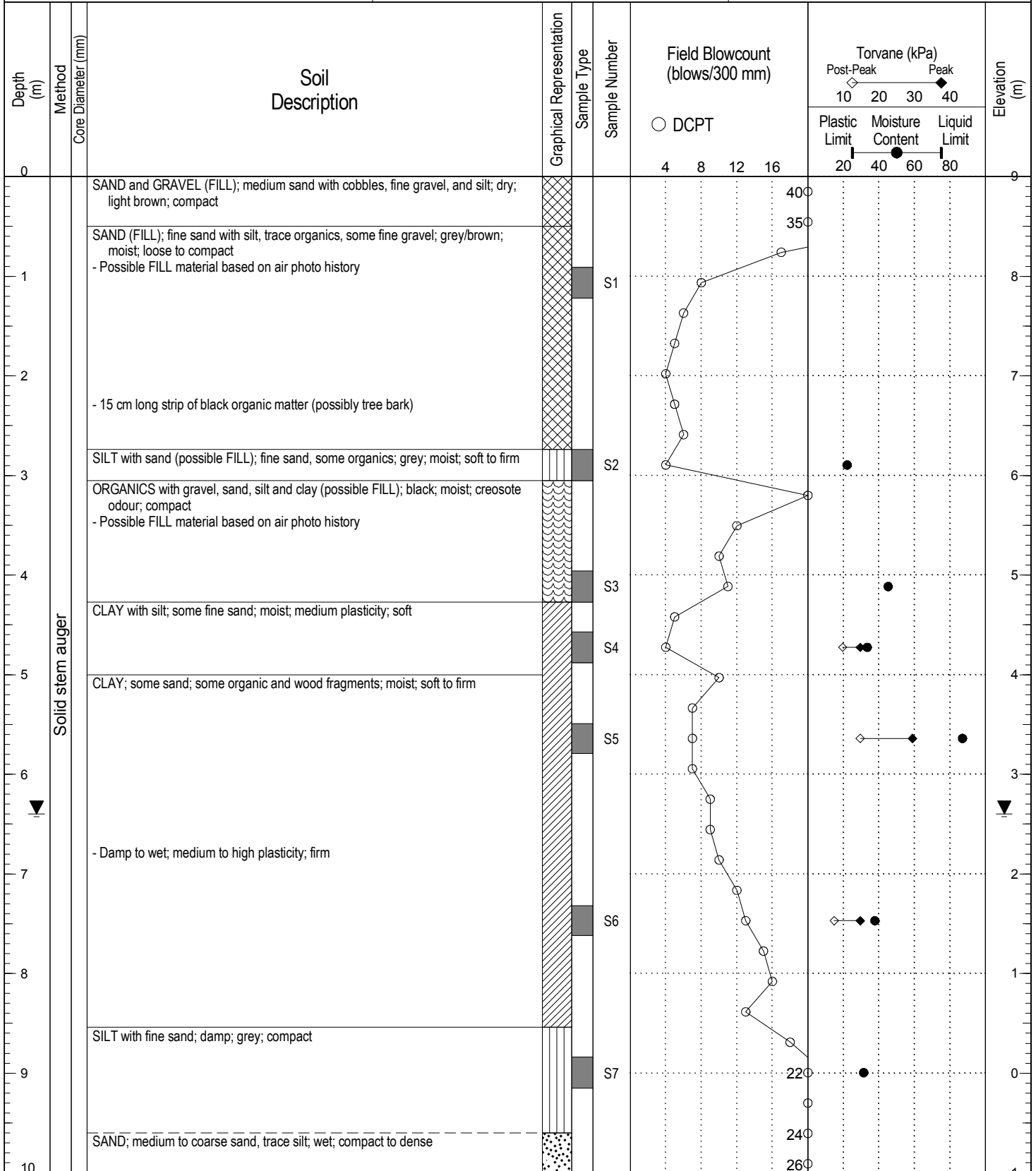
Project: Contaminated Soils Transfer Facility

Project No: VGEO03082

Location: Derwent Way and Salter St

Ground Elev: 9 m

New Westminster, BC



**TETRA TECH** EBA

Contractor: Downrite Drilling

Completion Depth: 12.2 m

Drilling Rig Type: Auger Tracked

Start Date: May 25, 2016

Logged By: CMrak

Completion Date: May 25, 2016

Reviewed By:

Page 1 of 2



**SUMMIT**  
RECYCLING INC.

# Borehole No: TH15-05

Project: Contaminated Soils Transfer Facility

Project No: VGE003082

Location: Derwent Way and Salter St

Ground Elev: 9 m

New Westminster, BC

Depth (m)	Method Core Diameter (mm)	Soil Description	Graphical Representation	Sample Type	Sample Number	Field Blowcount (blows/300 mm)	Torvane (kPa)			Elevation (m)
							Post-Peak	Moisture Content	Peak	
10						○ DCPT 4    8    12    16	10    20    30    40	Plastic Limit 20    40    60    80		
11	Solid stem auger		[Graphical Representation]			45○ 50○				
12										
13		EOH @ 12.2 m - Soil description and Unified Soil Classification is based on visual assessment. - Elevation is approximate and based on Google Earth. - Estimates of soil consistency were made from in situ test results and visual classification of samples. Estimates are based on engineering judgement.								
14										
15										
16										
17										
18										
19										
20										



**TETRA TECH EBA**

Contractor: Downrite Drilling

Completion Depth: 12.2 m

Drilling Rig Type: Auger Tracked

Start Date: May 25, 2016

Logged By: CMrak

Completion Date: May 25, 2016

Reviewed By:

Page 2 of 2



# Tetra Tech EBA

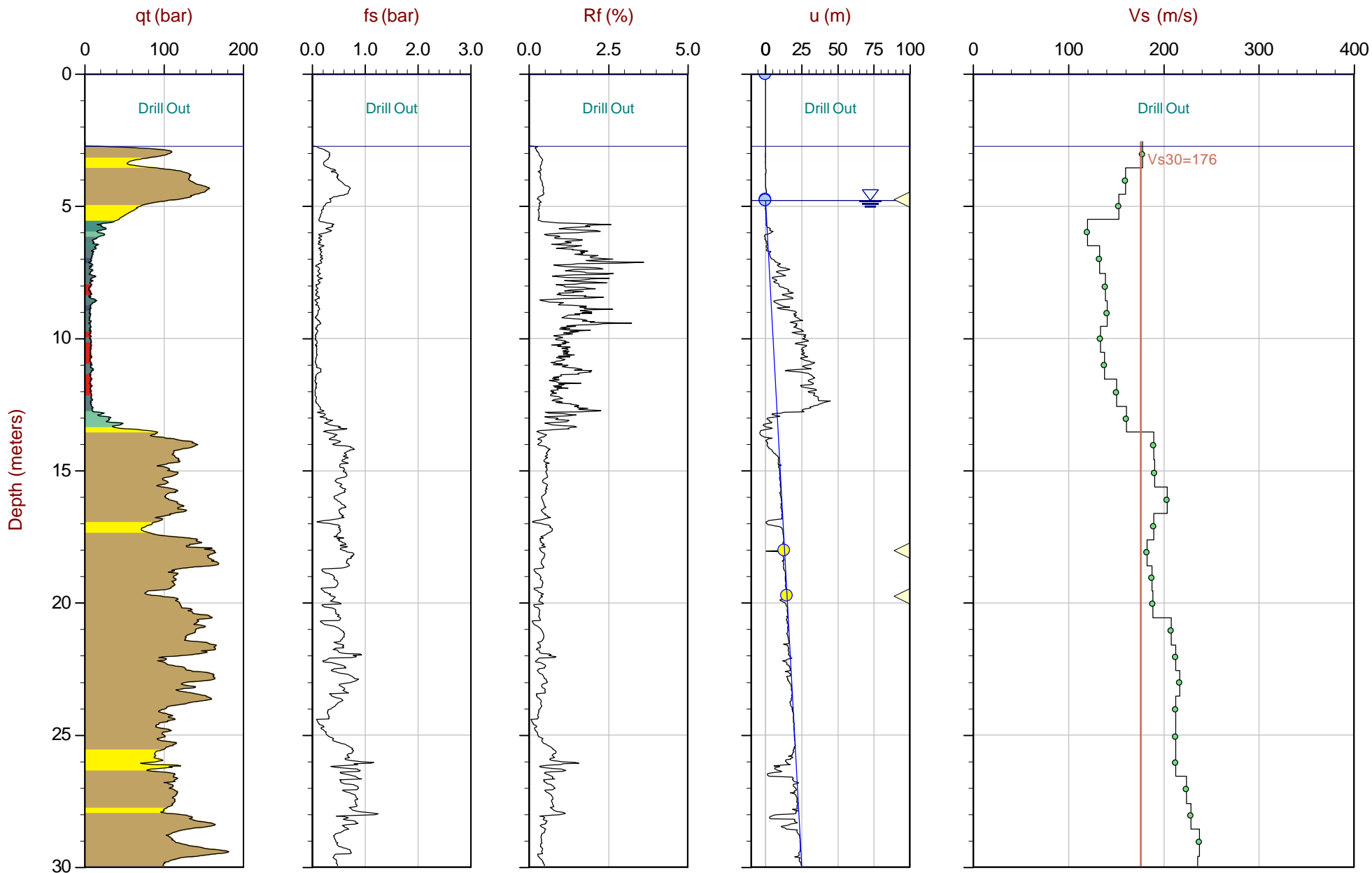
Job No: 16-02039

Date: 05:25:16 10:36

Site: Derwent Way & Salter St.

Sounding: SCPT16-01

Cone: 412:T1500F15U500



Max Depth: 50.000 m / 164.04 ft

Depth Inc: 0.025 m / 0.082 ft

Avg Int: 0.200m

Overplot Item:

- Assumed Ueq
- Ueq

File: 16-02039\_SP01.COR

Unit Wt: SBT Zones

- Dissipation, equilibrium achieved
- Dissipation, equilibrium assumed

SBT: Robertson and Campanella, 1986

Coords: UTM10N N: 5448289m E: 504941m

Sheet No: 1 of 2

Hydrostatic Line



# Tetra Tech EBA

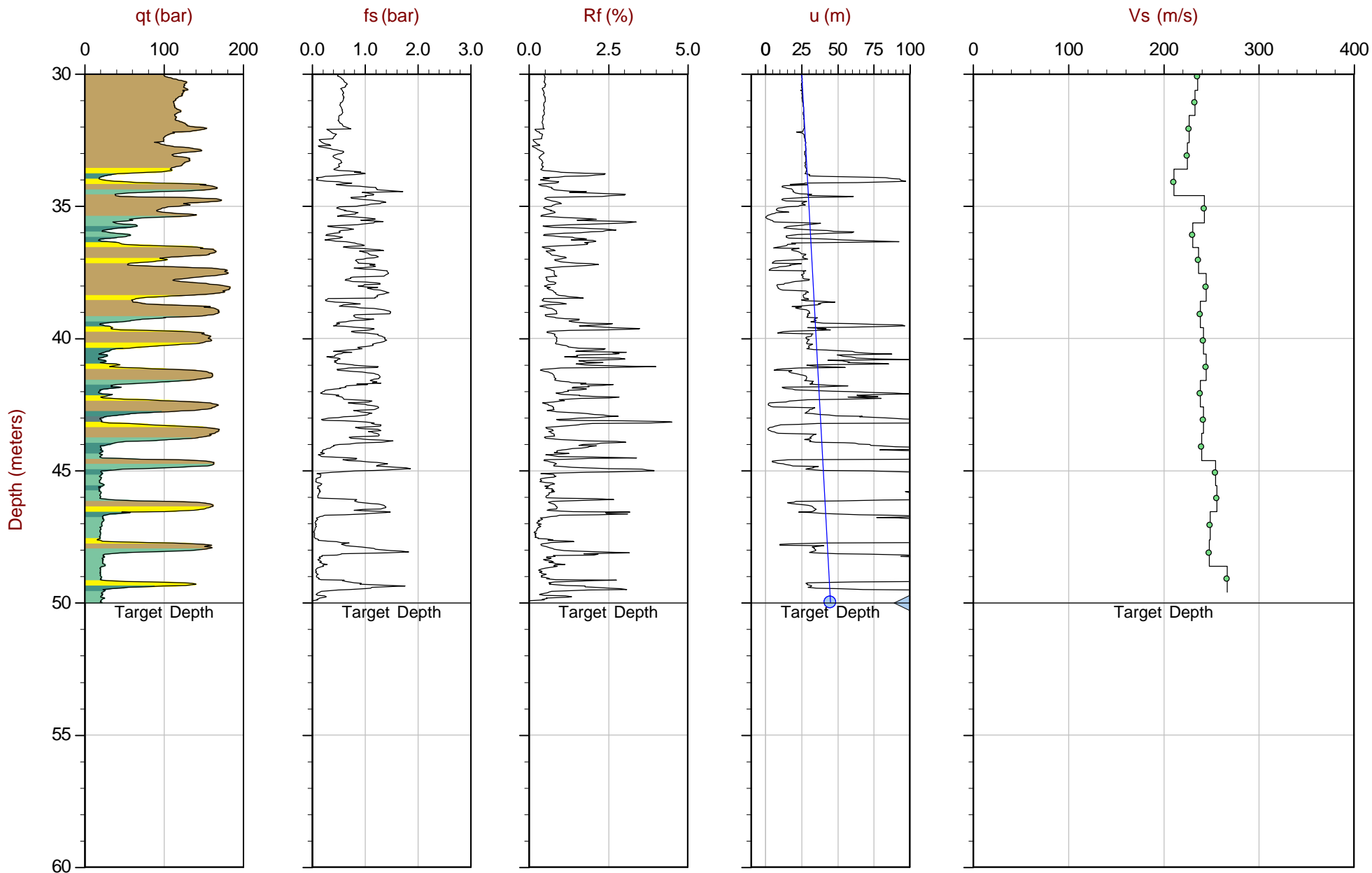
Job No: 16-02039

Date: 05:25:16 10:36

Site: Derwent Way & Salter St.

Sounding: SCPT16-01

Cone: 412:T1500F15U500



Max Depth: 50.000 m / 164.04 ft

Depth Inc: 0.025 m / 0.082 ft

Avg Int: 0.200m

Overplot Item:

- Assumed Ueq
- Ueq

File: 16-02039\_SP01.COR

Unit Wt: SBT Zones

- ◀ Dissipation, equilibrium achieved
- ◀ Dissipation, equilibrium assumed

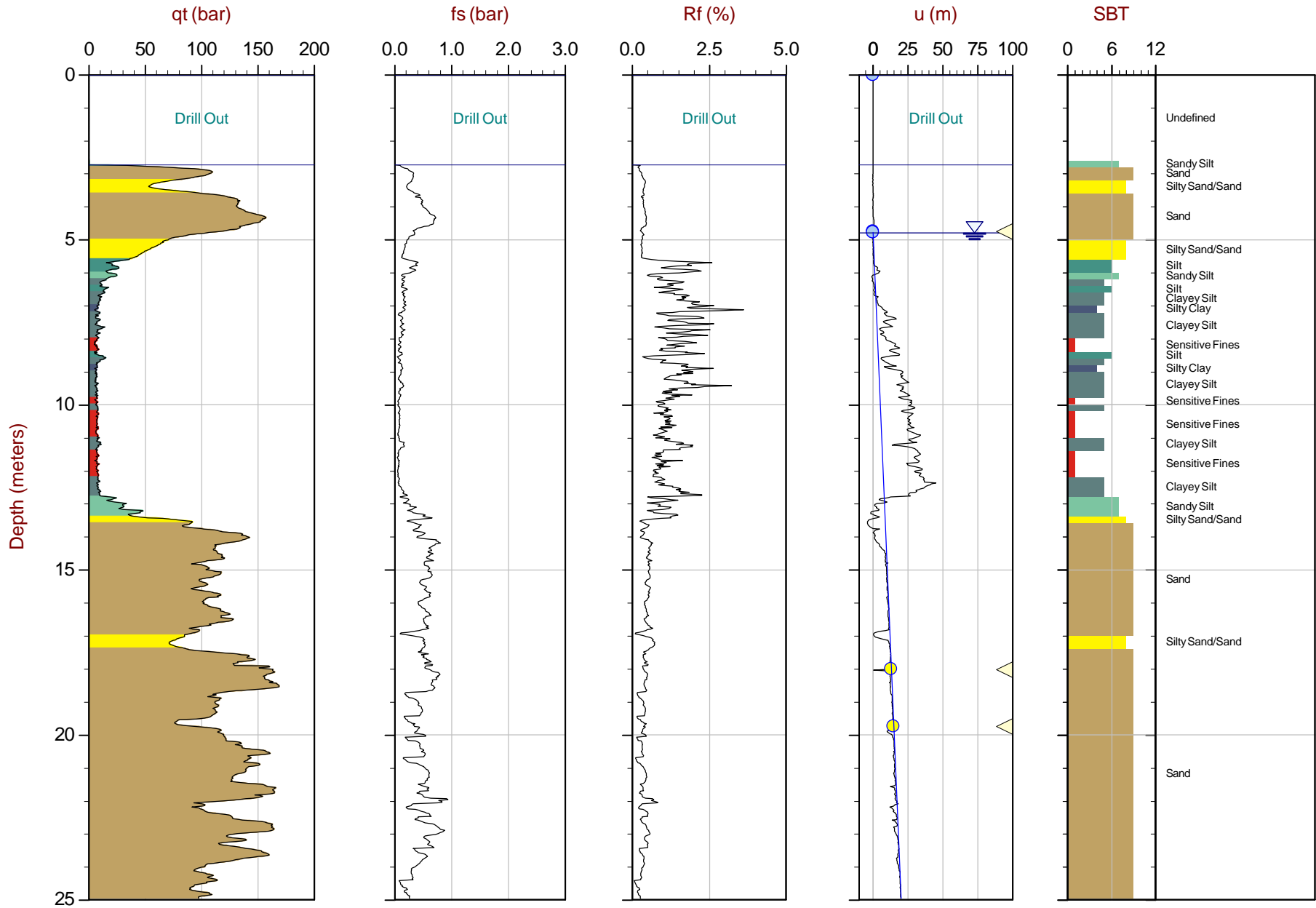
SBT: Robertson and Campanella, 1986

Coords: UTM 10N N: 5448289m E: 504941m

Sheet No: 2 of 2

- Hydrostatic Line



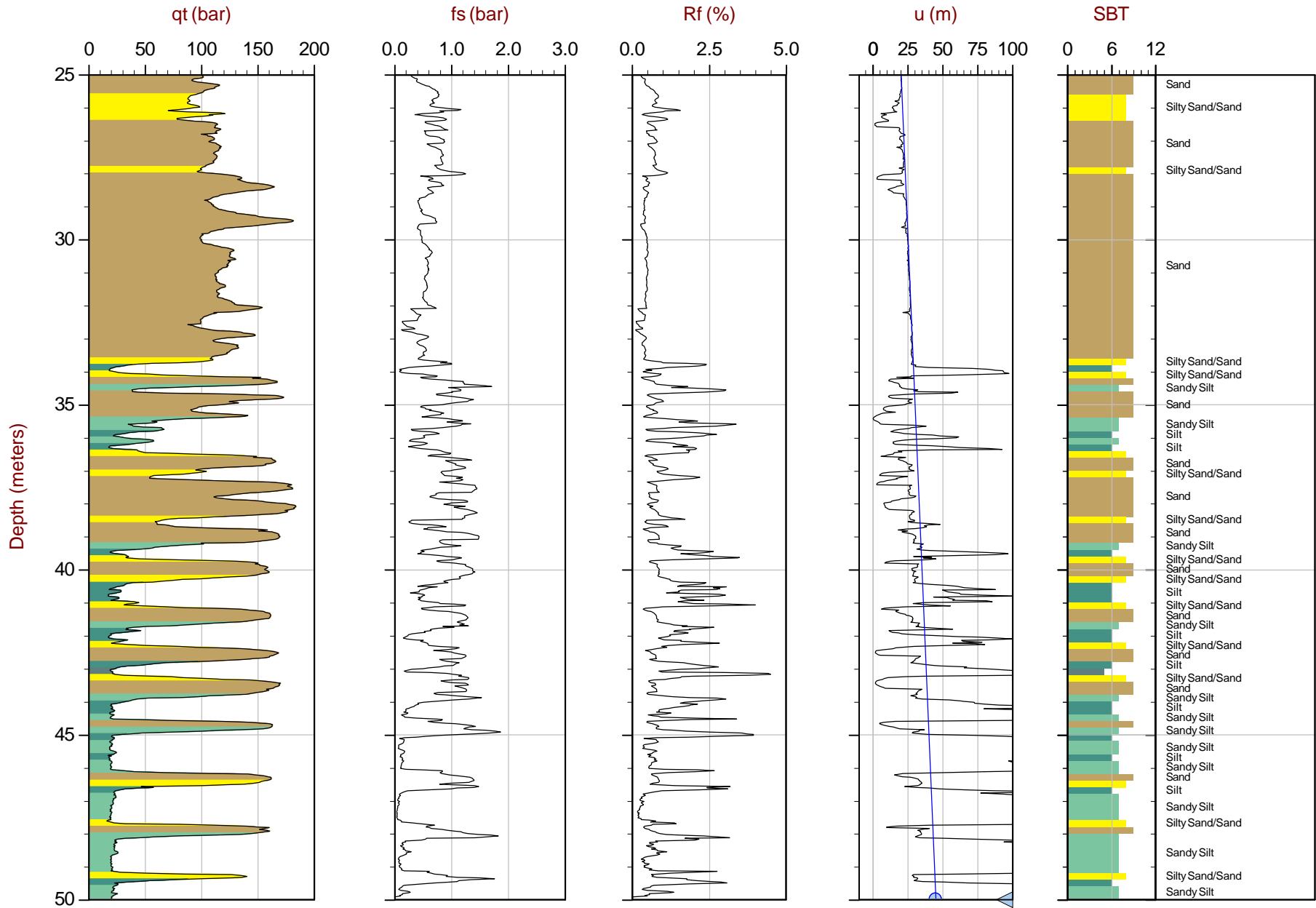


Max Depth: 50.000 m / 164.04 ft  
 Depth Inc: 0.025 m / 0.082 ft  
 Avg Int: 0.200m

File: 16-02039\_SP01.COR  
 Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986  
 Coords: UTM10N N:5448289m E:504941m  
 Sheet No: 1 of 2

Overplot Item: ● Assumed Ueq    ▲ Dissipation, equilibrium achieved    — Hydrostatic Line  
● Ueq    ▲ Dissipation, equilibrium assumed

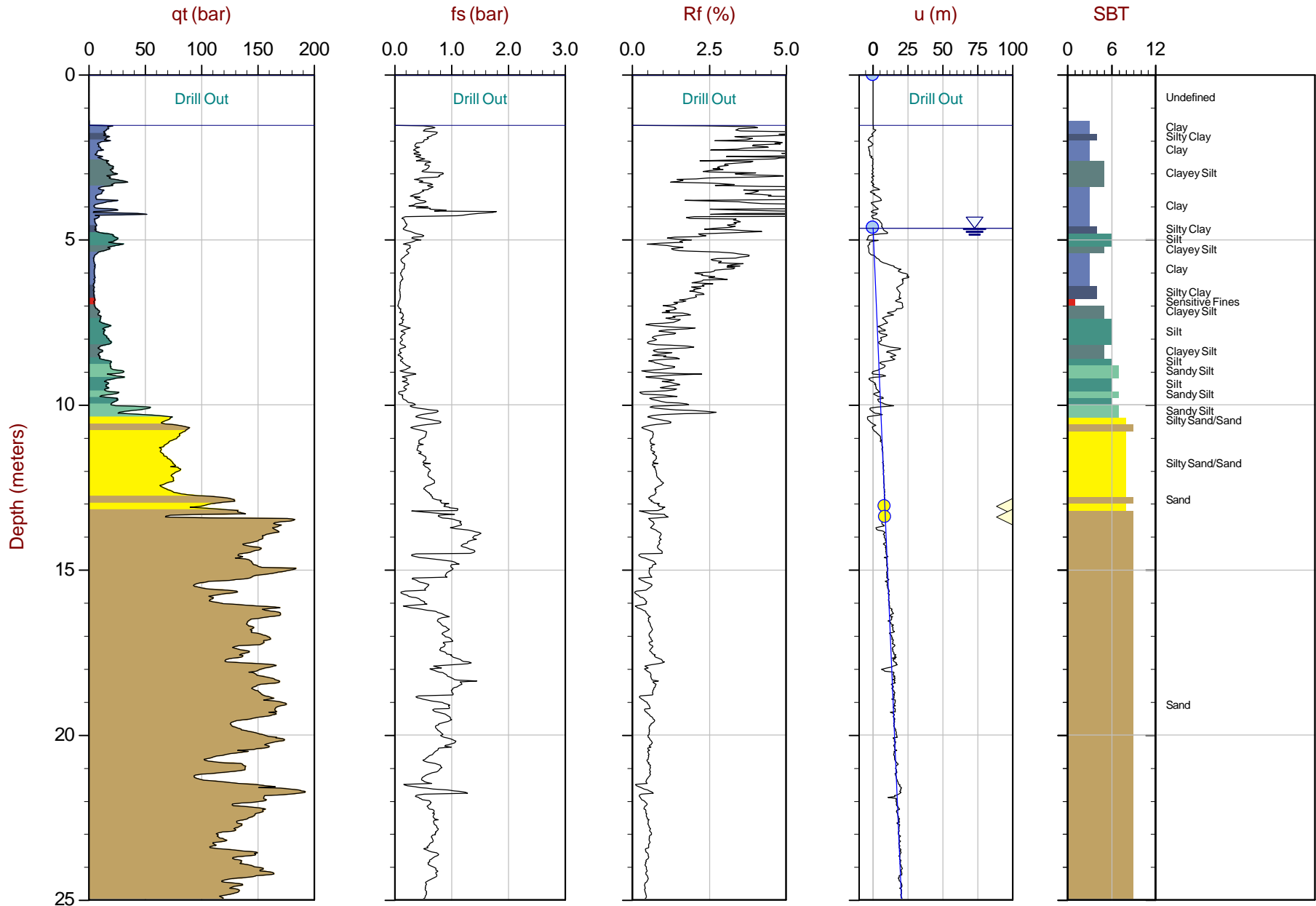


Max Depth: 50.000 m / 164.04 ft  
 Depth Inc: 0.025 m / 0.082 ft  
 Avg Int: 0.200m

File: 16-02039\_SP01.COR  
 Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986  
 Coords: UTM10N N: 5448289m E: 504941m  
 Sheet No: 2 of 2

Overplot Item: ● Assumed Ueq    ▲ Dissipation, equilibrium achieved    — Hydrostatic Line  
● Ueq    ▲ Dissipation, equilibrium assumed

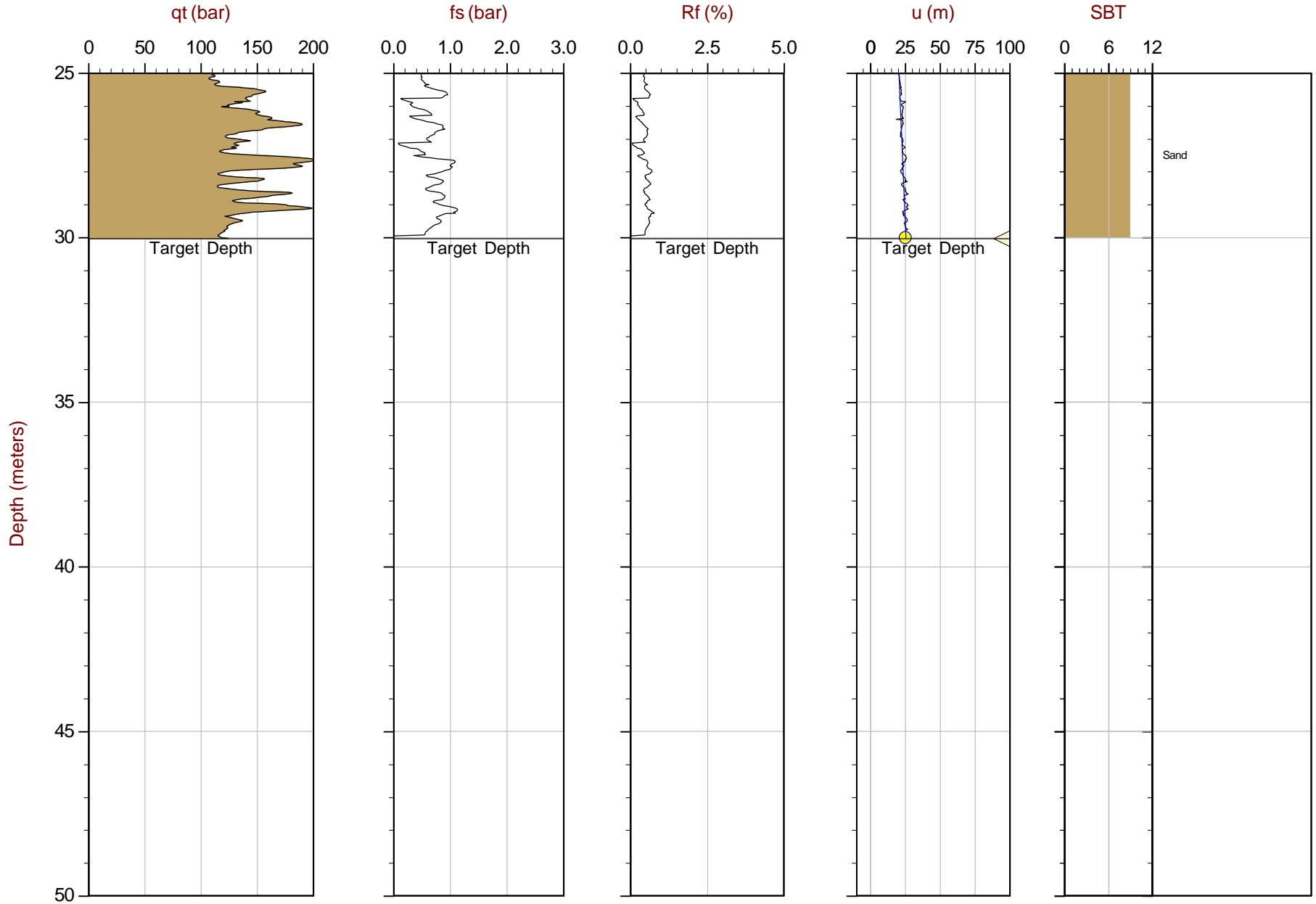


Max Depth: 30.025 m / 98.51 ft  
 Depth Inc: 0.025 m / 0.082 ft  
 Avg Int: 0.200m

File: 16-02039\_CP02.COR  
 Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986  
 Coords: UTM 10N N: 5448356m E: 504901m  
 Sheet No: 1 of 2

Overplot Item: ● Assumed Ueq ● Ueq ▲ Dissipation, equilibrium achieved ▲ Dissipation, equilibrium assumed — Hydrostatic Line



Max Depth: 30.025 m / 98.51 ft

Depth Inc: 0.025 m / 0.082 ft

Avg Int: 0.200 m

Overplot Item:

- Assumed Ueq
- Ueq

File: 16-02039\_CP02.COR

Unit Wt: SBT Zones

- ◁ Dissipation, equilibrium achieved
- ▷ Dissipation, equilibrium assumed

SBT: Robertson and Campanella, 1986

Coords: UTM 10N N: 5448356m E: 504901m

Sheet No: 2 of 2

— Hydrostatic Line