


# FOUNDATION DRAINAGE SUMMARY FORM



General Information	
Applicant Name:	
Development Address:	
Development Application #:	
Available Sewer Servicing: <input type="checkbox"/> Storm Sewers <input type="checkbox"/> Combined Sewers <input type="checkbox"/> Sanitary Sewers	
Groundwater Level Assessment	
GW Monitoring Approach: <input type="checkbox"/> 1. Flexible Year-Round <input type="checkbox"/> 2. Peak Season <input type="checkbox"/> 3. Alternate (Attach Justification)	
Monitoring Length [weeks]:	
Monitoring Months: <input type="checkbox"/> Jan <input type="checkbox"/> Feb <input type="checkbox"/> Mar <input type="checkbox"/> Apr <input type="checkbox"/> May <input type="checkbox"/> Jun <input type="checkbox"/> Jul <input type="checkbox"/> Aug <input type="checkbox"/> Sept <input type="checkbox"/> Oct <input type="checkbox"/> Nov <input type="checkbox"/> Dec	
# of Measurements:	
Peak Observed GWL [masl]:	
Estimated Maximum Anticipated GWL [masl]:	
Lowest Elevation of Proposed Structure [masl]:	
Proposed Condition and Measures (Complete all)	
On-site Management Provided? <input type="checkbox"/> Yes (Describe) <input type="checkbox"/> No (Provide Rationale)	
Infrastructure Required for Future Emergency Repair? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Foundation Drainage Expected to Contain Only Infiltrated Stormwater? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Site Condition: <input type="checkbox"/> Non-Brownfield with no RSC <input type="checkbox"/> Brownfield with RSC + Risk Management <input type="checkbox"/> Other (Describe)	
Proposed Foundation Drainage Management (Select one)	
<input type="checkbox"/> On-site Management (no long-term discharge to sewers)	
<input type="checkbox"/> On-site Management with Infrastructure for Future Emergency Repair (in accordance with Policy 4.4)	
<input type="checkbox"/> Long-term Discharge to Storm or Combined Sewers (in accordance with Policy Statement 4.3)	
<input type="checkbox"/> Request for Exemption of Policy to apply for Long-Term Discharge Agreement (in accordance with Policy Sec 5.0)	
Description/Attachments in Foundation Drainage Technical Brief (Select all that apply)	
<input type="checkbox"/> On-site Management Description/Rationale for Technological Infeasibility	
<input type="checkbox"/> GWL Monitoring Well Plan, including Monitoring Methodology and Justification (where alternate is proposed)	
<input type="checkbox"/> GWL Monitoring and Peak Flow Estimation Results, Analysis & Interpretation	
<input type="checkbox"/> Building Elevation Plan	
<input type="checkbox"/> Site Condition Supporting Documentation (e.g., Brownfield/RSC Status, Soil Quality)	
<input type="checkbox"/> Exemption Rationale and Documentation for Technical Infeasibility and/or Extenuating Circumstances.	
Describe physical and design constraints to substantiate that a technical solution was not feasible; include documentation to substantiate that there are extenuating circumstances (e.g., application submission timeline and milestones) that may warrant an exemption, where applicable.	
<input type="checkbox"/> Other Documentation; Specify -	
Qualified Professional Sign-Off	
Name:	Designation:
Signature: 	Date:

Form to accompany *Foundation Drainage Technical Brief* document prepared in accordance with the *Foundation Drainage Policy and Guidelines*.

Jameson Plaza Limited  
2700 Dufferin Street, Unit 50  
Toronto, ON, M6B 4J3

File No. 23-014  
March 27, 2023

Attention: Barry Berens

**Subject: Foundation Drainage Summary Form Technical Brief  
1437-1455 Queen St W, Toronto, Ontario**

Grounded Engineering Inc. ("Grounded") is pleased to provide you with this Foundation Drainage Summary Form Technical Brief for the site known as 1437-1455 Queen St W, in Toronto, Ontario.

The proposed project includes constructing a 12-storey residential tower with one level of underground (P1). The lowest elevation of the proposed structure (Elev. 94.1 m) is above the Maximum Anticipated Groundwater Level (MAGWL) (Elev. 93.4m). Foundation drainage will contain only infiltrated stormwater.

**On-site Management Provided?**

The proposed development occupies the majority of the site area. There is no available space for on-site management of infiltrated stormwater.

**Site Condition Supporting Documentation**

The subject site is not a Brownfield Property, per Foundation Drainage Policy Section 4.3.a(i). Regardless, a Record of Site Condition (RSC) is required for the development based on the proposed change in land-use. Grounded is the Environmental Engineer of Record for the site and will be filing an RSC with the Ministry of Environment, Conservation and Parks (MECP).

A permanent connection to the City's storm sewers for the discharge of infiltrated stormwater/surface water should be allowable (Foundation Drainage Policy Section 4), provided an RSC is obtained for the site.

We trust that the information contained in this letter is sufficient for your present requirements. If we can be of any further assistance, please do not hesitate to contact us.

For and on behalf of our team,

**GROUNDED**  
ENGINEERING   


Matt Bielaski, P.Eng., QP<sub>RA-ESA</sub>  
Principal

Jameson Plaza Limited  
2700 Dufferin Street, Unit 50  
Toronto, ON, M6B 4J3

File No. 23-014  
March 27, 2023

Attention: Barry Berens

**RE: HYDROGEOLOGICAL REVIEW REPORT**  
**1437-1455 Queen Street West, Toronto, Ontario**

Grounded Engineering Inc. ("Grounded") is pleased to provide you with this Hydrogeological Review for the site known as 1437-1455 Queen Street West, in Toronto, Ontario.

The following documents are provided as part of this package:

- City of Toronto Hydrogeological Review Summary Form
- Hydrogeological Review Report

As part of the development applications process, the City of Toronto requires that both documents are submitted together for review.

We trust that the information contained with this report is adequate for your present requirements. If we can be of further assistance, please do not hesitate to contact us.



Nico Piers, B.A.Sc.  
Project Coordinator



Matt Bielaski, P.Eng., QP<sub>RA-ESA</sub>  
Principal

August 2018

## HYDROLOGICAL REVIEW SUMMARY

The form is to be completed by the Professional that prepared the Hydrological Review.  
 Use of the form by the City of Toronto is not to be construed as verification of engineering/hydrological content.

Refer to the Terms of Reference, Hydrological Review:  
[Link to Terms of Reference Hydrological Review](#)

For City Staff Use Only:	
Name of ECS Case Manager (Please print)	
Date Review Summary provided to to TW, EM&P	

**IF ANY OF THE REQUIREMENTS LISTED BELOW HAVE NOT BEEN INCLUDED IN THE HYDROLOGICAL REVIEW, THE REVIEW WILL BE CONSIDERED INCOMPLETE.  
 THE GREY SHADED BOXES WILL REQUIRE A CONSISTANCY CHECK BY THE ECS CASE MANAGER.**

**Summary of Key Information:**

SITE INFORMATION	Page # & Section # of Review	Review Includes this Information City Staff (Check)
Site Address	1437-1455 Queen Street West, Toronto, Ontario	Title, i (Exec Sum), 1 (Sec 1)
Postal Code	M6R 1A1	1 (Sec 1)
Property Owner (on request for comments memo)	Jameson Plaza Ltd & 1437 Queen West Ltd	Title, i (Exec Sum), 1 (Sec 1)
Proposed description of the project (if applicable) (point towers, number of podiums)	12 storey structure with 1 level of underground parking	i (Exec Sum), 1 (Sec 1)
Land Use (ex. commercial, residential, mixed, institutional, industrial)	Current: Commercial Proposed: Residential	i (Exec Sum), 1 (Sec 1)
Number of below grade levels for the proposed structure	1	i (Exec Sum), 1 (Sec 1)
HYDROLOGICAL REVIEW INFORMATION		
Date Hydrological Review was prepared:	2023-03-27	Title
Who Performed the Hydrological Review (Consulting Firm)	Grounded Engineering Inc.	Title, i (Exec Sum), 2 (Sec 1)
Name of Author of Hydrological Review	Matthew Bielaski, P.Eng., QP <sub>ESA-RA</sub>	2 (Sec 1), 13 (Sec 14)

### HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION	Page # & Section # of Review	Review Includes this Information City Staff (Check)
<p>Check the directories on the website for Professional Geoscientists and/or Professional Engineers of Ontario been checked to ensure that the Hydrological Report has been prepared by a qualified person who is a licensed Professional Geoscientist as set out in the Professional Geoscientist Act of Ontario or a Professional Engineer?            PEO: <a href="#">Professional Engineers of Ontario</a>            APGO: <a href="#">Association of Professional Geoscientists of Ontario</a></p>	✓ Yes	N/A
<p>Has the Hydrological Review been prepared in accordance with all the following:</p> <ul style="list-style-type: none"> <li>• Ontario Water Resources Act</li> <li>• Ontario Regulation 387/04</li> <li>• Toronto Municipal Code Chapter 681- Sewers</li> </ul>	✓ Yes	2 (Sec 1)
<p>Total Volume (L/day) Short Term Discharge of groundwater (construction dewatering) <b>with safety factor included</b></p>	<p>Groundwater: 0 L/day            Rainfall: 75,000 L/day            Total: 75,000 L/day            FoS = 2.0</p>	ii (Exec Sum), 8-10 (Sec 10)

### HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
<p>Total Volume (L/day) Short Term Discharge of groundwater (construction dewatering) <b>without safety factor included</b></p>	<p>Groundwater: 0 L/day                      Rainfall: 75,000 L/day                      Total: 75,000 L/day</p>	<p>Appendix F</p>	
<p>Total Volume (L/day) Long Term drainage of groundwater (from foundation drainage, weeping tiles, sub slab drainage) <b>with safety factor included</b></p> <p>If the development is part of a multiple tower complex, include total volume for each separate tower</p>	<p>Groundwater: 0 L/day                      Infiltration: 1,000 L/day                      Total: 1,000 L/day                      FoS = 2.0</p>	<p>ii (Exec Sum),                      8-10 (Sec 10)</p>	
<p>List the nearest surface water (river, creek, lake)</p>	<p>The nearest waterbody is Lake Ontario located approximately 600 m southwest of the Property.</p>	<p>4 (Sec 3)</p>	
<p>Lowest basement elevation</p>	<p>94.1 masl – Base of Excavation                      94.6 masl – Finished Floor Elevation</p>	<p>i (Exec Sum),                      Appendix F</p>	
<p>Foundation elevation</p>	<p>93.6 – Base of Footings</p>	<p>i (Exec Sum)</p>	
<p>Ground elevation</p>	<p>98.1 masl</p>	<p>Appendix F</p>	

### HYDROLOGICAL REVIEW SUMMARY

<b>SITE INFORMATION</b>		<b>Page # &amp; Section # of Review</b>	<b>Review Includes this Information City Staff (Check)</b>
<b>STUDY AREA MAP</b>			<b>Review Includes this Information City Staff (Check)</b>
Study area map(s) have been included in the report.	✓ Yes	Figures 1 & 2	N/A
Study area map(s) been prepared according to the Hydrological Review Terms of Reference.	✓ Yes	Figures 1 & 2 3 (Sec 2)	N/A
<b>WATER LEVEL AND WELLS</b>		<b>Page # &amp; Section # of every occurrence in the Review</b>	<b>Review Includes this Information (City Staff Initial)</b>
The groundwater level has been monitored using all wells located on site (within property boundary).	✓ Yes	4 (Sec 4 and 5), Figures 2 & 3	
The static water level measurements have been monitored at all monitoring wells for a minimum of 3 months with samples taken every 2 weeks for a minimum of 6 samples.  The intent is for the qualified professional to use professional judgement to estimate the seasonally high groundwater level.	The required 3-months ground water level monitoring is currently ongoing for the Property. As such, additional water levels will continue to be collected.	4 (Sec 4 and 5), Appendix A	

### HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
All water levels in the wells have been measured with respect to masl.	✓ Yes	4 (Sec 5), Appendix A	
A table of geology/soil stratigraphy for the property has been included.	✓ Yes	i (Exec Sum), 3 (Sec 3)	
GEOLOGY AND PHYSICAL HYDROLOGY		Page # & Section # of every occurrence in the Review	Review Includes this Information (City Staff Initial)
The review has made reference to the soil materials including thickness, composition and texture, and bedrock environments.	✓ Yes	3 (Sec 3)	
Key aquifers and the site's proximity to nearby surface water has been identified.	✓ Yes	3 (Sec 3)	N/A
PUMP TEST/SLUG TEST/DRAWDOWN ANALYSIS		Page # & Section # of every occurrence in the Review	Review Includes this Information City Staff (Check)
A summary of the pumping test data and analysis is included in the review.	A pumping test was not conducted.	5 (Sec 6.1)	
The pump test been carried out for at least 24 hours if possible. If not, has a slug test been conducted?	A pump test was not conducted. Slug tests were conducted.	5-6 (Sec 6.2)	
Have the monitoring well(s) have been monitored using digital devices? If yes how frequently?	<p>Yes, water level measurements have been taken using a digital water level meter, and are still ongoing.</p> <p>The frequency of the measurements have been and will continue to be every two weeks over the course of a 3 month period.</p>	4 (Sec 5)	



### HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
<p>If a slug or pump test has been conducted has the static groundwater level been monitored at all monitoring well(s) multiple times to measure recovery?</p> <p>-prior to the slug or pumping test(s)?</p> <p>-post slug or pumping test(s)?</p>	<p>✓ Yes</p> <p>✓ Yes</p> <p>✓ Yes</p>	<p>4 (Sec 5), 5-6 (Sec 6.2)</p>	<p>N/A</p>
<p>The above noted slug or pump tests have been included in the report.</p>	<p>✓ Yes</p>	<p>5-6 (Sec 6.2), Appendix B</p>	
WATER QUALITY		Page # & Section # of every occurrence in the Review	Review Includes this Information City Staff (Check)
<p>The report includes baseline water quality samples from a laboratory. The water quality must be analyzed for all parameters listed in Tables 1 and 2 of Chapter 681 Sewers of the Toronto Municipal Code (found in Appendix A) and the samples must have to be taken unfiltered within 9 months of the date of submission.</p>	<p>✓ Yes</p>	<p>7 (Sec 7), Appendix E</p>	
<p>The water quality data templates in Appendix A have been completed for each sample taken for both sanitary/combined and storm sewer limits.</p>	<p>For sanitary discharge- See the sanitary/combined sewer parameter limit template</p> <p>For storm discharge- See the storm sewer parameter limit template</p>	<p>Pg. 11-14 of Hydrological Review Summary</p>	

### HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION	Page # & Section # of Review	Review Includes this Information City Staff (Check)
<p>Qualified professional to list all sample parameters that have violated the Bylaw limits for each sample taken for the sanitary/combined Bylaw limits</p> <p><b>If there are any sample parameter Exceedances the groundwater can't be discharged as is.</b></p>	<p>Sanitary Combined Sewer:</p> <ul style="list-style-type: none"> <li>• No exceedances</li> </ul>	7 (Sec 7)
<p>Qualified professional to list all sample parameters that have violated the Bylaw limits for each sample taken for the storm Bylaw limits.</p> <p><b>If there are any sample parameter exceedances the groundwater can't be discharged as is.</b></p>	<p>Storm Sewer:</p> <ul style="list-style-type: none"> <li>▪ Total Suspended Solids (Limit 15 mg/L, Result 21.9 mg/L, RDL 2 mg/L)</li> <li>▪ Total Manganese (Limit 0.05 mg/L, Result 0.577 mg/L, RDL 0.00001 mg/L)</li> <li>▪ BOD (Limit 15 mg/L, Result 28 mg/L, RDL 2.0mg/L)</li> <li>▪ Tetrachloroethylene (Limit 4.4 µg/L, Result 9.88 µg/L, RDL 0.5 µg/L,)</li> </ul>	7 (Sec 7)
<p>The water quality samples have been analyzed by a Canadian laboratory accredited and licensed by Standards Council of Canada and/or Canadian Association for Laboratory Accreditation.</p> <p>List of Canadian accredited laboratories:  <a href="#">Standards Council of Canada</a></p>	✓ Yes	Appendix E
<p>A chain of custody record for the samples is included with the report.</p>	✓ Yes	Appendix E
<p>Has the chain of custody reference any filtered sample? If yes, the report has to be amended and re-submitted to include only non-filtered samples.</p>	✓ Yes	Appendix E

### HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION	Page # & Section # of Review	Review Includes this Information City Staff (Check)
<p>List any of the sample parameters that exceed the Bylaw limits with the reporting detection limit (RDL) included.</p> <p>Sanitary Combined Sewer:</p> <ul style="list-style-type: none"> <li>No exceedances</li> </ul> <p>Storm Sewer:</p> <ul style="list-style-type: none"> <li>Total Suspended Solids (Limit 15 mg/L, Result 21.9 mg/L, RDL 2 mg/L)</li> <li>Total Manganese (Limit 0.05 mg/L, Result 0.577 mg/L, RDL 0.00001 mg/L)</li> <li>BOD (Limit 15 mg/L, Result 28 mg/L, RDL 2.0mg/L)</li> <li>Tetrachloroethylene (Limit 4.4 µg/L, Result 9.88 µg /L, RDL 0.5 µg/L,)</li> </ul>	7 (Sec 7), Appendix E	
<p>A true copy of the Certificate of Analysis report, is included with the report.</p>	✓ Yes	Appendix E
EVALUATION OF IMPACT	Page # & Section # of every occurrence in the Review	Review Includes this Information City Staff (Check)
<p>Does the report recommend a back-up system or relief safety valve(s)?</p>	✓ Yes	8 (Sec 9)
<p>Does the associated Geotechnical report recommend a back-up system or relief safety valve(s)?</p>	✓ Yes	19 (Sec 3.5) of Geotech Report
<p>The taking and discharging of groundwater on site has been analyzed to ensure that no negative impacts will occur to: the City sewage works in terms of quality and quantity (including existing infrastructure), the natural environment, and settlement issues.</p>	✓ Yes	11-12 (Sec 11) N/A

### HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION	Page # & Section # of Review	Review Includes this Information City Staff (Check)
<p>Has it been determined that there will be a negative impact to the natural environment, City sewage works, or surrounding properties has the study identified the following: the extent of the negative impact, the detail of the precondition state of all the infrastructure, City sewage works, and natural environment within the effected zone and the proposed remediation and monitoring plan?</p>	<p><input checked="" type="checkbox"/> No</p> <p><b>If yes, identify impact:</b></p>	<p>11-12 (Sec 11-12)</p> <p>N/A</p>

Summary of Additional Information and Key Items (if applicable):

HYDROLOGICAL REVIEW SUMMARY

**Appendix A:**

**SANITARY/COMBINED**

**Sample Location: BH102S**

Inorganics		Sample Result (mg/L)	Sample Result with upper RDL included (mg/L)	
<u>Parameter</u>	<u>mg/L</u>			<u>ug/L</u>
BOD	300	28.0	28.0 (2.0)	300,000
Fluoride	10	0.163	0.163 (0.020)	10,000
TKN	100	<0.500	<0.500 (0.050)	100,000
pH	6.0 - 11.5	7.73	7.73	6.0 - 11.5
Phenolics 4AAP	1	<0.0010	<0.0010 (0.0010)	1,000
TSS	350	21.9	21.9 (3.0)	350,000
Total Cyanide	2	<0.0020	<0.0020 (0.0020)	2,000
<b>Metals</b>				
Chromium Hexavalent	2	<0.00050	<0.00050 (0.00050)	2,000
Mercury	0.01	<0.0000050	<0.0000050 (0.0000050)	10
Total Aluminum	50	1.28	1.28 (0.0030)	50,000
Total Antimony	5	<0.00100	<0.00100 (0.00010)	5,000
Total Arsenic	1	<0.00100	<0.00100 (0.00010)	1,000
Total Cadmium	0.7	<0.0000500	<0.0000500 (0.0000050)	700
Total Chromium	4	<0.00500	<0.00500 (0.00050)	4,000
Total Cobalt	5	0.00116	0.00116 (0.00010)	5,000
Total Copper	2	<0.00500	<0.00500 (0.00050)	2,000
Total Lead	1	0.000701	0.000701 (0.000050)	1,000
Total Manganese	5	0.577	0.577 (0.00010)	5,000
Total Molybdenum	5	0.00216	0.00216 (0.000050)	5,000
Total Nickel	2	<0.00500	<0.00500 (0.00050)	2,000
Total Phosphorus	10	0.119	0.119 (0.0020)	10,000
Total Selenium	1	<0.000500	<0.000500 (0.000050)	1,000
Total Silver	5	<0.000100	<0.000100 (0.000010)	5,000
Total Tin	5	0.00214	0.00214 (0.00010)	5,000
Total Titanium	5	0.0676	0.0676 (0.00030)	5,000
Total Zinc	2	<0.0300	<0.0300 (0.0030)	2,000
<b>Petroleum Hydrocarbons</b>				
Animal/Vegetable Oil & Grease	150	<5.0	<5.0 (5.0)	150,000
Mineral/Synthetic Oil & Grease	15	<5.0	<5.0 (5.0)	15,000

August 2018

### HYDROLOGICAL REVIEW SUMMARY

Volatile Organics		Sample Result (mg/L)	Sample Result with upper RDL included (mg/L)	
<u>Parameter</u>	<u>mg/L</u>			<u>ug/L</u>
Benzene	0.01	<0.50	<0.50 (0.50)	10
Chloroform	0.04	<0.50	<0.50 (0.50)	40
1,2-Dichlorobenzene	0.05	<0.50	<0.50 (0.50)	50
1,4-Dichlorobenzene	0.08	<0.50	<0.50 (0.50)	80
Cis-1,2-Dichloroethylene	4	0.92	0.92 (0.50)	4,000
Trans-1,3-Dichloropropylene	0.14	<0.30	<0.30 (0.30)	140
Ethyl Benzene	0.16	<0.50	<0.50 (0.50)	160
Methylene Chloride	2	<1.0	<1.0 (1.0)	2,000
1,1,2,2-Tetrachloroethane	1.4	<0.50	<0.50 (0.50)	1,400
Tetrachloroethylene	1	9.88	9.88 (0.50)	1,000
Toluene	0.016	<0.50	<0.50 (0.50)	16
Trichloroethylene	0.4	2.90	2.90 (0.50)	400
Total Xylenes	1.4	<0.50	<0.50 (0.50)	1,400
<b>Semi-Volatile Organics</b>				
Di-n-butyl Phthalate	0.08	<1.0	<1.0 (1.0)	80
Bis (2-ethylhexyl) Phthalate	0.012	<2.0	<2.0 (2.0)	12
3,3'-Dichlorobenzidine	0.002	<0.40	<0.40 (0.40)	2
Pentachlorophenol	0.005	<0.50	<0.50 (0.50)	5
Total PAHs	0.005	<0.00175	<0.00175 (0.00175)	5
<b>Misc Parameters</b>				
Nonylphenols	0.02	<1.0	<1.0 (1.0)	20
Nonylphenol Ethoxylates	0.2	<2.0	<2.0 (2.0)	200

Sample Collected: Feb 21, 2023

Temperature: 7.2 °C

## HYDROLOGICAL REVIEW SUMMARY

**STORM**

**Sample Location: BH102S**

Inorganics		Sample Result (mg/L)	Sample Result with upper RDL included (mg/L)	
<u>Parameter</u>	<u>mg/L</u>			<u>ug/L</u>
pH	6.0 - 9.5	7.73	7.73	
BOD	15	28.0	28.0 (2.0)	15,000
Phenolics 4AAP	0.008	<0.0010	<0.0010 (0.0010)	8
TSS	15	21.9	21.9 (3.0)	15,000
Total Cyanide	0.02	<0.0020	<0.0020 (0.0020)	20
<b>Metals</b>				
Total Arsenic	0.02	<0.00100	<0.00100 (0.00010)	20
Total Cadmium	0.008	<0.0000500	<0.0000500 (0.0000050)	8
Total Chromium	0.08	<0.00500	<0.00500 (0.00050)	80
Chromium Hexavalent	0.04	<0.00050	<0.00050 (0.00050)	40
Total Copper	0.04	<0.00500	<0.00500 (0.00050)	40
Total Lead	0.12	0.000701	0.000701 (0.000050)	120
Total Manganese	0.05	0.577	0.577 (0.00010)	50
Total Mercury	0.0004	<0.0000050	<0.0000050 (0.00000050)	0.4
Total Nickel	0.08	<0.00500	<0.00500 (0.00050)	80
Total Phosphorus	0.4	0.119	0.119 (0.0020)	400
Total Selenium	0.02	<0.000500	<0.000500 (0.000050)	20
Total Silver	0.12	<0.000100	<0.000100 (0.000010)	120
Total Zinc	0.04	<0.0300	<0.0300 (0.0030)	40
<b>Microbiology</b>				
E.coli	200	<1	<1 (1)	200,000
<b>Volatile Organics</b>				
<u>Parameter</u>	<u>mg/L</u>			<u>ug/L</u>
Benzene	0.002	<0.50	<0.50 (0.50)	2
Chloroform	0.002	<0.50	<0.50 (0.50)	2
1,2-Dichlorobenzene	0.0056	<0.50	<0.50 (0.50)	6
1,4-Dichlorobenzene	0.0068	<0.50	<0.50 (0.50)	7
Cis-1,2-Dichloroethylene	0.0056	0.92	0.92 (0.50)	6
Trans-1,3-Dichloropropylene	0.0056	<0.30	<0.30 (0.30)	6
Ethyl Benzene	0.002	<0.50	<0.50 (0.50)	2
Methylene Chloride	0.0052	<1.0	<1.0 (1.0)	5
1,1,2,2-Tetrachloroethane	0.017	<0.50	<0.50 (0.50)	17
Tetrachloroethylene	0.0044	9.88	9.88 (0.50)	4
Toluene	0.002	<0.50	<0.50 (0.50)	2
Trichloroethylene	0.0076	2.90	2.90 (0.50)	8
Total Xylenes	0.0044	<0.50	<0.50 (0.50)	4

August 2018

## HYDROLOGICAL REVIEW SUMMARY

Semi-Volatile Organics		Sample Result (mg/L)	Sample Result with upper RDL included (mg/L)	
Di-n-butyl Phthalate	0.015	<1.0	<1.0 (1.0)	5
Bis (2-ethylhexyl) Phthalate	0.0088	<2.0	<2.0 (2.0)	8.8
3,3'-Dichlorobenzidine	0.0008	<0.40	<0.40 (0.40)	0.8
Pentachlorophenol	0.002	<0.50	<0.50 (0.50)	2
Total PAHs	0.002	<0.00175	<0.00175 (0.00175)	2
PCBs	0.0004	<0.060	<0.060 (0.060)	0.4
<b>Misc Parameters</b>				
Nonylphenols	0.001	<1.0	<1.0 (1.0)	1
Nonylphenol Ethoxylates	0.01	<2.0	<2.0 (2.0)	10

Sample Collected: Feb 21, 2023

Temperature: 7.2 °C

Consulting Firm that prepared Hydrological Report: [Grounded Engineering](#)

Qualified Professional who completed the report summary: Matthew Bielaski  
Print Name

Qualified Professional who completed the report summary: \_\_\_\_\_



Date & Stamp



# HYDROGEOLOGICAL REVIEW REPORT

**PREPARED FOR:**

Jameson Plaza Limited  
2700 Dufferin Street, Unit 50  
Toronto, ON, M6B 4J3

**ATTENTION:**

Barry Berens

**1437-1455 Queen Street West,  
Toronto, Ontario**

**Grounded Engineering Inc.**

File No. 23-014

Issued March 27, 2023



## Executive Summary

Grounded Engineering Inc. (Grounded) was retained by Jameson Plaza Limited to conduct a Hydrogeological Review for the proposed redevelopment of 1437-1455 Queen Street West in Toronto, Ontario (site). The conclusions of the investigation are summarized as follows:

### Site Information

Existing Development					
Site	Above Grade Levels	Below Grade Levels			
		Level #	Lowest Finished Floor		Approximate Base of Foundations (masl)
			Depth (m)	Elevation (masl)	
1437 Queen St W	2.5	1	Approx. 2.5	Approx. 96.0	Unknown
1439 Queen St W	1	1	Approx. 2.5	Approx. 95.6	Unknown
1441-1455 Queen St W	1 to 2	1*	Approx. 2.5	Approx. 95.6	Unknown

\*Partial Basement only beneath a portion of this building

Proposed Development					
Site	Above Grade Levels	Below Grade Levels			
		Level #	Lowest Finished Floor		Approximate Base of Foundations (masl)
			Depth (m)	Elevation (masl)	
1437 – 1455 Queen St W	13	1	3.5	94.6	93.6

### Site Conditions

Site Stratigraphy				
Stratum/Formation	Depth Range (mbgs)	Elevation Range (masl)	Hydraulic Conductivity (m/s)	Method
Fill	0 – 2.3	98.4 – 95.4	$1.0 \times 10^{-5}$	Literature
Sandy Silt	1.5 – 7.6	96.9 – 90.1	$9.7 \times 10^{-6}$	Slug Test
Sand	4.6 – 15.2	93.3 – 82.5	$3.1 \times 10^{-4}$	Slug Test
Glacial Till	12.2 – 15.3	85.7 – 82.4	$1.0 \times 10^{-7}$	Literature
Weathered	13.2 – 15.6	84.2 – 82.1	$3.3 \times 10^{-6}$	Slug Test
Sound	15.6 – 19.9	82.1 – 77.8	$3.3 \times 10^{-6}$	Slug Test

Groundwater Elevation	
Design Groundwater Elevation (masl)	91.5
MAGWL Assessment Option	Option 1
Seasonal Fluctuation (m)	1.9
Maximum Anticipated Groundwater Level (MAGWL)	93.4



### Groundwater Quality

Sample ID	Sample Date	Sample Expiry Date	City of Toronto Storm Sewer Limits	City of Toronto Sanitary and Combined Sewer Limits
SW-UF-BH102S	Feb 21, 2023	Nov. 21, 2023	Exceeds	Meets

### Groundwater Control

#### Stored Groundwater (pre-excavation/dewatering)

Volume of Excavation (m <sup>3</sup> )	Volume of Excavation Below Water Table (m <sup>3</sup> )	Estimated Volume of Stored Groundwater		Estimated Volume of Available Groundwater	
		m <sup>3</sup>	L	m <sup>3</sup>	L
13,147	0	0	0	0	0

#### Short Term (Construction) Steady State Groundwater Quantity – Safety Factor of 2.0 Used

Estimated Groundwater Seepage		Design Rainfall Event (25mm)		Estimated Total Daily Water Takings	
L/day	L/min	L/day	L/min	L/day	L/min
0	0	75,000	52.1	75,000	52.1

#### Long Term (Permanent) Steady State Groundwater Quantity – Safety Factor of 2.0 Used

Estimated Groundwater Seepage		Estimated Infiltrated Stormwater – Design Rainfall Event (25mm)		Estimated Total Daily Water Takings	
L/day	L/min	L/day	L/min	L/day	L/min
0	0	1,000	0.7	1,000	0.7

### Land Stability

	Short Term (Construction)	Long Term (Permanent)
Maximum Zone of Influence (m)	0	0
Maximum Potential Settlement (mm)	0	0

### Regulatory Requirements

Environmental Activity and Sector Registry (EASR) Posting	Not Required
Short Term Permit to Take Water (PTTW)	Not Required
Long Term Permit to Take Water (PTTW)	Not Required
Short Term Discharge Agreement City of Toronto	Required
Long Term Discharge Agreement City of Toronto	Required



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## **FIGURES**

Figure 1 – Study Area Map

Figure 2 – Borehole and Monitoring Well Location Plan – Existing

Figure 3 – Borehole and Monitoring Well Location Plan – Proposed

Figure 4 – Subsurface Profile

## **APPENDICES**

Appendix A – Borehole Logs

Appendix B – Aquifer Response Tests

Appendix C – Grain Size Analysis

Appendix D – HydrogeoSieveXL Data

Appendix E – Laboratory Certificate of Analysis

Appendix F – Finite Element Model

Appendix G – Dewatering Calculations

Appendix H – Borehole Logs (Previously Reported) by S2S Environmental Inc.



# 1 Introduction

Jameson Plaza Limited has retained Grounded Engineering Inc. (“Grounded”) to provide hydrogeological engineering design advice for their proposed development at 1437-1455 Queen Street West, in Toronto, Ontario.

Property Information	
Location of Site	1437-1455 Queen Street West, Toronto, Ontario, M6R 1A1
Ownership of Site	Jameson Plaza Ltd & 1437 Queen West Ltd
Site Dimensions (m)	85 x 38
Site Area (m <sup>2</sup> )	3,230

Existing Development	
Number of Building Structures	3
Number of Above Grade Levels	1437 Queen St W: 2.5 1439 Queen St W: 1 1441-1455 Queen St W: 1 to 2
Number of Underground Levels	1437 Queen St W: 1 1439 Queen St W: 1 1441-1455 Queen St W: 1 (Only beneath a portion of this building)
Sub-Grade Depth of Development (m)	1437 Queen St W: Approx. 2.5 1439 Queen St W: 2.5 1441-1455 Queen St W: 2.5
Sub-Grade Area (m <sup>2</sup> )	Approx. 2,075
Land Use Classification	Commercial

Proposed Development	
Number of Building Structures	1
Number of Above Grade Levels	12
Number of Underground Levels	1
Sub-Grade Depth of Development (m)	Approx. 3.5
Sub-Grade Area (m <sup>2</sup> )	3,000
Land Use Classification	Residential



Qualified Person and Hydrogeological Review Information	
<b>Qualified Person</b>	Matt Bielaski, P.Eng., QP <sub>RA-ESA</sub>
<b>Consulting Firm</b>	Grounded Engineering Inc.
<b>Date of Hydrogeological Review</b>	March 27, 2023
<b>Scope of Work</b>	<ul style="list-style-type: none"> <li>▪ Review of MECP Water Well Records for the area</li> <li>▪ Review of geological information for the area</li> <li>▪ Review of topographic information for the area</li> <li>▪ Advancement of 3 boreholes to a maximum depth of 19.9 m, which were instrumented with 5 monitoring wells</li> <li>▪ Completion of a 24-hour pump test (if feasible)</li> <li>▪ Completion of slug tests in all available monitoring wells</li> <li>▪ Groundwater elevation monitoring for three (3) months on a bi-weekly basis</li> <li>▪ Groundwater sampling and analysis to the City of Toronto Sewer Use Limits</li> <li>▪ Assessment of groundwater controls and potential impacts</li> <li>▪ Report preparation in accordance with Ontario Water Resources Act, Ontario Regulation 387/04 and Toronto Municipal Code Chapter 681</li> </ul>

General Hydrogeological Characterization	
<b>Site Topography</b>	The site has an approximate ground surface elevation of 98 masl.
<b>Local Physiographic Features</b>	The site is composed of sandy silt, sands and glacial till overlying Georgian Bay formation bedrock.
<b>Regional Physiographic Features</b>	<p>The lowland bordering Lake Ontario, when the last glacier was receding but still occupied the St. Lawrence Valley, was inundated by a body of water known as Lake Iroquois which emptied eastward at Rome, New York State. The Iroquois plain extends around the western part of Lake Ontario, from the Niagara River to the Trent River, a distance of 190 miles, its width varying from a few hundred yards to about eight miles.</p> <p>The first settlement area in the City of Toronto (and where the first century of growth took place was an inheritance from the realm of glacial Lake Iroquois. The Iroquois lake plain, cut in previously deposited clay and till, is partly floored with sand deposits.</p>
<b>Watershed</b>	The site is located within the Lake Ontario Waterfront. Locally, groundwater is anticipated to flow south towards Lake Ontario.
<b>Surface Drainage</b>	Surface water is expected to flow towards municipal catch basins located on or adjacent to the site, via Queen Street to the East and West.



## 2 Study Area Map

A map has been enclosed which shows the following information:

- All monitoring wells identified on site
- All monitoring wells identified off site within the study area
- All boreholes identified on site
- All buildings identified on site and within the study area
- The Site boundaries
- Any watercourses and drainage features within the study area.

## 3 Geology and Physical Hydrogeology

The site stratigraphy, including soil materials, composition and texture are presented in detail on the borehole logs in Appendix A. A summary of stratigraphic units that were encountered at the site is outlined as follows:

<b>Site Stratigraphy</b>				
<b>Stratum/Formation</b>	<b>Depth Range (mbgs)</b>	<b>Elevation Range (masl)</b>	<b>Hydraulic Conductivity (m/s)</b>	<b>Method of Determination</b>
<b>Fill</b>	0 – 2.3	98.4 – 95.4	$1.0 \times 10^{-5}$	Literature <sup>1</sup>
<b>Sandy Silt</b>	1.5 – 7.6	96.9 – 90.1	$9.7 \times 10^{-6}$	Slug Test
<b>Sand</b>	4.6 – 15.2	93.3 – 82.5	$3.1 \times 10^{-4}$	Slug Test
<b>Glacial Till</b>	12.2 – 15.3	85.7 – 82.4	$1.0 \times 10^{-7}$	Literature <sup>1</sup>

<b>Bedrock</b>				
<b>Stratum/Formation</b>	<b>Depth Range (mbgs)</b>	<b>Elevation Range (masl)</b>	<b>Hydraulic Conductivity (m/s)</b>	<b>Method of Determination</b>
Weathered	13.2 – 15.6	84.2 – 82.1	$3.3 \times 10^{-6}$	Slug Test
Sound	15.6 – 19.9	82.1 – 77.8	$3.3 \times 10^{-6}$	Slug Test

<sup>1</sup> Freeze and Cherry (1979)





Surface Water			
Surface Water Body	Distance from site (m)	Direction from site	Hydraulically Connected to Site (yes/no)
Lake Ontario	600	Southwest	No

## 4 Monitoring Well Information

Well ID	Well Diameter (mm)	Ground Surface (masl)	Top of Screen (masl)	Bottom of Screen (masl)	Screened Geological Unit
101S	50	97.9	93.3	90.3	Sand
101D	50	97.9	82.3	79.3	Bedrock
102S	50	97.7	91.7	88.6	Silt / Sand
102D	50	97.7	81.0	77.9	Bedrock
103	50	98.4	87.4	84.4	Sand

## 5 Groundwater Elevations

Well ID	Groundwater Elevation (masl)				
	Feb 13, 2023	Feb 21, 2023	March 3, 2023	March 17, 2023	Maximum
101S	91.1	91.1	91.1	91.2	91.2
101D	91.0	91.0	91.2	91.5	91.5
102S	91.0	91.0	91.0	91.1	91.1
102D	90.8	90.7	90.9	90.9	90.9
103	90.9	90.9	90.9	91.0	91.0

For design purposes, the groundwater table is at Elev. 91.5 m in sandy silt and sand units.

Groundwater levels fluctuate with time depending on the amount of precipitation and surface runoff and may be influenced by known or unknown dewatering activities at nearby sites.

Per the City of Toronto, Toronto Water Infrastructure Management's Foundation Drainage Policy (November 1, 2021), long term connection to and discharge of foundation drainage to the City's sanitary sewer system will not be permitted. A temporary, emergency foundation drainage connection to the City's sewer systems **may** be granted if the lowest elevation of any proposed



structure is higher than the Maximum Anticipated Groundwater Level at the site. The MAGWL is determined based on the following equation:

$$\text{Maximum Anticipated GWL} = \text{Peak Static GWL Observed} + \text{Fluctuation Allowance}$$

Groundwater Elevation	
Design Groundwater Elevation (masl)	91.5
MAGWL Assessment Option	Option 1
Seasonal Fluctuation (m)	1.9
Maximum Anticipated Groundwater Level (MAGWL)	93.4
Base of Subfloor Drainage Layer (masl)	94.1
Structure is Above or Below the MAGWL	Above

The lowest elevation of the proposed structure (taken as the base of subfloor drainage layer) at the site will be higher than the determined MAGWL. A drained basement structure may be permitted. Further discussion is provided in Section 10.

## 6 Aquifer Testing

### 6.1 Pump Test

A pumping test was not attempted at the site. Slug tests were conducted and are presented in the section below.

### 6.2 Single Well Response Test (Slug Test)

The hydraulic conductivities from the monitoring wells were determined based on slug tests (single-well response tests). These tests involve rapid removal of water or addition of a “slug” which displaces a known volume of water from a single well, and then monitoring the water level in the well until it recovers. The results of the slug tests were analyzed using the Bouwer and Rice method (1976).

The hydraulic properties of the strata applicable to the site are as follows:

Well ID	Well Screen Elevation (masl)	Screened Geological Unit	Hydraulic Conductivity (m/s)
101S	93.3 - 90.3	Sand	$2.6 \times 10^{-6}$
101D	82.3 - 79.3	Bedrock	$3.3 \times 10^{-6}$
102S	91.6 - 88.6	Silt / Sand	$9.7 \times 10^{-6}$



Well ID	Well Screen Elevation (masl)	Screened Geological Unit	Hydraulic Conductivity (m/s)
102D	81.0 - 77.9	Bedrock	$2.5 \times 10^{-7}$
103	87.4 - 84.4	Sand	$2.2 \times 10^{-4}$

### 6.3 Soil Grain Size Distribution

The hydraulic conductivities of various soil types can also be estimated from grain size analyses. An assessment of the grain sizes was conducted using the excel-based tool, HydrogeoSieve XL (*HydrogeoSieve XL ver.2.2, J.F. Devlin, University of Kansas, 2015*). HydrogeoSieve XL compares the results of the grain size analyses against fifteen (15) different analytical methods.

Given our experience in the area as well as published literature, some of the geometric means provided for the soil were biased low by one or more methods. In these instances, the values determined by these methods were excluded from the mean. The table below illustrates the hydraulic conductivity values estimated from the mean of the analytical methods where the soil met the applicable analysis criteria.

Sample ID	Soil Description	Applicable Analysis Methods	Hydraulic Conductivity (m/s)
BH101 SS5	Clayey silt	Alyamani and Sen, Barr, Sauerbrei	$2.4 \times 10^{-9}$
BH101 SS8	Silty sand	Alyamani and Sen, Barr, Krumbein and Monk, Sauerbrei	$1.5 \times 10^{-5}$
BH102 SS7	Silt and sand	Alyamani and Sen, Barr, Sauerbrei	$2.5 \times 10^{-8}$
BH103 SS11	Gravelly sand	Alyamani and Sen, Barr, Krumbein and Monk, Sauerbrei	$1.4 \times 10^{-5}$

The results of the analyses are presented in Appendix D.

### 6.4 Literature

According to Freeze and Cherry (1979), the typical hydraulic conductivity of the strata investigated at the site are:

Stratum/Formation	Hydraulic Conductivity (m/s)
Earth Fill	$10^{-2}$ to $10^{-6}$
Silts	$10^{-5}$ to $10^{-9}$
Glacial Till	$10^{-6}$ to $10^{-12}$
Clays	$10^{-9}$ to $10^{-12}$
Bedrock (Shale)	$10^{-6}$ to $10^{-13}$



## 7 Water Quality

One (1) unfiltered groundwater sample was collected and analyzed by a Canadian laboratory accredited and licensed by Standards Council of Canada and or Canadian Association for Laboratory Accreditation.

The sample was collected directly from monitoring well BH102S on February 21, 2023. The sample was analyzed for the following parameters:

- City of Toronto Municipal Code Chapter 681 Table 1 – Limits for Sanitary and Combined Sewers Discharge
- City of Toronto Municipal Code Chapter 681 Table 2 – Limits for Storm Sewer Discharge

The groundwater sample **exceeded** the **Limits for Storm Sewer Discharge** for the following parameters:

- Total Suspended Solids (Limit 15 mg/L, Result 21.9 mg/L)
- Total Manganese (Limit 0.05 mg/L, Result 0.577 mg/L)
- BOD (Limit 15 mg/L, Result 28 mg/L)
- Tetrachloroethylene (Limit 4.4 µg/L, Result 9.88 µg /L)

The groundwater sample **met** the **Limits for Sanitary and Combined Sewer Discharge** for all parameters analyzed.

A true copy of the analysis report, Certificate of Analysis and a chain of custody record for the sample are enclosed.

## 8 Proposed Construction Method

For design purposes, the groundwater table is in the sandy silt and sand units. These deposits have a relatively high permeability and will yield free-flowing water when penetrated.

The proposed shoring methodology at the site is currently undetermined. For the purposes of this report, numerical analyses were conducted employing conventional soldier piling and lagging in order to determine a “worst-case scenario” with respect to dewatering volumes and groundwater seepage at the site.

For design purposes, the stabilized groundwater table is at about Elev. 91.5± m. The groundwater table is present in the sandy silt, sand, glacial till, and the bedrock. The lowest (P1) FFE is at about Elev. 94.6 m. Therefore,

- Bulk excavation will not extend below the elevation of the design groundwater table.
- Foundation excavations will not extend below the design groundwater table.



Within the zone of excavation, the boreholes were generally dry and open with no seepage. There is infiltrated stormwater in the fill. On this basis, it is expected that groundwater if encountered will be of limited extent. Groundwater may be allowed to drain into the excavation and then pumped out. In open excavations, it is anticipated that seepage volumes will be limited to the extent that temporary pumping will sufficiently control any groundwater seepage. Regardless, excavation delays will occur as seepage (however limited) is controlled. These delays should be anticipated in the construction schedule.

The proposed underground structure may be permitted as a fully drained structure at this site, per the discussion in Sections 5 and 10.

## **9 Private Water Drainage System (PWDS)**

If the proposed development consists of drained foundations, then a private water drainage system will be required. The total sub floor drain area will be approximately 3,000 m<sup>2</sup> based on the drawings which have been provided.

If the development is designed with a private water drainage system, the drainage system is a critical structural element since it keeps water pressure from acting on the basement walls and floor slab. As such, the sump that ensures the performance of this system must have a duplexed pump arrangement for 100% pumping redundancy and these pumps must be on emergency power. The size of the sump should be adequate to accommodate the estimated groundwater seepage. It is anticipated that the groundwater seepage can be controlled with typical, widely available, commercial/residential sump pumps.

If the proposed development is designed as a watertight structure, then a private water drainage system will not be required. However, the structure must then be designed to resist hydrostatic pressure and uplift forces based on a design groundwater elevation of 91.5 m. A connection to the City's sewer for emergency repair services is recommended.

## **10 Groundwater Extraction and Discharge**

Numerical analyses were conducted for both short-term and long-term dewatering scenarios. The modeling was conducted using computer software, which deploys the finite element modelling method. The Finite Element Model (FEM) for groundwater seepage indicates the short-term (construction) and long-term (permanent) dewatering requirements as provided below. The finite element model results are presented in Appendix F.

The groundwater seepage estimates, which have been provided, represent the steady state groundwater seepage. There will be an initial drawdown of the groundwater before a steady state condition is reached. The rate of the initial drawdown, and therefore discharge, is dependent on the dewatering contractor and how the groundwater is being dealt with at the site. An estimated initial volume of stored groundwater which will require removal before steady state is reached has been provided below.



Please note that if excavation is exposed to the elements, stormwater will have to be managed. The short-term control of groundwater should consider stormwater management from rainfall events. A dewatering system should be designed to consider the removal of rainfall from excavation. A design storm of 25 mm has been used in the quantity estimates.

As required by Ontario Regulation 63/16, a plan for discharge must consider the conveyance of stormwater from a 100-year storm. The additional volume that will be generated in the occurrence of a 100-year storm event is approximately 281,000 L.

The following design considerations and values have been incorporated into the numerical modelling / dewatering estimates:

- A Factor of Safety of 2.0 was used for all groundwater seepage volume calculations.
- The design hydraulic conductivities for the site are:

Design Hydraulic Conductivity	
Stratum/Formation	K (m/s)
Earth Fill	$1.0 \times 10^{-5}$
Sandy Silt	$9.7 \times 10^{-6}$
Sands	$3.1 \times 10^{-4}$
Glacial Till	$1.0 \times 10^{-7}$
Weathered Bedrock	$3.3 \times 10^{-6}$
Sound Bedrock	$3.3 \times 10^{-6}$

Stored Groundwater (pre-excavation/dewatering)					
Volume of Excavation (m <sup>3</sup> )	Volume of Excavation Below Water Table (m <sup>3</sup> )	Estimated Volume of Stored Groundwater		Estimated Volume of Available Groundwater	
		m <sup>3</sup>	L	m <sup>3</sup>	L
13,147	0	0	0	0	0

Short-Term (Construction) Steady State Groundwater Quantity – Safety Factor of 2.0 Used					
Estimated Groundwater Seepage		Design Rainfall Event (25mm)		Estimated Total Daily Water Takings	
L/day	L/min	L/day	L/min	L/day	L/min
0	0	75,000	52.1	75,000	52.1



Long-Term (Permanent) Steady State Groundwater Quantity – Safety Factor of 2.0 Used					
Estimated Groundwater Seepage		Estimated Infiltrated Stormwater – Design Rainfall Event (25mm)		Estimated Total Daily Water Takings	
L/day	L/min	L/day	L/min	L/day	L/min
0	0	1,000	0.7	1,000	0.7

Regulatory Requirements	
Environmental Activity and Sector Registry (EASR) Posting	Not Required
Short-Term Permit to Take Water (PTTW)	Not Required
Long-Term Permit to Take Water (PTTW)	Not Required
Short-Term Discharge Agreement City of Toronto	Required
Long-Term Discharge Agreement City of Toronto	Required

Drained underground structures may be permitted at this site. Per the City of Toronto, Toronto Water Infrastructure Management’s Foundation Drainage Policy (November 1, 2021), long-term connection to and discharge of foundation drainage to the City’s sanitary sewer system will not be permitted.

The lowest elevation of the proposed structure (taken as the base of subfloor drainage layer) at the site (Elev. 94.1 m) will be higher than the determined MAGWL (Elev. 93.4 m). Under the City’s foundation drainage policy, the **discharge of infiltrated stormwater** can also be allowed provided the following:

- The structure does not intersect a confined aquifer
- On-site management of stormwater is not feasible
- The lowest proposed structure elevation is above the MAGWL
- Therefore, a permanent connection to the City’s storm sewers for the discharge of infiltrated stormwater/surface water should be allowable (Foundation Drainage Policy Section 4), provided an RSC is obtained for the site.

The City of Toronto will require Discharge Agreements in the short- and long- terms, if any water is to be discharged to the storm or sanitary sewers. It should be noted that securing a permit to take water on a permanent basis may not be supported by regulatory agencies.

Please note:

- The proposed pump schedule for long-term permanent drainage has not been completed. As such the actual peak long-term discharge rate is not available at the time writing of this report. The pump schedule must be specified by the mechanical consultant.
- On-site containment (infiltration gallery/dry well etc.) has not been considered as part of the proposed development at this time. If this option is considered, additional work will have to be conducted (i.e. infiltration testing).



## 11 Evaluation of Impact

### 11.1 Zone of Influence (ZOI)

Considering that bulk and foundation excavation will not extend near or below the groundwater table, positive dewatering is not required, and the ZOI with respect to groundwater seepage is 0 m.

### 11.2 Land Stability

The impacts to land stability at the site on adjacent structures are summarized as follows:

- As the groundwater table is below the proposed structure (taken as the underside of the subfloor drainage layer) there will be no positive dewatering in the short- and long-term conditions.
- There will be no ZOI.
- There will be no increase in effective stress due to lowering of the groundwater table.
- As such, there will be no dewatering-induced settlement on adjacent structures or lands.

### 11.3 City's Sewage Works

Negative impacts to City's sewage works may occur in terms of the quantity or quality of the groundwater discharged. This report provided the estimated quantity of the water discharge. However, this report does not speak to the sewer capacities. The sewer capacity analysis is provided under a separate cover by the civil consultant.

The quality of the proposed groundwater discharge is provided in Section 7. As noted in that section, the groundwater sample exceeded the Limits for Storm Sewer Discharge and met the Limits for Sanitary and Combined Sewer Discharge.

As such, additional treatment will be required before the water can be discharged to the Storm Sewer to avoid impacts to the City's sewage works caused by groundwater quality. Additional treatment will not be required before the water can be discharged to the Sanitary and Combined Sewer.

Per the City of Toronto, Toronto Water Infrastructure Management's Foundation Drainage Policy (November 1, 2021), long-term connection to and discharge of foundation drainage to the City's sanitary sewer system will not be permitted. A temporary, emergency foundation drainage connection to the City's sewer systems **may** be granted if the lowest elevation of any proposed structure is higher than the Maximum Anticipated Groundwater Level at the site (such as in this case as presently proposed).





## **11.4 Natural Environment**

There is no ZOI, per the above sections. As such, no natural waterbodies will be affected. Any groundwater which will be taken from the site will be discharged (if required) into the City's sewer systems and not into any natural waterbody. As such, there will be no impact to the natural environment caused by the water takings at the site.

## **11.5 Local Drinking Water Wells**

The site is located within the municipal boundaries of the City of Toronto. The site and surrounding area are provided with municipal piped water and sewer supply. There is no use of the groundwater for water supply in this area of Toronto. As such, there will be no impact to drinking water wells.

## **11.6 Contamination Source**

There is no ZOI, per the above sections. As such, there will be no pumping of groundwater, and the migration of potential contaminants from surrounding sources is not anticipated.

## **12 Proposed Mitigation Measures and Monitoring Plan**

There is no ZOI, per the above sections. Negative impacts associated with dewatering are limited to within the ZOI. Therefore, negative impacts are not anticipated. The groundwater elevation will be monitored during construction to ensure that this is the case.

## **13 Limitations**

Natural occurrences, the passage of time, local construction, and other human activity all have the potential to directly or indirectly alter the subsurface conditions at or near the project site. Contractual obligations related to groundwater or stormwater control must be considered with attention and care as they relate this potential site alteration.

The hydrogeological engineering advice provided in this report is based on the factual observations made from the site investigations as reported. It is intended for use by the owner and their retained design team. If there are changes to the features of the development or to the scope, the interpreted subsurface information, geotechnical engineering design parameters, advice, and discussion on construction considerations may not be relevant or complete for the project. Grounded should be retained to review the implications of such changes with respect to the contents of this report.

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including consequential financial effects on transactions or property values, or requirements for follow-up actions and costs.

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## 14 Closure

If there are any questions regarding the discussion and advice provided, please do not hesitate to contact our office. We trust that this report meets your requirements at present.

For and on behalf of our team,



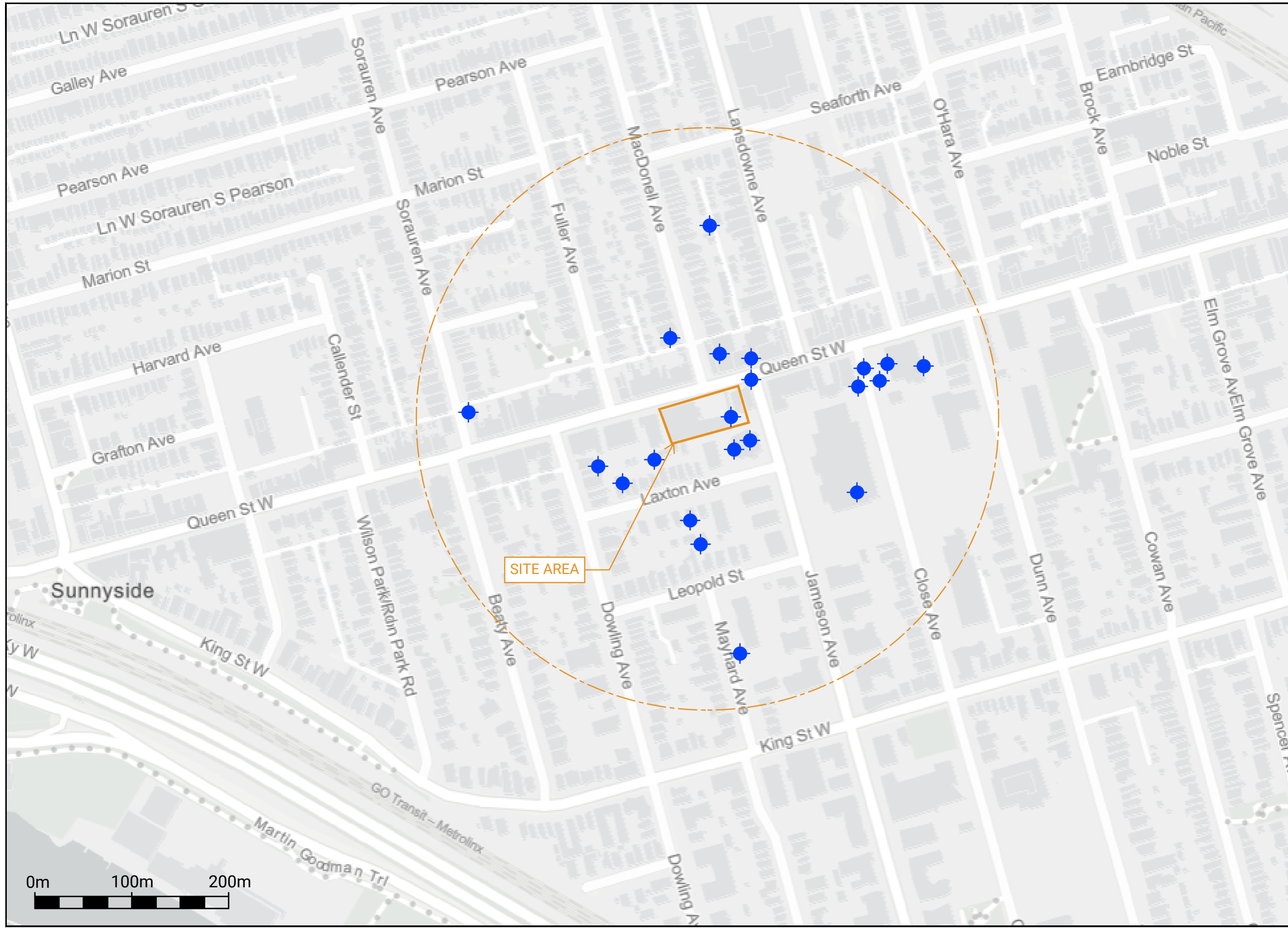
Nico Piers, B.A.Sc.  
Project Coordinator



Matt Bielaski, P.Eng., QP<sub>RA-ESA</sub>  
Principal

# FIGURES





**GROUNDED**  
ENGINEERING

1 BANIGAN DRIVE, TORONTO, ONT., M4H 1G3  
www.groundedeng.ca

**LEGEND**

- APPROXIMATE PROPERTY BOUNDARY
- STUDY AREA (250 m RADIUS)
- MECP WELL LOCATION

Note

Reference

ArcGis MyMap, 2023

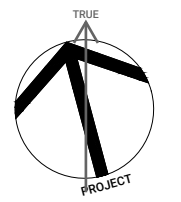
Project

**1437-1455 QUEEN ST W,  
TORONTO, ONTARIO**

Figure Title

**SITE LOCATION PLAN**

North



Date

MARCH 2023

Scale

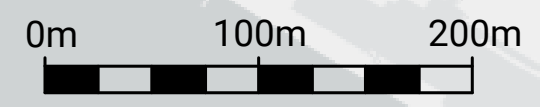
AS INDICATED

Job No

23-014

Figure No

**FIGURE 1**





**GROUND**  
ENGINEERING

1 BANIGAN DRIVE, TORONTO, ONT., M4H 1G3  
www.groundedeng.ca

**LEGEND**

- PROPERTY BOUNDARY
- EXISTING BUILDING STRUCTURE
- MONITORING WELL/BOREHOLE BY GROUND
- MONITORING WELL/BOREHOLE BY OTHERS

Note

Reference

Plan of Survey, Parts of Lot 1 and All of Lots 2 to 6, Registered Plan 1106 of City of Toronto, Job No. 23-037-00, Schaeffer Dzaidov Purcell Ltd, Dated March 9, 2023

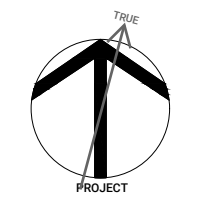
Project

**1437-1455 QUEEN ST W,  
TORONTO, ONTARIO**

Figure Title

**BOREHOLE LOCATION  
PLAN - EXISTING**

North

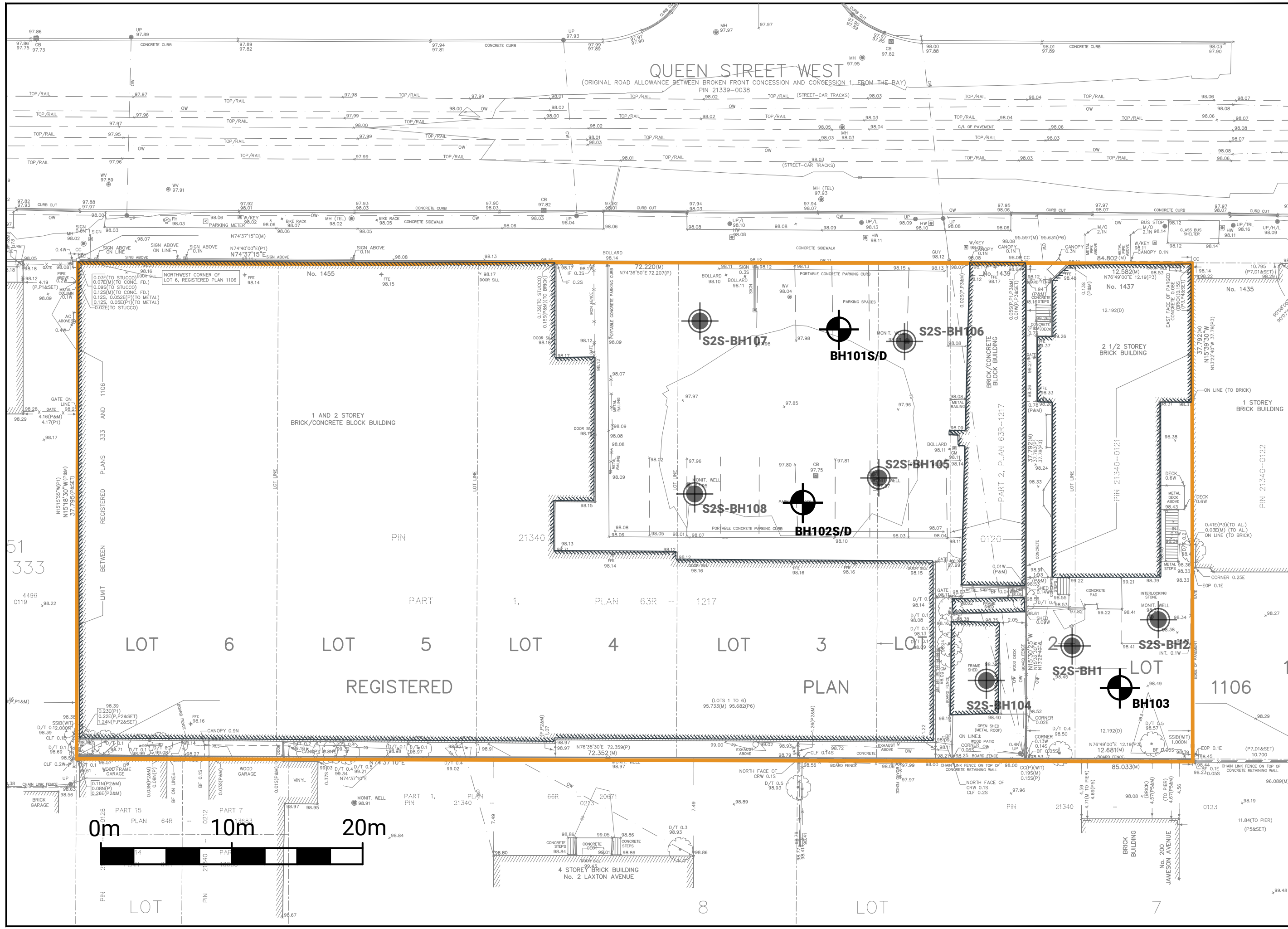


Date  
MARCH 2023

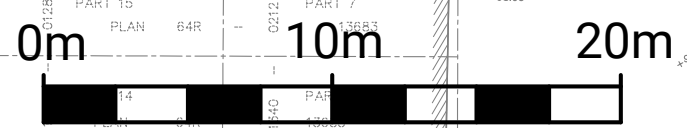
Scale  
AS INDICATED

Job No  
23-014

Figure No  
**FIGURE 2**



51  
333





**GROUND**  
ENGINEERING

1 BANIGAN DRIVE, TORONTO, ONT., M4H 1G3  
www.groundedeng.ca

**LEGEND**

- PROPERTY BOUNDARY
- ⊕ MONITORING WELL/BOREHOLE BY GROUNDED
- ⊙ MONITORING WELL/BOREHOLE BY OTHERS

Note

Reference

Conceptual Site Plans, RAW Design, "1437-1455 Queen St W", Dated February 16, 2023

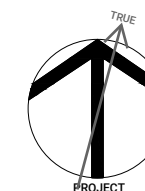
Project

**1437-1455 QUEEN ST W,  
TORONTO, ONTARIO**

Figure Title

**BOREHOLE LOCATION  
PLAN - PROPOSED**

North



Date

MARCH 2023

Scale

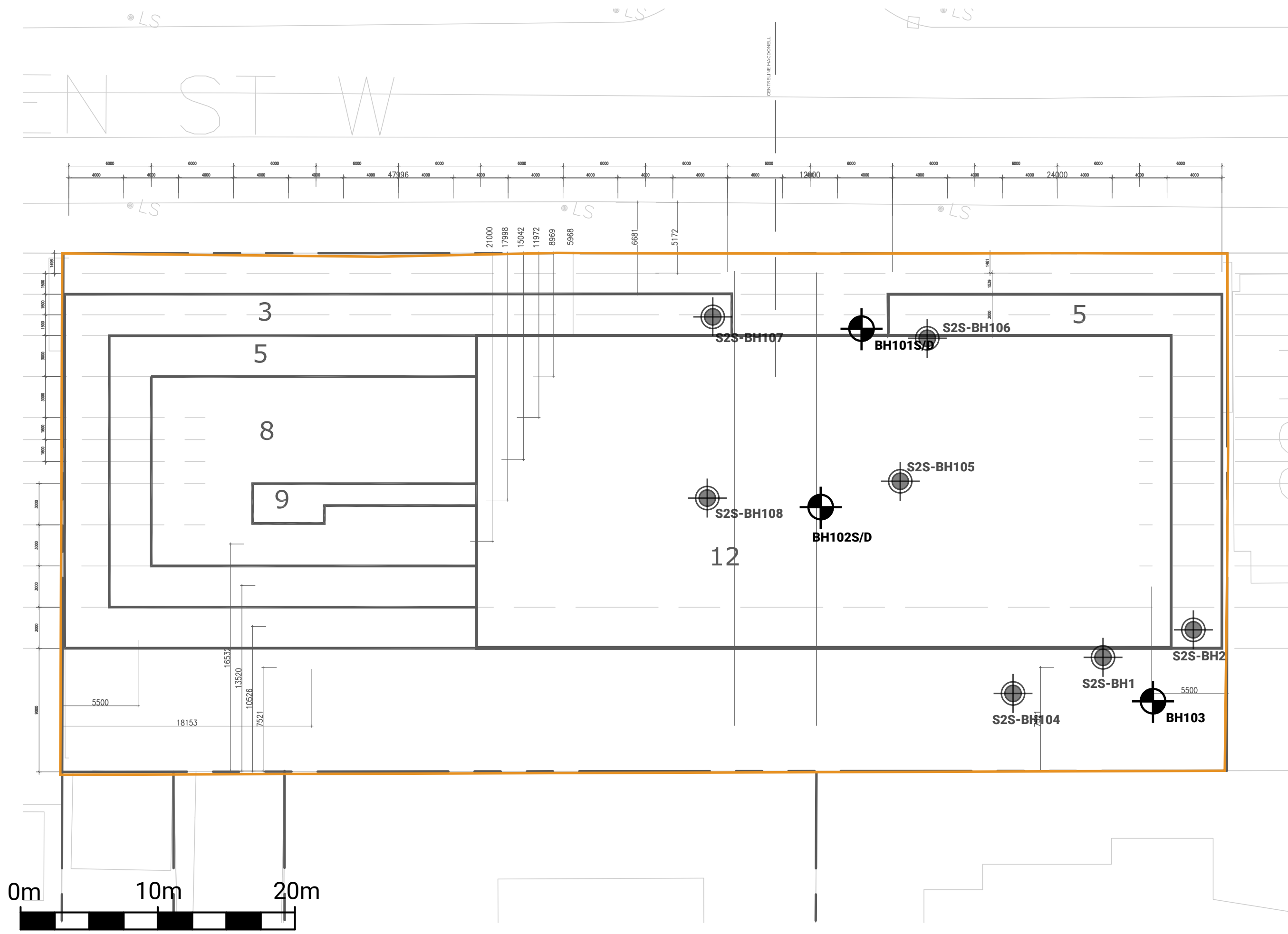
AS INDICATED

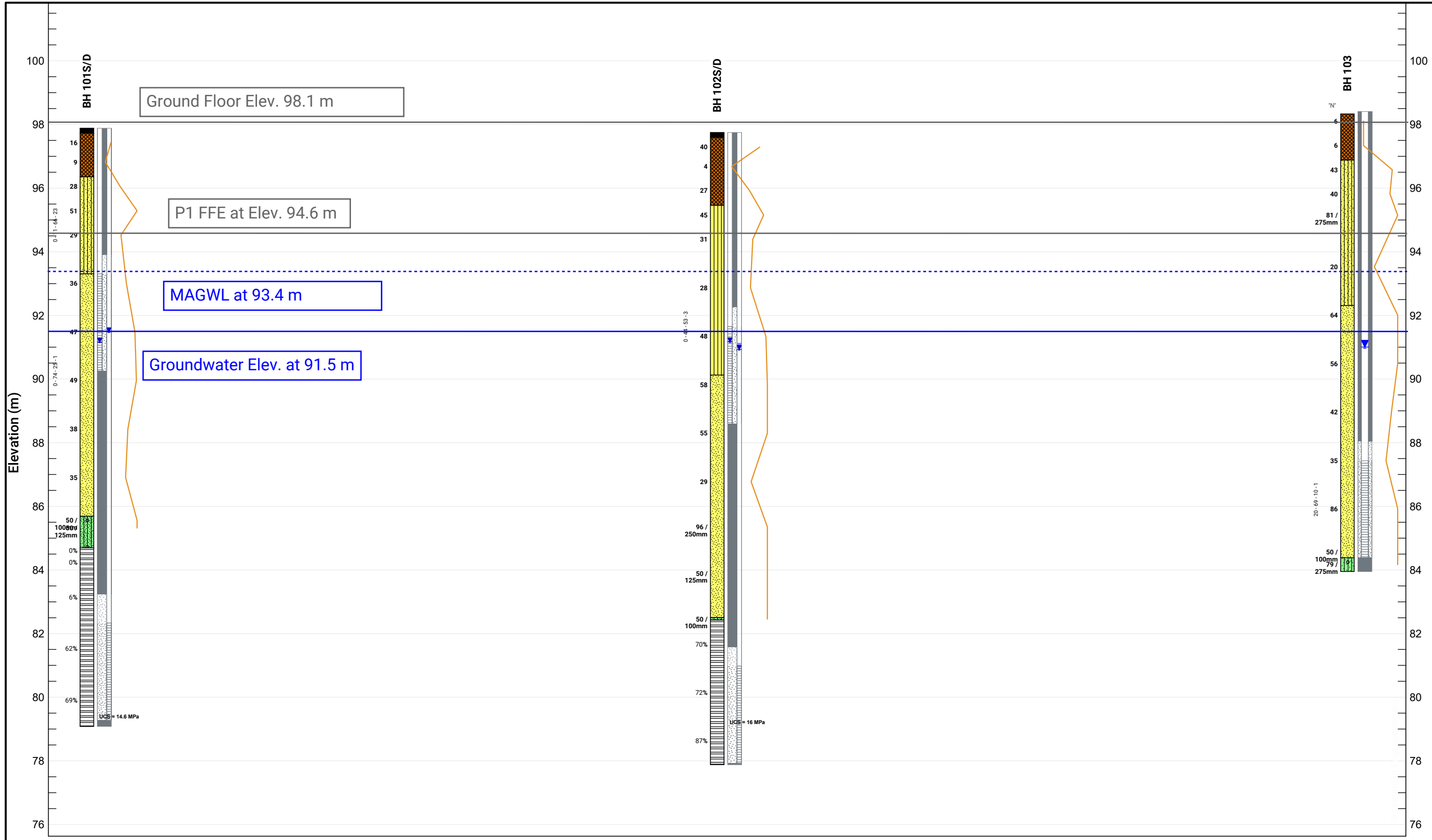
Job No

23-014

Figure No

**FIGURE 3**





**LEGEND**

- FILL
- GRAVELS (gravel to gravelly sand)
- SILT TO SAND (not till)
- COHESIONLESS TILLS
- COHESIVE SOILS (clayey silt to clay, incl. tills)
- DISTURBED/REWORKED/ORGANIC

- water level, unstabilized
- water level, stabilized (latest)
- water level, stabilized (highest)

Project  
**1437-1455 QUEEN ST W**  
**1437-1455 QUEEN ST W**

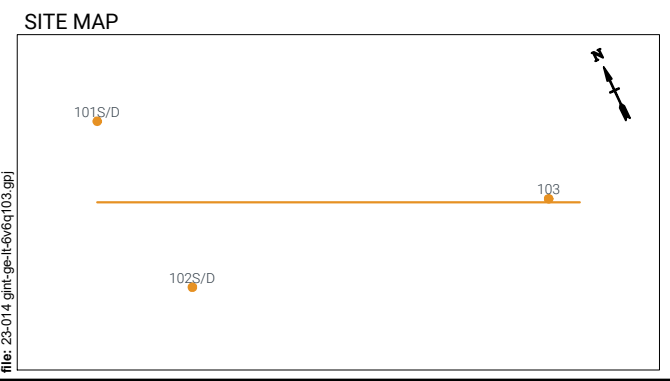
Figure Title  
**SUBSURFACE PROFILE**

Date  
MARCH 2023

Scale  
AS INDICATED

Job No  
23-014

Figure No  
**FIGURE 4**



**BOREHOLE STRATIGRAPHY LEGEND**

<span style="display: inline-block; width: 15px; height: 15px; background-color: black; border: 1px solid black; margin-right: 5px;"></span> Asphalt	<span style="display: inline-block; width: 15px; height: 15px; background: repeating-linear-gradient(45deg, transparent, transparent 2px, black 2px, black 4px); border: 1px solid black; margin-right: 5px;"></span> Sand and Silt Till
<span style="display: inline-block; width: 15px; height: 15px; background-color: #8B4513; border: 1px solid black; margin-right: 5px;"></span> Fill	<span style="display: inline-block; width: 15px; height: 15px; background: repeating-linear-gradient(-45deg, transparent, transparent 2px, black 2px, black 4px); border: 1px solid black; margin-right: 5px;"></span> Shale
<span style="display: inline-block; width: 15px; height: 15px; background: radial-gradient(circle, black 1px, transparent 1px); background-size: 4px 4px; border: 1px solid black; margin-right: 5px;"></span> Sandy Silt	<span style="display: inline-block; width: 15px; height: 15px; background: repeating-linear-gradient(-45deg, transparent, transparent 2px, black 2px, black 4px); border: 1px solid black; margin-right: 5px;"></span> Silt
<span style="display: inline-block; width: 15px; height: 15px; background-color: #FFD700; border: 1px solid black; margin-right: 5px;"></span> Sand	<span style="display: inline-block; width: 15px; height: 15px; background: radial-gradient(circle, black 1px, transparent 1px); background-size: 4px 4px; border: 1px solid black; margin-right: 5px;"></span> Sandy Silt Till

*Boreholes Equally Spaced*

# APPENDIX A





## SAMPLING/TESTING METHODS

SS: split spoon sample  
 AS: auger sample  
 GS: grab sample  
 FV: shear vane  
 DP: direct push  
 PMT: pressuremeter test  
 ST: shelby tube  
 CORE: soil coring  
 RUN: rock coring

## SYMBOLS & ABBREVIATIONS

MC: moisture content  
 LL: liquid limit  
 PL: plastic limit  
 PI: plasticity index  
 $\gamma$ : soil unit weight (bulk)  
 $G_s$ : specific gravity  
 $S_u$ : undrained shear strength  
 unstabalized water level  
 1st water level measurement  
 2nd water level measurement most recent  
 water level measurement

## ENVIRONMENTAL SAMPLES

M&I: metals and inorganic parameters  
 PAH: polycyclic aromatic hydrocarbon  
 PCB: polychlorinated biphenyl  
 VOC: volatile organic compound  
 PHC: petroleum hydrocarbon  
 BTEX: benzene, toluene, ethylbenzene and xylene  
 PPM: parts per million

## FIELD MOISTURE (based on tactile inspection)

**DRY:** no observable pore water  
**MOIST:** inferred pore water, not observable (i.e. grey, cool, etc.)  
**WET:** visible pore water

## COHESIONLESS

Relative Density	N-Value
Very Loose	<4
Loose	4 - 10
Compact	10 - 30
Dense	30 - 50
Very Dense	>50

## COHESIVE

Consistency	N-Value	Su (kPa)
Very Soft	<2	<12
Soft	2 - 4	12 - 25
Firm	4 - 8	25 - 50
Stiff	8 - 15	50 - 100
Very Stiff	15 - 30	100 - 200
Hard	>30	>200

## COMPOSITION

Term	% by weight
trace silt	<10
some silt	10 - 20
silty	20 - 35
sand and silt	>35

## ASTM STANDARDS

### ASTM D1586 Standard Penetration Test (SPT)

Driving a 51 mm O.D. split-barrel sampler ("split spoon") into soil with a 63.5 kg weight free falling 760 mm. The blows required to drive the split spoon 300 mm ("bpf") after an initial penetration of 150 mm is referred to as the N-Value.

### ASTM D3441 Cone Penetration Test (CPT)

Pushing an internal still rod with a outer hollow rod ("sleeve") tipped with a cone with an apex angle of 60° and a cross-sectional area of 1000 mm<sup>2</sup> into soil. The resistance is measured in the sleeve and at the tip to determine the skin friction and the tip resistance.

### ASTM D2573 Field Vane Test (FVT)

Pushing a four blade vane into soil and rotating it from the surface to determine the torque required to shear a cylindrical surface with the vane. The torque is converted to the shear strength of the soil using a limit equilibrium analysis.

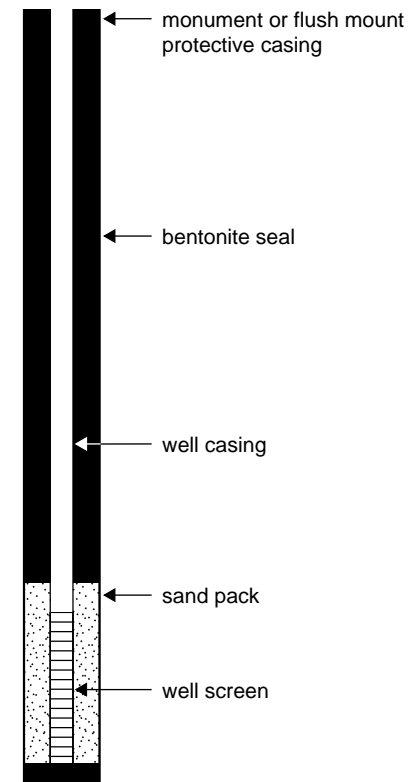
### ASTM D1587 Shelby Tubes (ST)

Pushing a thin-walled metal tube into the in-situ soil at the bottom of a borehole, removing the tube and sealing the ends to prevent soil movement or changes in moisture content for the purposes of extracting a relatively undisturbed sample.

### ASTM D4719 Pressuremeter Test (PMT)

Place an inflatable cylindrical probe into a pre-drilled hole and expanding it while measuring the change in volume and pressure in the probe. It is inflated under either equal pressure increments or equal volume increments. This provides the stress-strain response of the soil.



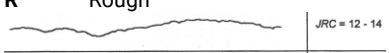

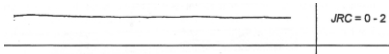

## WELL LEGEND



- TCR** **Total Core Recovery** the total length of recovery (soil or rock) per run, as a percentage of the drilled length
- SCR** **Solid Core Recovery** the total length of sound full-diameter rock core pieces per run, as a percentage of the drilled length
- RQD** **Rock Quality Designation** the sum of all pieces of sound rock core in a run which are 10 cm or greater in length, as a percentage of the drilled length

**Natural Fracture Frequency (typically per 0.3 m)** The number of natural discontinuities (joints, faults, etc.) which are present per 0.3m. Ignores mechanical or drill-induced breaks, and closed discontinuities (e.g. bedding planes).

## LOGGING DISCONTINUITIES

<p><b>Discontinuity Type</b></p> <p><b>BP</b> bedding parting  <b>CL</b> cleavage  <b>CS</b> crushed seam  <b>FZ</b> fracture zone  <b>MB</b> mechanical break  <b>IS</b> infilled seam  <b>JT</b> Joint  <b>SS</b> shear surface  <b>SZ</b> shear zone  <b>VN</b> vein  <b>VO</b> void</p> <p><b>Coating</b></p> <p><b>CN</b> Clean  <b>SN</b> Stained  <b>OX</b> Oxidized  <b>VN</b> Veneer  <b>CT</b> Coating (&gt;1 mm)</p> <p><b>Dip Inclination</b></p> <p><b>H</b> horizontal/flat 0 - 20°  <b>D</b> dipping 20 - 50°  <b>SV</b> sub-vertical 50 - 90°  <b>V</b> vertical 90±°</p>	<p><b>Roughness (Barton et al.)</b></p>  <p><b>VR</b> Very rough   JRC = 16 - 18</p> <p><b>R</b> Rough   JRC = 12 - 14</p> <p><b>S</b> Smooth   JRC = 4 - 6</p> <p><b>SL</b> Slickensided  <i>(visually assessed)</i></p> <p><b>POL</b> Polished   JRC = 0 - 2</p> <p> JRC = 2 - 4</p>	<p><b>Spacing in Discontinuity Sets (ISRM 1981)</b></p> <p><b>VC</b> very close &lt; 60 mm  <b>C</b> close 60 – 200 mm  <b>M</b> mod. close 0.2 to 0.6 m  <b>W</b> wide 0.6 to 2 m  <b>VW</b> very wide &gt; 2 m</p> <p><b>Aperture Size</b></p> <p><b>T</b> closed / tight &lt; 0.5 mm  <b>GA</b> gapped 0.5 to 10 mm  <b>OP</b> open &gt; 10 mm</p> <p><b>Planarity</b></p> <p><b>PR</b> Planar  <b>UN</b> Undulating  <b>ST</b> Stepped  <b>IR</b> Irregular  <b>DIS</b> Discontinuous  <b>CU</b> Curved</p>
---	---	---

## GENERAL

### Weathering Grades (after ISRM 1981b)

Grade	Term	Description
I	fresh	no visible sign of rock material weathering; perhaps slight discoloration only
II	slightly weathered	discoloration indicates weathering; rock material may be somewhat weaker than in its fresh condition
III	moderately weathered	less than half of rock is decomposed to soil; fresh rock is present as continuous framework
IV	highly weathered	more than half of rock is decomposed to soil; fresh rock is present as discontinuous framework
V	completely weathered	soil-like matrix only; original mass structure is still largely intact

### Strength classification (after Marinos and Hoek, 2001; ISRM 1981b)

Grade	UCS (MPa)	Field Estimate (Description)
<b>R6</b>	extremely strong > 250	can only be chipped by geological hammer
<b>R5</b>	very strong 100 - 250	requires many blows from geological hammer
<b>R4</b>	strong 50 - 100	requires more than one blow from geological hammer
<b>R3</b>	medium strong 25 - 50	can't be scraped, breaks under one blow from geological hammer
<b>R2</b>	weak 5 - 25	can be peeled / scraped with knife with difficulty
<b>R1</b>	very weak 1 - 5	easily scraped / peeled, crumbles under firm blow of geo. hammer
<b>R0</b>	extremely weak < 1	indented by thumbnail

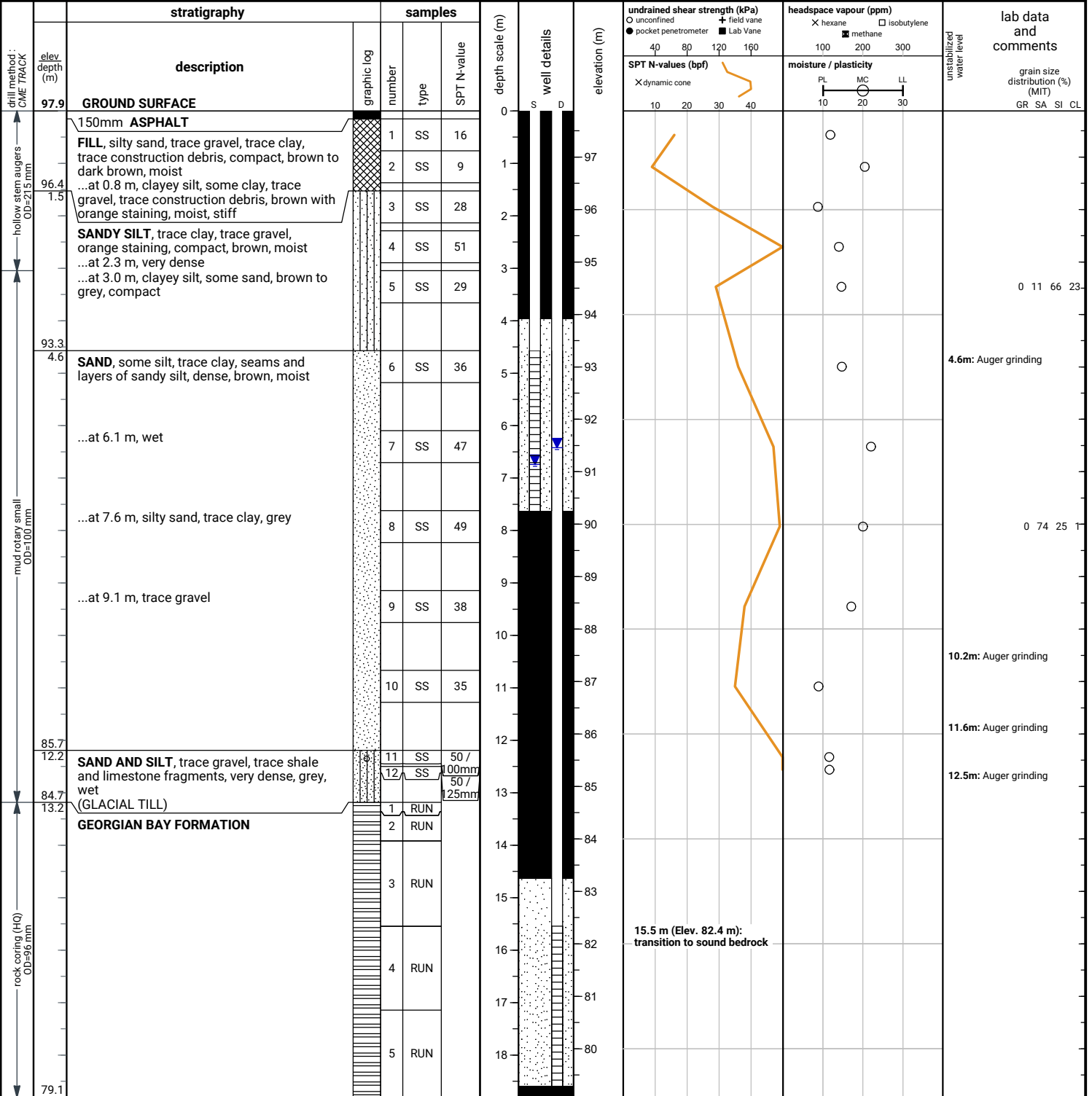
### Bedding Thickness (Q. J. Eng. Geology, Vol 3, 1970)

Very thickly bedded	> 2 m
Thickly bedded	0.6 – 2m
Medium bedded	200 – 600mm
Thinly bedded	60 – 200mm
Very thinly bedded	20 – 60mm
Laminated	6 – 20mm
Thinly Laminated	< 6mm

File No. : 23-014

Project : 1437-1455 Queen St W, 1437-1455 Queen St W

Client : Jameson Plaza Limited



**END OF BOREHOLE**

Borehole was filled with drill water upon completion of drilling.

S: 50 mm dia. monitoring well installed.  
 D: 50 mm dia. monitoring well installed.

**101S/D-S GROUNDWATER LEVELS**

date	depth (m)	elevation (m)
Feb 13, 2023	6.8	91.1
Feb 21, 2023	6.8	91.1
Mar 3, 2023	6.8	91.1
Mar 17, 2023	6.7	91.2

**101S/D-D GROUNDWATER LEVELS**

date	depth (m)	elevation (m)
Feb 13, 2023	6.9	91.0
Feb 21, 2023	6.9	91.0
Mar 3, 2023	6.7	91.2
Mar 17, 2023	6.4	91.5

file: 23-014\_gint-ge-it-6-6-21-03.gpj

File No. : 23-014 Project : 1437-1455 Queen St W, 1437-1455 Queen St W Client : Jameson Plaza Limited

depth (m)	graphic log	stratigraphy	run elev depth (m)	recovery	elevation (m)	shale weathering zones	UCS (MPa)						natural fracture frequency	laboratory testing	notes and comments	elevation (m)
							estimated strength									
		<b>Rock coring started at 13.2m below grade</b>	<b>84.7</b>													
		<b>GEORGIAN BAY FORMATION</b> Shale, grey, thinly bedded to medium bedded, weak; joints are horizontal, closed, clean, smooth, planar;  interbedded with limestone, light green, laminated to thinly bedded, medium, occasionally fossiliferous  Overall shale: 85%, limestone: 15% Run 1 : 21% limestone 79% shale  Run 2 : 5% limestone 95% shale	13.2 R1 13.4  R2  13.9	TCR = 101% SCR = 72% RQD = 0%  TCR = 100% SCR = 11% RQD = 0%		Z1 Z2 Z3 Z4	R1 R2 R3 R4 R5 R6									
14					84											84
15					83											83
		... at 15.5 m (Elev. 82.4 m), transition to sound rock	82.4 15.5													
16		Run 3 : 0% limestone 100% shale		TCR = 100% SCR = 86% RQD = 62%												
17		Run 4 : 29% limestone 71% shale	80.8 17.1													
18		Run 5 : 20% limestone 80% shale	79.1	TCR = 100% SCR = 85% RQD = 69%												
		<b>END OF COREHOLE</b>	<b>18.8m</b>													

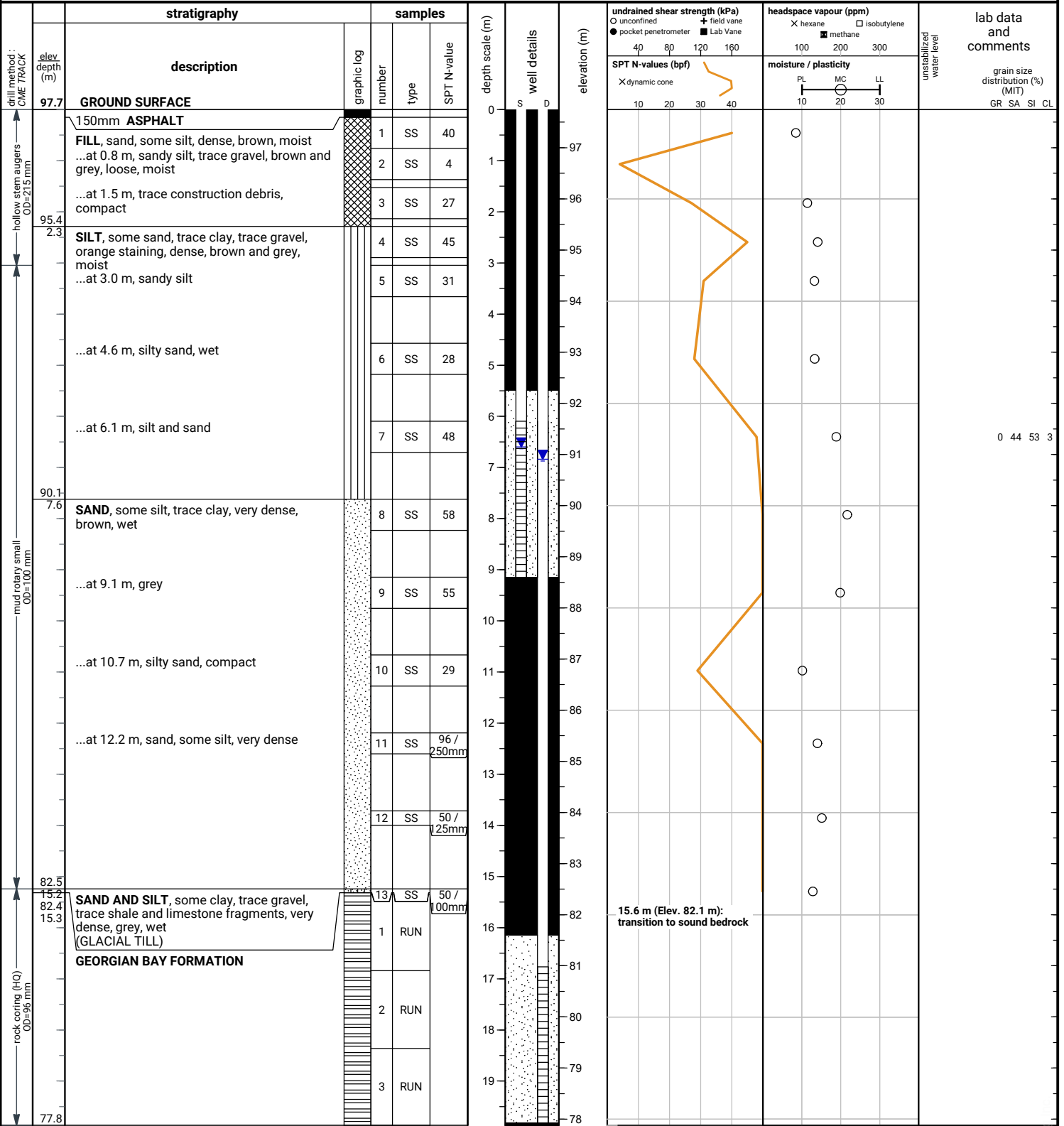
EI. 79.4m:  
UCS = 14.6 MPa  
E = 1.70 GPa  
γ = 25.4 kN/m<sup>3</sup>

file: 23\_014\_gint-ge-kt-6-6-21-03.gpj

File No. : 23-014

Project : 1437-1455 Queen St W, 1437-1455 Queen St W

Client : Jameson Plaza Limited



END OF BOREHOLE	102S/D-S GROUNDWATER LEVELS			102S/D-D GROUNDWATER LEVELS		
	date	depth (m)	elevation (m)	date	depth (m)	elevation (m)
Borehole was filled with drill water upon completion of drilling.	Feb 13, 2023	6.7	91.0	Feb 13, 2023	6.9	90.8
	Feb 21, 2023	6.7	91.0	Feb 21, 2023	7.0	90.7
	Mar 3, 2023	6.7	91.0	Mar 3, 2023	6.8	90.9
	Mar 17, 2023	6.6	91.1	Mar 17, 2023	6.8	90.9
S: 50 mm dia. monitoring well installed.						
D: 50 mm dia. monitoring well installed.						

file: 23-014\_gint-ge-it-6v6c103.gpj



File No. : 23-014

Project : 1437-1455 Queen St W, 1437-1455 Queen St W

Client : Jameson Plaza Limited

depth (m)	graphic log	stratigraphy	run elev depth (m)	recovery	elevation (m)	shale weathering zones		UCS (MPa)						laboratory testing	notes and comments	elevation (m)
						Z1	Z2	estimated strength								
		<b>Rock coring started at 15.3m below grade</b>	82.4					5	25	50	100	250				
16		<b>GEORGIAN BAY FORMATION</b> Shale, grey, thinly bedded to medium bedded, weak; joints are horizontal, closed, clean, smooth, planar;  interbedded with limestone, light grey, laminated to thinly bedded, medium, occasionally fossiliferous  Overall shale: 81%, limestone: 19% ... at 15.6 m (Elev. 82.1 m), transition to sound rock	15.3		82										15.3 / 82.4m: JT SV PR GA CN	82
			R1	TCR = 100% SCR = 92% RQD = 70%											16.0 / 81.8 - 16.1 / 81.7m: rubillized zone	
17		Run 1 : 14% limestone 86% shale	80.9		81										16.9 / 80.8m: JT SV PR GA CN	81
			16.8													
			R2	TCR = 100% SCR = 95% RQD = 72%												
18		Run 2 : 23% limestone 77% shale	79.3		80										18.0 / 79.7m: IS clay	80
			18.4											18.1 / 79.7 - 18.1 / 79.7m: rubillized zone		
			R3	TCR = 100% SCR = 97% RQD = 87%											18.4 / 79.4m: IS clay	
19		Run 3 : 20% limestone 80% shale	77.8		79											79
			19.9m		78											78

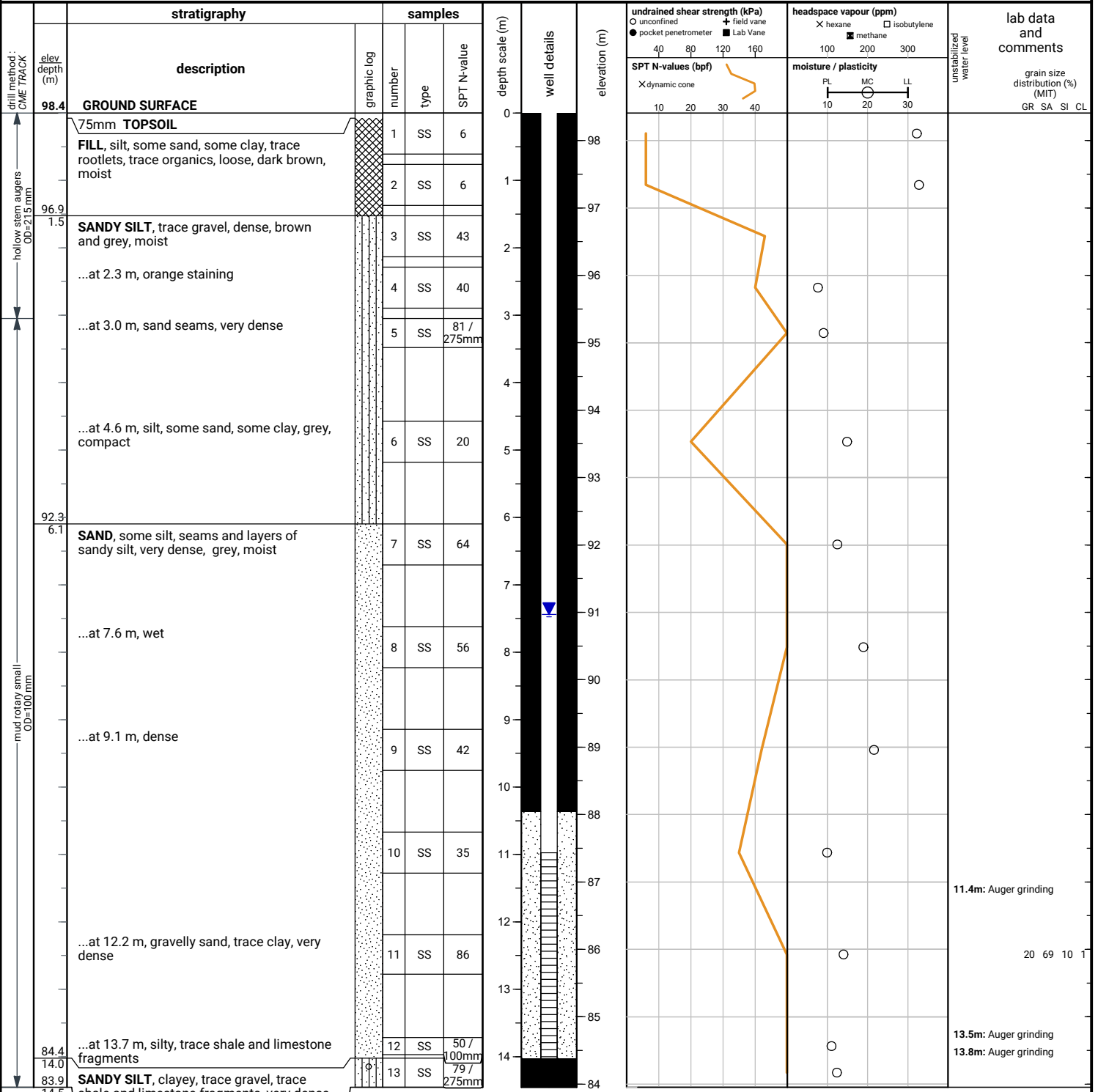
END OF COREHOLE

El. 79.2m:  
 UCS = 16 MPa  
 E = 1.50 GPa  
 $\gamma = 25.7 \text{ kN/m}^3$

File No. : 23-014

Project : 1437-1455 Queen St W, 1437-1455 Queen St W

Client : Jameson Plaza Limited



**GROUNDWATER LEVELS**

date	depth (m)	elevation (m)
Feb 13, 2023	7.5	90.9
Feb 21, 2023	7.5	90.9
Mar 3, 2023	7.5	90.9
Mar 17, 2023	7.4	91.0

**END OF BOREHOLE**

Dry and open upon completion of drilling.

50 mm dia. monitoring well installed.  
No. 10 screen

file: 23-014\_gint-ge-ll-6-6-6-103.gpj

# APPENDIX B







**Slug Test Analysis Report**

Project: 1437-1455 Queen St W

Number: 23-014

Client: Jameson Plaza Limited

Location: Toronto

Slug Test: BH101D RHT

Test Well: BH101D RHT

Test Conducted by: AJ

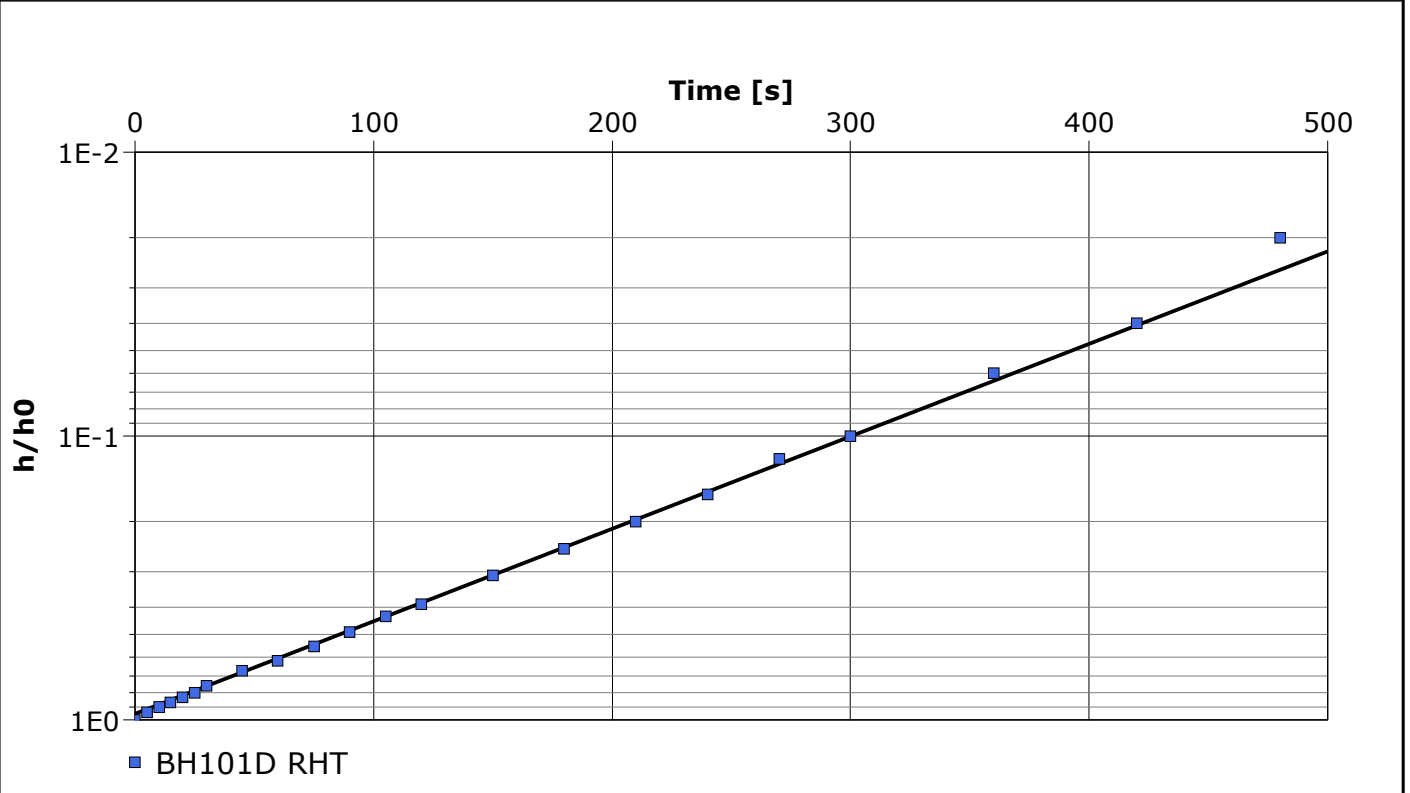
Test Date: 2/22/2023

Analysis Performed by: AK

Bouwer and Rice

Analysis Date: 3/8/2023

Aquifer Thickness: 20.00 m



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]
BH101D RHT	$3.27 \times 10^{-6}$



**Slug Test Analysis Report**

Project: 1437-1455 Queen St W

Number: 23-014

Client: Jameson Plaza Limited

Location: Toronto

Slug Test: BH101S FHT

Test Well: BH101S FHT

Test Conducted by: AJ

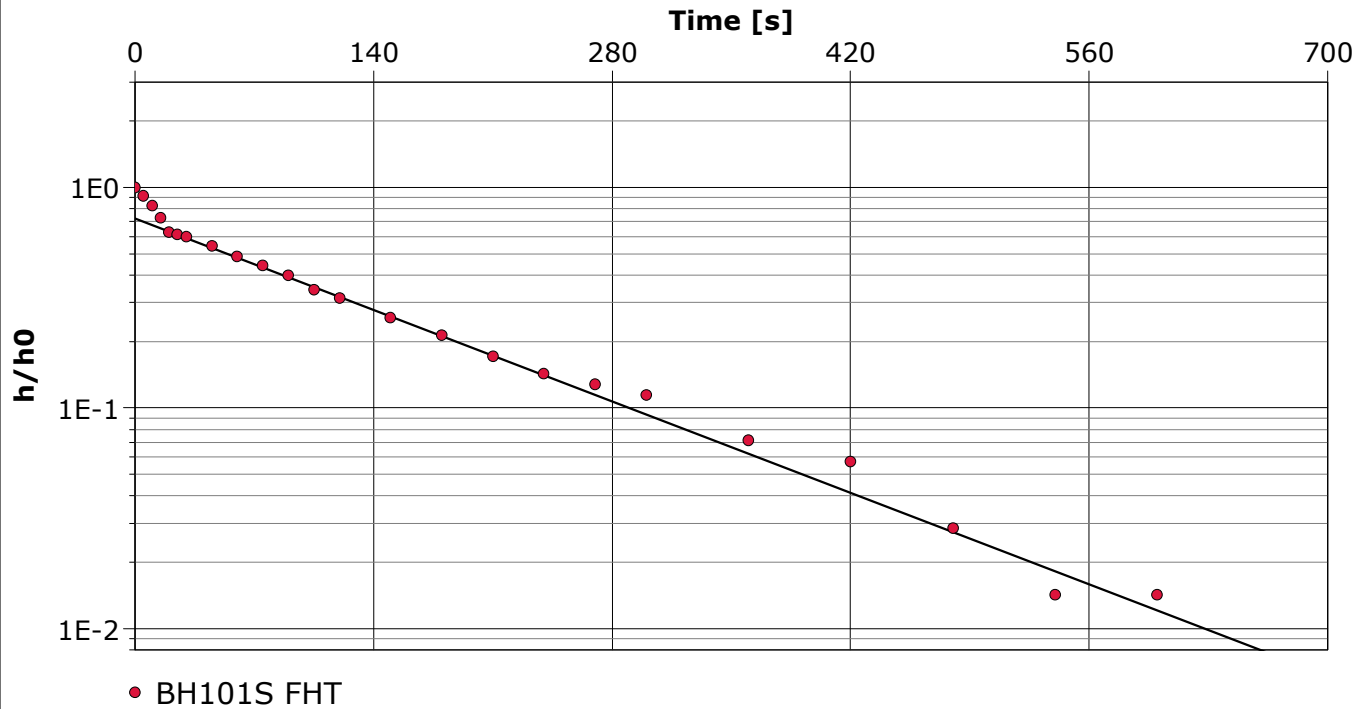
Test Date: 2/21/2023

Analysis Performed by: AK

Bouwer and Rice

Analysis Date: 3/8/2023

Aquifer Thickness: 13.20 m



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]
BH101S FHT	$2.57 \times 10^{-6}$



**Slug Test Analysis Report**

Project: 1437-1455 Queen St W

Number: 23-014

Client: Jameson Plaza Limited

Location: Toronto

Slug Test: BH102S RHT

Test Well: BH102S RHT

Test Conducted by: AK

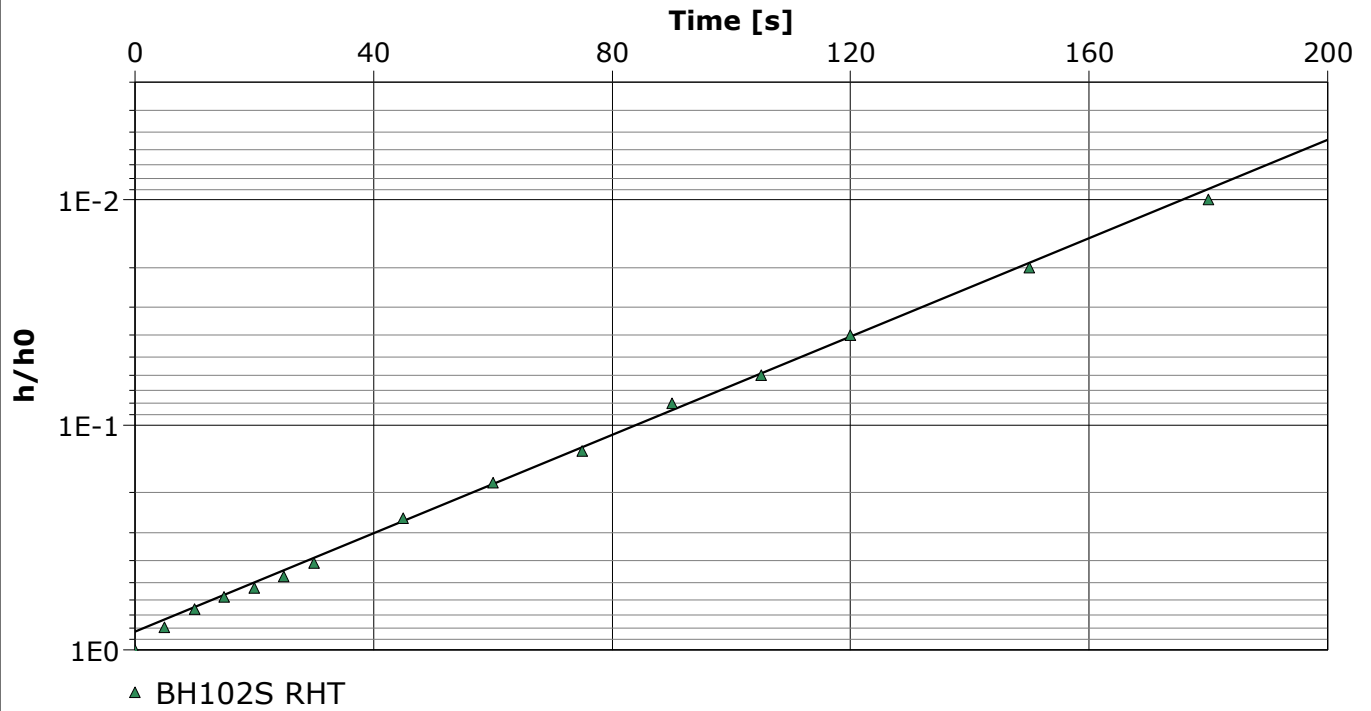
Test Date: 2/21/2023

Analysis Performed by: AK

Bouwer and Rice

Analysis Date: 3/8/2023

Aquifer Thickness: 15.30 m



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH102S RHT	$9.67 \times 10^{-6}$	



**Slug Test Analysis Report**

Project: 1437-1455 Queen St W

Number: 23-014

Client: Jameson Plaza Limited

Location: Toronto

Slug Test: BH102D RHT

Test Well: BH102D RHT

Test Conducted by: AJ

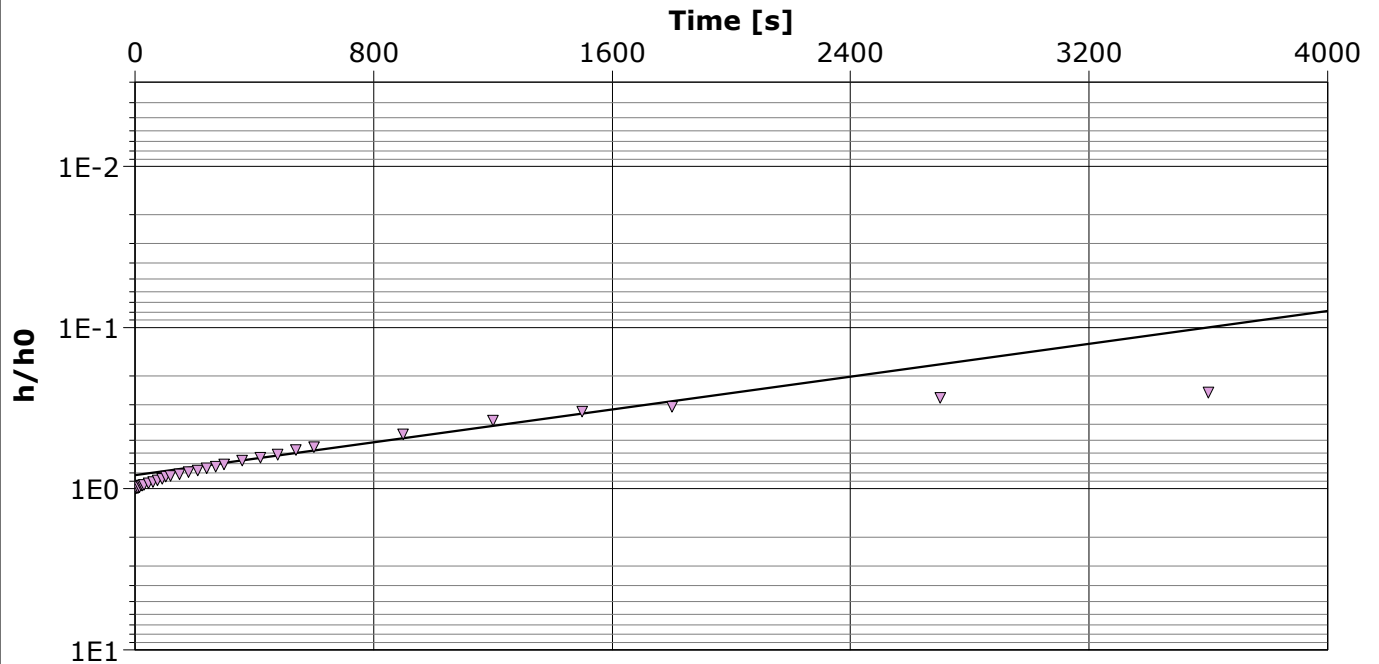
Test Date: 2/21/2023

Analysis Performed by: AK

Bouwer and Rice

Analysis Date: 3/8/2023

Aquifer Thickness: 22.00 m



▽ BH102D RHT

Calculation using Bouwer & Rice

Observation Well

Hydraulic  
Conductivity  
[m/s]

BH102D RHT

$2.52 \times 10^{-7}$



**Slug Test Analysis Report**

Project: 1437-1455 Queen St W

Number: 23-014

Client: Jameson Plaza Limited

Location: Toronto

Slug Test: BH103 Slug Test 2

Test Well: BH103 Slug Test

Test Conducted by: AK

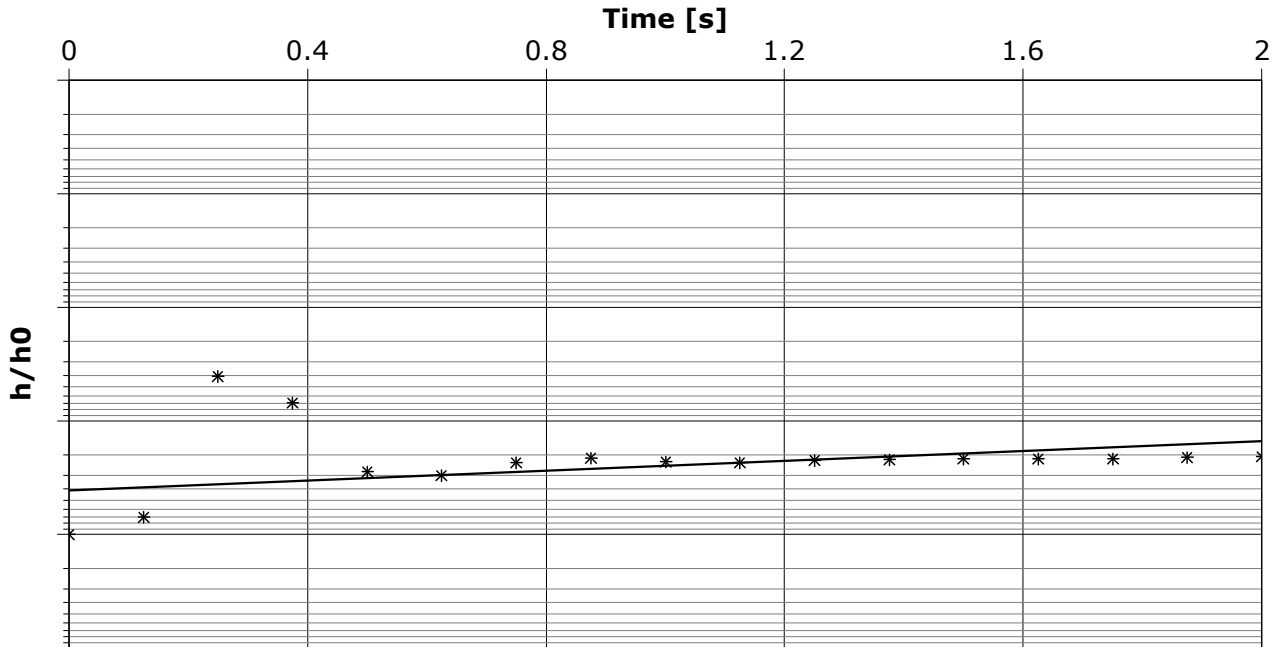
Test Date: 2/23/2023

Analysis Performed by: AK

Bouwer and Rice

Analysis Date: 3/8/2023

Aquifer Thickness: 14.50 m



\* BH103 Slug Test

Calculation using Bouwer & Rice

Observation Well

Hydraulic  
Conductivity  
[m/s]

BH103 Slug Test

$2.15 \times 10^{-4}$



**Slug Test Analysis Report**

Project: 1437-1455 Queen St W

Number: 23-014

Client: Jameson Plaza Limited

Location: Toronto

Slug Test: BH103 Slug Test 1

Test Well: BH103 Slug Test

Test Conducted by: AK

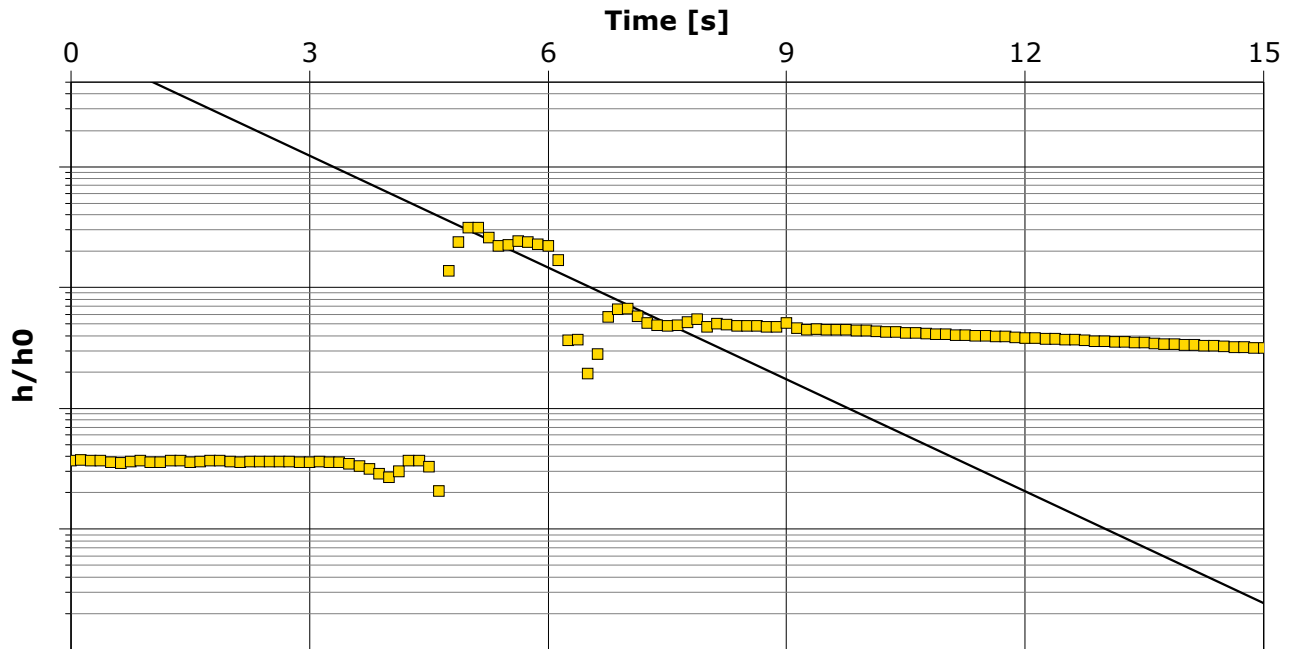
Test Date: 2/23/2023

Analysis Performed by: AK

Bouwer and Rice

Analysis Date: 3/9/2023

Aquifer Thickness: 14.50 m



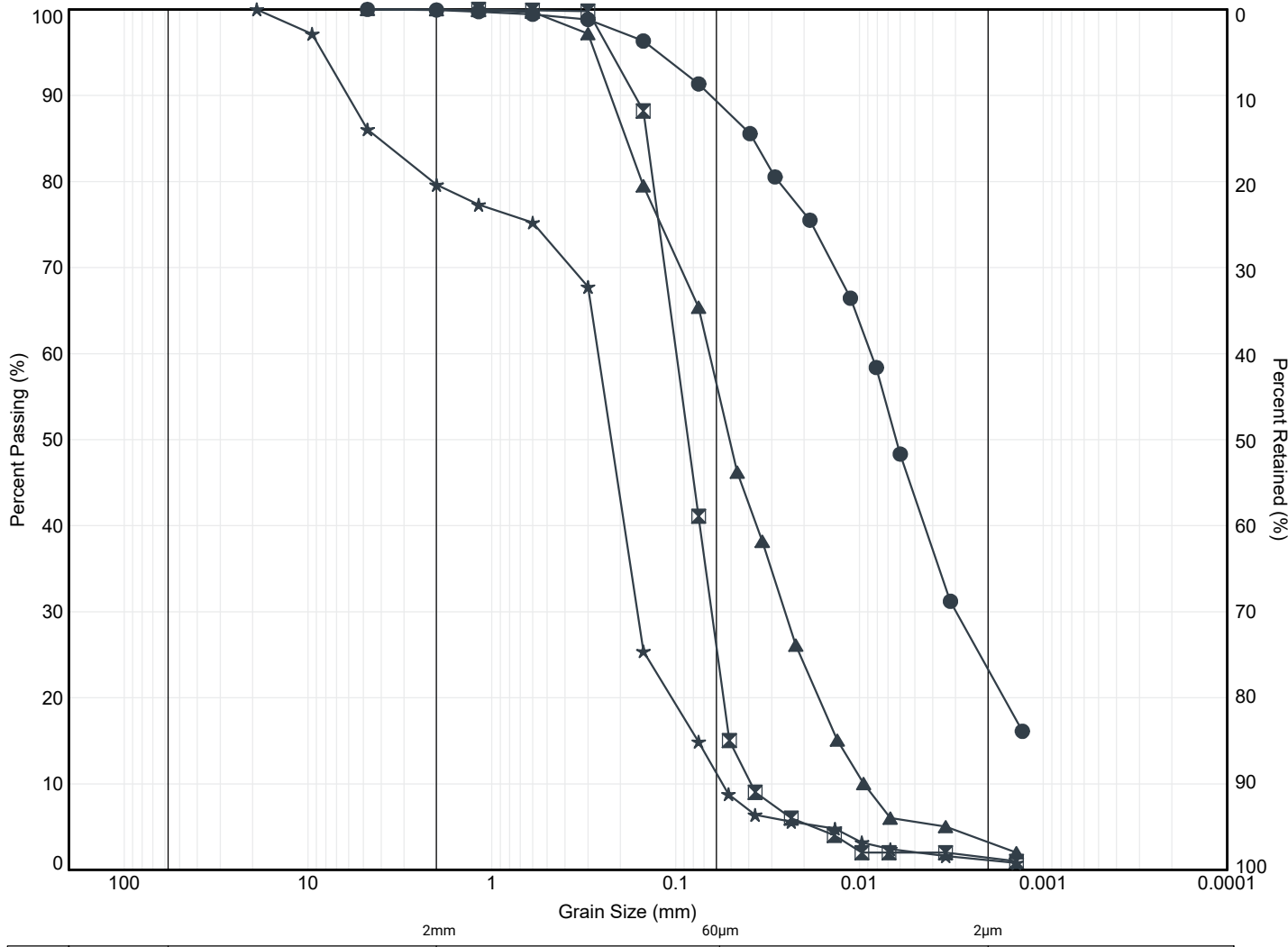
■ BH103 Slug Test

Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]
BH103 Slug Test	$3.07 \times 10^{-4}$

# APPENDIX C





MIT SYSTEM	COBBLES	GRAVEL			SAND			SILT	CLAY
		COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE		

MIT SYSTEM

Borehole	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
● 101S/D	SS5	3.4	94.5	0	11	66	23
☒ 101S/D	SS8	7.9	90.0	0	74	25	1
▲ 102S/D	SS7	6.4	91.3	0	44	53	3
★ 103	SS11	12.5	85.9	20	69	10	1

file:23-014.grit.gpi



Title:	<b>GRAIN SIZE DISTRIBUTION</b>
File No.:	<b>23-014</b>



# APPENDIX D





K from Grain Size Analysis Report

Date: March 9, 2023

Sample Name:

BH101 SS5

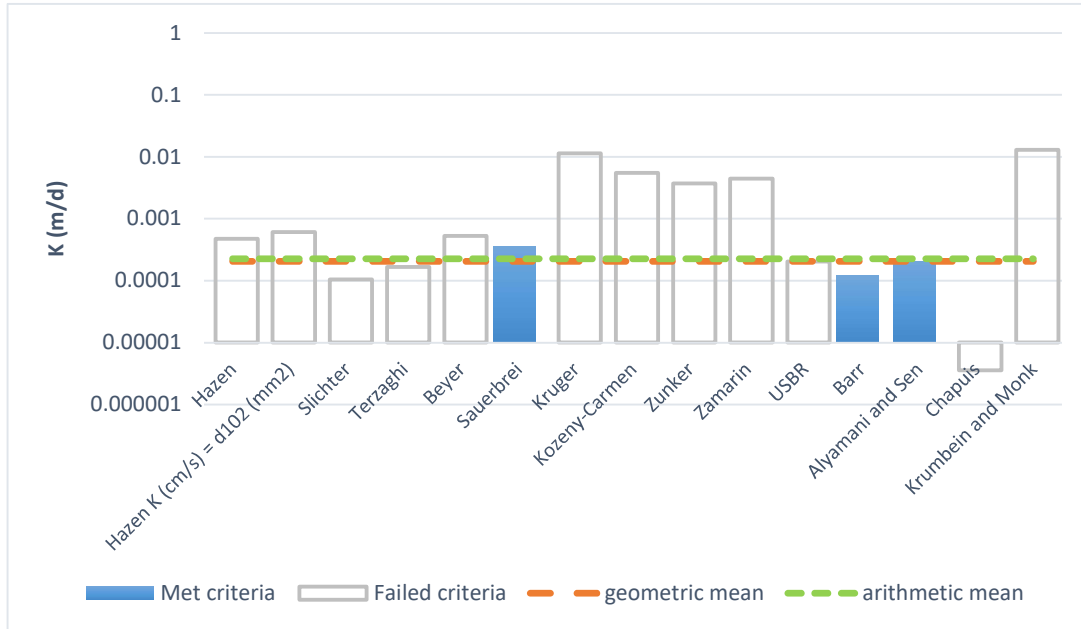
Mass Sample (g):

146.4

T (oC)

20

Poorly sorted clay with fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	5.5E-07	5.5E-09	0.00	
Hazen K (cm/s) = d <sub>10</sub> (mm)	7.0E-07	7.0E-09	0.00	
Slichter	1.2E-07	1.2E-09	0.00	
Terzaghi	1.9E-07	1.9E-09	0.00	
Beyer	6.1E-07	6.1E-09	0.00	
Sauerbrei	4.1E-07	4.1E-09	0.00	
Kruger	1.3E-05	1.3E-07	0.01	
Kozeny-Carmen	6.3E-06	6.3E-08	0.01	
Zunker	4.3E-06	4.3E-08	0.00	
Zamarin	5.1E-06	5.1E-08	0.00	
USBR	2.4E-07	2.4E-09	0.00	
Barr	1.4E-07	1.4E-09	0.00	
Alyamani and Sen	2.4E-07	2.4E-09	0.00	
Chapuis	4.1E-09	4.1E-11	0.00	
Krumbein and Monk	1.5E-05	1.5E-07	0.01	
geometric mean	2.4E-07	2.4E-09	0.00	
arithmetic mean	2.6E-07	2.6E-09	0.00	



K from Grain Size Analysis Report

Date: 9-Mar-23

Sample Name:

BH101 SS8

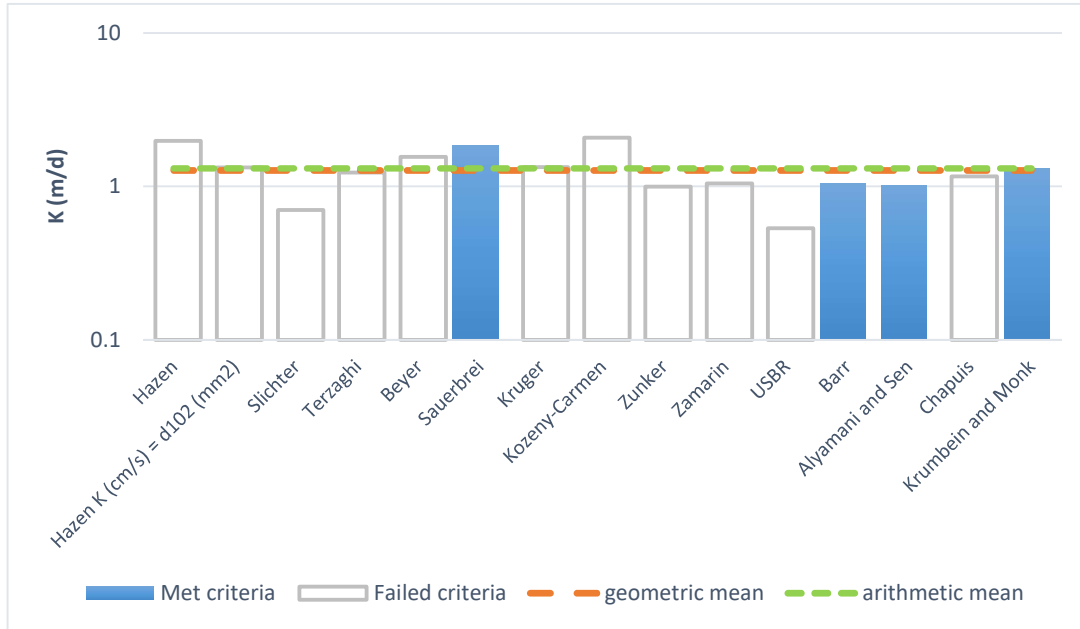
Mass Sample (g):

173.2

T (oC)

20

**Moderately well sorted sand low in fines**



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	2.3E-03	2.3E-05	1.98	
Hazen K (cm/s) = d <sub>10</sub> (mm)	1.5E-03	1.5E-05	1.33	
Slichter	8.1E-04	8.1E-06	0.70	
Terzaghi	1.4E-03	1.4E-05	1.23	
Beyer	1.8E-03	1.8E-05	1.56	
Sauerbrei	2.2E-03	2.2E-05	1.87	
Kruger	1.5E-03	1.5E-05	1.33	
Kozeny-Carmen	2.4E-03	2.4E-05	2.08	
Zunker	1.2E-03	1.2E-05	1.00	
Zamarin	1.2E-03	1.2E-05	1.04	
USBR	6.2E-04	6.2E-06	0.53	
Barr	1.2E-03	1.2E-05	1.05	
Alyamani and Sen	1.2E-03	1.2E-05	1.02	
Chapuis	1.3E-03	1.3E-05	1.16	
Krumbein and Monk	1.5E-03	1.5E-05	1.32	
geometric mean	1.5E-03	1.5E-05	1.27	
arithmetic mean	1.5E-03	1.5E-05	1.31	



K from Grain Size Analysis Report

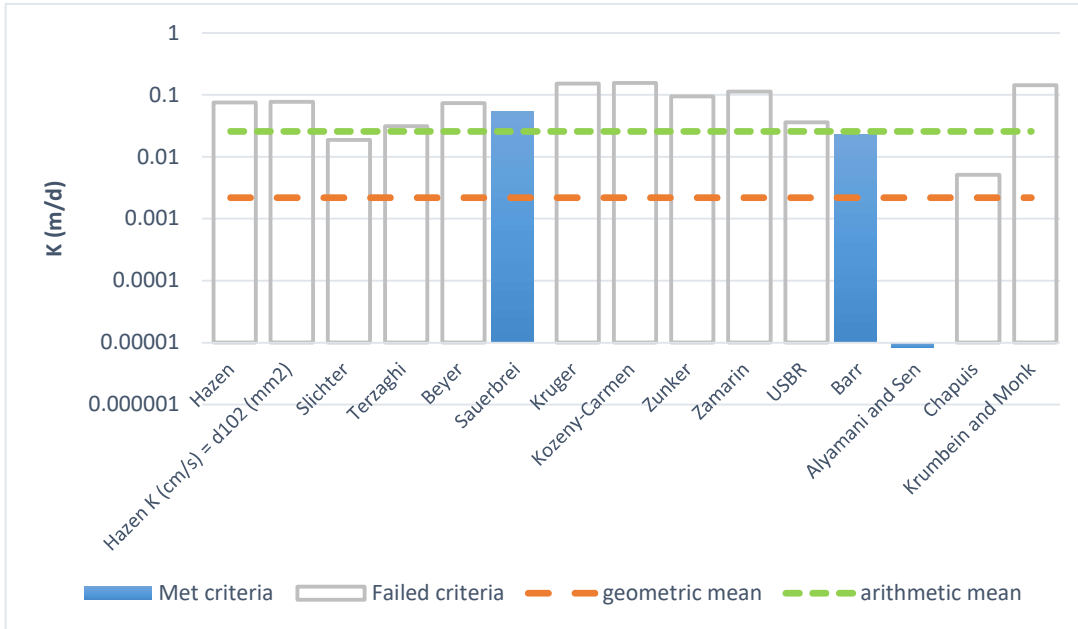
Date: 9-Mar-23

Sample Name: BH102 SS7

Mass Sample (g): 140.1

T (oC) 20

Poorly sorted sandy silt with fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	8.7E-05	8.7E-07	0.08	
Hazen K (cm/s) = d <sub>10</sub> (mm)	9.0E-05	9.0E-07	0.08	
Slichter	2.2E-05	2.2E-07	0.02	
Terzaghi	3.6E-05	3.6E-07	0.03	
Beyer	8.6E-05	8.6E-07	0.07	
Sauerbrei	6.3E-05	6.3E-07	0.05	
Kruger	1.8E-04	1.8E-06	0.15	
Kozeny-Carmen	1.8E-04	1.8E-06	0.16	
Zunker	1.1E-04	1.1E-06	0.10	
Zamarin	1.3E-04	1.3E-06	0.11	
USBR	4.2E-05	4.2E-07	0.04	
Barr	2.6E-05	2.6E-07	0.02	
Alyamani and Sen	9.7E-09	9.7E-11	0.00	
Chapuis	5.9E-06	5.9E-08	0.01	
Krumbein and Monk	1.7E-04	1.7E-06	0.14	
geometric mean	2.5E-06	2.5E-08	0.00	
arithmetic mean	3.0E-05	3.0E-07	0.03	



K from Grain Size Analysis Report

Date: 9-Mar-23

Sample Name:

BH103 SS11

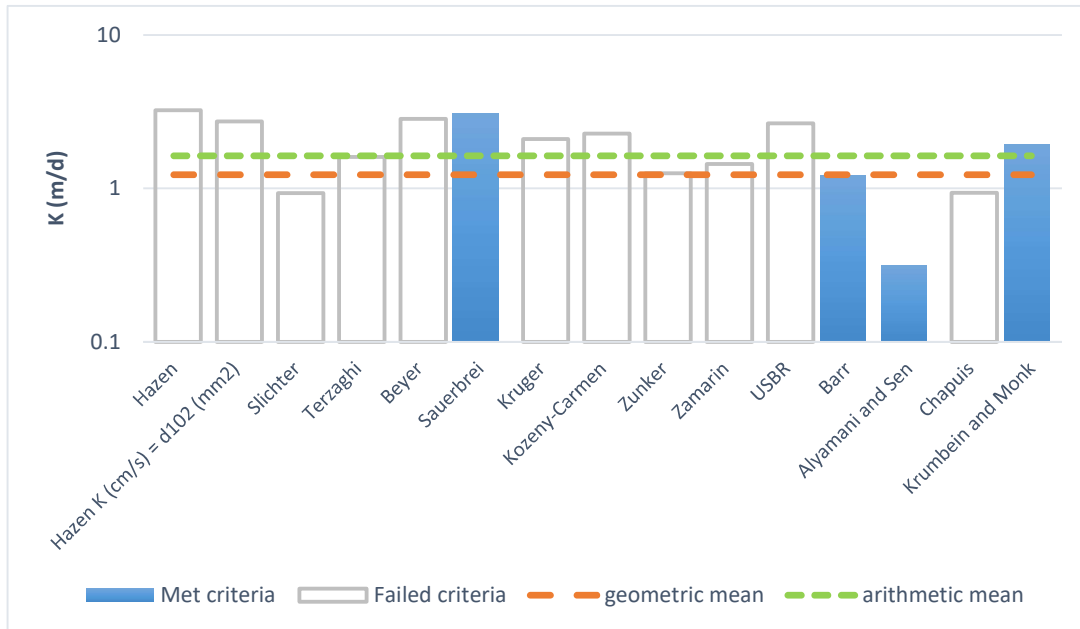
Mass Sample (g):

183.5

T (oC)

20

**Moderately well sorted gravelly sand low in fines**



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	3.7E-03	3.7E-05	3.23	
Hazen K (cm/s) = d <sub>10</sub> (mm)	3.2E-03	3.2E-05	2.73	
Slichter	1.1E-03	1.1E-05	0.93	
Terzaghi	1.9E-03	1.9E-05	1.60	
Beyer	3.3E-03	3.3E-05	2.84	
Sauerbrei	3.6E-03	3.6E-05	3.08	
Kruger	2.4E-03	2.4E-05	2.09	
Kozeny-Carmen	2.6E-03	2.6E-05	2.28	
Zunker	1.5E-03	1.5E-05	1.25	
Zamarin	1.7E-03	1.7E-05	1.44	
USBR	3.1E-03	3.1E-05	2.65	
Barr	1.4E-03	1.4E-05	1.22	
Alyamani and Sen	3.6E-04	3.6E-06	0.31	
Chapuis	1.1E-03	1.1E-05	0.94	
Krumbein and Monk	2.2E-03	2.2E-05	1.93	
geometric mean	1.4E-03	1.4E-05	1.23	
arithmetic mean	1.9E-03	1.9E-05	1.64	

# APPENDIX E





**CERTIFICATE OF ANALYSIS (GUIDELINE EVALUATION)**

<b>Work Order</b>	: <b>WT2304211</b>	<b>Page</b>	: 1 of 11
<b>Client</b>	: <b>Grounded Engineering Inc.</b>	<b>Laboratory</b>	: Waterloo - Environmental
<b>Contact</b>	: Nicholas Piers	<b>Account Manager</b>	: Amanda Overholster
<b>Address</b>	: 1 Banigan Drive Toronto ON Canada M4H 1G3	<b>Address</b>	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
<b>Telephone</b>	: 647 264 7928	<b>Telephone</b>	: 1 416 817 2944
<b>Project</b>	: 23-014	<b>Date Samples Received</b>	: 21-Feb-2023 14:50
<b>PO</b>	: ----	<b>Date Analysis Commenced</b>	: 21-Feb-2023
<b>C-O-C number</b>	: 20-887472	<b>Issue Date</b>	: 02-Mar-2023 14:06
<b>Sampler</b>	: AJ/ IH		
<b>Site</b>	: 1437 Queen St. W, Toronto		
<b>Quote number</b>	: 2023 SOA Pricing		
<b>No. of samples received</b>	: 1		
<b>No. of samples analysed</b>	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Guideline Comparison

**Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).**

**Signatories**

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Danielle Gravel	Supervisor - Semi-Volatile Instrumentation	Organics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Inorganics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Metals, Waterloo, Ontario
Jeremy Gingras	Team Leader - Semi-Volatile Instrumentation	Organics, Waterloo, Ontario
Jocelyn Kennedy	Department Manager - Semi-Volatile Organics	Organics, Waterloo, Ontario
Katrina Zwambag	Business Manager - Environmental	LCMS, Waterloo, Ontario
Sarah Birch	VOC Section Supervisor	Organics, Waterloo, Ontario
Wayne Smith	Client Services Specialist	Microbiology, Waterloo, Ontario



## Summary of Guideline Breaches by Sample

SampleID/Client ID	Matrix	Analyte	Analyte Summary	Guideline	Category	Result	Limit
SW- UF BH102S	Water	Solids, total suspended [TSS]		TORSUB	STM	21.9 mg/L	15 mg/L
	Water	Manganese, total		TORSUB	STM	0.577 mg/L	0.05 mg/L
	Water	Biochemical oxygen demand [BOD]		TORSUB	STM	28.0 mg/L	15 mg/L
	Water	Tetrachloroethylene		TORSUB	STM	9.88 µg/L	4.4 µg/L

### General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guidelines are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Key : LOR: Limit of Reporting (detection limit).

Unit	Description
µg/L	micrograms per litre
CFU/100mL	colony forming units per hundred millilitres
mg/L	milligrams per litre
pH units	pH units

>: greater than.

<: less than.

Red shading is applied where the result is greater than the Guideline Upper Limit or the result is lower than the Guideline Lower Limit.

For drinking water samples, Red shading is applied where the result for E.coli, fecal or total coliforms is greater than or equal to the Guideline Upper Limit.





## Qualifiers

<i>Qualifier</i>	<i>Description</i>
<i>DLDS</i>	<i>Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.</i>
<i>DLHC</i>	<i>Detection Limit Raised: Dilution required due to high concentration of test analyte(s).</i>
<i>DLM</i>	<i>Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).</i>



## Analytical Results Evaluation

Matrix: Groundwater		Client sample ID	SW- UF BH102S	----	----	----	----	----	----
		Sampling date/time	21-Feb-2023 10:15	----	----	----	----	----	----
		Sub-Matrix	Groundwater	----	----	----	----	----	----
Analyte	CAS Number	Unit	WT2304211-001	-----	-----	-----	-----	-----	-----
<b>Physical Tests</b>									
pH	----	pH units	7.73	----	----	----	----	----	----
Solids, total suspended [TSS]	----	mg/L	21.9	----	----	----	----	----	----
<b>Anions and Nutrients</b>									
Chloride	16887-00-6	mg/L	690	----	----	----	----	----	----
Fluoride	16984-48-8	mg/L	0.163 <small>DLDS</small>	----	----	----	----	----	----
Kjeldahl nitrogen, total [TKN]	----	mg/L	<0.500 <small>DLM</small>	----	----	----	----	----	----
Phosphorus, total	7723-14-0	mg/L	0.119	----	----	----	----	----	----
Sulfate (as SO4)	14808-79-8	mg/L	167 <small>DLDS</small>	----	----	----	----	----	----
<b>Cyanides</b>									
Cyanide, strong acid dissociable (Total)	----	mg/L	<0.0020	----	----	----	----	----	----
<b>Microbiological Tests</b>									
Coliforms, Escherichia coli [E. coli]	----	CFU/100mL	Not Detected	----	----	----	----	----	----
<b>Total Metals</b>									
Aluminum, total	7429-90-5	mg/L	1.28 <small>DLHC</small>	----	----	----	----	----	----
Antimony, total	7440-36-0	mg/L	<0.00100 <small>DLHC</small>	----	----	----	----	----	----
Arsenic, total	7440-38-2	mg/L	<0.00100 <small>DLHC</small>	----	----	----	----	----	----
Cadmium, total	7440-43-9	mg/L	<0.0000500 <small>DLHC</small>	----	----	----	----	----	----
Chromium, total	7440-47-3	mg/L	<0.00500 <small>DLHC</small>	----	----	----	----	----	----
Cobalt, total	7440-48-4	mg/L	0.00116 <small>DLHC</small>	----	----	----	----	----	----
Copper, total	7440-50-8	mg/L	<0.00500 <small>DLHC</small>	----	----	----	----	----	----
Lead, total	7439-92-1	mg/L	0.000701 <small>DLHC</small>	----	----	----	----	----	----
Manganese, total	7439-96-5	mg/L	0.577 <small>DLHC</small>	----	----	----	----	----	----
Mercury, total	7439-97-6	mg/L	<0.0000050	----	----	----	----	----	----
Molybdenum, total	7439-98-7	mg/L	0.00216 <small>DLHC</small>	----	----	----	----	----	----
Nickel, total	7440-02-0	mg/L	<0.00500 <small>DLHC</small>	----	----	----	----	----	----
Selenium, total	7782-49-2	mg/L	<0.000500 <small>DLHC</small>	----	----	----	----	----	----
Silver, total	7440-22-4	mg/L	<0.000100 <small>DLHC</small>	----	----	----	----	----	----



## Analytical Results Evaluation

Matrix: Groundwater		Client sample ID	SW- UF BH102S	----	----	----	----	----	----
		Sampling date/time	21-Feb-2023 10:15	----	----	----	----	----	----
		Sub-Matrix	Groundwater	----	----	----	----	----	----
Analyte	CAS Number	Unit	WT2304211-001	-----	-----	-----	-----	-----	-----
<b>Total Metals</b>									
Tin, total	7440-31-5	mg/L	0.00214 <sup>DLHC</sup>	----	----	----	----	----	----
Titanium, total	7440-32-6	mg/L	0.0676 <sup>DLHC</sup>	----	----	----	----	----	----
Zinc, total	7440-66-6	mg/L	<0.0300 <sup>DLHC</sup>	----	----	----	----	----	----
<b>Speciated Metals</b>									
Chromium, hexavalent [Cr VI], total	18540-29-9	mg/L	<0.00050	----	----	----	----	----	----
<b>Aggregate Organics</b>									
Biochemical oxygen demand [BOD]	----	mg/L	28.0	----	----	----	----	----	----
Oil & grease (gravimetric)	----	mg/L	<5.0	----	----	----	----	----	----
Oil & grease, animal/vegetable (gravimetric)	----	mg/L	<5.0	----	----	----	----	----	----
Oil & grease, mineral (gravimetric)	----	mg/L	<5.0	----	----	----	----	----	----
Phenols, total (4AAP)	----	mg/L	<0.0010	----	----	----	----	----	----
<b>Volatile Organic Compounds</b>									
Benzene	71-43-2	µg/L	<0.50	----	----	----	----	----	----
Chloroform	67-66-3	µg/L	<0.50	----	----	----	----	----	----
Dichlorobenzene, 1,2-	95-50-1	µg/L	<0.50	----	----	----	----	----	----
Dichlorobenzene, 1,4-	106-46-7	µg/L	<0.50	----	----	----	----	----	----
Dichloroethylene, cis-1,2-	156-59-2	µg/L	0.92	----	----	----	----	----	----
Dichloromethane	75-09-2	µg/L	<1.0	----	----	----	----	----	----
Dichloropropylene, trans-1,3-	10061-02-6	µg/L	<0.30	----	----	----	----	----	----
Ethylbenzene	100-41-4	µg/L	<0.50	----	----	----	----	----	----
Tetrachloroethane, 1,1,2,2-	79-34-5	µg/L	<0.50	----	----	----	----	----	----
Tetrachloroethylene	127-18-4	µg/L	9.88	----	----	----	----	----	----
Toluene	108-88-3	µg/L	<0.50	----	----	----	----	----	----
Trichloroethylene	79-01-6	µg/L	2.90	----	----	----	----	----	----
Xylene, m+p-	179601-23-1	µg/L	<0.40	----	----	----	----	----	----
Xylene, o-	95-47-6	µg/L	<0.30	----	----	----	----	----	----
Xylenes, total	1330-20-7	µg/L	<0.50	----	----	----	----	----	----
<b>Volatile Organic Compounds Surrogates</b>									
Bromofluorobenzene, 4-	460-00-4	%	90.0	----	----	----	----	----	----



### Analytical Results Evaluation

Matrix: Groundwater			Client sample ID	SW- UF BH102S	----	----	----	----	----	----
			Sampling date/time	21-Feb-2023 10:15	----	----	----	----	----	----
			Sub-Matrix	Groundwater	----	----	----	----	----	----
Analyte	CAS Number	Unit	WT2304211-001	-----	-----	-----	-----	-----	-----	-----
<b>Volatile Organic Compounds Surrogates</b>										
Difluorobenzene, 1,4-	540-36-3	%	97.5	----	----	----	----	----	----	----
<b>Polycyclic Aromatic Hydrocarbons</b>										
Anthracene	120-12-7	mg/L	<0.000010	----	----	----	----	----	----	----
Benz(a)anthracene	56-55-3	mg/L	<0.000010	----	----	----	----	----	----	----
Benzo(a)pyrene	50-32-8	mg/L	<0.0000050	----	----	----	----	----	----	----
Benzo(b+j)fluoranthene	n/a	mg/L	<0.000010	----	----	----	----	----	----	----
Benzo(e)pyrene	192-97-2	mg/L	<0.000010	----	----	----	----	----	----	----
Benzo(g,h,i)perylene	191-24-2	mg/L	<0.000010	----	----	----	----	----	----	----
Benzo(k)fluoranthene	207-08-9	mg/L	<0.000010	----	----	----	----	----	----	----
Chrysene	218-01-9	mg/L	<0.000010	----	----	----	----	----	----	----
Dibenz(a,h)acridine	226-36-8	mg/L	<0.000050	----	----	----	----	----	----	----
Dibenz(a,h)anthracene	53-70-3	mg/L	<0.0000050	----	----	----	----	----	----	----
Dibenz(a,j)acridine	224-42-0	mg/L	<0.000050	----	----	----	----	----	----	----
Dibenzo(a,i)pyrene	189-55-9	mg/L	<0.000050	----	----	----	----	----	----	----
Dibenzo(c,g)carbazole, 7H-	194-59-2	mg/L	<0.000050	----	----	----	----	----	----	----
Dinitropyrene, 1,3-	75321-20-9	mg/L	<0.0010	----	----	----	----	----	----	----
Dinitropyrene, 1,6-	42397-64-8	mg/L	<0.0010	----	----	----	----	----	----	----
Dinitropyrene, 1,8-	42397-65-9	mg/L	<0.0010	----	----	----	----	----	----	----
Fluoranthene	206-44-0	mg/L	<0.000010	----	----	----	----	----	----	----
Indeno(1,2,3-c,d)pyrene	193-39-5	mg/L	<0.000010	----	----	----	----	----	----	----
Methylcholanthrene, 3-	56-49-5	mg/L	<0.000050	----	----	----	----	----	----	----
Perylene	198-55-0	mg/L	0.000012	----	----	----	----	----	----	----
Phenanthrene	85-01-8	mg/L	0.000015	----	----	----	----	----	----	----
Pyrene	129-00-0	mg/L	<0.000010	----	----	----	----	----	----	----
PAHs, total (ON Sewer Use)	n/a	mg/L	<0.00175	----	----	----	----	----	----	----
<b>Polycyclic Aromatic Hydrocarbons Surrogates</b>										
Chrysene-d12	1719-03-5	%	83.1	----	----	----	----	----	----	----
Naphthalene-d8	1146-65-2	%	88.0	----	----	----	----	----	----	----
Phenanthrene-d10	1517-22-2	%	94.6	----	----	----	----	----	----	----



## Analytical Results Evaluation

Matrix: Groundwater			Client sample ID	SW- UF BH102S	----	----	----	----	----	----
			Sampling date/time	21-Feb-2023 10:15	----	----	----	----	----	----
			Sub-Matrix	Groundwater	----	----	----	----	----	----
Analyte	CAS Number	Unit	WT2304211-001	-----	-----	-----	-----	-----	-----	-----
<b>Polycyclic Aromatic Hydrocarbons Surrogates</b>										
Terphenyl-d14, p-	1718-51-0	%	89.7	----	----	----	----	----	----	----
<b>Phthalate Esters</b>										
bis(2-Ethylhexyl) phthalate [DEHP]	117-81-7	µg/L	<2.0	----	----	----	----	----	----	----
Di-n-butyl phthalate	84-74-2	µg/L	<1.0	----	----	----	----	----	----	----
<b>Semi-Volatile Organics</b>										
Dichlorobenzidine, 3,3'-	91-94-1	µg/L	<0.40	----	----	----	----	----	----	----
<b>Semi-Volatile Organics Surrogates</b>										
Fluorobiphenyl, 2-	321-60-8	%	61.9	----	----	----	----	----	----	----
Terphenyl-d14, p-	1718-51-0	%	98.6	----	----	----	----	----	----	----
<b>Chlorinated Phenolics</b>										
Pentachlorophenol [PCP]	87-86-5	µg/L	<0.50	----	----	----	----	----	----	----
<b>Phenolics Surrogates</b>										
Tribromophenol, 2,4,6-	118-79-6	%	109	----	----	----	----	----	----	----
<b>Nonylphenols</b>										
Nonylphenol diethoxylates [NP2EO]	n/a	µg/L	<0.10	----	----	----	----	----	----	----
Nonylphenol ethoxylates, total	n/a	µg/L	<2.0	----	----	----	----	----	----	----
Nonylphenol monoethoxylates [NP1EO]	n/a	µg/L	<2.0	----	----	----	----	----	----	----
Nonylphenols [NP]	84852-15-3	µg/L	<1.0	----	----	----	----	----	----	----
<b>Polychlorinated Biphenyls</b>										
Aroclor 1016	12674-11-2	µg/L	<0.020	----	----	----	----	----	----	----
Aroclor 1221	11104-28-2	µg/L	<0.020	----	----	----	----	----	----	----
Aroclor 1232	11141-16-5	µg/L	<0.020	----	----	----	----	----	----	----
Aroclor 1242	53469-21-9	µg/L	<0.020	----	----	----	----	----	----	----
Aroclor 1248	12672-29-6	µg/L	<0.020	----	----	----	----	----	----	----
Aroclor 1254	11097-69-1	µg/L	<0.020	----	----	----	----	----	----	----
Aroclor 1260	11096-82-5	µg/L	<0.020	----	----	----	----	----	----	----
Aroclor 1262	37324-23-5	µg/L	<0.020	----	----	----	----	----	----	----
Aroclor 1268	11100-14-4	µg/L	<0.020	----	----	----	----	----	----	----



## Analytical Results Evaluation

Matrix: Groundwater			Client sample ID	SW- UF BH102S	----	----	----	----	----	----
			Sampling date/time	21-Feb-2023 10:15	----	----	----	----	----	----
			Sub-Matrix	Groundwater	----	----	----	----	----	----
Analyte	CAS Number	Unit		WT2304211-001	-----	-----	-----	-----	-----	-----
<b>Polychlorinated Biphenyls</b>										
<b>Polychlorinated biphenyls [PCBs], total</b>		---	µg/L	<0.060	----	----	----	----	----	----
<b>Polychlorinated Biphenyls Surrogates</b>										
<b>Decachlorobiphenyl</b>	2051-24-3	%		73.1	----	----	----	----	----	----
<b>Tetrachloro-m-xylene</b>	877-09-8	%		95.8	----	----	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.



### Summary of Guideline Limits

Analyte	CAS Number	Unit	TORSUB SAN	TORSUB STM					
<b>Physical Tests</b>									
pH	----	pH units	6 - 11.5 pH units	6 - 9.5 pH units					
Solids, total suspended [TSS]	----	mg/L	350 mg/L	15 mg/L					
<b>Anions and Nutrients</b>									
Chloride	16887-00-6	mg/L							
Fluoride	16984-48-8	mg/L	10 mg/L						
Kjeldahl nitrogen, total [TKN]	----	mg/L	100 mg/L						
Phosphorus, total	7723-14-0	mg/L	10 mg/L	0.4 mg/L					
Sulfate (as SO4)	14808-79-8	mg/L							
<b>Cyanides</b>									
Cyanide, strong acid dissociable (Total)	----	mg/L	2 mg/L	0.02 mg/L					
<b>Microbiological Tests</b>									
Coliforms, Escherichia coli [E. coli]	----	CFU/100mL		200 CFU/100mL					
<b>Total Metals</b>									
Aluminum, total	7429-90-5	mg/L	50 mg/L						
Antimony, total	7440-36-0	mg/L	5 mg/L						
Arsenic, total	7440-38-2	mg/L	1 mg/L	0.02 mg/L					
Cadmium, total	7440-43-9	mg/L	0.7 mg/L	0.008 mg/L					
Chromium, total	7440-47-3	mg/L	4 mg/L	0.08 mg/L					
Cobalt, total	7440-48-4	mg/L	5 mg/L						
Copper, total	7440-50-8	mg/L	2 mg/L	0.04 mg/L					
Lead, total	7439-92-1	mg/L	1 mg/L	0.12 mg/L					
Manganese, total	7439-96-5	mg/L	5 mg/L	0.05 mg/L					
Mercury, total	7439-97-6	mg/L	0.01 mg/L	0.0004 mg/L					
Molybdenum, total	7439-98-7	mg/L	5 mg/L						
Nickel, total	7440-02-0	mg/L	2 mg/L	0.08 mg/L					
Selenium, total	7782-49-2	mg/L	1 mg/L	0.02 mg/L					
Silver, total	7440-22-4	mg/L	5 mg/L	0.12 mg/L					
Tin, total	7440-31-5	mg/L	5 mg/L						
Titanium, total	7440-32-6	mg/L	5 mg/L						
Zinc, total	7440-66-6	mg/L	2 mg/L	0.04 mg/L					
<b>Speciated Metals</b>									
Chromium, hexavalent [Cr VI], total	18540-29-9	mg/L	2 mg/L	0.04 mg/L					
<b>Aggregate Organics</b>									
Biochemical oxygen demand [BOD]	----	mg/L	300 mg/L	15 mg/L					
Oil & grease (gravimetric)	----	mg/L							



Analyte	CAS Number	Unit	TORSUB SAN	TORSUB STM					
<b>Aggregate Organics - Continued</b>									
Oil & grease, animal/vegetable (gravimetric)	----	mg/L	150 mg/L						
Oil & grease, mineral (gravimetric)	----	mg/L	15 mg/L						
Phenols, total (4AAP)	----	mg/L	1 mg/L	0.008 mg/L					
<b>Volatile Organic Compounds</b>									
Benzene	71-43-2	µg/L	10 µg/L	2 µg/L					
Chloroform	67-66-3	µg/L	40 µg/L	2 µg/L					
Dichlorobenzene, 1,2-	95-50-1	µg/L	50 µg/L	5.6 µg/L					
Dichlorobenzene, 1,4-	106-46-7	µg/L	80 µg/L	6.8 µg/L					
Dichloroethylene, cis-1,2-	156-59-2	µg/L	4000 µg/L	5.6 µg/L					
Dichloromethane	75-09-2	µg/L	2000 µg/L	5.2 µg/L					
Dichloropropylene, trans-1,3-	10061-02-6	µg/L	140 µg/L	5.6 µg/L					
Ethylbenzene	100-41-4	µg/L	160 µg/L	2 µg/L					
Tetrachloroethane, 1,1,1,2-	79-34-5	µg/L	1400 µg/L	17 µg/L					
Tetrachloroethylene	127-18-4	µg/L	1000 µg/L	4.4 µg/L					
Toluene	108-88-3	µg/L	16 µg/L	2 µg/L					
Trichloroethylene	79-01-6	µg/L	400 µg/L	7.6 µg/L					
Xylene, m+p-	179601-23-1	µg/L							
Xylene, o-	95-47-6	µg/L							
Xylenes, total	1330-20-7	µg/L	1400 µg/L	4.4 µg/L					
<b>Polycyclic Aromatic Hydrocarbons</b>									
Anthracene	120-12-7	mg/L							
Benz(a)anthracene	56-55-3	mg/L							
Benzo(a)pyrene	50-32-8	mg/L							
Benzo(b+j)fluoranthene	n/a	mg/L							
Benzo(e)pyrene	192-97-2	mg/L							
Benzo(g,h,i)perylene	191-24-2	mg/L							
Benzo(k)fluoranthene	207-08-9	mg/L							
Chrysene	218-01-9	mg/L							
Dibenz(a,h)acridine	226-36-8	mg/L							
Dibenz(a,h)anthracene	53-70-3	mg/L							
Dibenz(a,j)acridine	224-42-0	mg/L							
Dibenzo(a,i)pyrene	189-55-9	mg/L							
Dibenzo(c,g)carbazole, 7H-	194-59-2	mg/L							
Dinitropyrene, 1,3-	75321-20-9	mg/L							
Dinitropyrene, 1,6-	42397-64-8	mg/L							
Dinitropyrene, 1,8-	42397-65-9	mg/L							
Fluoranthene	206-44-0	mg/L							
Indeno(1,2,3-c,d)pyrene	193-39-5	mg/L							
Methylcholanthrene, 3-	56-49-5	mg/L							





Analyte	CAS Number	Unit	TORSUB SAN	TORSUB STM					
<b>Polycyclic Aromatic Hydrocarbons - Continued</b>									
PAHs, total (ON Sewer Use)	n/a	mg/L	0.005 mg/L	0.002 mg/L					
Perylene	198-55-0	mg/L							
Phenanthrene	85-01-8	mg/L							
Pyrene	129-00-0	mg/L							
<b>Phthalate Esters</b>									
bis(2-Ethylhexyl) phthalate [DEHP]	117-81-7	µg/L	12 µg/L	8.8 µg/L					
Di-n-butyl phthalate	84-74-2	µg/L	80 µg/L	15 µg/L					
<b>Semi-Volatile Organics</b>									
Dichlorobenzidine, 3,3'-	91-94-1	µg/L	2 µg/L	0.8 µg/L					
<b>Chlorinated Phenolics</b>									
Pentachlorophenol [PCP]	87-86-5	µg/L	5 µg/L	2 µg/L					
<b>Nonylphenols</b>									
Nonylphenol diethoxylates [NP2EO]	n/a	µg/L							
Nonylphenol ethoxylates, total	n/a	µg/L	200 µg/L	10 µg/L					
Nonylphenol monoethoxylates [NP1EO]	n/a	µg/L							
Nonylphenols [NP]	84852-15-3	µg/L	20 µg/L	1 µg/L					
<b>Polychlorinated Biphenyls</b>									
Aroclor 1016	12674-11-2	µg/L							
Aroclor 1221	11104-28-2	µg/L							
Aroclor 1232	11141-16-5	µg/L							
Aroclor 1242	53469-21-9	µg/L							
Aroclor 1248	12672-29-6	µg/L							
Aroclor 1254	11097-69-1	µg/L							
Aroclor 1260	11096-82-5	µg/L							
Aroclor 1262	37324-23-5	µg/L							
Aroclor 1268	11100-14-4	µg/L							
Polychlorinated biphenyls [PCBs], total	----	µg/L	1 µg/L	0.4 µg/L					

Please refer to the General Comments section for an explanation of any qualifiers detected.

**Key:**

TORSUB Ontario Toronto Sanitary Discharge Sewer By-Law 100-2016 (FEB 4,2016)  
 SAN Toronto Sanitary Discharge Sewer By-Law  
 STM Toronto Storm Discharge Sewer By-Law




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## QUALITY CONTROL INTERPRETIVE REPORT

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<p><b>Work Order</b> : <b>WT2304211</b></p> <p><b>Client</b> : <b>Grounded Engineering Inc.</b></p> <p><b>Contact</b> : Nicholas Piers</p> <p><b>Address</b> : 1 Banigan Drive Toronto ON Canada M4H 1G3</p> <p><b>Telephone</b> : 647 264 7928</p> <p><b>Project</b> : 23-014</p> <p><b>PO</b> : ----</p> <p><b>C-O-C number</b> : 20-887472</p> <p><b>Sampler</b> : AJ/ IH</p> <p><b>Site</b> : 1437 Queen St. W, Toronto</p> <p><b>Quote number</b> : 2023 SOA Pricing</p> <p><b>No. of samples received</b> : 1</p> <p><b>No. of samples analysed</b> : 1</p>	<p><b>Page</b> : 1 of 14</p> <p><b>Laboratory</b> : Waterloo - Environmental</p> <p><b>Account Manager</b> : Amanda Overholster</p> <p><b>Address</b> : 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8</p> <p><b>Telephone</b> : 1 416 817 2944</p> <p><b>Date Samples Received</b> : 21-Feb-2023 14:50</p> <p><b>Issue Date</b> : 02-Mar-2023 14:06</p>
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This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

**Key**

- Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
- CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
- DQO: Data Quality Objective.
- LOR: Limit of Reporting (detection limit).
- RPD: Relative Percent Difference.

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### ***Workorder Comments***

Holding times are displayed as "----" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

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### ***Summary of Outliers***

#### ***Outliers : Quality Control Samples***

- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- Method Blank value outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

#### ***Outliers: Reference Material (RM) Samples***

- No Reference Material (RM) Sample outliers occur.

***Outliers : Analysis Holding Time Compliance (Breaches)***

- No Analysis Holding Time Outliers exist.

***Outliers : Frequency of Quality Control Samples***

- No Quality Control Sample Frequency Outliers occur.



**Outliers : Quality Control Samples**

*Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes*

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
<b>Method Blank (MB) Values</b>								
Total Metals	QC-841269-001	----	Aluminum, total	7429-90-5	E420	0.0079 <sup>B</sup> mg/L	0.003 mg/L	Blank result exceeds permitted value
Total Metals	QC-841269-001	----	Manganese, total	7439-96-5	E420	0.00017 <sup>B</sup> mg/L	0.0001 mg/L	Blank result exceeds permitted value
Total Metals	QC-841269-001	----	Titanium, total	7440-32-6	E420	0.00156 <sup>B</sup> mg/L	0.0003 mg/L	Blank result exceeds permitted value

**Result Qualifiers**

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.



## Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Aggregate Organics : Biochemical Oxygen Demand - 5 day</b>										
HDPE [BOD HT-4d] SW- UF BH102S	E550	21-Feb-2023	----	----	----		22-Feb-2023	4 days	1 days	✓
<b>Aggregate Organics : Mineral Oil &amp; Grease by Gravimetry</b>										
Amber glass (hydrochloric acid) SW- UF BH102S	E567SG	21-Feb-2023	02-Mar-2023	28 days	9 days	✓	02-Mar-2023	40 days	0 days	✓
<b>Aggregate Organics : Oil &amp; Grease by Gravimetry</b>										
Amber glass (hydrochloric acid) SW- UF BH102S	E567	21-Feb-2023	02-Mar-2023	28 days	9 days	✓	02-Mar-2023	40 days	0 days	✓
<b>Aggregate Organics : Phenols (4AAP) in Water by Colorimetry</b>										
Amber glass total (sulfuric acid) [ON MECP] SW- UF BH102S	E562	21-Feb-2023	23-Feb-2023	----	----		24-Feb-2023	28 days	3 days	✓
<b>Anions and Nutrients : Chloride in Water by IC</b>										
HDPE [ON MECP] SW- UF BH102S	E235.Cl	21-Feb-2023	22-Feb-2023	----	----		23-Feb-2023	28 days	2 days	✓
<b>Anions and Nutrients : Fluoride in Water by IC</b>										
HDPE [ON MECP] SW- UF BH102S	E235.F	21-Feb-2023	22-Feb-2023	----	----		23-Feb-2023	28 days	2 days	✓
<b>Anions and Nutrients : Sulfate in Water by IC</b>										
HDPE [ON MECP] SW- UF BH102S	E235.SO4	21-Feb-2023	22-Feb-2023	----	----		23-Feb-2023	28 days	2 days	✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)</b>											
<b>Amber glass total (sulfuric acid) [ON MECP]</b> SW- UF BH102S	E318	21-Feb-2023	24-Feb-2023	----	----		27-Feb-2023	28 days	6 days	✔	
<b>Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)</b>											
<b>Amber glass total (sulfuric acid) [ON MECP]</b> SW- UF BH102S	E372-U	21-Feb-2023	24-Feb-2023	----	----		27-Feb-2023	28 days	6 days	✔	
<b>Chlorinated Phenolics : BNA (Ontario Sanitary Sewer SVOC Target List) by GC-MS</b>											
<b>Amber glass/Teflon lined cap [ON MECP]</b> SW- UF BH102S	E655F	21-Feb-2023	23-Feb-2023	14 days	2 days	✔	24-Feb-2023	40 days	1 days	✔	
<b>Cyanides : Total Cyanide</b>											
<b>UV-inhibited HDPE - total (sodium hydroxide)</b> SW- UF BH102S	E333	21-Feb-2023	22-Feb-2023	----	----		22-Feb-2023	14 days	1 days	✔	
<b>Microbiological Tests : E. coli (MF-mFC-BCIG)</b>											
<b>Sterile HDPE (Sodium thiosulphate) [ON MECP]</b> SW- UF BH102S	E012A.EC	21-Feb-2023	----	----	----		23-Feb-2023	48 hrs	49 hrs	✔	
<b>Nonylphenols : Nonylphenol Ethoxylates in Water by LC-MS-MS Positive Mode</b>											
<b>Amber glass/Teflon lined cap - LCMS</b> SW- UF BH102S	E749B	21-Feb-2023	23-Feb-2023	7 days	2 days	✔	24-Feb-2023	7 days	1 days	✔	
<b>Nonylphenols : Nonylphenol, Octylphenol and BPA in Water by LC-MS-MS Negative Mode</b>											
<b>Amber glass/Teflon lined cap - LCMS</b> SW- UF BH102S	E749A	21-Feb-2023	23-Feb-2023	7 days	2 days	✔	24-Feb-2023	7 days	1 days	✔	
<b>Phthalate Esters : BNA (Ontario Sanitary Sewer SVOC Target List) by GC-MS</b>											
<b>Amber glass/Teflon lined cap [ON MECP]</b> SW- UF BH102S	E655F	21-Feb-2023	23-Feb-2023	14 days	2 days	✔	24-Feb-2023	40 days	1 days	✔	
<b>Physical Tests : pH by Meter</b>											
<b>HDPE [ON MECP]</b> SW- UF BH102S	E108	21-Feb-2023	22-Feb-2023	----	----		23-Feb-2023	14 days	2 days	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Physical Tests : TSS by Gravimetry</b>										
<b>HDPE [ON MECP]</b> SW- UF BH102S	E160	21-Feb-2023	----	----	----		23-Feb-2023	7 days	2 days	✔
<b>Polychlorinated Biphenyls : PCB Aroclors by GC-MS</b>										
<b>Amber glass/Teflon lined cap [ON MECP]</b> SW- UF BH102S	E687	21-Feb-2023	01-Mar-2023	14 days	8 days	✔	01-Mar-2023	40 days	0 days	✔
<b>Polycyclic Aromatic Hydrocarbons : PAHs (ON Special List) by GC-MS</b>										
<b>Amber glass/Teflon lined cap [ON MECP]</b> SW- UF BH102S	E642D	21-Feb-2023	23-Feb-2023	14 days	2 days	✔	24-Feb-2023	40 days	1 days	✔
<b>Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS (Low Level)</b>										
<b>Amber glass/Teflon lined cap (sodium bisulfate)</b> SW- UF BH102S	E641A-L	21-Feb-2023	01-Mar-2023	14 days	8 days	✔	02-Mar-2023	40 days	1 days	✔
<b>Semi-Volatile Organics : BNA (Ontario Sanitary Sewer SVOC Target List) by GC-MS</b>										
<b>Amber glass/Teflon lined cap [ON MECP]</b> SW- UF BH102S	E655F	21-Feb-2023	23-Feb-2023	14 days	2 days	✔	24-Feb-2023	40 days	1 days	✔
<b>Speciated Metals : Total Hexavalent Chromium (Cr VI) by IC</b>										
<b>HDPE - total (NaOH+Buf) [ON MECP]</b> SW- UF BH102S	E532	21-Feb-2023	----	----	----		22-Feb-2023	28 days	1 days	✔
<b>Total Metals : Total Mercury in Water by CVAAS</b>										
<b>Glass vial total (hydrochloric acid) [ON MECP]</b> SW- UF BH102S	E508	21-Feb-2023	22-Feb-2023	----	----		22-Feb-2023	28 days	1 days	✔
<b>Total Metals : Total metals in Water by CRC ICPMS</b>										
<b>HDPE total (nitric acid)</b> SW- UF BH102S	E420	21-Feb-2023	21-Feb-2023	----	----		22-Feb-2023	180 days	2 days	✔
<b>Volatile Organic Compounds : VOCs (Eastern Canada List) by Headspace GC-MS</b>										
<b>Glass vial (sodium bisulfate)</b> SW- UF BH102S	E611D	21-Feb-2023	21-Feb-2023	----	----		21-Feb-2023	14 days	0 days	✔

[Legend & Qualifier Definitions](#)

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Work Order : WT2304211  
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Project : 23-014

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Rec. HT: ALS recommended hold time (see units).





## Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water** Evaluation: \* = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		Evaluation
			QC	Regular	Actual	Expected	
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
Biochemical Oxygen Demand - 5 day	E550	841698	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	841986	1	17	5.8	5.0	✓
E. coli (MF-mFC-BCIG)	E012A.EC	842918	1	19	5.2	5.0	✓
Fluoride in Water by IC	E235.F	841990	1	5	20.0	5.0	✓
Nonylphenol Ethoxylates in Water by LC-MS-MS Positive Mode	E749B	843401	1	19	5.2	5.0	✓
Nonylphenol, Octylphenol and BPA in Water by LC-MS-MS Negative Mode	E749A	843400	1	19	5.2	5.0	✓
pH by Meter	E108	841992	1	19	5.2	5.0	✓
Phenols (4AAP) in Water by Colorimetry	E562	843232	1	14	7.1	5.0	✓
Sulfate in Water by IC	E235.SO4	841989	1	5	20.0	5.0	✓
Total Cyanide	E333	841513	1	6	16.6	5.0	✓
Total Hexavalent Chromium (Cr VI) by IC	E532	841461	1	9	11.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	843230	1	18	5.5	5.0	✓
Total Mercury in Water by CVAAS	E508	841425	1	10	10.0	5.0	✓
Total metals in Water by CRC ICPMS	E420	841269	1	17	5.8	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	843231	1	20	5.0	5.0	✓
TSS by Gravimetry	E160	841922	1	19	5.2	4.7	✓
VOCs (Eastern Canada List) by Headspace GC-MS	E611D	841153	1	20	5.0	5.0	✓
<b>Laboratory Control Samples (LCS)</b>							
Biochemical Oxygen Demand - 5 day	E550	841698	1	20	5.0	5.0	✓
BNA (Ontario Sanitary Sewer SVOC Target List) by GC-MS	E655F	842560	1	12	8.3	5.0	✓
Chloride in Water by IC	E235.Cl	841986	1	17	5.8	5.0	✓
Fluoride in Water by IC	E235.F	841990	1	5	20.0	5.0	✓
Mineral Oil & Grease by Gravimetry	E567SG	849165	1	19	5.2	5.0	✓
Nonylphenol Ethoxylates in Water by LC-MS-MS Positive Mode	E749B	843401	1	19	5.2	5.0	✓
Nonylphenol, Octylphenol and BPA in Water by LC-MS-MS Negative Mode	E749A	843400	1	19	5.2	5.0	✓
Oil & Grease by Gravimetry	E567	849164	1	20	5.0	5.0	✓
PAHs (ON Special List) by GC-MS	E642D	842563	1	10	10.0	5.0	✓
PAHs by Hexane LVI GC-MS (Low Level)	E641A-L	848635	1	7	14.2	5.0	✓
PCB Aroclors by GC-MS	E687	848636	1	19	5.2	4.7	✓
pH by Meter	E108	841992	1	19	5.2	5.0	✓
Phenols (4AAP) in Water by Colorimetry	E562	843232	1	14	7.1	5.0	✓
Sulfate in Water by IC	E235.SO4	841989	1	5	20.0	5.0	✓
Total Cyanide	E333	841513	1	6	16.6	5.0	✓
Total Hexavalent Chromium (Cr VI) by IC	E532	841461	1	9	11.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	843230	1	18	5.5	5.0	✓
Total Mercury in Water by CVAAS	E508	841425	1	10	10.0	5.0	✓



Matrix: **Water** Evaluation: ✖ = QC frequency outside specification; ✔ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		
			QC	Regular	Actual	Expected	Evaluation
<b>Analytical Methods</b>							
<b>Laboratory Control Samples (LCS) - Continued</b>							
Total metals in Water by CRC ICPMS	E420	841269	1	17	5.8	5.0	✔
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	843231	1	20	5.0	5.0	✔
TSS by Gravimetry	E160	841922	1	19	5.2	4.7	✔
VOCs (Eastern Canada List) by Headspace GC-MS	E611D	841153	1	20	5.0	5.0	✔
<b>Method Blanks (MB)</b>							
Biochemical Oxygen Demand - 5 day	E550	841698	1	20	5.0	5.0	✔
BNA (Ontario Sanitary Sewer SVOC Target List) by GC-MS	E655F	842560	1	12	8.3	5.0	✔
Chloride in Water by IC	E235.Cl	841986	1	17	5.8	5.0	✔
E. coli (MF-mFC-BCIG)	E012A.EC	842918	1	19	5.2	5.0	✔
Fluoride in Water by IC	E235.F	841990	1	5	20.0	5.0	✔
Mineral Oil & Grease by Gravimetry	E567SG	849165	1	19	5.2	5.0	✔
Nonylphenol Ethoxylates in Water by LC-MS-MS Positive Mode	E749B	843401	1	19	5.2	5.0	✔
Nonylphenol, Octylphenol and BPA in Water by LC-MS-MS Negative Mode	E749A	843400	1	19	5.2	5.0	✔
Oil & Grease by Gravimetry	E567	849164	1	20	5.0	5.0	✔
PAHs (ON Special List) by GC-MS	E642D	842563	1	10	10.0	5.0	✔
PAHs by Hexane LVI GC-MS (Low Level)	E641A-L	848635	1	7	14.2	5.0	✔
PCB Aroclors by GC-MS	E687	848636	1	19	5.2	4.7	✔
Phenols (4AAP) in Water by Colorimetry	E562	843232	1	14	7.1	5.0	✔
Sulfate in Water by IC	E235.SO4	841989	1	5	20.0	5.0	✔
Total Cyanide	E333	841513	1	6	16.6	5.0	✔
Total Hexavalent Chromium (Cr VI) by IC	E532	841461	1	9	11.1	5.0	✔
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	843230	1	18	5.5	5.0	✔
Total Mercury in Water by CVAAS	E508	841425	1	10	10.0	5.0	✔
Total metals in Water by CRC ICPMS	E420	841269	1	17	5.8	5.0	✔
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	843231	1	20	5.0	5.0	✔
TSS by Gravimetry	E160	841922	1	19	5.2	4.7	✔
VOCs (Eastern Canada List) by Headspace GC-MS	E611D	841153	1	20	5.0	5.0	✔
<b>Matrix Spikes (MS)</b>							
Chloride in Water by IC	E235.Cl	841986	1	17	5.8	5.0	✔
Fluoride in Water by IC	E235.F	841990	1	5	20.0	5.0	✔
Nonylphenol Ethoxylates in Water by LC-MS-MS Positive Mode	E749B	843401	1	19	5.2	5.0	✔
Nonylphenol, Octylphenol and BPA in Water by LC-MS-MS Negative Mode	E749A	843400	1	19	5.2	5.0	✔
Phenols (4AAP) in Water by Colorimetry	E562	843232	1	14	7.1	5.0	✔
Sulfate in Water by IC	E235.SO4	841989	1	5	20.0	5.0	✔
Total Cyanide	E333	841513	1	6	16.6	5.0	✔
Total Hexavalent Chromium (Cr VI) by IC	E532	841461	1	9	11.1	5.0	✔
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	843230	1	18	5.5	5.0	✔
Total Mercury in Water by CVAAS	E508	841425	1	10	10.0	5.0	✔
Total metals in Water by CRC ICPMS	E420	841269	1	17	5.8	5.0	✔



Matrix: **Water** Evaluation: ✖ = QC frequency outside specification; ✔ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		
			QC	Regular	Actual	Expected	Evaluation
<i>Analytical Methods</i>							
<b>Matrix Spikes (MS) - Continued</b>							
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	843231	1	20	5.0	5.0	✔
VOCs (Eastern Canada List) by Headspace GC-MS	E611D	841153	1	20	5.0	5.0	✔



## Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
E. coli (MF-mFC-BCIG)	E012A.EC Waterloo - Environmental	Water	ON E3433 (mod)	Following filtration (0.45 µm), and incubation at 44.5±0.2°C for 24 hours, colonies exhibiting characteristic morphology of the target organism are enumerated.
pH by Meter	E108 Waterloo - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160 Waterloo - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Chloride in Water by IC	E235.Cl Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Waterloo - Environmental	Water	Method Fialab 100, 2018	TKN in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021).
Total Cyanide	E333 Waterloo - Environmental	Water	ISO 14403 (mod)	Total or Strong Acid Dissociable (SAD) Cyanide is determined by Continuous Flow Analyzer (CFA) with in-line UV digestion followed by colourimetric analysis.  Method Limitation: High levels of thiocyanate (SCN) may cause positive interference (up to 0.5% of SCN concentration).
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U Waterloo - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.



Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total metals in Water by CRC ICPMS	E420 Waterloo - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.  Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Mercury in Water by CVAAS	E508 Waterloo - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Total Hexavalent Chromium (Cr VI) by IC	E532 Waterloo - Environmental	Water	APHA 3500-Cr C (Ion Chromatography)	Hexavalent Chromium is measured by Ion chromatography-Post column reaction and UV detection.  Results are based on an un-filtered, field-preserved sample.
Biochemical Oxygen Demand - 5 day	E550 Waterloo - Environmental	Water	APHA 5210 B (mod)	Samples are diluted and incubated for a specified time period, after which the oxygen depletion is measured using a dissolved oxygen meter.  Free chlorine is a negative interference in the BOD method; please advise ALS when free chlorine is present in samples.
Phenols (4AAP) in Water by Colorimetry	E562 Waterloo - Environmental	Water	EPA 9066	This automated method is based on the distillation of phenol and subsequent reaction of the distillate with alkaline ferricyanide (K <sub>3</sub> Fe(CN) <sub>6</sub> ) and 4-amino-antipyrine (4-AAP) to form a red complex which is measured colorimetrically.
Oil & Grease by Gravimetry	E567 Waterloo - Environmental	Water	BC MOE Lab Manual (Oil & Grease) (mod)	The entire water sample is extracted with hexane and the extract is evaporated to dryness. The residue is then weighed to determine Oil and Grease.
Mineral Oil & Grease by Gravimetry	E567SG Waterloo - Environmental	Water	BC MOE Lab Manual (Oil & Grease) (mod)	The entire water sample is extracted with hexane, followed by silica gel treatment after which the extract is evaporated to dryness. The residue is then weighed to determine Mineral Oil and Grease.
VOCs (Eastern Canada List) by Headspace GC-MS	E611D Waterloo - Environmental	Water	EPA 8260D (mod)	Volatile Organic Compounds (VOCs) are analyzed by static headspace GC-MS. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
PAHs by Hexane LVI GC-MS (Low Level)	E641A-L Waterloo - Environmental	Water	EPA 8270E (mod)	Polycyclic Aromatic Hydrocarbons (PAHs) are analyzed by large volume injection (LVI) GC-MS.
PAHs (ON Special List) by GC-MS	E642D Waterloo - Environmental	Water	EPA 8270E (mod)	Polycyclic Aromatic Hydrocarbons (PAHs) are analyzed by GC-MS.



Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
BNA (Ontario Sanitary Sewer SVOC Target List) by GC-MS	E655F Waterloo - Environmental	Water	EPA 8270E (mod)	BNA are analyzed by GC-MS.
PCB Aroclors by GC-MS	E687 Waterloo - Environmental	Water	EPA 8270E (mod)	PCB Aroclors are analyzed by GC-MS
Nonylphenol, Octylphenol and BPA in Water by LC-MS-MS Negative Mode	E749A Waterloo - Environmental	Water	J. Chrom A849 (1999) p.467-482	An aliquot of 5.0 ± 0.10 mL of filtered sample is spiked with Nonylphenol-D4, Nonylphenol Diethoxylate 13C6, and Bisphenol A 13C12 internal standards and analyzed by LC-MS/MS.
Nonylphenol Ethoxylates in Water by LC-MS-MS Positive Mode	E749B Waterloo - Environmental	Water	J. Chrom A849 (1999) p.467-482	Water samples are filtered and analyzed on LCMS/MS by direct injection.
Animal & Vegetable Oil & Grease by Gravimetry	EC567A.SG Waterloo - Environmental	Water	APHA 5520 (mod)	Animal & vegetable oil and grease is calculated as follows: Oil & Grease (gravimetric) minus Mineral Oil & Grease (gravimetric)
Total PAH (Ontario Sewer Use Extended List)	EC640A Waterloo - Environmental	Water	Calculation (Sum of the Squares)	Total PAH (Ontario Sewer Use) is the sum of the following PAHs: anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(b+j)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, indeno(1,2,3-c,d)pyrene, phenanthrene, pyrene, benzo(e)pyrene, perylene, 3-methylcholanthrene, 1,3-dinitropyrene, 1,6-dinitropyrene, 1,8-dinitropyrene, 7H-dibenzo(c,g)carbazole, dibenzo(a,i)pyrene, dibenz(a,j)acridine, and dibenz(a,h)acridine. When the PAH is less than LOR, zero is used for calculation.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Digestion for TKN in water	EP318 Waterloo - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested at high temperature using Sulfuric Acid with Copper catalyst, which converts organic nitrogen sources to Ammonia, which is then quantified by the analytical method as TKN. This method is unsuitable for samples containing high levels of nitrate. If nitrate exceeds TKN concentration by ten times or more, results may be biased low.
Digestion for Total Phosphorus in water	EP372 Waterloo - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Oil & Grease Extraction for Gravimetry	EP567 Waterloo - Environmental	Water	BC MOE Lab Manual (Oil & Grease) (mod)	The entire water sample is extracted with hexane by liquid-liquid extraction.



<i>Preparation Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
VOCs Preparation for Headspace Analysis	EP581 Waterloo - Environmental	Water	EPA 5021A (mod)	Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler. An aliquot of the headspace is then injected into the GC/MS-FID system.
PHCs and PAHs Hexane Extraction	EP601 Waterloo - Environmental	Water	EPA 3511 (mod)	Petroleum Hydrocarbons (PHCs) and Polycyclic Aromatic Hydrocarbons (PAHs) are extracted using a hexane liquid-liquid extraction.
PAHs DCM Extraction	EP642 Waterloo - Environmental	Water	EPA 3510C (mod)	PAH are extracted from aqueous sample using DCM liquid-liquid extraction.
BNA Extraction	EP655 Waterloo - Environmental	Water	EPA 3510C (mod)	SVOCs are extracted from aqueous sample using DCM liquid-liquid extraction.
Pesticides, PCB, and Neutral Extractable Chlorinated Hydrocarbons Extraction	EP660 Waterloo - Environmental	Water	EPA 3511 (mod)	Samples are extracted from aqueous sample using an organic solvent liquid-liquid extraction.
Preparation of Nonylphenol and Nonylphenol Ethoxylates	EP749 Waterloo - Environmental	Water	J. Chrom A849 (1999) p.467-482	An aliquot of 5.0 ± 0.10 mL of filtered sample is spiked with Nonylphenol-D4, Nonylphenol Diethoxylate 13C6, and Bisphenol A 13C12 internal standards and analyzed by LC-MS/MS.

## QUALITY CONTROL REPORT

<p><b>Work Order</b> : <b>WT2304211</b></p> <p><b>Client</b> : Grounded Engineering Inc.</p> <p><b>Contact</b> : Nicholas Piers</p> <p><b>Address</b> : 1 Banigan Drive Toronto ON Canada M4H 1G3</p> <p><b>Telephone</b> :</p> <p><b>Project</b> : 23-014</p> <p><b>PO</b> : ----</p> <p><b>C-O-C number</b> : 20-887472</p> <p><b>Sampler</b> : AJ/ IH 647 264 7928</p> <p><b>Site</b> : 1437 Queen St. W, Toronto</p> <p><b>Quote number</b> : 2023 SOA Pricing</p> <p><b>No. of samples received</b> : 1</p> <p><b>No. of samples analysed</b> : 1</p>	<p><b>Page</b> : 1 of 14</p> <p><b>Laboratory</b> : Waterloo - Environmental</p> <p><b>Account Manager</b> : Amanda Overholster</p> <p><b>Address</b> : 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8</p> <p><b>Telephone</b> : 1 416 817 2944</p> <p><b>Date Samples Received</b> : 21-Feb-2023 14:50</p> <p><b>Date Analysis Commenced</b> : 21-Feb-2023</p> <p><b>Issue Date</b> : 02-Mar-2023 14:06</p>
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This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

### Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Danielle Gravel	Supervisor - Semi-Volatile Instrumentation	Waterloo Organics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Waterloo Inorganics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Waterloo Metals, Waterloo, Ontario
Jeremy Gingras	Team Leader - Semi-Volatile Instrumentation	Waterloo Organics, Waterloo, Ontario
Jocelyn Kennedy	Department Manager - Semi-Volatile Organics	Waterloo Organics, Waterloo, Ontario
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Sarah Birch	VOC Section Supervisor	Waterloo Organics, Waterloo, Ontario
Wayne Smith	Client Services Specialist	Waterloo Microbiology, Waterloo, Ontario



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Work Order : WT2304211  
Client : Grounded Engineering Inc.  
Project : 23-014



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## General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

### Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percent Difference

# = Indicates a QC result that did not meet the ALS DQO.

## Workorder Comments

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Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

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### Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: <b>Water</b>					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Physical Tests (QC Lot: 841922)</b>											
WT2303958-002	Anonymous	Solids, total suspended [TSS]	----	E160	3.0	mg/L	26.3	28.5	2.2	Diff <2x LOR	----
<b>Physical Tests (QC Lot: 841992)</b>											
WT2304310-001	Anonymous	pH	----	E108	0.10	pH units	7.82	7.71	1.42%	4%	----
<b>Anions and Nutrients (QC Lot: 841986)</b>											
WT2304310-001	Anonymous	Chloride	16887-00-6	E235.Cl	0.50	mg/L	10.3	10.4	0.634%	20%	----
<b>Anions and Nutrients (QC Lot: 841989)</b>											
WT2304310-001	Anonymous	Sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	0.34	0.35	0.009	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 841990)</b>											
WT2304310-001	Anonymous	Fluoride	16984-48-8	E235.F	0.020	mg/L	0.038	0.038	0.0002	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 843230)</b>											
WT2304132-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	1.66	1.77	6.34%	20%	----
<b>Anions and Nutrients (QC Lot: 843231)</b>											
WT2304132-001	Anonymous	Phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0373	0.0365	2.25%	20%	----
<b>Cyanides (QC Lot: 841513)</b>											
WT2304175-001	Anonymous	Cyanide, strong acid dissociable (Total)	----	E333	0.0020	mg/L	<0.0020	<0.0020	0	Diff <2x LOR	----
<b>Microbiological Tests (QC Lot: 842918)</b>											
WT2304211-001	SW- UF BH102S	Coliforms, Escherichia coli [E. coli]	----	E012A.EC	1	CFU/100mL	<1	<1	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 841269)</b>											
WT2304142-001	Anonymous	Aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0478	0.0506	5.69%	20%	----
		Antimony, total	7440-36-0	E420	0.00010	mg/L	0.00016	0.00020	0.00004	Diff <2x LOR	----
		Arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00014	0.00014	0.000007	Diff <2x LOR	----
		Cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.0000334	0.0000315	0.0000019	Diff <2x LOR	----
		Chromium, total	7440-47-3	E420	0.00050	mg/L	0.00117	0.00122	0.00005	Diff <2x LOR	----
		Cobalt, total	7440-48-4	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		Copper, total	7440-50-8	E420	0.00050	mg/L	0.00161	0.00163	0.00002	Diff <2x LOR	----
		Lead, total	7439-92-1	E420	0.000050	mg/L	0.000410	0.000420	0.000010	Diff <2x LOR	----
		Manganese, total	7439-96-5	E420	0.00010	mg/L	0.00200	0.00200	0.145%	20%	----
		Molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.000462	0.000480	0.000018	Diff <2x LOR	----
		Nickel, total	7440-02-0	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----



Sub-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Total Metals (QC Lot: 841269) - continued</b>											
WT2304142-001	Anonymous	Selenium, total	7782-49-2	E420	0.000050	mg/L	0.000069	0.000064	0.000005	Diff <2x LOR	----
		Silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		Tin, total	7440-31-5	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		Titanium, total	7440-32-6	E420	0.000030	mg/L	0.00112	0.00128	0.00017	Diff <2x LOR	----
		Zinc, total	7440-66-6	E420	0.0030	mg/L	0.0477	0.0478	0.165%	20%	----
<b>Total Metals (QC Lot: 841425)</b>											
TY2301281-001	Anonymous	Mercury, total	7439-97-6	E508	0.000100	mg/L	<0.100 µg/L	<0.000100	0	Diff <2x LOR	----
<b>Speciated Metals (QC Lot: 841461)</b>											
WT2304178-001	Anonymous	Chromium, hexavalent [Cr VI], total	18540-29-9	E532	0.00050	mg/L	174 µg/L	0.165	4.76%	20%	----
<b>Aggregate Organics (QC Lot: 841698)</b>											
WT2304291-001	Anonymous	Biochemical oxygen demand [BOD]	----	E550	2.0	mg/L	2.3	2.6	13.2%	30%	----
<b>Aggregate Organics (QC Lot: 843232)</b>											
WT2304132-001	Anonymous	Phenols, total (4AAP)	----	E562	0.0010	mg/L	0.0012	0.0012	0.00002	Diff <2x LOR	----
<b>Volatile Organic Compounds (QC Lot: 841153)</b>											
WT2303957-001	Anonymous	Benzene	71-43-2	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		Chloroform	67-66-3	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		Dichlorobenzene, 1,2-	95-50-1	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		Dichlorobenzene, 1,4-	106-46-7	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		Dichloroethylene, cis-1,2-	156-59-2	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		Dichloromethane	75-09-2	E611D	1.0	µg/L	<1.0	<1.0	0	Diff <2x LOR	----
		Dichloropropylene, trans-1,3-	10061-02-6	E611D	0.30	µg/L	<0.30	<0.30	0	Diff <2x LOR	----
		Ethylbenzene	100-41-4	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		Tetrachloroethane, 1,1,2,2-	79-34-5	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		Tetrachloroethylene	127-18-4	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		Toluene	108-88-3	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		Trichloroethylene	79-01-6	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		Xylene, m+p-	179601-23-1	E611D	0.40	µg/L	<0.40	<0.40	0	Diff <2x LOR	----
		Xylene, o-	95-47-6	E611D	0.30	µg/L	<0.30	<0.30	0	Diff <2x LOR	----
<b>Nonylphenols (QC Lot: 843400)</b>											
WT2304136-001	Anonymous	Nonylphenols [NP]	84852-15-3	E749A	1.0	µg/L	<1.0	<1.0	0	Diff <2x LOR	----
<b>Nonylphenols (QC Lot: 843401)</b>											
WT2304136-001	Anonymous	Nonylphenol diethoxylates [NP2EO]	n/a	E749B	0.10	µg/L	<0.10	<0.10	0	Diff <2x LOR	----
		Nonylphenol monoethoxylates [NP1EO]	n/a	E749B	2.0	µg/L	<2.0	<2.0	0	Diff <2x LOR	----



## Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Physical Tests (QCLot: 841922)</b>						
Solids, total suspended [TSS]	---	E160	3	mg/L	<3.0	---
<b>Anions and Nutrients (QCLot: 841986)</b>						
Chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	---
<b>Anions and Nutrients (QCLot: 841989)</b>						
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	---
<b>Anions and Nutrients (QCLot: 841990)</b>						
Fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	---
<b>Anions and Nutrients (QCLot: 843230)</b>						
Kjeldahl nitrogen, total [TKN]	---	E318	0.05	mg/L	<0.050	---
<b>Anions and Nutrients (QCLot: 843231)</b>						
Phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	---
<b>Cyanides (QCLot: 841513)</b>						
Cyanide, strong acid dissociable (Total)	---	E333	0.002	mg/L	<0.0020	---
<b>Microbiological Tests (QCLot: 842918)</b>						
Coliforms, Escherichia coli [E. coli]	---	E012A.EC	1	CFU/100mL	<1	---
<b>Total Metals (QCLot: 841269)</b>						
Aluminum, total	7429-90-5	E420	0.003	mg/L	# 0.0079	B
Antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	---
Arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	---
Cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	---
Chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	---
Cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	---
Copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	---
Lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	---
Manganese, total	7439-96-5	E420	0.0001	mg/L	# 0.00017	B
Molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	---
Nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	---
Selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	---
Silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	---
Tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	---
Titanium, total	7440-32-6	E420	0.0003	mg/L	# 0.00156	B



Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Total Metals (QCLot: 841269) - continued</b>						
Zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
<b>Total Metals (QCLot: 841425)</b>						
Mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
<b>Speciated Metals (QCLot: 841461)</b>						
Chromium, hexavalent [Cr VI], total	18540-29-9	E532	0.0005	mg/L	<0.00050	----
<b>Aggregate Organics (QCLot: 841698)</b>						
Biochemical oxygen demand [BOD]	----	E550	2	mg/L	<2.0	----
<b>Aggregate Organics (QCLot: 843232)</b>						
Phenols, total (4AAP)	----	E562	0.001	mg/L	<0.0010	----
<b>Aggregate Organics (QCLot: 849164)</b>						
Oil & grease (gravimetric)	----	E567	5	mg/L	<5.0	----
<b>Aggregate Organics (QCLot: 849165)</b>						
Oil & grease, mineral (gravimetric)	----	E567SG	5	mg/L	<5.0	----
<b>Volatile Organic Compounds (QCLot: 841153)</b>						
Benzene	71-43-2	E611D	0.5	µg/L	<0.50	----
Chloroform	67-66-3	E611D	0.5	µg/L	<0.50	----
Dichlorobenzene, 1,2-	95-50-1	E611D	0.5	µg/L	<0.50	----
Dichlorobenzene, 1,4-	106-46-7	E611D	0.5	µg/L	<0.50	----
Dichloroethylene, cis-1,2-	156-59-2	E611D	0.5	µg/L	<0.50	----
Dichloromethane	75-09-2	E611D	1	µg/L	<1.0	----
Dichloropropylene, trans-1,3-	10061-02-6	E611D	0.3	µg/L	<0.30	----
Ethylbenzene	100-41-4	E611D	0.5	µg/L	<0.50	----
Tetrachloroethane, 1,1,2,2-	79-34-5	E611D	0.5	µg/L	<0.50	----
Tetrachloroethylene	127-18-4	E611D	0.5	µg/L	<0.50	----
Toluene	108-88-3	E611D	0.5	µg/L	<0.50	----
Trichloroethylene	79-01-6	E611D	0.5	µg/L	<0.50	----
Xylene, m+p-	179601-23-1	E611D	0.4	µg/L	<0.40	----
Xylene, o-	95-47-6	E611D	0.3	µg/L	<0.30	----
<b>Polycyclic Aromatic Hydrocarbons (QCLot: 842563)</b>						
Dibenz(a,h)acridine	226-36-8	E642D	0.05	µg/L	<0.050	----
Dibenz(a,j)acridine	224-42-0	E642D	0.05	µg/L	<0.050	----
Dibenzo(a,i)pyrene	189-55-9	E642D	0.05	µg/L	<0.050	----
Dibenzo(c,g)carbazole, 7H-	194-59-2	E642D	0.05	µg/L	<0.050	----
Dinitropyrene, 1,3-	75321-20-9	E642D	1	µg/L	<1.0	----
Dinitropyrene, 1,6-	42397-64-8	E642D	1	µg/L	<1.0	----



Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Polycyclic Aromatic Hydrocarbons (QCLot: 842563) - continued</b>						
Dinitropyrene, 1,8-	42397-65-9	E642D	1	µg/L	<1.0	---
Methylcholanthrene, 3-	56-49-5	E642D	0.05	µg/L	<0.050	---
<b>Polycyclic Aromatic Hydrocarbons (QCLot: 848635)</b>						
Anthracene	120-12-7	E641A-L	0.01	µg/L	<0.010	---
Benz(a)anthracene	56-55-3	E641A-L	0.01	µg/L	<0.010	---
Benzo(a)pyrene	50-32-8	E641A-L	0.005	µg/L	<0.0050	---
Benzo(b+j)fluoranthene	n/a	E641A-L	0.01	µg/L	<0.010	---
Benzo(e)pyrene	192-97-2	E641A-L	0.01	µg/L	<0.010	---
Benzo(g,h,i)perylene	191-24-2	E641A-L	0.01	µg/L	<0.010	---
Benzo(k)fluoranthene	207-08-9	E641A-L	0.01	µg/L	<0.010	---
Chrysene	218-01-9	E641A-L	0.01	µg/L	<0.010	---
Dibenz(a,h)anthracene	53-70-3	E641A-L	0.005	µg/L	<0.0050	---
Fluoranthene	206-44-0	E641A-L	0.01	µg/L	<0.010	---
Indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.01	µg/L	<0.010	---
Perylene	198-55-0	E641A-L	0.01	µg/L	<0.010	---
Phenanthrene	85-01-8	E641A-L	0.01	µg/L	<0.010	---
Pyrene	129-00-0	E641A-L	0.01	µg/L	<0.010	---
<b>Phthalate Esters (QCLot: 842560)</b>						
bis(2-Ethylhexyl) phthalate [DEHP]	117-81-7	E655F	2	µg/L	<2.0	---
Di-n-butyl phthalate	84-74-2	E655F	1	µg/L	<1.0	---
<b>Semi-Volatile Organics (QCLot: 842560)</b>						
Dichlorobenzidine, 3,3'-	91-94-1	E655F	0.4	µg/L	<0.40	---
<b>Chlorinated Phenolics (QCLot: 842560)</b>						
Pentachlorophenol [PCP]	87-86-5	E655F	0.5	µg/L	<0.50	---
<b>Nonylphenols (QCLot: 843400)</b>						
Nonylphenols [NP]	84852-15-3	E749A	1	µg/L	<1.0	---
<b>Nonylphenols (QCLot: 843401)</b>						
Nonylphenol diethoxylates [NP2EO]	n/a	E749B	0.1	µg/L	<0.10	---
Nonylphenol monoethoxylates [NP1EO]	n/a	E749B	2	µg/L	<2.0	---
<b>Polychlorinated Biphenyls (QCLot: 848636)</b>						
Aroclor 1016	12674-11-2	E687	0.02	µg/L	<0.020	---
Aroclor 1221	11104-28-2	E687	0.02	µg/L	<0.020	---
Aroclor 1232	11141-16-5	E687	0.02	µg/L	<0.020	---
Aroclor 1242	53469-21-9	E687	0.02	µg/L	<0.020	---
Aroclor 1248	12672-29-6	E687	0.02	µg/L	<0.020	---



Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Polychlorinated Biphenyls (QCLot: 848636) - continued</b>						
Aroclor 1254	11097-69-1	E687	0.02	µg/L	<0.020	----
Aroclor 1260	11096-82-5	E687	0.02	µg/L	<0.020	----
Aroclor 1262	37324-23-5	E687	0.02	µg/L	<0.020	----
Aroclor 1268	11100-14-4	E687	0.02	µg/L	<0.020	----

**Qualifiers**

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.



## Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: Water

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
<b>Physical Tests (QCLot: 841922)</b>									
Solids, total suspended [TSS]	----	E160	3	mg/L	150 mg/L	95.8	85.0	115	----
<b>Physical Tests (QCLot: 841992)</b>									
pH	----	E108	----	pH units	7 pH units	102	98.0	102	----
<b>Anions and Nutrients (QCLot: 841986)</b>									
Chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	100	90.0	110	----
<b>Anions and Nutrients (QCLot: 841989)</b>									
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	101	90.0	110	----
<b>Anions and Nutrients (QCLot: 841990)</b>									
Fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	101	90.0	110	----
<b>Anions and Nutrients (QCLot: 843230)</b>									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	102	75.0	125	----
<b>Anions and Nutrients (QCLot: 843231)</b>									
Phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.845 mg/L	94.9	80.0	120	----
<b>Cyanides (QCLot: 841513)</b>									
Cyanide, strong acid dissociable (Total)	----	E333	0.002	mg/L	0.25 mg/L	91.6	80.0	120	----
<b>Total Metals (QCLot: 841269)</b>									
Aluminum, total	7429-90-5	E420	0.003	mg/L	0.1 mg/L	103	80.0	120	----
Antimony, total	7440-36-0	E420	0.0001	mg/L	0.05 mg/L	105	80.0	120	----
Arsenic, total	7440-38-2	E420	0.0001	mg/L	0.05 mg/L	101	80.0	120	----
Cadmium, total	7440-43-9	E420	0.000005	mg/L	0.005 mg/L	97.4	80.0	120	----
Chromium, total	7440-47-3	E420	0.0005	mg/L	0.0125 mg/L	99.8	80.0	120	----
Cobalt, total	7440-48-4	E420	0.0001	mg/L	0.0125 mg/L	98.0	80.0	120	----
Copper, total	7440-50-8	E420	0.0005	mg/L	0.0125 mg/L	94.5	80.0	120	----
Lead, total	7439-92-1	E420	0.00005	mg/L	0.025 mg/L	95.6	80.0	120	----
Manganese, total	7439-96-5	E420	0.0001	mg/L	0.0125 mg/L	97.0	80.0	120	----
Molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.0125 mg/L	102	80.0	120	----
Nickel, total	7440-02-0	E420	0.0005	mg/L	0.025 mg/L	95.7	80.0	120	----
Selenium, total	7782-49-2	E420	0.00005	mg/L	0.05 mg/L	93.9	80.0	120	----
Silver, total	7440-22-4	E420	0.00001	mg/L	0.005 mg/L	89.7	80.0	120	----
Tin, total	7440-31-5	E420	0.0001	mg/L	0.025 mg/L	97.0	80.0	120	----





Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
<b>Total Metals (QCLot: 841269) - continued</b>									
Titanium, total	7440-32-6	E420	0.0003	mg/L	0.0125 mg/L	98.6	80.0	120	----
Zinc, total	7440-66-6	E420	0.003	mg/L	0.025 mg/L	95.5	80.0	120	----
<b>Total Metals (QCLot: 841425)</b>									
Mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	91.7	80.0	120	----
<b>Speciated Metals (QCLot: 841461)</b>									
Chromium, hexavalent [Cr VI], total	18540-29-9	E532	0.0005	mg/L	0.025 mg/L	98.6	80.0	120	----
<b>Aggregate Organics (QCLot: 841698)</b>									
Biochemical oxygen demand [BOD]	----	E550	2	mg/L	198 mg/L	104	85.0	115	----
<b>Aggregate Organics (QCLot: 843232)</b>									
Phenols, total (4AAP)	----	E562	0.001	mg/L	0.02 mg/L	108	85.0	115	----
<b>Aggregate Organics (QCLot: 849164)</b>									
Oil & grease (gravimetric)	----	E567	5	mg/L	200 mg/L	92.4	70.0	130	----
<b>Aggregate Organics (QCLot: 849165)</b>									
Oil & grease, mineral (gravimetric)	----	E567SG	5	mg/L	100 mg/L	91.7	70.0	130	----
<b>Volatile Organic Compounds (QCLot: 841153)</b>									
Benzene	71-43-2	E611D	0.5	µg/L	100 µg/L	110	70.0	130	----
Chloroform	67-66-3	E611D	0.5	µg/L	100 µg/L	107	70.0	130	----
Dichlorobenzene, 1,2-	95-50-1	E611D	0.5	µg/L	100 µg/L	102	70.0	130	----
Dichlorobenzene, 1,4-	106-46-7	E611D	0.5	µg/L	100 µg/L	103	70.0	130	----
Dichloroethylene, cis-1,2-	156-59-2	E611D	0.5	µg/L	100 µg/L	100	70.0	130	----
Dichloromethane	75-09-2	E611D	1	µg/L	100 µg/L	110	70.0	130	----
Dichloropropylene, trans-1,3-	10061-02-6	E611D	0.3	µg/L	100 µg/L	90.7	70.0	130	----
Ethylbenzene	100-41-4	E611D	0.5	µg/L	100 µg/L	96.1	70.0	130	----
Tetrachloroethane, 1,1,1,2,2-	79-34-5	E611D	0.5	µg/L	100 µg/L	94.4	70.0	130	----
Tetrachloroethylene	127-18-4	E611D	0.5	µg/L	100 µg/L	102	70.0	130	----
Toluene	108-88-3	E611D	0.5	µg/L	100 µg/L	96.8	70.0	130	----
Trichloroethylene	79-01-6	E611D	0.5	µg/L	100 µg/L	106	70.0	130	----
Xylene, m+p-	179601-23-1	E611D	0.4	µg/L	200 µg/L	101	70.0	130	----
Xylene, o-	95-47-6	E611D	0.3	µg/L	100 µg/L	96.1	70.0	130	----
<b>Polycyclic Aromatic Hydrocarbons (QCLot: 842563)</b>									
Dibenz(a,h)acridine	226-36-8	E642D	0.05	µg/L	1.6 µg/L	106	60.0	130	----
Dibenz(a,j)acridine	224-42-0	E642D	0.05	µg/L	1.6 µg/L	116	60.0	130	----



Sub-Matrix: Water

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
<b>Polycyclic Aromatic Hydrocarbons (QCLot: 842563) - continued</b>									
Dibenzo(a,i)pyrene	189-55-9	E642D	0.05	µg/L	1.6 µg/L	74.3	60.0	130	----
Dibenzo(c,g)carbazole, 7H-	194-59-2	E642D	0.05	µg/L	1.6 µg/L	112	60.0	130	----
Dinitropyrene, 1,3-	75321-20-9	E642D	1	µg/L	1.6 µg/L	117	60.0	130	----
Dinitropyrene, 1,6-	42397-64-8	E642D	1	µg/L	1.6 µg/L	63.8	60.0	130	----
Dinitropyrene, 1,8-	42397-65-9	E642D	1	µg/L	1.6 µg/L	90.7	60.0	130	----
Methylcholanthrene, 3-	56-49-5	E642D	0.05	µg/L	1.6 µg/L	122	60.0	130	----
<b>Polycyclic Aromatic Hydrocarbons (QCLot: 848635)</b>									
Anthracene	120-12-7	E641A-L	0.01	µg/L	0.5263 µg/L	113	50.0	140	----
Benz(a)anthracene	56-55-3	E641A-L	0.01	µg/L	0.5263 µg/L	118	50.0	140	----
Benzo(a)pyrene	50-32-8	E641A-L	0.005	µg/L	0.5263 µg/L	111	50.0	140	----
Benzo(b+j)fluoranthene	n/a	E641A-L	0.01	µg/L	0.5263 µg/L	122	50.0	140	----
Benzo(e)pyrene	192-97-2	E641A-L	0.01	µg/L	0.5263 µg/L	129	50.0	140	----
Benzo(g,h,i)perylene	191-24-2	E641A-L	0.01	µg/L	0.5263 µg/L	124	50.0	140	----
Benzo(k)fluoranthene	207-08-9	E641A-L	0.01	µg/L	0.5263 µg/L	135	50.0	140	----
Chrysene	218-01-9	E641A-L	0.01	µg/L	0.5263 µg/L	135	50.0	140	----
Dibenz(a,h)anthracene	53-70-3	E641A-L	0.005	µg/L	0.5263 µg/L	102	50.0	140	----
Fluoranthene	206-44-0	E641A-L	0.01	µg/L	0.5263 µg/L	132	50.0	140	----
Indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.01	µg/L	0.5263 µg/L	135	50.0	140	----
Perylene	198-55-0	E641A-L	0.01	µg/L	0.5263 µg/L	116	50.0	140	----
Phenanthrene	85-01-8	E641A-L	0.01	µg/L	0.5263 µg/L	122	50.0	140	----
Pyrene	129-00-0	E641A-L	0.01	µg/L	0.5263 µg/L	130	50.0	140	----
<b>Phthalate Esters (QCLot: 842560)</b>									
bis(2-Ethylhexyl) phthalate [DEHP]	117-81-7	E655F	2	µg/L	6.4 µg/L	128	50.0	140	----
Di-n-butyl phthalate	84-74-2	E655F	1	µg/L	6.4 µg/L	108	50.0	140	----
<b>Semi-Volatile Organics (QCLot: 842560)</b>									
Dichlorobenzidine, 3,3'-	91-94-1	E655F	0.4	µg/L	1.6 µg/L	66.6	50.0	140	----
<b>Chlorinated Phenolics (QCLot: 842560)</b>									
Pentachlorophenol [PCP]	87-86-5	E655F	0.5	µg/L	4.8 µg/L	121	50.0	140	----
<b>Nonylphenols (QCLot: 843400)</b>									
Nonylphenols [NP]	84852-15-3	E749A	1	µg/L	10 µg/L	91.0	75.0	125	----
<b>Nonylphenols (QCLot: 843401)</b>									
Nonylphenol diethoxylates [NP2EO]	n/a	E749B	0.1	µg/L	1 µg/L	99.7	75.0	125	----



Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
<b>Nonylphenols (QCLot: 843401) - continued</b>									
Nonylphenol monoethoxylates [NP1EO]	n/a	E749B	2	µg/L	20 µg/L	100	75.0	125	----
<b>Polychlorinated Biphenyls (QCLot: 848636)</b>									
Aroclor 1016	12674-11-2	E687	0.02	µg/L	0.2 µg/L	115	60.0	140	----
Aroclor 1221	11104-28-2	E687	0.02	µg/L	0.2 µg/L	115	60.0	140	----
Aroclor 1232	11141-16-5	E687	0.02	µg/L	0.2 µg/L	115	60.0	140	----
Aroclor 1242	53469-21-9	E687	0.02	µg/L	0.2 µg/L	115	60.0	140	----
Aroclor 1248	12672-29-6	E687	0.02	µg/L	0.2 µg/L	100	60.0	140	----
Aroclor 1254	11097-69-1	E687	0.02	µg/L	0.2 µg/L	102	60.0	140	----
Aroclor 1260	11096-82-5	E687	0.02	µg/L	0.2 µg/L	127	60.0	140	----
Aroclor 1262	37324-23-5	E687	0.02	µg/L	0.2 µg/L	127	60.0	140	----
Aroclor 1268	11100-14-4	E687	0.02	µg/L	0.2 µg/L	127	60.0	140	----



## Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Anions and Nutrients (QCLot: 841986)</b>										
WT2304310-001	Anonymous	Chloride	16887-00-6	E235.Cl	96.4 mg/L	100 mg/L	96.4	75.0	125	----
<b>Anions and Nutrients (QCLot: 841989)</b>										
WT2304310-001	Anonymous	Sulfate (as SO4)	14808-79-8	E235.SO4	97.8 mg/L	100 mg/L	97.8	75.0	125	----
<b>Anions and Nutrients (QCLot: 841990)</b>										
WT2304310-001	Anonymous	Fluoride	16984-48-8	E235.F	0.970 mg/L	1 mg/L	97.0	75.0	125	----
<b>Anions and Nutrients (QCLot: 843230)</b>										
WT2304132-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	2.76 mg/L	2.5 mg/L	110	70.0	130	----
<b>Anions and Nutrients (QCLot: 843231)</b>										
WT2304132-001	Anonymous	Phosphorus, total	7723-14-0	E372-U	0.0946 mg/L	0.1 mg/L	94.6	70.0	130	----
<b>Cyanides (QCLot: 841513)</b>										
WT2304175-001	Anonymous	Cyanide, strong acid dissociable (Total)	----	E333	0.210 mg/L	0.25 mg/L	83.9	75.0	125	----
<b>Total Metals (QCLot: 841269)</b>										
WT2304175-001	Anonymous	Aluminum, total	7429-90-5	E420	ND mg/L	0.1 mg/L	ND	70.0	130	----
		Antimony, total	7440-36-0	E420	0.0494 mg/L	0.05 mg/L	98.7	70.0	130	----
		Arsenic, total	7440-38-2	E420	0.0512 mg/L	0.05 mg/L	102	70.0	130	----
		Cadmium, total	7440-43-9	E420	0.00470 mg/L	0.005 mg/L	94.0	70.0	130	----
		Chromium, total	7440-47-3	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		Cobalt, total	7440-48-4	E420	0.0123 mg/L	0.0125 mg/L	98.6	70.0	130	----
		Copper, total	7440-50-8	E420	0.0118 mg/L	0.0125 mg/L	94.3	70.0	130	----
		Lead, total	7439-92-1	E420	0.0223 mg/L	0.025 mg/L	89.1	70.0	130	----
		Manganese, total	7439-96-5	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		Molybdenum, total	7439-98-7	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		Nickel, total	7440-02-0	E420	0.0244 mg/L	0.025 mg/L	97.5	70.0	130	----
		Selenium, total	7782-49-2	E420	0.0497 mg/L	0.05 mg/L	99.4	70.0	130	----
		Silver, total	7440-22-4	E420	0.00439 mg/L	0.005 mg/L	87.8	70.0	130	----
		Tin, total	7440-31-5	E420	0.0240 mg/L	0.025 mg/L	95.8	70.0	130	----
		Titanium, total	7440-32-6	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		Zinc, total	7440-66-6	E420	0.0237 mg/L	0.025 mg/L	94.9	70.0	130	----
<b>Total Metals (QCLot: 841425)</b>										



Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Total Metals (QCLot: 841425) - continued</b>										
TY2301356-001	Anonymous	Mercury, total	7439-97-6	E508	0.0000924 mg/L	0.0001 mg/L	92.4	70.0	130	----
<b>Speciated Metals (QCLot: 841461)</b>										
WT2304178-001	Anonymous	Chromium, hexavalent [Cr VI], total	18540-29-9	E532	ND mg/L	0.04 mg/L	ND	70.0	130	----
<b>Aggregate Organics (QCLot: 843232)</b>										
WT2304132-001	Anonymous	Phenols, total (4AAP)	----	E562	0.0211 mg/L	0.02 mg/L	105	75.0	125	----
<b>Volatile Organic Compounds (QCLot: 841153)</b>										
WT2303957-001	Anonymous	Benzene	71-43-2	E611D	105 µg/L	100 µg/L	105	60.0	140	----
		Chloroform	67-66-3	E611D	103 µg/L	100 µg/L	103	60.0	140	----
		Dichlorobenzene, 1,2-	95-50-1	E611D	97.5 µg/L	100 µg/L	97.5	60.0	140	----
		Dichlorobenzene, 1,4-	106-46-7	E611D	97.4 µg/L	100 µg/L	97.4	60.0	140	----
		Dichloroethylene, cis-1,2-	156-59-2	E611D	96.8 µg/L	100 µg/L	96.8	60.0	140	----
		Dichloromethane	75-09-2	E611D	106 µg/L	100 µg/L	106	60.0	140	----
		Dichloropropylene, trans-1,3-	10061-02-6	E611D	86.3 µg/L	100 µg/L	86.3	60.0	140	----
		Ethylbenzene	100-41-4	E611D	90.8 µg/L	100 µg/L	90.8	60.0	140	----
		Tetrachloroethane, 1,1,2,2-	79-34-5	E611D	90.4 µg/L	100 µg/L	90.4	60.0	140	----
		Tetrachloroethylene	127-18-4	E611D	94.6 µg/L	100 µg/L	94.6	60.0	140	----
		Toluene	108-88-3	E611D	91.8 µg/L	100 µg/L	91.8	60.0	140	----
		Trichloroethylene	79-01-6	E611D	99.9 µg/L	100 µg/L	99.9	60.0	140	----
		Xylene, m+p-	179601-23-1	E611D	188 µg/L	200 µg/L	94.1	60.0	140	----
Xylene, o-	95-47-6	E611D	91.5 µg/L	100 µg/L	91.5	60.0	140	----		
<b>Nonylphenols (QCLot: 843400)</b>										
WT2304136-001	Anonymous	Nonylphenols [NP]	84852-15-3	E749A	9.9 µg/L	10 µg/L	99.2	60.0	140	----
<b>Nonylphenols (QCLot: 843401)</b>										
WT2304136-001	Anonymous	Nonylphenol diethoxylates [NP2EO]	n/a	E749B	0.94 µg/L	1 µg/L	94.5	60.0	140	----
		Nonylphenol monoethoxylates [NP1EO]	n/a	E749B	14.3 µg/L	20 µg/L	71.4	60.0	140	----



# APPENDIX F

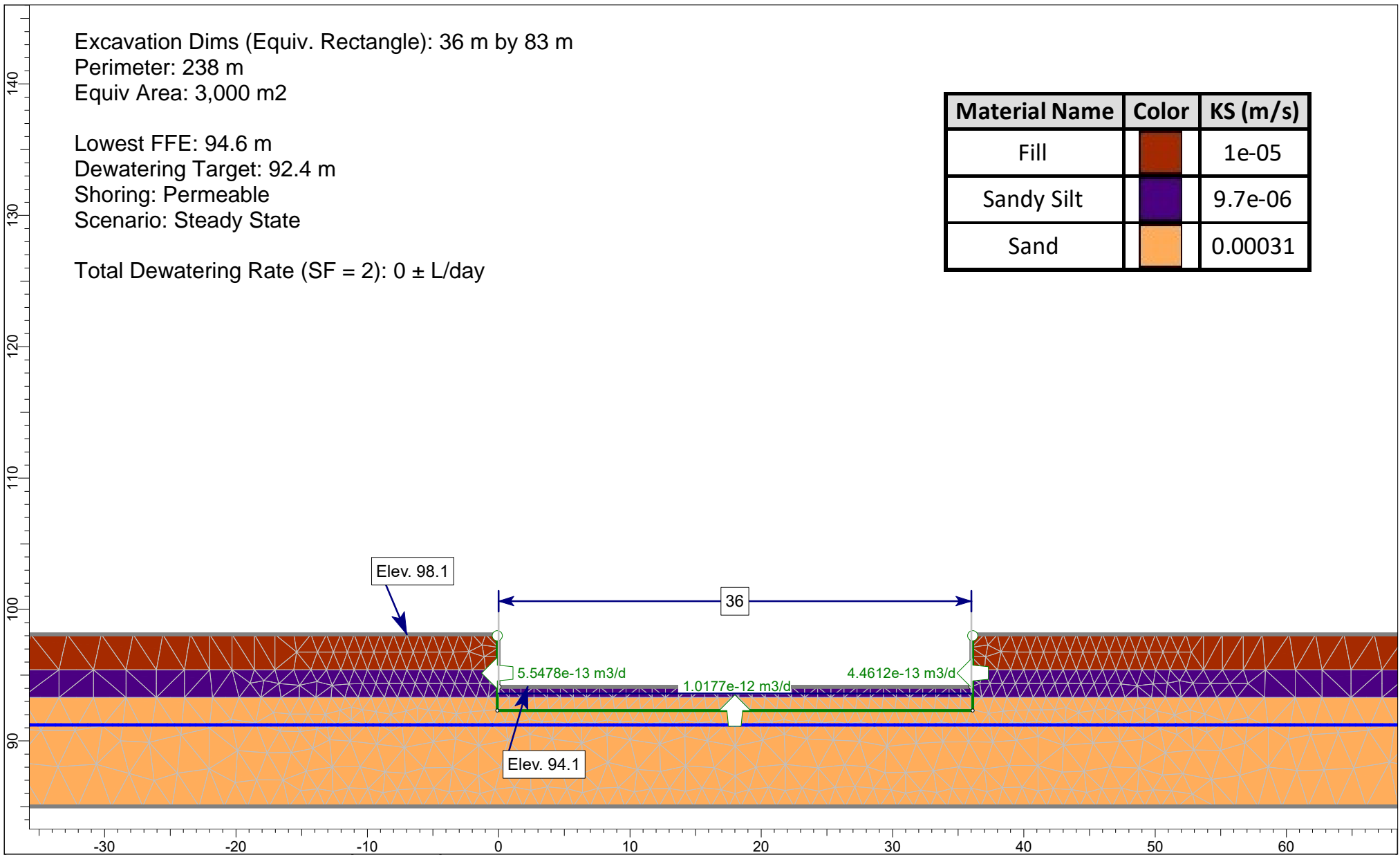



Excavation Dims (Equiv. Rectangle): 36 m by 83 m  
 Perimeter: 238 m  
 Equiv Area: 3,000 m<sup>2</sup>

Lowest FFE: 94.6 m  
 Dewatering Target: 92.4 m  
 Shoring: Permeable  
 Scenario: Steady State

Total Dewatering Rate (SF = 2): 0 ± L/day

Material Name	Color	KS (m/s)
Fill		1e-05
Sandy Silt		9.7e-06
Sand		0.00031



	File	23-014   1437-1455 Queen Street W			
	Analysis	Steady State: Group 1, Short Term Permeable Shoring			
	Ref.				
	RS2 File	23-014 FEM.slmd	Scale	1:398	Eng



Excavation Dims (Equiv. Rectangle): 36 m by 83 m

Perimeter: 238 m

Equiv Area: 3,000 m<sup>2</sup>

Lowest FFE: 94.6 m

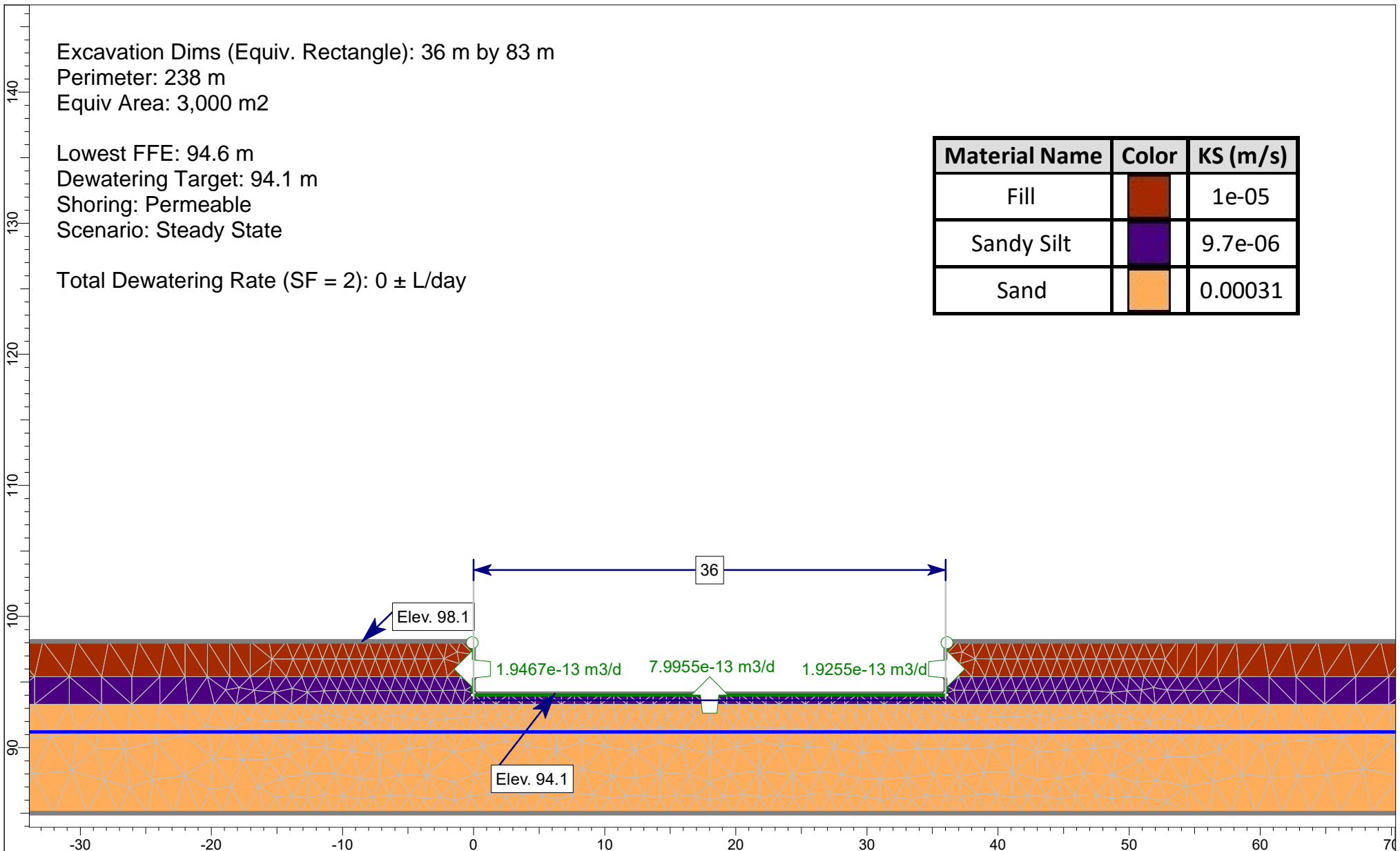
Dewatering Target: 94.1 m


Shoring: Permeable

Scenario: Steady State

Total Dewatering Rate (SF = 2): 0 ± L/day

Material Name	Color	KS (m/s)
Fill		1e-05
Sandy Silt		9.7e-06
Sand		0.00031



	File	23-014   1437-1455 Queen Street W			
	Analysis	Steady State: Group 1, Long Term Permeable Shoring			
	Ref.				
	RS2 File	23-014 FEM.slmd	Scale	1:398	Eng

# APPENDIX G



### SHORT TERM - Permeable Shoring

Excavation Dimensions [m]		Rainfall Data		
N-S	36	Year	2	100
E-W	83	Hour	3	12
Area (m <sup>2</sup> )	2988	Depth (mm)	25	94
Perimeter (m)	238	Depth (m)	0.025	0.094

Section	Flow [m <sup>3</sup> /day]	Length [m]	Volume [L/day]
Base	0	83	-
Sides	0	238	-
Total			-
Factor of Safety	2.0		-

Storm Events		Summary	L/day	L/min
2 Year [L/day]	100 Year [L/day]	Groundwater	-	-
74,700	281,000	Rainfall	75,000	52.1
		Total	75,000	52.1

### LONG TERM - Permeable Shoring

Excavation Dimensions [m]		Rainfall Data		
N-S	36	Year	2	100
E-W	83	Hour	3	12
Area (m <sup>2</sup> )	2988	Depth (mm)	25	94
Perimeter (m)	238	Depth (m)	0.025	0.094

Section	Flow [m <sup>3</sup> /day]	Length [m]	Volume [L/day]
Base	0	83	-
Sides	0	238	-
Total			-
Factor of Safety	2.0		-

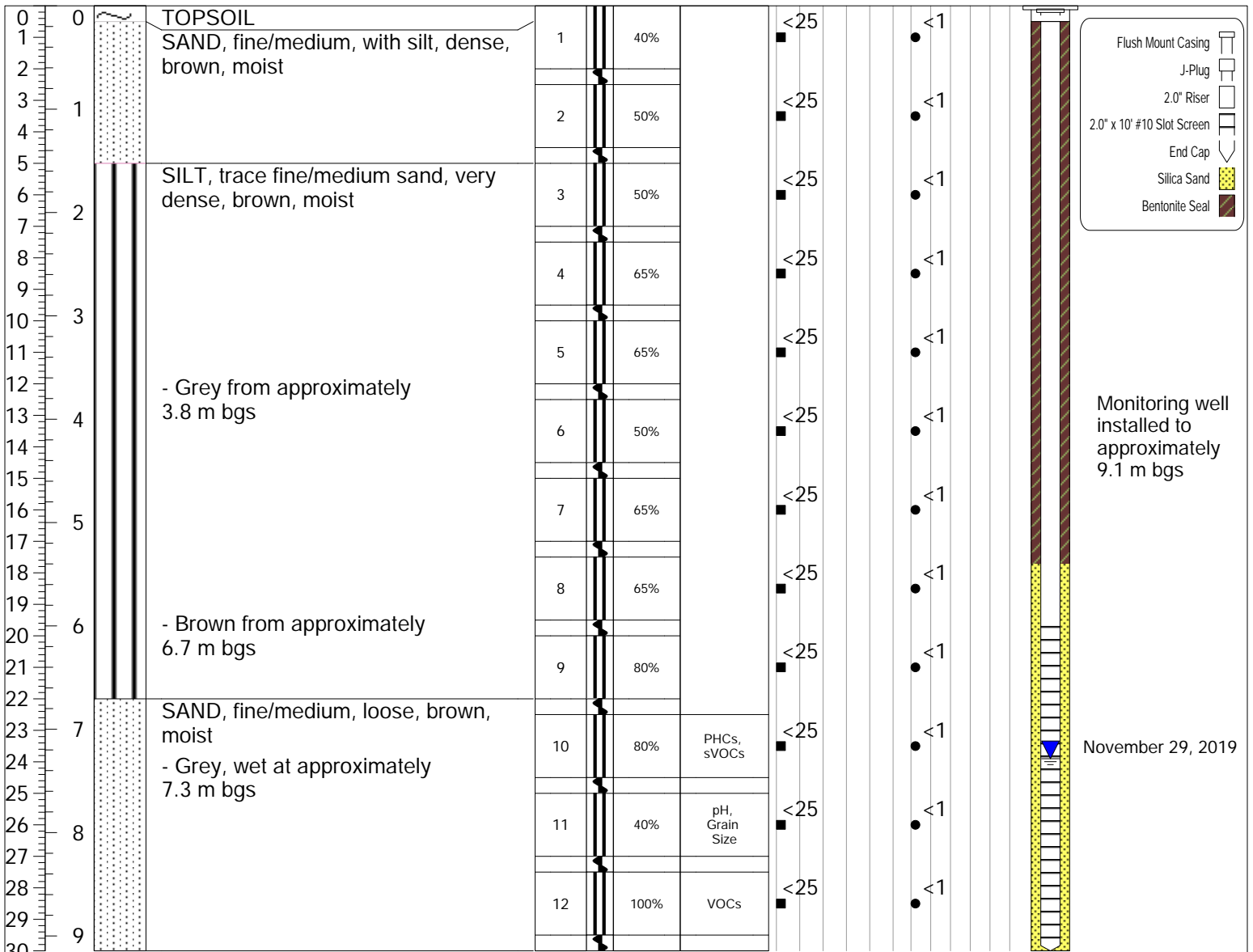
Infiltration [L/day]	Summary	L/day	L/min
892.5	Groundwater	-	-
	Infiltration	1,000	0.7
	Total	1,000	0.7

# APPENDIX H





SUBSURFACE PROFILE				SAMPLE				Hex (%LEL)		Well Completion Details
Depth (ft)	Depth (m)	Symbol	Description	Number	Type	Recovery	Laboratory Analyses	Hex (ppm)	IBL (ppm)	



End of Borehole

- Flush Mount Casing
- J-Plug
- 2.0" Riser
- 2.0" x 10" #10 Slot Screen
- End Cap
- Silica Sand
- Bentonite Seal

Monitoring well installed to approximately 9.1 m bgs

November 29, 2019

**Drill Rig:** B-45HD

**Hole Size/Drill Method:** 152 mm/HSA

**Logged by:** AU

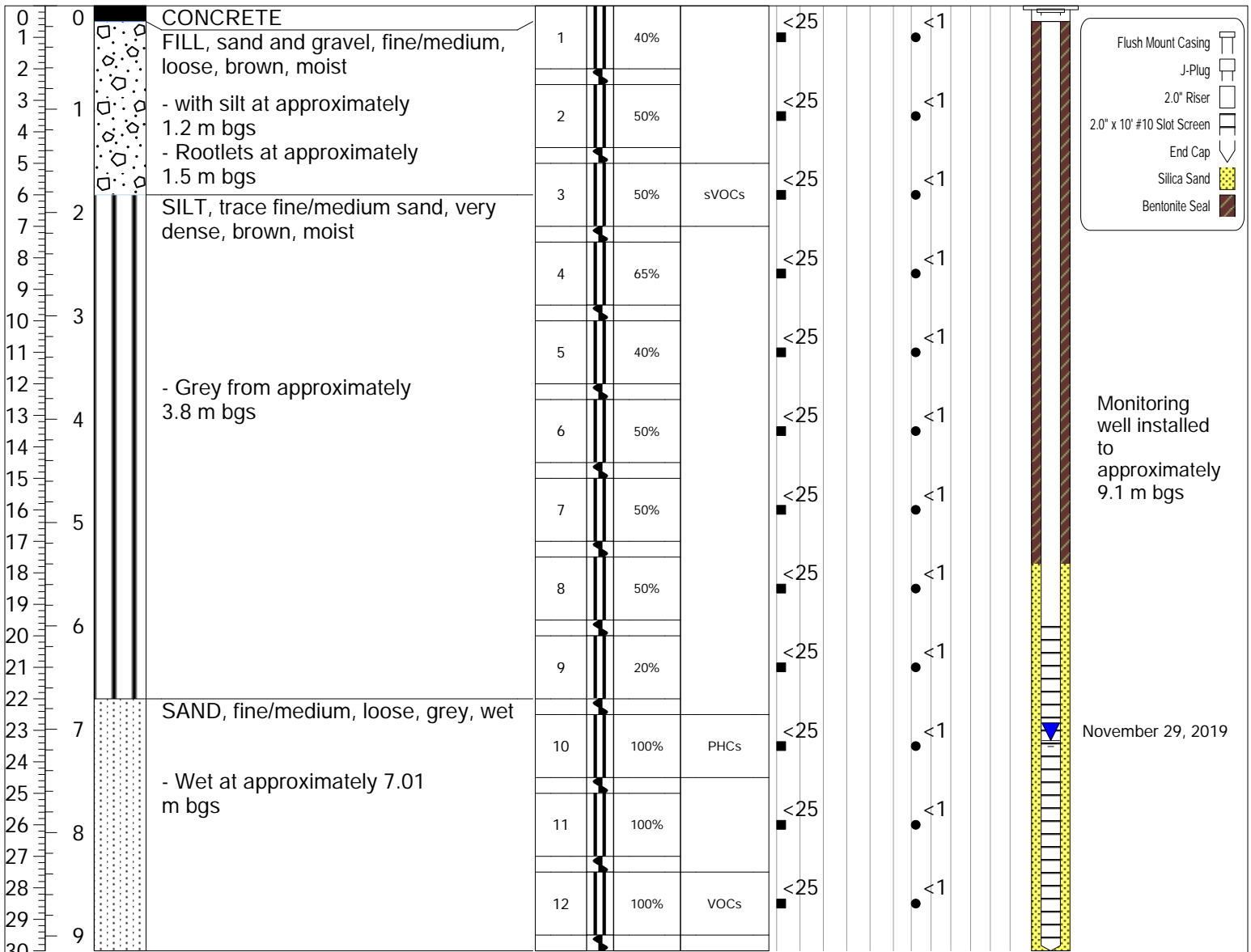
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**Sheet:** 1 of 1

Notes: One groundwater sample (BH1) was collected on November 29, 2019 and submitted for laboratory analyses of PHCs, selected VOCs and ABNs.



SUBSURFACE PROFILE				SAMPLE				Hex (%LEL)		Well Completion Details
Depth (ft)	Depth (m)	Symbol	Description	Number	Type	Recovery	Laboratory Analyses	Hex (ppm)	IBL (ppm)	



End of Borehole

**Drill Rig:** B-45HD

**Hole Size/Drill Method:** 152 mm/HSA

**Logged by:** AU

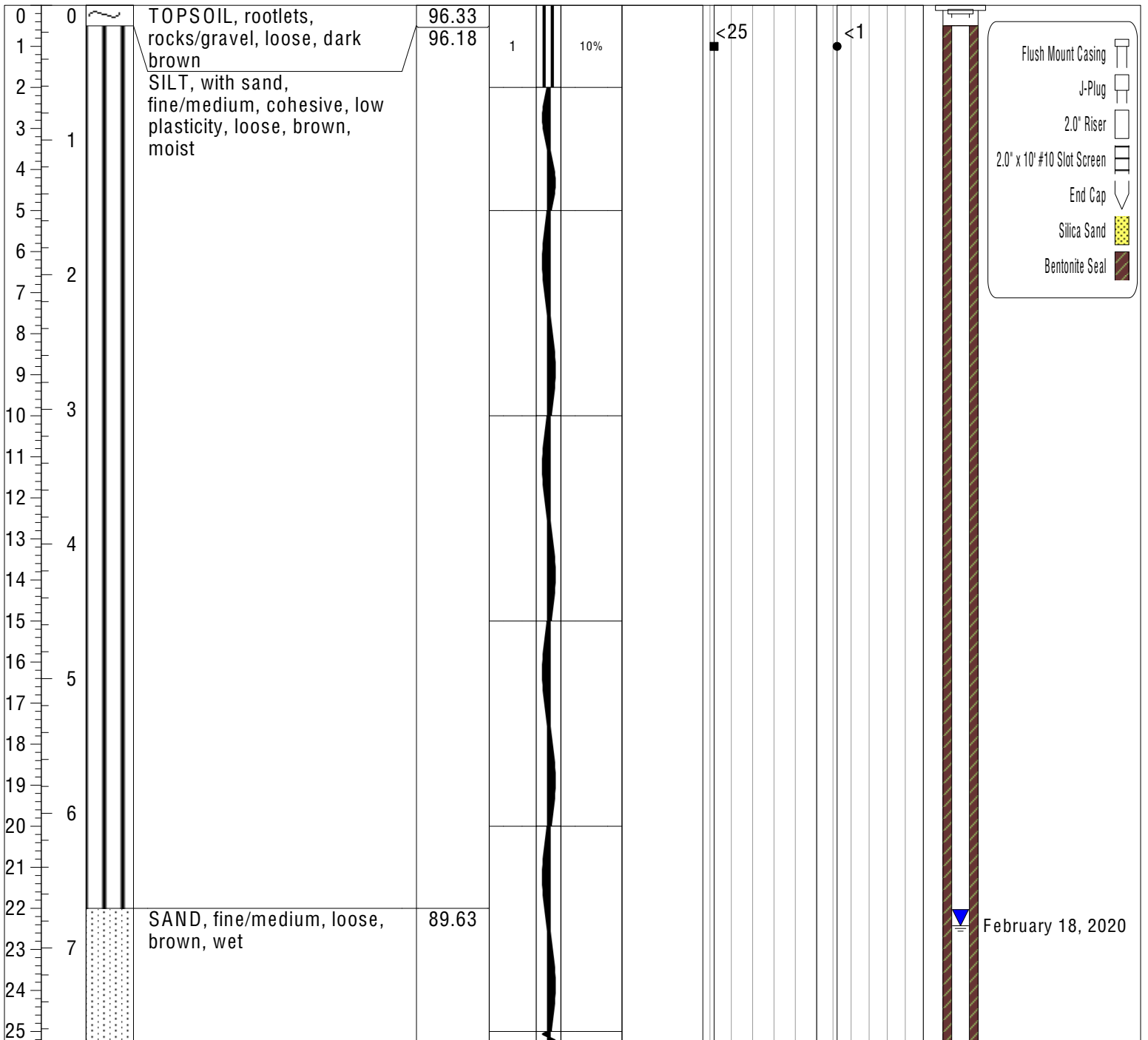
**Checked by:** LF

**Sheet:** 1 of 1

Notes: One groundwater sample (BH2) was collected on November 29, 2019 and submitted for laboratory analyses of PHCs, selected VOCs and ABNs.



SUBSURFACE PROFILE				SAMPLE				Hex (%LEL)		Well Completion Details
Depth (ft)	Depth (m)	Symbol	Description	Elevation (m)	Number	Type	Recovery	Laboratory Analyses	Hex (ppm)	



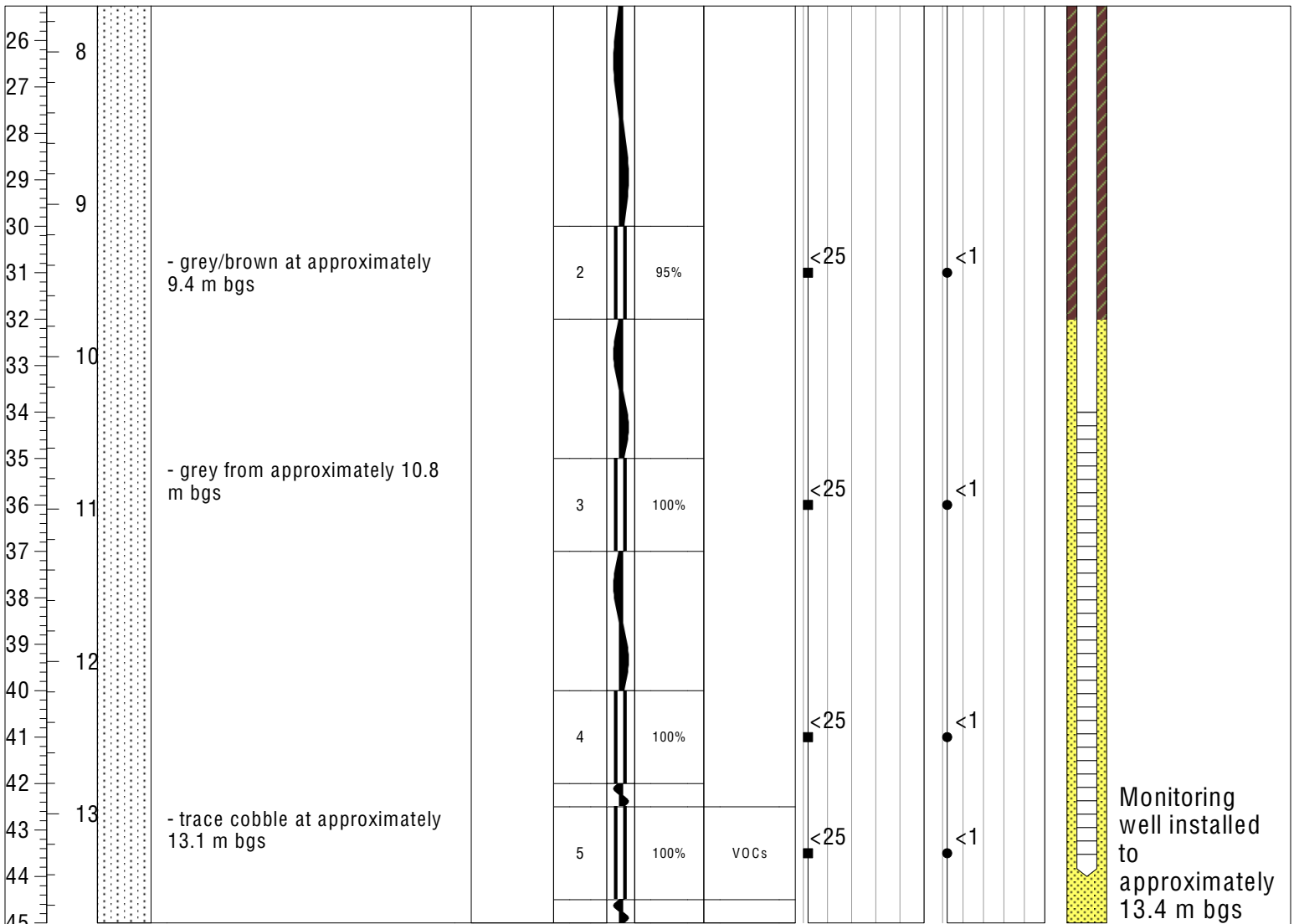
**Drill Rig:** Track-Mounted B-45HD  
**Hole Size/Drill Method:** 152 mm/HSA  
**Easting:** 626025.4 E  
**Northing:** 4833078 N  
**Datum:** Geodetic

**Logged by:** BZ  
**Checked by:** LF  
**Sheet:** 1 of 2

Notes: One groundwater sample (BH104) was collected on February 18, 2020 and submitted for laboratory analysis of selected VOCs.



SUBSURFACE PROFILE					SAMPLE				Hex (%LEL)		Well Completion Details
Depth (ft)	Depth (m)	Symbol	Description	Elevation (m)	Number	Type	Recovery	Laboratory Analyses	Hex (ppm)	IBL (ppm)	



End of Borehole

Monitoring well installed to approximately 13.4 m bgs

**Drill Rig:** Track-Mounted B-45HD

**Hole Size/Drill Method:** 152 mm/HSA

**Easting:** 626025.4 E

**Northing:** 4833078 N

**Datum:** Geodetic

**Logged by:** BZ

**Checked by:** LF

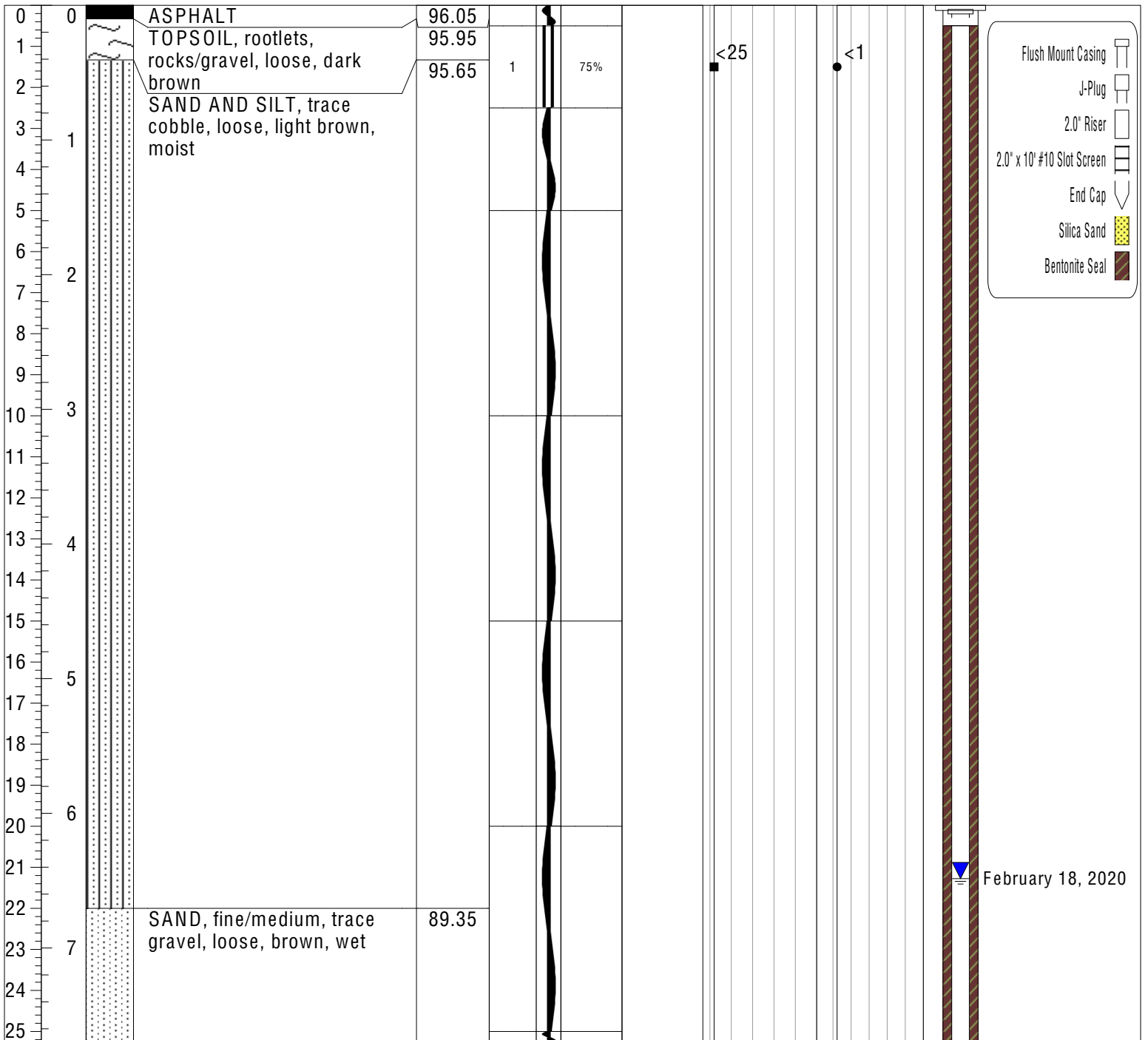
**Sheet:** 2 of 2

Notes: One groundwater sample (BH104) was collected on February 18, 2020 and submitted for laboratory analysis of selected VOCs.





SUBSURFACE PROFILE					SAMPLE				Hex (%LEL)		Well Completion Details
Depth (ft)	Depth (m)	Symbol	Description	Elevation (m)	Number	Type	Recovery	Laboratory Analyses	Hex (ppm)	IBL (ppm)	



**Drill Rig:** Track-Mounted B-45HD

**Hole Size/Drill Method:** 152 mm/HSA

**Easting:** 626010.1 E

**Northing:** 4833091 N

**Datum:** Geodetic

**Logged by:** BZ

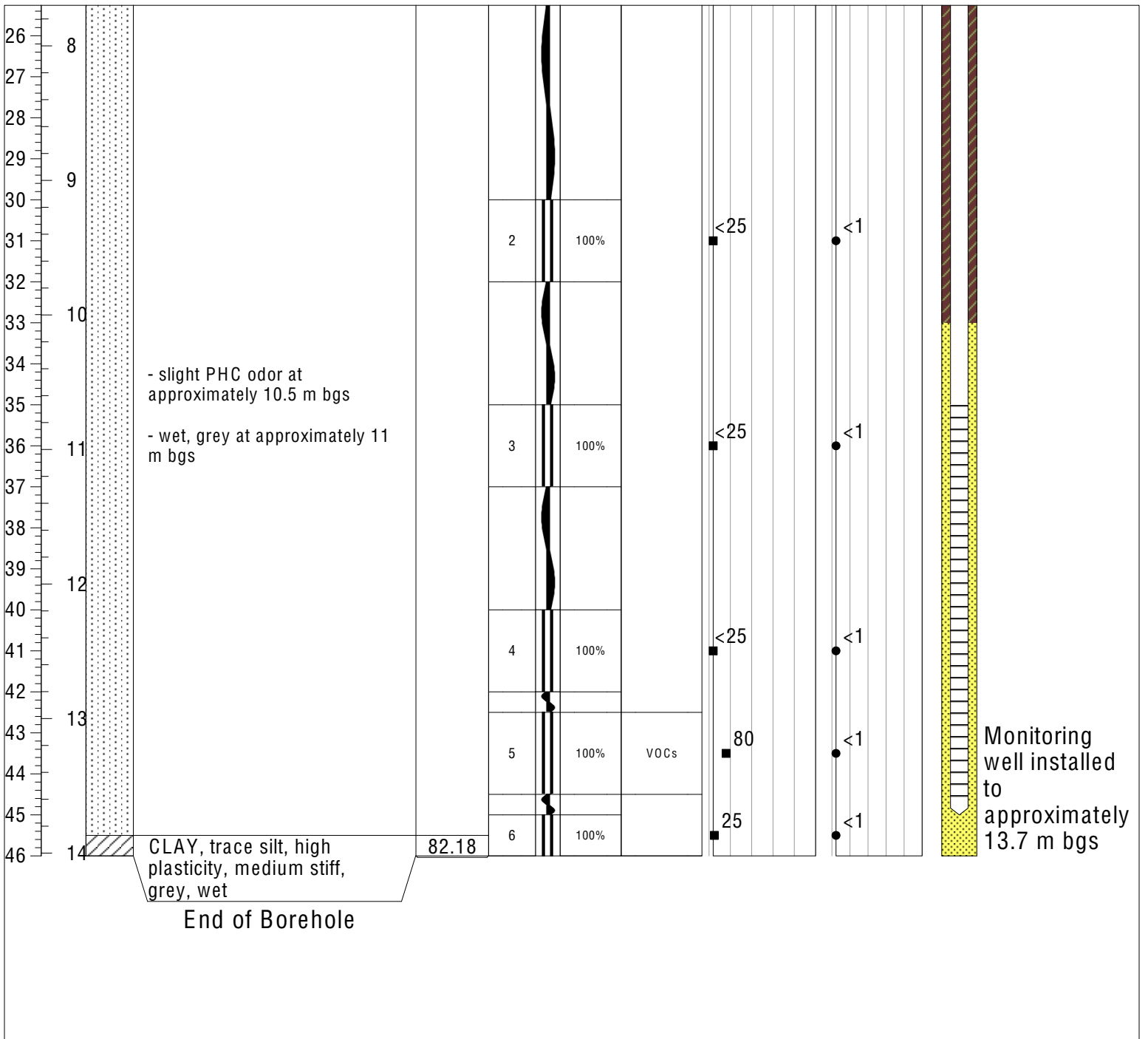
**Checked by:** LF

**Sheet:** 1 of 2

Notes: One groundwater sample (BH105) was collected on February 18, 2020 and submitted for laboratory analysis of selected VOCs.



SUBSURFACE PROFILE				SAMPLE				Hex (%LEL)		Well Completion Details
Depth (ft)	Depth (m)	Symbol	Description	Elevation (m)	Number	Type	Recovery	Laboratory Analyses	Hex (ppm)	



**Drill Rig:** Track-Mounted B-45HD

**Hole Size/Drill Method:** 152 mm/HSA

**Easting:** 626010.1 E

**Northing:** 4833091 N

**Datum:** Geodetic

**Logged by:** BZ

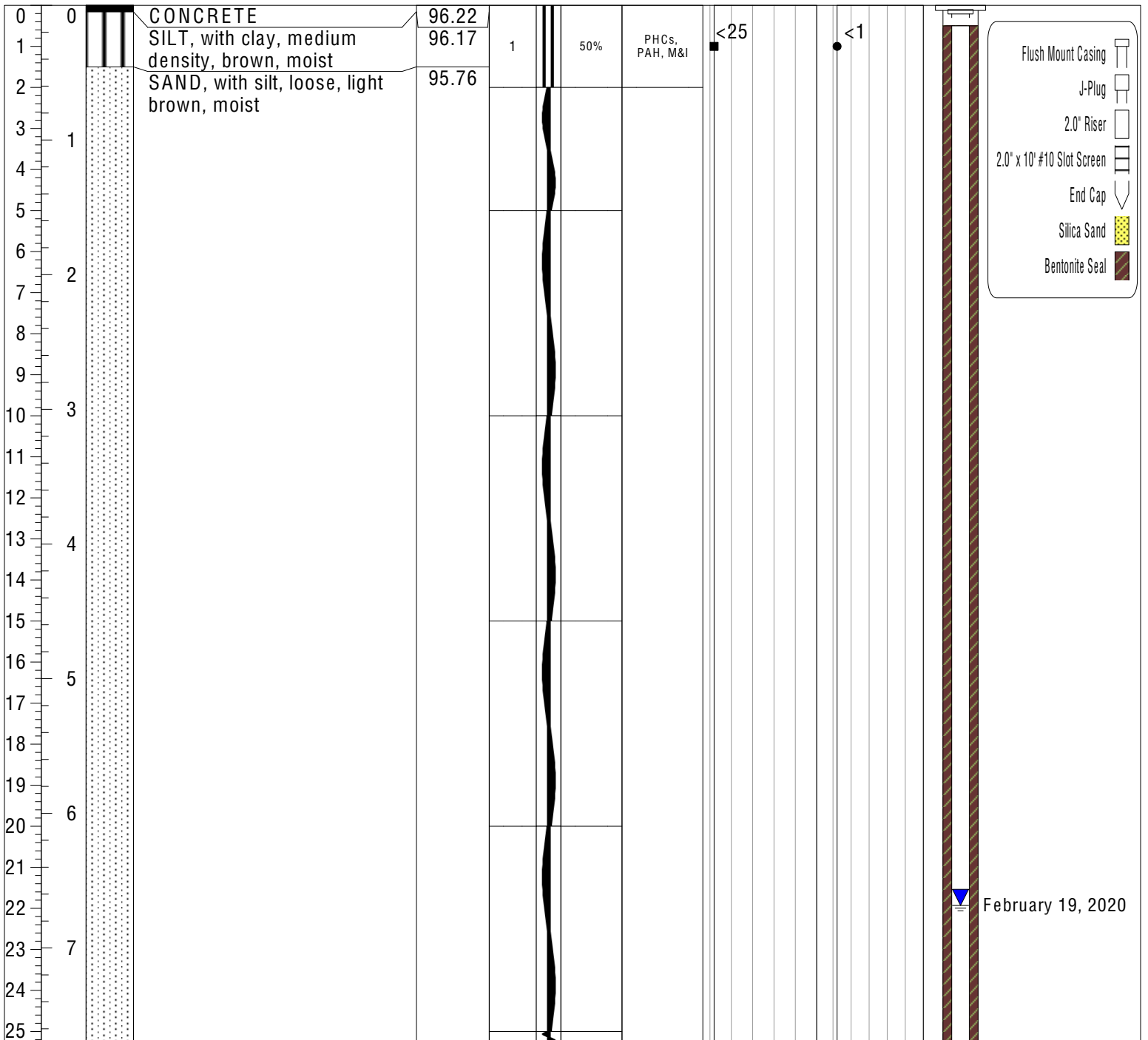
**Checked by:** LF

**Sheet:** 2 of 2

Notes: One groundwater sample (BH105) was collected on February 18, 2020 and submitted for laboratory analysis of selected VOCs.



SUBSURFACE PROFILE				SAMPLE				Hex (%LEL)		Well Completion Details
Depth (ft)	Depth (m)	Symbol	Description	Elevation (m)	Number	Type	Recovery	Laboratory Analyses	Hex (ppm)	



**Drill Rig:** Track-Mounted B-45HD

**Hole Size/Drill Method:** 152 mm/HSA

**Easting:** 626010.3 E

**Northing:** 4833101 N

**Datum:** Geodetic

**Logged by:** BZ

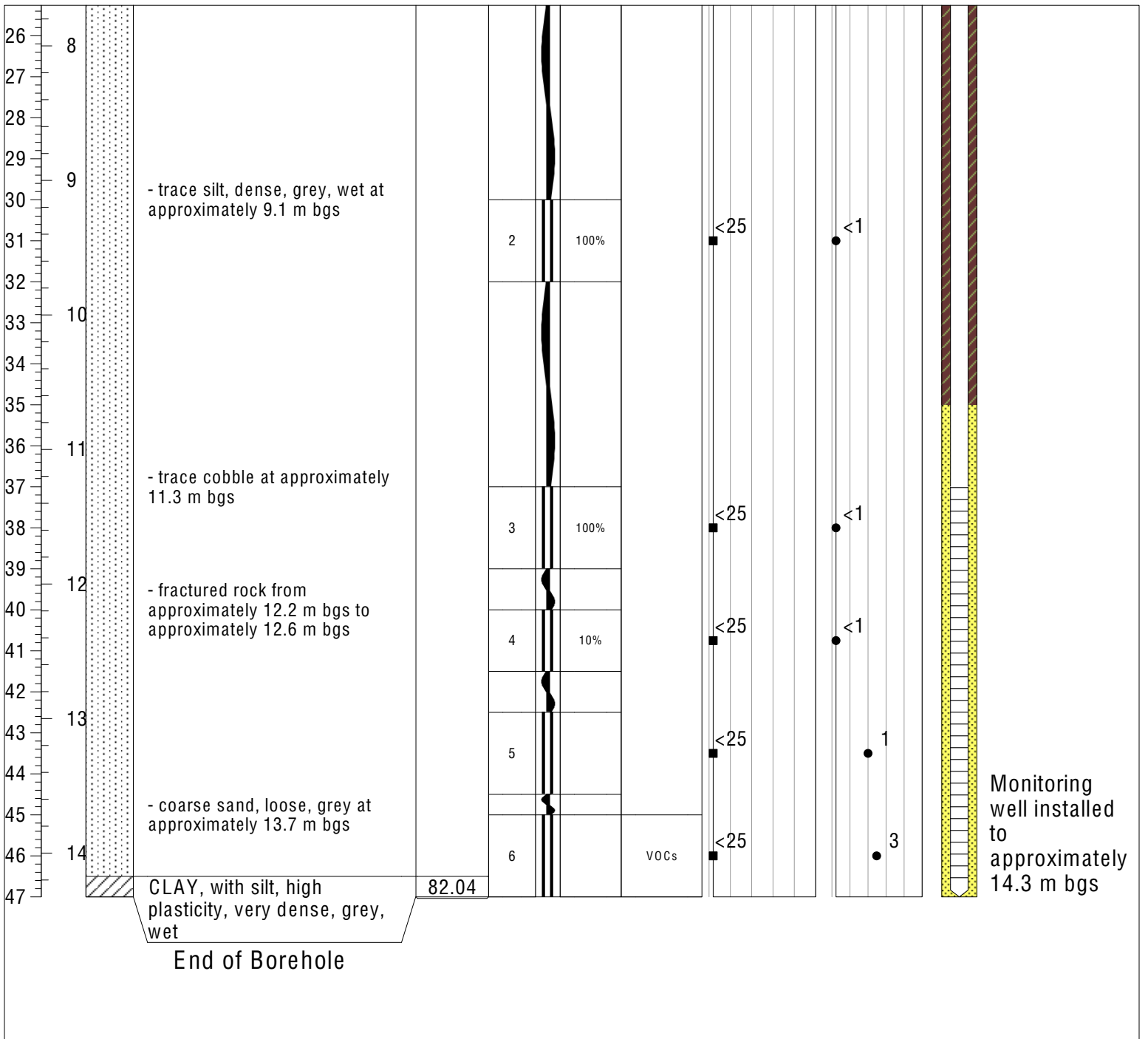
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**Sheet:** 1 of 2

Notes: One groundwater sample (BH106) was collected on February 19, 2020 and submitted for laboratory analysis of selected VOCs.



SUBSURFACE PROFILE				SAMPLE				Hex (%LEL)		Well Completion Details
Depth (ft)	Depth (m)	Symbol	Description	Elevation (m)	Number	Type	Recovery	Laboratory Analyses	Hex (ppm)	



**Drill Rig:** Track-Mounted B-45HD

**Hole Size/Drill Method:** 152 mm/HSA

**Easting:** 626010.3 E

**Northing:** 4833101 N

**Datum:** Geodetic

**Logged by:** BZ

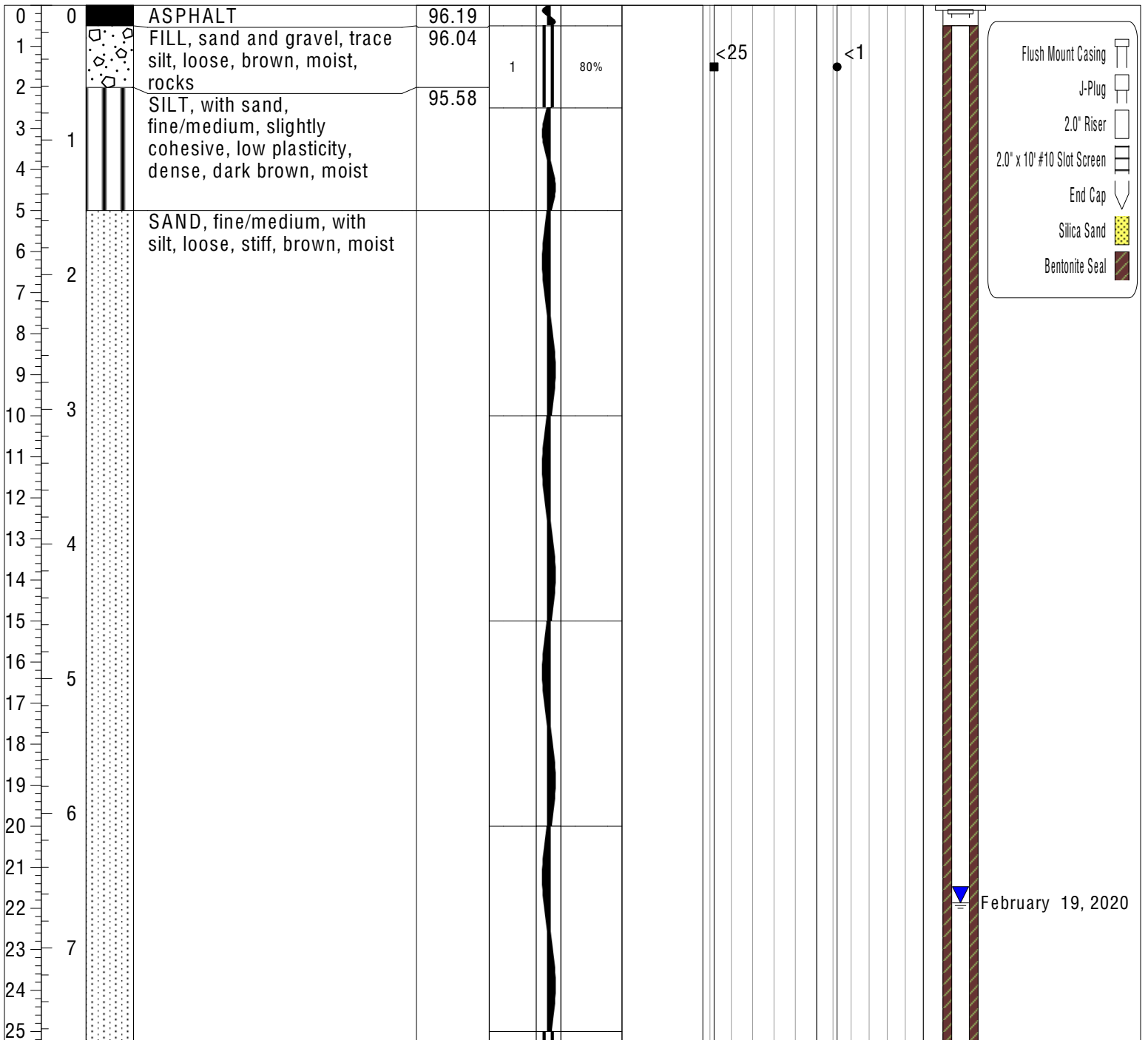
**Checked by:** LF

**Sheet:** 2 of 2

Notes: One groundwater sample (BH106) was collected on February 19, 2020 and submitted for laboratory analysis of selected VOCs.



SUBSURFACE PROFILE				SAMPLE				Hex (%LEL)		Well Completion Details
Depth (ft)	Depth (m)	Symbol	Description	Elevation (m)	Number	Type	Recovery	Laboratory Analyses	Hex (ppm)	



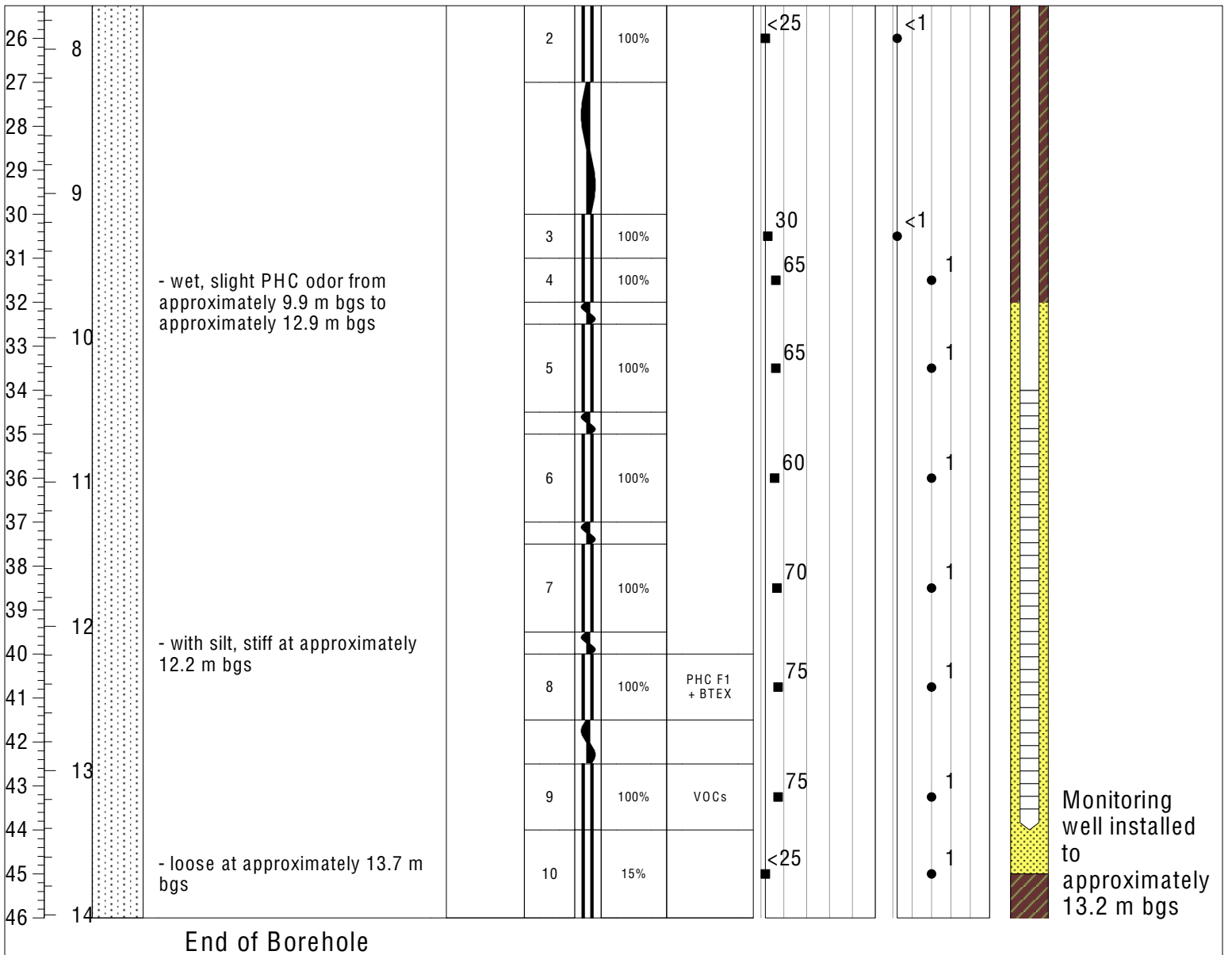
**Drill Rig:** Track-Mounted B-45HD  
**Hole Size/Drill Method:** 152 mm/HSA  
**Easting:** 625995.1 E  
**Northing:** 4833096 N  
**Datum:** Geodetic

**Logged by:** BZ  
**Checked by:** LF  
**Sheet:** 1 of 2

Notes: One groundwater sample (BH107) was collected on February 19, 2020 and submitted for laboratory analysis of selected VOCs.



SUBSURFACE PROFILE				SAMPLE				Hex (%LEL)		Well Completion Details
Depth (ft)	Depth (m)	Symbol	Description	Elevation (m)	Number	Type	Recovery	Laboratory Analyses	Hex (ppm)	



End of Borehole

**Drill Rig:** Track-Mounted B-45HD

**Hole Size/Drill Method:** 152 mm/HSA

**Easting:** 625995.1 E

**Northing:** 4833096 N

**Datum:** Geodetic

**Logged by:** BZ

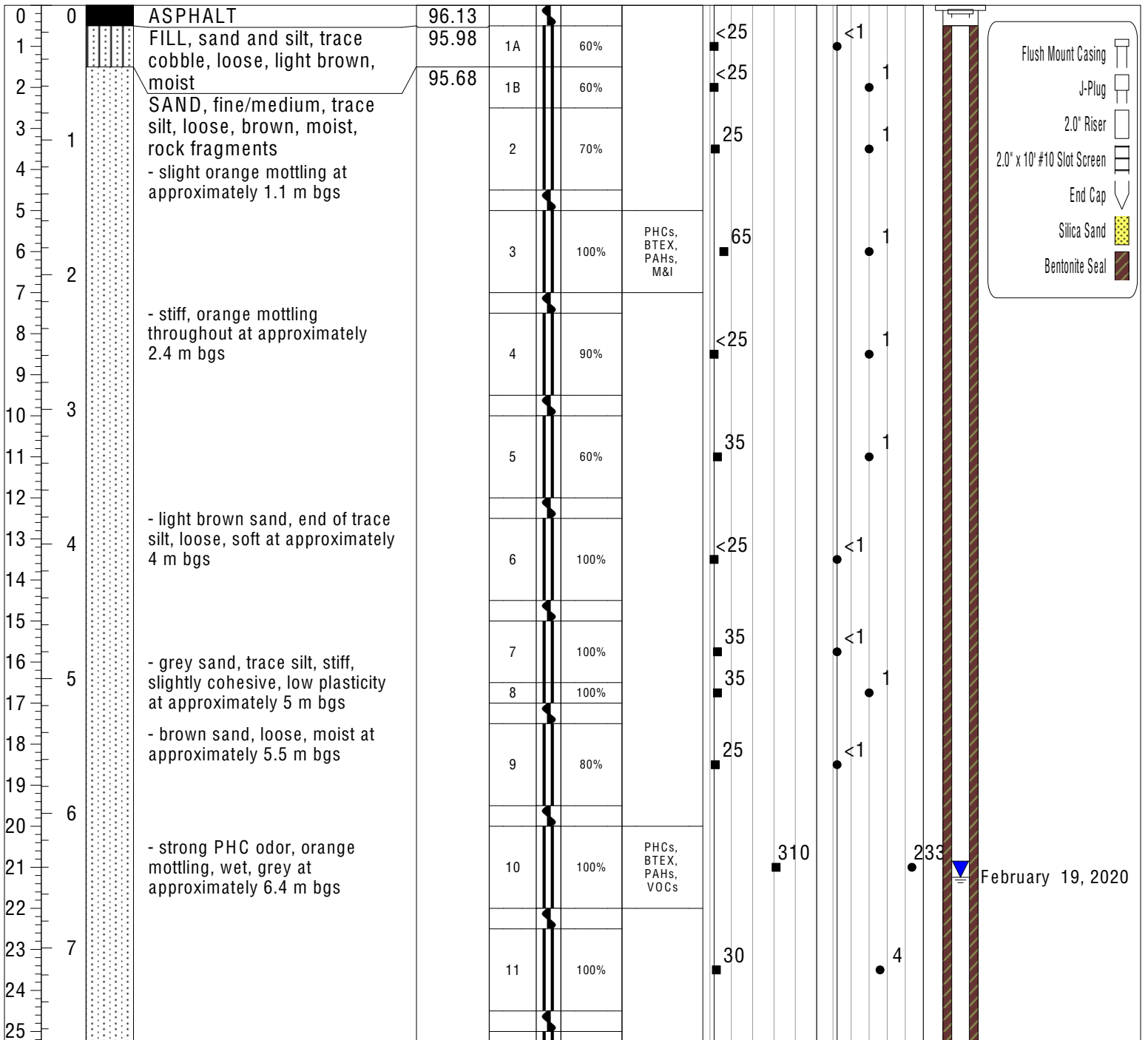
**Checked by:** LF

**Sheet:** 2 of 2

Notes: One groundwater sample (BH107) was collected on February 19, 2020 and submitted for laboratory analysis of selected VOCs.



SUBSURFACE PROFILE				SAMPLE				Hex (%LEL)		Well Completion Details
Depth (ft)	Depth (m)	Symbol	Description	Elevation (m)	Number	Type	Recovery	Laboratory Analyses	Hex (ppm)	



Well Completion Details

- Flush Mount Casing
- J-Plug
- 2.0" Riser
- 2.0" x 10' #10 Slot Screen
- End Cap
- Silica Sand
- Bentonite Seal

February 19, 2020

**Drill Rig:** Track-Mounted B-45HD

**Hole Size/Drill Method:** 152 mm/HSA

**Easting:** 625997 E

**Northing:** 4833086 N

**Datum:** Geodetic

**Logged by:** BZ

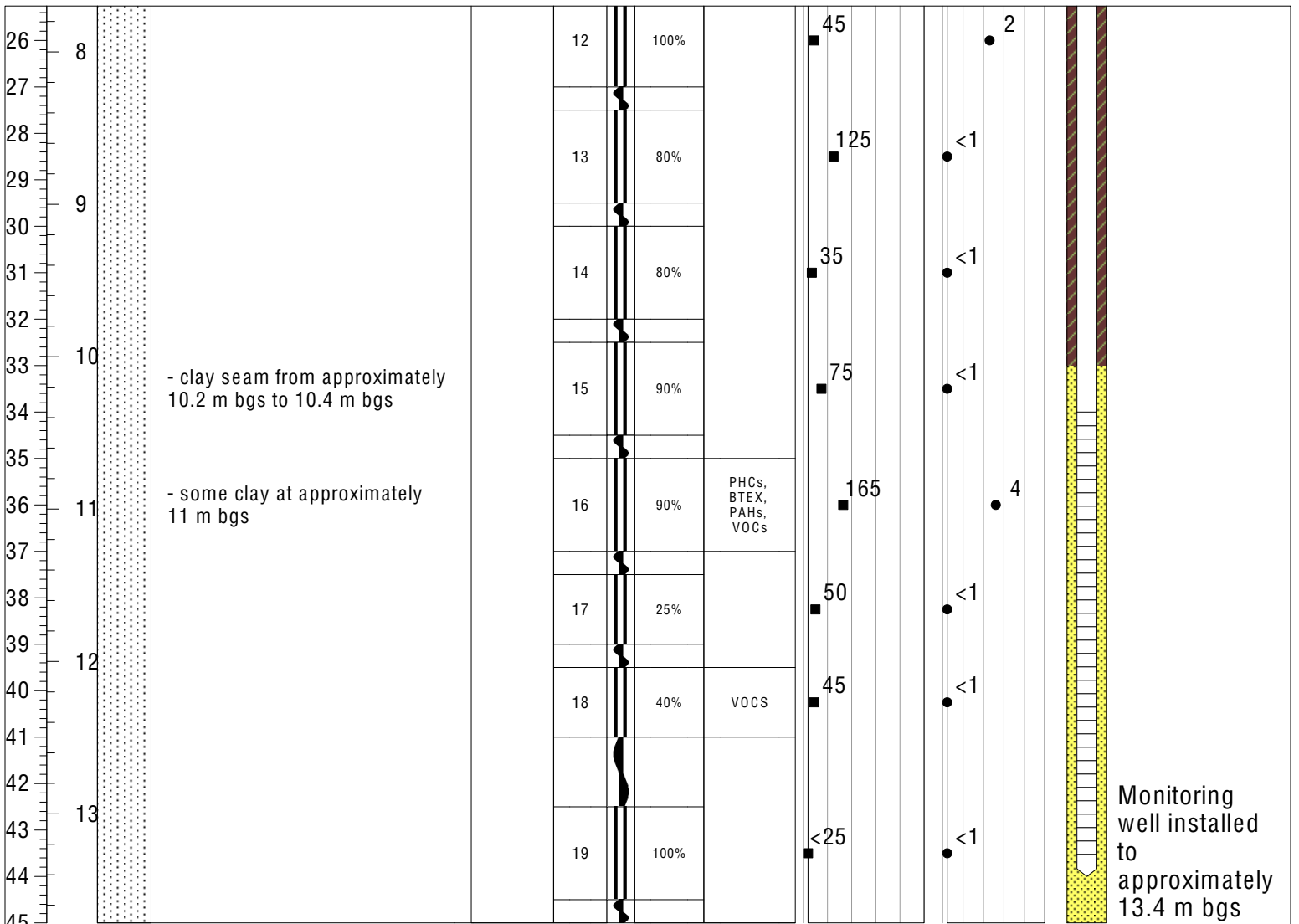
**Checked by:** LF

**Sheet:** 1 of 2

Notes: Two groundwater samples (BH108) and (BH108-DUP) were collected on February 19, 2020 and submitted for laboratory analyses of selected PAHs, selected VOCs and metals/ inorganics



SUBSURFACE PROFILE				SAMPLE				Hex (%LEL)		Well Completion Details
Depth (ft)	Depth (m)	Symbol	Description	Elevation (m)	Number	Type	Recovery	Laboratory Analyses	Hex (ppm)	



End of Borehole

Monitoring well installed to approximately 13.4 m bgs

**Drill Rig:** Track-Mounted B-45HD

**Hole Size/Drill Method:** 152 mm/HSA

**Easting:** 625997 E

**Northing:** 4833086 N

**Datum:** Geodetic

**Logged by:** BZ

**Checked by:** LF

**Sheet:** 2 of 2

Notes: Two groundwater samples (BH108) and (BH108-DUP) were collected on February 19, 2020 and submitted for laboratory analyses of selected PAHs, selected VOCs and metals/ inorganics