

***Foundations,  
Excavation &  
Shoring  
Specialists***

Braun Geotechnical  
102 – 19049 95A Ave  
Surrey, BC V4N 4P3  
Tel: 604-513-4190  
Fax: 604-513-4195  
[info@braungeo.com](mailto:info@braungeo.com)

[www.braungeo.com](http://www.braungeo.com)

***Foundations***

***Excavation &  
Shoring***

***Slope Stability***

***Natural Hazards***

***Pavement Design  
and Management***

***Reinforced Soil  
Walls and Slopes***

February 20, 2020

Our File: 13-5854

Via email: [chloe.stone@xcg.com](mailto:chloe.stone@xcg.com)

**XCG Consultants Ltd.**  
10455 – 84<sup>th</sup> Avenue  
Edmonton, AB  
T6E 2H3

**Attn: Chloe Stone, B.Sc., P.Eng.**

**Re: Preliminary Geotechnical Report**  
Sechelt Landfill Sinkhole  
4905 Dusty Road, Sechelt, BC

## **1.0 INTRODUCTION**

As requested, Braun Geotechnical Ltd. has completed a localized geotechnical exploration for the above referenced project. The purpose of the exploration was to investigate the soil and fill conditions in the area of a sinkhole that recently appeared in the northwest corner of the site.

Collection of soil and groundwater samples for environmental testing purposes was beyond the scope of our services.

## **2.0 SITE AND PROJECT DESCRIPTION**

The subject area is located at the northwest corner of the Sechelt Landfill site. The area of interest was filled about 1.5 m to 2.0 m above surrounding grade. Fill placed in this area is retained by gravity Lock Block retaining walls or sloped down to meet existing grades.

In our discussion with site staff, we were informed that besides stripping of the site, there has been no mining of soil from beneath the subject area. From our air photo review, clearing and development of the subject site was observed in the 1967 and newer air photos, with the footprint of the landfill increasing to the current cleared dimensions in the 1998 air photo.



It was also noted that voids had formed beneath a concrete slab located at the northwest corner of the site.

## **3.0 SUBSURFACE EXPLORATION**

On February 3, 2019, we mobilized personnel and a drill rig to the site to explore the soil conditions in the area of the sinkhole and the extent of the MSW/drywall material. A total of eleven solid stem auger holes were advanced to about 3 m depth. Nine Dynamic Cone Penetration Tests (DCPTs) were conducted adjacent to select auger hole locations to a maximum depth of about 4.3 m. Approximate test hole locations are shown on the attached Test Hole Location Plan (Dwg. No. 13-5854-01).

The soil conditions were logged in the field and representative disturbed soil samples were collected from the auger flights by a Braun Geotechnical field engineer.

A test pit was excavated at the location of the observed sinkhole by a track mounted excavator under the direction of landfill operations staff. About 1 m of surficial granular fill over about 300 mm of drywall, possibly supported on construction debris was observed. A void was observed beneath the drywall materials (see Photos 1 and 2). The bottom of the void was not investigated. The test pit was backfilled with granular fill (minus 150 mm sand and gravel).

	
<b>Photo 1:</b> Void beneath drywall material	<b>Photo 2:</b> Void beneath drywall material

#### 4.0 SOIL AND GROUNDWATER CONDITIONS

The results of the drilling exploration are summarized below. The attached test hole logs provide detailed descriptions of the conditions encountered and should be used in preference to the generalized descriptions provided below.

##### SAND AND GRAVEL (FILL)

Dark brown to brown, damp, very loose to very dense, fine to coarse SAND and fine to medium GRAVEL (in varying proportions) with trace silt was encountered below existing grades to depths of 0.7 m to 2.6 m. DCPT penetration rates varied between 11 to greater than 100 blows per 300 mm.

##### MUNICIPAL SOLID WASTE (MSW)

Grey to white, moist, soft to firm, water softened, drywall (MSW), locally with some wood fragments, mixed with trace to some sand, carpet material and ash(?). MSW was encountered in TH20-1 to -4, -7 to -8 and -10 below the surficial granular fill. The thickness of the MSW varied between 0.3 m and 1.5 m. DCPT penetration rates varied between 3 to 13 blows per 300 mm.

In AH20-9, a 0.6 m thick layer of MSW comprising brick, vitrified pipe and tile fragments, wire and asphalt pieces was encountered. DCPT penetration rates varied between 8 and 9 blows per 300 mm through this material.

#### SAND AND GRAVEL

Rusty brown, moist, loose to very dense SAND and GRAVEL (in varying proportions) with trace silt. The full thickness of this layer was not explored. DCPT penetration rates through this material varied between 7 blows to greater than 100 blows per 300 mm. This is assumed to be natural soil.

#### GROUNDWATER

Groundwater seepage was not encountered in the test holes. The subject area is elevated above surround grades. Minor groundwater seepage within the fill and MSW should be expected during periods of intense and prolonged periods of precipitation.

The subsurface conditions described above were encountered at the test hole locations only and actual conditions could vary between test holes.

Terraprobe Geoscience Corp. recently completed a ground penetrating radar exploration program on the Sechelt Landfill site. For completeness, the results of Terraprobe's work have been overlaid onto the test hole Location Plan (see Dwg. No. 13-5854-01). Terraprobe's report should be referred to for details regarding the results of their work.

## **5.0 DISCUSSION AND RECOMMENDATIONS**

### **5.1 General**

The subject area is covered with a veneer of granular fill that overlies MSW. The MSW comprises various materials including drywall and other debris/materials over natural deposits of sand and gravel. We understand that in the 1970's, the site was stripped of topsoil prior to placement of MSW.

### **5.2 Sinkhole and Voids within the MSW and Granular Fill**

There is no historical information regarding MSW placement procedures/methodology in this area. From our observations of the test pit excavation (at the sinkhole), the drywall material appears to have been placed on top of construction debris such that the material was suspended/supported by the debris which resulted in a void. It is likely that as the drywall material degraded, the granular fill supported by the drywall likely collapsed into the void and a sinkhole eventually formed at the ground surface. Groundwater within the fill and surface water entering from above could accelerate the collapse of the fill.

The test holes and DCPTs completed in this area did not intersect/encounter any voids.

### **5.3 Sinkhole/Void Remediation Options**

Several options could be considered to remediate or reduce the risk of further formation of sinkholes in the ground surface, as described below. It should be noted that the drywall may contain hazardous material, and any work that disturbs or exposes the drywall should be carried out under the direction of a qualified consultant or contractor.

#### **5.3.1 Managed Approach**

Consideration could be given to a managed approach to deal with the sinkholes. This would entail only remediating sinkholes as they appear. This approach could include regular monitoring of the area for the presence of sinkholes and limiting access to the area if a sinkhole appears. We

understand that there is equipment and materials available on site that could be quickly mobilized to fill or remediate any sinkholes.

The advantage of this approach allows the MSW to remain in place and relatively undisturbed. However, this option does not eliminate the risk of future sinkhole formation.

As an alternative to granular fill, consideration could also be given to the use of weak cementitious grout/high slump concrete (controlled density fill with a compressive strength of less than 1 MPa), or polyurethane foam could be injected into voids to reduce further sinkhole formation. Determining the lateral and vertical extents of the void(s) would be required and could possibly be achieved by probing the area with DCPTS or drill holes.

This option does not require disturbance or removal of existing fill or MSW. But it does require identifying the voids which could be completed by drilling or geophysical methods.

### **5.3.2 Expose, Reorganize, and Cover**

Consideration could be given to stripping of the surficial granular fill and exposing the MSW/drywall. Subsequently, the exposed material could be re-arranged to eliminate existing voids. If required, the drywall material could then be covered with low permeability soil or a geosynthetic/membrane to reduce surface water infiltration into the material. The drywall material could then be covered with the previously stripped surficial granular fill. As an addition or alternate to the above mentioned low permeability barrier, consideration could be given to covering this area with flexible pavement with suitable drainage.

This option eliminates existing voids and allows the material to be managed in place.

### **5.3.3 Permeation Grouting**

Permeation Grouting is a method where relatively small diameter holes (100 mm to 150 mm) are drilled into the soil/fill in a grid pattern. Once the target depth has been achieved, low strength, low viscosity cementitious grout is injected/tremied through the drill steel/rods and the drill hole and void (if present) is gravity filled/low pressure injection from the bottom up during removal of the drill steel.

The holes could be quickly drilled with an air track drill. The drill has the option to drill with air or air-water injection to clear the drill bit and drill hole. Drilling with air and water could limit the ejection of fibrous material into the surrounding environment. The grout mix should be designed with a compressive strength of less than 1 MPa.

The benefits of this method include minimal disturbance to ground surface, and filling of the drill hole and voids with grout. We are aware that this method has been successfully used to treat areas with sinkholes at two locations in the Lower Lonsdale area of North Vancouver.

### **5.3.4 Rapid Impact Compaction**

Rapid Impact Compaction (RIC) is a ground treatment method typically used to improve / densify near surface granular soils. RIC densification consists of repeatedly dropping a 7.5 ton weight from a controlled height onto a pedestal resting on the ground surface. This is typically repeated in a 3 m by 3 m grid pattern on the ground surface over the area selected for densification. A second pass is completed between the locations of the first pass. This densification method is generally considered to be suitable for unsaturated granular soils within the thickness range of the MSW. However, the ability of RIC to densify MSW is unknown.

Typically, craters (of variable depth) are formed during treatment. The craters should be filled with granular fill or the ground surface should be leveled. The fill or levelled ground surface



should be compacted using a heavy vibratory roller. Additional site grading fill/surfacing materials may be required to raise grades to original/desired elevations.

This method should not be conducted adjacent to existing retaining walls or structures as they would likely be displaced/damaged during treatment. If deemed necessary by the Sunshine Coast Regional District, a pre-construction survey of any nearby buildings and structures within approximately 15 m of the proposed limits of densification is recommended in order to document their baseline (current) condition. Full-time vibration monitoring of any vibration sensitive structures within 15 m of the densification area should be carried out during RIC treatment. Additionally, existing underground services and utilities within the proposed treatment area should be relocated or terminated.

This treatment method is anticipated to remediate voids that have and have not been identified within the treatment area. There is a potential that this method may not “collapse” all voids that are a result of nested wood/construction debris.

### 5.3.5 Removal of MSW

Removal of the MSW/drywall materials could eliminate the risk of further void formation in this area. This would require the excavation of the surficial fill (which could be stockpiled for future re-use) and removal of the drywall materials and any other construction debris conducive to the formation of sinkholes or voids. The vertical and lateral extent of the drywall materials could impact the surrounding Lock Block retaining walls, if the MSW extended beneath or beyond the walls. It may not be necessary to subexcavate the MSW near or beneath the existing retaining walls. There are two steel containers and concrete slabs on grade located at the northwest corner of the area that would need to be addressed.

## 6.0 CLOSURE

The use of this assessment report is subject to the conditions on the attached Report Interpretation and Limitations sheet. The reader’s attention is drawn specifically to those conditions, as it is considered essential that they be followed for proper use and interpretation of this report.

We hope the above meets with your requirements. Should any questions arise, please do not hesitate to contact the undersigned.

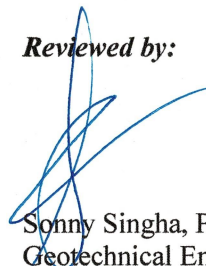
Yours truly,  
**Braun Geotechnical Ltd.**



Gunther Yip, P.Eng.  
Geotechnical Engineer



**Reviewed by:**



Sonny Singha, P.Eng.  
Geotechnical Engineer

Enclosures: Report Interpretation and Limitation  
Test Hole Location Plan and Ground Penetration Radar Results  
Test Hole Logs

cc: Arun Kumar, Manager, Solid Waste Operations - [Arun.Kumar@scrd.ca](mailto:Arun.Kumar@scrd.ca)

## **REPORT INTERPRETATION AND LIMITATIONS**

### **1. STANDARD OF CARE**

Braun Geotechnical Ltd. (Braun) has prepared this report in a manner consistent with generally accepted engineering consulting practices in this area, subject to the time and physical constraints applicable. No other warranty, expressed or implied, is made.

### **2. COMPLETENESS OF THIS REPORT**

This Report represents a summary of paper, electronic and other documents, records, data and files and is not intended to stand alone without reference to the instructions given to Braun by the Client, communications between Braun and the Client, and/or to any other reports, writings, proposals or documents prepared by Braun for the Client relating to the specific site described herein.

This report is intended to be used and quoted in its entirety. Any references to this report must include the whole of the report and any appendices or supporting material. Braun cannot be responsible for use by any party of portions of this report without reference to the entire report.

### **3. BASIS OF THIS REPORT**

This report has been prepared for the specific site, development, design objective, and purpose described to Braun by the Client or the Client's Representatives or Consultants. The applicability and reliability of any of the factual data, findings, recommendations or opinions expressed in this document pertain to a specific project as described in this report and are not applicable to any other project or site, and are valid only to the extent that there has been no material alteration to or variation from any of the descriptions provided to Braun. Braun cannot be responsible for use of this report, or portions thereof, unless we were specifically requested by the Client to review and revise the Report in light of any alterations or variations to the project description provided by the Client.

If the project does not commence within 18 months of the report date, the report may become invalid and further review may be required.

The recommendations of this report should only be used for design. The extent of exploration including number of test pits or test holes necessary to thoroughly investigate the site for conditions that may affect construction costs will generally be greater than that required for design purposes. Contractors should rely upon their own explorations and interpretation of the factual data provided for costing purposes, equipment requirements, construction techniques, or to establish project schedule.

The information provided in this report is based on limited exploration, for a specific project scope. Braun cannot accept responsibility for independent conclusions, interpretations, interpolations or decisions by the Client or others based on information contained in this Report. This restriction of liability includes decisions made to purchase or sell land.

### **4. USE OF THIS REPORT**

The contents of this report, including plans, data, drawings and all other documents including electronic and hard copies remain the copyright property of Braun Geotechnical Ltd. However, we will consider any reasonable request by the Client to approve the use of this report by other parties as "Approved Users." With regard to the duplication and distribution of this Report or its contents, we authorize only the Client and Approved Users to make copies of the Report only in such quantities as are reasonably necessary for the use of this Report by those parties. The Client and "Approved Users" may not give, lend, sell or otherwise make this Report or any portion thereof available to any other party without express written permission from Braun. Any use which a third party makes of this Report – in its entirety or portions thereof – is the sole responsibility of such third parties. BRAUN GEOTECHNICAL LTD. ACCEPTS NO RESPONSIBILITY FOR DAMAGES SUFFERED BY ANY PARTY RESULTING FROM THE UNAUTHORIZED USE OF THIS REPORT.

Electronic media is susceptible to unauthorized modification or unintended alteration, and the Client should not rely on electronic versions of reports or other documents. All documents should be obtained directly from Braun.

### **5. INTERPRETATION OF THIS REPORT**

Classification and identification of soils and rock and other geological units, including groundwater conditions have been based on exploration(s) performed in accordance with the standards set out in Paragraph 1. These tasks are judgemental in nature; despite comprehensive sampling and testing programs properly performed by experienced personnel with the appropriate equipment, some conditions may elude detection. As such, all explorations involve an inherent risk that some conditions will not be detected.

Further, all documents or records summarizing such exploration will be based on assumptions of what exists between the actual points sampled at the time of the site exploration. Actual conditions may vary

significantly between the points investigated and all persons making use of such documents or records should be aware of and accept this risk.

The Client and "Approved Users" accept that subsurface conditions may change with time and this report only represents the soil conditions encountered at the time of exploration and/or review. Soil and ground water conditions may change due to construction activity on the site or on adjacent sites, and also from other causes, including climactic conditions.

The exploration and review provided in this report were for geotechnical purposes only. Environmental aspects of soil and groundwater have not been included in the exploration or review, or addressed in any other way.

The exploration and Report is based on information provided by the Client or the Client's Consultants, and conditions observed at the time of our site reconnaissance or exploration. Braun has relied in good faith upon all information provided. Accordingly, Braun cannot accept responsibility for inaccuracies, misstatements, omissions, or deficiencies in this Report resulting from misstatements, omissions, misrepresentations or fraudulent acts of persons or sources providing this information.

## **6. DESIGN AND CONSTRUCTION REVIEW**

This report assumes that Braun will be retained to work and coordinate design and construction with other Design Professionals and the Contractor. Further, it is assumed that Braun will be retained to provide field reviews during construction to confirm adherence to building code guidelines and generally accepted engineering practices, and the recommendations provided in this report. Field services recommended for the project represent the minimum necessary to confirm that the work is being carried out in general conformance with Braun's recommendations and generally accepted engineering standards. It is the Client's or the Client's Contractor's responsibility to provide timely notice to Braun to carry out site reviews. The Client acknowledges that unsatisfactory or unsafe conditions may be missed by intermittent site reviews by Braun. Accordingly, it is the Client's or Client's Contractor's responsibility to inform Braun of any such conditions.

Work that is covered prior to review by Braun may have to be re-exposed at considerable cost to the Client. Review of all Geotechnical aspects of the project are required for submittal of unconditional Letters of Assurance to regulatory authorities. The site reviews are not carried out for the benefit of the Contractor(s) and therefore do not in any way effect the Contractor(s) obligations to perform under the terms of his/her Contract.

## **7. SAMPLE DISPOSAL**

Braun will dispose of all samples 3 months after issuance of this report, or after a longer period of time at the Client's expense if requested by the Client. All contaminated samples remain the property of the Client and it will be the Client's responsibility to dispose of them properly.

## **8. SUBCONSULTANTS AND CONTRACTORS**

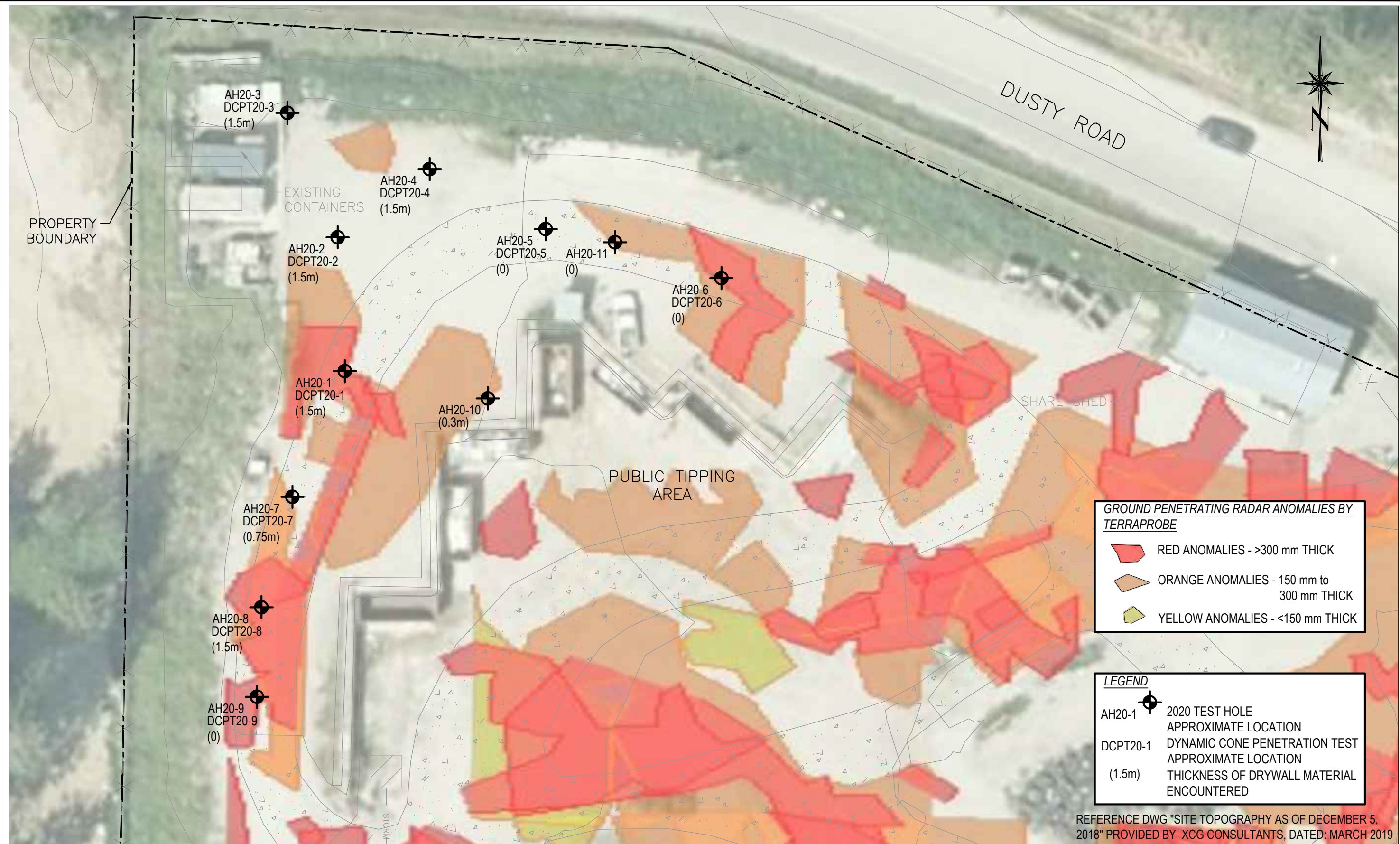
Engineering studies frequently requires hiring the services of individuals and companies with special expertise and/or services which Braun Geotechnical Ltd. does not provide. These services are arranged as a convenience to our Clients, for the Client's benefit. Accordingly, the Client agrees to hold the Company harmless and to indemnify and defend Braun Geotechnical Ltd. from and against all claims arising through such Subconsultants or Contractors as though the Client had retained those services directly. This includes responsibility for payment of services rendered and the pursuit of damages for errors, omissions or negligence by those parties in carrying out their work. These conditions apply to specialized subconsultants and the use of drilling, excavation and laboratory testing services, and any other Subconsultant or Contractor.

## **9. SITE SAFETY**

Braun Geotechnical Ltd. assumes responsibility for site safety solely for the activities of our employees on the jobsite. The Client or any Contractors on the site will be responsible for their own personnel. The Client or his representatives, Contractors or others retain control of the site. It is the Client's or the Client's Contractors responsibility to inform Braun of conditions pertaining to the safety and security of the site – hazardous or otherwise – of which the Client or Contractor is aware.

Exploration or construction activities could uncover previously unknown hazardous conditions, materials, or substances that may result in the necessity to undertake emergency procedures to protect workers, the public or the environment. Additional work may be required that is outside of any previously established budget(s). The Client agrees to reimburse Braun for fees and expenses resulting from such discoveries. The Client acknowledges that some discoveries require that certain regulatory bodies be informed. The Client agrees that notification to such bodies by Braun Geotechnical Ltd. will not be a cause for either action or dispute.





Rev.	Description	Date
0	Issued for Discussion	Feb.10, 2020

Client	XCG Consultants Ltd.			
Project	Sechelt Landfill Sunshine Coast Regional District, BC			
Project no.	13-5854	Drawn	CD	Design
			GY	Checked
			SS	

Title			LOCATION PLAN		
Date	February 10, 2020	Scale	1:300	Drawing no.	13-5854-01



# Test Hole Log: AH20-1

File: 13-5854  
 Project: Sechelt Landfill  
 Client: XCG Consultants Ltd.  
 Location: Sunshine Coast Regional District, BC



Depth ft m	Thickness (mm)	Sample	Soil Description	Sample #	Water cont.	DCPT (Blows per ft)	Remarks
0	0		brown, compact to dense SAND, some gravel (FILL)				
1		○	grey-white, moist, stiff to firm, DRYWALL material mixed with brown, compact SAND (FILL)	S1			
5		○		S2			
2		○	rusty-brown, dense to very dense, moist SAND & GRAVEL	S3			
10	3		End of Test Hole @ 3.0m				- rough drilling 52 blows / 7"
						End of DCPT, Refusal @ 3.2m	
4							
15							

Equipment: Truck Mounted Auger Rig  
 Sampling Method: Grab Off Auger Flight  
 Hammer Type: Automatic Trip  
 (140 lb, 30" Drop)

Datum: Ground Surface  
 Water Depth: Not Encountered  
 (at time of drilling)

Logged By: GY  
 Exploration Date: Feb. 3, 2020  
 Dwg No.: 13-5854-AH20-1  
 Page: 1 of 1

# Test Hole Log: AH20-2

File: 13-5854  
 Project: Sechelt Landfill  
 Client: XCG Consultants Ltd.  
 Location: Sunshine Coast Regional District, BC



Depth ft m	Thickness (mm)	Sample	Soil Description	Sample #	Water cont.	DCPT (Blows per ft)	Remarks
						0 10 20 30 40 50 60	
0	0		brown, compact to dense, fine to coarse SAND, trace to some fine-coarse gravel (FILL)	S1			
1		○	grey-brown, moist, firm to soft, DRYWALL material, (some black fibrous material), mixed with sand & gravel (FILL)	S2			
5		○	grey, moist, soft to firm DRYWALL material (FILL)	S3			
2		○	rusty-brown, compact to dense, fine to coarse SAND & GRAVEL	S4			
10	3		End of Test Hole @ 3.0m				52 blows / 6"
						End of DCPT, Refusal @ 3.2m	
4							
15							

Equipment: Truck Mounted Auger Rig  
 Sampling Method: Grab Off Auger Flight  
 Hammer Type: Automatic Trip  
 (140 lb, 30" Drop)

Datum: Ground Surface  
 Water Depth: Not Encountered  
 (at time of drilling)

Logged By: GY  
 Exploration Date: Feb. 3, 2020  
 Dwg No.: 13-5854-AH20-2  
 Page: 1 of 1

# Test Hole Log: AH20-3

File: 13-5854  
 Project: Sechelt Landfill  
 Client: XCG Consultants Ltd.  
 Location: Sunshine Coast Regional District, BC



Depth		Thickness (mm)	Sample	Soil Description	Sample #	Water cont.	DCPT (Blows per ft)							Remarks			
ft	m						0	10	20	30	40	50	60				
0	0			GRASS ABOVE													
			○	brown, loose to very loose, fine to coarse SAND, trace some firm, fine to medium gravel (FILL)	S1												
			○	grey-black, soft DRYWALL material mixed with some brown sand (FILL)	S2												
5			○	light grey, soft to firm DRYWALL material, occasional fibrous material (FILL)	S3												
			○	dark brown, loose to very dense SAND & fine to coarse GRAVEL	S4												
10	3			End of Test Hole @ 3.0m													51 blows / 7.25"
																	End of DCPT, Refusal @ 2.9m

Equipment: Truck Mounted Auger Rig  
 Sampling Method: Grab Off Auger Flight  
 Hammer Type: Automatic Trip  
 (140 lb, 30" Drop)

Datum: Ground Surface  
 Water Depth: Not Encountered  
 (at time of drilling)

Logged By: GY  
 Exploration Date: Feb. 3, 2020  
 Dwg No.: 13-5854-AH20-3  
 Page: 1 of 1



File: 13-5854  
Project: Sechelt Landfill  
Client: XCG Consultants Ltd.  
Location: Sunshine Coast Regional District, BC



Depth		Thickness (mm)	Sample	Soil Description	Sample #	Water cont.	DCPT	Remarks
ft	m						(Blows per ft)	
0	0			brown, compact, fine to coarse SAND, trace some gravel (FILL)	S1			
				grey-white to black, firm DRYWALL material	S2			
5				grey, soft to firm DRYWALL material, trace sand (FILL)	S3			
2				red-brown, very dense, fine to coarse SAND, some fine to coarse gravel	S4			
3				End of Test Hole @ 3.0m				
							End of DCPT, Refusal @ 2.4m	

Equipment: Truck Mounted Auger Rig  
Sampling Method: Grab Off Auger Flight  
Hammer Type: Automatic Trip  
(140 lb, 30" Drop)

Datum: Ground Surface  
Water Depth: Not Encountered  
(at time of drilling)

Logged By: GY  
 Exploration Date: Feb. 3, 2020  
 Dwg No.: 13-5854-AH20-4  
 Page: 1 of 1

# Test Hole Log: AH20-5

File: 13-5854  
 Project: Sechelt Landfill  
 Client: XCG Consultants Ltd.  
 Location: Sunshine Coast Regional District, BC



Depth ft m	Thickness (mm)	Sample	Soil Description	Sample #	Water cont.	DCPT (Blows per ft)	Remarks
						0 10 20 30 40 50 60	
0	0		brown to dark brown, compact to dense, fine to coarse SAND, some fine gravel, trace rootlets (FILL)	S1			
1		○					
5			brown to dark brown, compact to dense, fine to coarse SAND, some fine to coarse gravel (FILL)	S2			
2		○					
3			dark red-brown, very dense, fine to coarse SAND, trace to some fine to coarse gravel	S3			50 blows / 10.75"
10		○	End of Test Hole @ 3.0m			End of DCPT, Refusal @ 2.7m	
15							

Equipment: Truck Mounted Auger Rig  
 Sampling Method: Grab Off Auger Flight  
 Hammer Type: Automatic Trip  
 (140 lb, 30" Drop)

Datum: Ground Surface  
 Water Depth: Not Encountered  
 (at time of drilling)

Logged By: GY  
 Exploration Date: Feb. 3, 2020  
 Dwg No.: 13-5854-AH20-5  
 Page: 1 of 1

# Test Hole Log: AH20-6

File: 13-5854  
 Project: Sechelt Landfill  
 Client: XCG Consultants Ltd.  
 Location: Sunshine Coast Regional District, BC



Depth ft m	Thickness (mm)	Sample	Soil Description	Sample #	Water cont.	DCPT (Blows per ft)	Remarks
						0 10 20 30 40 50 60	
0	0		brown, compact to very dense, fine to coarse SAND, some fine to coarse gravel, occasional coarse gravel, (FILL)	S1			66
1		○					
5							
2		○	dark brown, compact to dense, fine to coarse SAND, some fine to medium gravel, occasional coarse gravel, some pieces of asphalt (FILL)	S2			
		○	rusty-brown, dense to very dense, fine to coarse SAND and some fine to medium gravel to gravelly	S3			37 blows / 8.5"
3							
10			End of Test Hole @ 3.0m			End of DCPT, Refusal @ 2.6m	
4							
15							

Equipment: Truck Mounted Auger Rig  
 Sampling Method: Grab Off Auger Flight  
 Hammer Type: Automatic Trip  
 (140 lb, 30" Drop)

Datum: Ground Surface  
 Water Depth: Not Encountered  
 (at time of drilling)

Logged By: GY  
 Exploration Date: Feb. 3, 2020  
 Dwg No.: 13-5854-AH20-6  
 Page: 1 of 1



# Test Hole Log: AH20-7

File: 13-5854  
 Project: Sechelt Landfill  
 Client: XCG Consultants Ltd.  
 Location: Sunshine Coast Regional District, BC



Depth ft m	Thickness (mm)	Sample	Soil Description	Sample #	Water cont.	DCPT (Blows per ft)		Remarks
						0	10 20 30 40 50 60	
0	0		brown, compact to dense, fine to coarse SAND, trace to some fine to coarse gravel (FILL)	S1				
1			white to grey, firm DRYWALL material, some wood pieces / frags (FILL)	S2				
5			dark brown, SAND and grey DRYWALL material					
2			rusty-brown, loose to very dense, fine to coarse SAND, some fine to coarse gravel to gravelly	S3				
3			End of Test Hole @ 3.0m					10 blows / 1.75"
10								End of DCPT, Refusal @ 3.1m
15								

Equipment: Truck Mounted Auger Rig  
 Sampling Method: Grab Off Auger Flight  
 Hammer Type: Automatic Trip  
 (140 lb, 30" Drop)

Datum: Ground Surface  
 Water Depth: Not Encountered  
 (at time of drilling)

Logged By: GY  
 Exploration Date: Feb. 3, 2020  
 Dwg No.: 13-5854-AH20-7  
 Page: 1 of 1

# Test Hole Log: AH20-8

File: 13-5854  
 Project: Sechelt Landfill  
 Client: XCG Consultants Ltd.  
 Location: Sunshine Coast Regional District, BC



Depth ft m	Thickness (mm)	Sample	Soil Description	Sample #	Water cont.	DCPT (Blows per ft)	Remarks
						0 10 20 30 40 50 60	
0	0		dark-brown, compact to very dense, fine to coarse SAND and fine to coarse Gravel to gravelly (FILL)	S1			36 blows / 0.5"  End of DCPT, Refusal @ 0.6m
		○	- carpet, asphalt fragments				
1		○	white-grey, soft DRYWALL material, with black fragments	S2			
5		○	grey-brown, soft, SILT and SAND / DRYWALL with black fragments (FILL)	S3			
2		○	brown, compact, fine SAND, some black wood fragments / charcoal	S4			
		○	red-brown, compact to dense, fine to coarse SAND, some fine to coarse gravel	S5			
10	3	○	brown, compact to dense, silty SAND, some fine to coarse gravel	S6			
4			End of Test Hole @ 4.0m				
15							

Equipment: Truck Mounted Auger Rig  
 Sampling Method: Grab Off Auger Flight  
 Hammer Type: Automatic Trip  
 (140 lb, 30" Drop)

Datum: Ground Surface  
 Water Depth: Not Encountered  
 (at time of drilling)

Logged By: GY  
 Exploration Date: Feb. 3, 2020  
 Dwg No.: 13-5854-AH20-8  
 Page: 1 of 1

# Test Hole Log: AH20-9

File: 13-5854  
 Project: Sechelt Landfill  
 Client: XCG Consultants Ltd.  
 Location: Sunshine Coast Regional District, BC



Depth		Thickness (mm)	Sample	Soil Description	Sample #	Water cont.	DCPT (Blows per ft)							Remarks			
ft	m						0	10	20	30	40	50	60				
0	0		○	brown, loose to compact, fine to coarse SAND, some fine to coarse gravel (FILL)	S1												
				- brick / vitrified pipe fragments - tile fragments - wire fragments and some asphalt - debris													
5			○	dark brown, loose to compact, fine to coarse silty SAND	S2												
10	3			End of Test Hole @ 3.0m													
4																	
15																	-hammer bouncing
							End of DCPT, Refusal @ 4.6m										

Equipment: Truck Mounted Auger Rig  
 Sampling Method: Grab Off Auger Flight  
 Hammer Type: Automatic Trip  
 (140 lb, 30" Drop)

Datum: Ground Surface  
 Water Depth: Not Encountered  
 (at time of drilling)

Logged By: GY  
 Exploration Date: Feb. 3, 2020  
 Dwg No.: 13-5854-AH20-9  
 Page: 1 of 1



# Test Hole Log: AH20-10

File: 13-5854  
 Project: Sechelt Landfill  
 Client: XCG Consultants Ltd.  
 Location: Sunshine Coast Regional District, BC



Depth ft m	Thickness (mm)	Sample	Soil Description	Sample #	Water cont.	Remarks
0			brown, dense, fine to coarse SAND, some fine to coarse gravel (FILL)			
1						
5		○	grey-white, soft DRYWALL material	S1		
2		○	brown, compact, fine to coarse SAND, trace silt, some fine to coarse gravel	S2		
10			End of Test Hole @ 3.0m			
4						
15						

Equipment: Truck Mounted Auger Rig  
 Sampling Method: Grab Off Auger Flight

Datum: Ground Surface  
 Water Depth: Not Encountered  
 (at time of drilling)

Logged By: GY  
 Exploration Date: Feb. 3, 2020  
 Dwg No.: 13-5854-AH20-10  
 Page: 1 of 1

# Test Hole Log: AH20-11

File: 13-5854  
 Project: Sechelt Landfill  
 Client: XCG Consultants Ltd.  
 Location: Sunshine Coast Regional District, BC



Depth ft m	Thickness (mm)	Sample	Soil Description	Sample #	Water cont.	Remarks
0			brown, fine to coarse SAND, some fine to coarse gravel to gravelly (FILL)			
1		○	brown to black, compact to dense, silty SAND to some silt (FILL)	S1		
2		○	grey fine to coarse SAND, some fine to coarse gravel	S2		
3			End of Test Hole @ 3.0m			
4						
15						

Equipment: Truck Mounted Auger Rig  
 Sampling Method: Grab Off Auger Flight

Datum: Ground Surface  
 Water Depth: Not Encountered  
 (at time of drilling)

Logged By: GY  
 Exploration Date: Feb. 3, 2020  
 Dwg No.: 13-5854-AH20-11  
 Page: 1 of 1