



Bridle Park Development Township of Clearview

Stayner, ON

Geotechnical Investigation

August 2, 2022

Project: 22021 – Rev.02

Attention: Mr. Evan Finbow – GIT

Submitted to:

Crozier Consulting Engineers
1 First Street, Suit 200
Collingwood, Ontario
L9Y 1A1

Prepared by:

AllRock Consulting Ltd
24 Brydon Drive, Unit #5
Toronto, Ontario
M9W 5R6

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**Re: Geotechnical Investigation – Bridle Park Development
Township of Clearview
Stayner, Ontario**

Enclosed is our geotechnical investigation report for the above noted project, in accordance with our proposal dated February 9th, 2022. This report was prepared by Gregory Davidson, P.Eng. and Scott Allen, P.Eng.

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Greg Davidson, P.Eng.
Project Manager
greg.davidson@allrockconsulting.com



Scott Allen, P.Eng.
Project Manager – Founder
scott.allen@allrockconsulting.com



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1.0 INTRODUCTION

This report presents the results of a geotechnical investigation carried out for the proposed subdivision development at Bridle Park located between North Street and Highway 26 in Stayner, Ontario.

The purpose of the investigation was to identify the general subsurface conditions at the site by means of a limited number of boreholes and, based on the factual information obtained, to provide engineering guidelines on the geotechnical design aspects of the project, including construction considerations that could influence design decisions.

This investigation was carried out in general accordance with our proposal dated February 9th, 2022. It is worthwhile to point out that no previous subsurface investigations have been conducted prior AllRock's Consulting Ltd ("AllRock") field investigation.

2.0 BACKGROUND

2.1 Project Description

The Subject Lands cover a total area of approximately 65.9 ha. It is currently used as agricultural lands with trees and vegetation lining the property. It is bounded to the south by residential units that front Regina/North St, to the west by a hydro corridor, to the north by an additional parcel of land owned by the Client (Clearview Garden Estates, which extends north to Nottawasaga 27/28 Sideroad), and to the east by the recreational Train Trail and residential units that front Highway 26. A wetland occupies a southwest portion of the site, and several watercourses exist that are a part of the Lamont Creek Watershed. From previous studies, it is presumed that the site has shallow groundwater near to the surface.

Based on the current Draft Plan, a residential subdivision is intended for the Bridle Park lands. Although the plan has not yet been finalized, the proposed development will feature the following:

- Detached homes, freehold townhomes, condominium row townhomes, and condominium apartments with full basements.
- A stormwater management area, floodplain storage, and parklands.
- An internal road network connecting the development to existing roads.
- Roadways to be constructed to an urban standard with full underground services.

It is noted that a Draft Subdivision Plan drawing was provided to AllRock for review.

2.2 Site Geology

Surficial geology and drift thickness maps of the area indicate that the site is underlain by glaciolacustrine deposits, composed of sand, gravelly sand and gravel, nearshore and beach deposits. Bedrock geology maps indicate that the site is part of the Shadow Lake formation, under the Ottawa and Simcoe Groups. This geology is composed of limestone, dolostone, shale, arkose, and sandstone.

2.3 Previous Investigations by Others

Previous preliminary geotechnical investigations were completed by AMEC Earth & Environmental and dated May 7, 2009 and March 30, 2011. As part of those investigations, a total of nineteen (19) boreholes were advanced at this site. The approximate locations of the previous boreholes are provided on the Borehole Location Plan, Figure 1.

As part of the previous investigations the subsurface conditions encountered included, topsoil overlying native deposits of silty sand, silty clay, gravelly sand and glacial till. Groundwater levels documented as part of the previous investigations ranged from about 0.2 to 1.5 metres below existing grade.

3.0 SUBSURFACE INVESTIGATION

3.1 Geotechnical Investigation

The field work for this investigation was carried out during from March 28th to April 1st, 2022. During that time, twenty (20) boreholes, numbered BH-01 to BH-20, inclusive, were advanced to depths of about 5.2 metres below existing grade using a CME-75 truck mount rig, owned, and operated by Landshark Drilling Inc.

The borehole locations were selected by AllRock and the Client and positioned on-site relative to existing features. The field work was observed throughout by a member of our engineering staff who directed the drilling operations and logged the samples.

Standard penetration tests (SPT) were carried out in the geotechnical boreholes and samples of the soils encountered were recovered using a 51-millimetre diameter split barrel sampler. Ten (10) monitoring wells were installed in boreholes BH-01, BH-02, BH-04, BH-05, BH-08, BH-13, BH-15, BH-17, BH-18, and BH-19 to measure the groundwater levels at the site.

Following completion of the drilling, the soil samples were returned to our laboratory for examination by a geotechnical/ materials engineer. Selected samples were submitted for moisture content and grain size distribution testing.

In addition, four (4) soil samples, from BH-02, BH-09, BH-11, and BH-15, were sent to ALS Laboratory Group (“ALS”) for basic chemical testing relating to corrosion of buried concrete and steel.

The approximate locations of the boreholes are shown on the Borehole Location Plan, Figure 1. The results of the boreholes and water levels are provided on the Record of Borehole Sheets in Appendix A. The results of the laboratory testing are provided in Appendix B. The results of corrosion testing are provided in Appendix C. The results of infiltration testing are provided in Appendix D.

3.2 Methodology

Materials and soil description have been made with reference to the following documents:

- Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System) – ASTM D2487-11
- Standard Practice for the Description and Identification of Soils (Visual-Manual Procedure) – ASTM D2488-09a
- Guelph Permeameter Test – The Guelph Permeameter is an in-hole constant head permeameter assembly that can measure the steady-state rate of water recharge into unsaturated soil using the Marriotte Principle
 - Equipment: Guelph Permeameter, Guelph Permeameter Extensions
 - Test Method: 2800K1 – Guelph Permeameter

3.3 Geotechnical Laboratory Testing

Samples were sent to AllRock’s laboratory for geotechnical testing respectively. The following tests were performed:

- Eight (8) grain size with hydrometer tests were completed on the weathered fill and glacial till samples;
- Four (4) sieve analysis were completed on the silty sand and glacial till samples;
- Ten (10) moisture content tests.

All samples will be stored for a six-month period.

3.4 Water Levels

Water level readings were taken from monitoring wells by a Crozier representative.

4.0 SUBSURFACE CONDITIONS

4.1 General

As previously indicated, the soil and groundwater conditions identified in the boreholes are given on the Record of Borehole sheets in Appendix A. The logs indicate the subsurface conditions at the specific test locations only. Boundaries between zones on the logs are often not distinct, but rather are transitional and have been interpreted. The precision with which subsurface conditions are indicated depends on the method of exploration, the frequency and recovery of samples, the method of sampling, and the uniformity of the subsurface conditions. Subsurface conditions at other than the borehole locations may vary from the conditions encountered in the boreholes.

The soil descriptions in this report are based on commonly accepted methods of classification and identification employed in geotechnical practice. Classification and identification of soil involves judgement and AllRock does not guarantee descriptions as exact but infers accuracy to the extent that is common in current geotechnical practice.

The groundwater conditions described in this report refer only to those observed at the place and time of observation noted in the report. It is noted that groundwater conditions can vary seasonally or as a result of construction activities in the area.

The following presents an overview of the subsurface conditions encountered in the boreholes advanced during this investigation.

4.2 Topsoil Fill Material

A surficial layer of topsoil fill material was encountered in all boreholes except for BH-07 and BH-14. The topsoil can be described as dark brown silty sand with trace to some clay and contains organic material. The topsoil has a thickness ranging from about 30 to 380 millimetres.

4.3 Weathered/Disturbed Material

Weathered/disturbed material was encountered from surface grade and/or below the topsoil at BH-01 to BH-04, inclusive, BH-07, BH-15, and BH-18. The weathered/disturbed material can be described as brown, silty gravelly sand with trace to some clay. The weathered/disturbed material has a thickness ranging from about 0.1 to 0.7 metres and extends to depths ranging from about 0.1 to 0.9 metres below existing grade.

4.4 Silty Sand/Sand

Native deposits of brown to grey, silty sand, trace to some clay and brown to grey clayey silty sand with trace to some gravel and clay and brown, fine to coarse grained sand with trace gravel and some silt were encountered at BH-04, BH-06, BH-08, BH-09, BH-12, BH-13, BH-16, BH-17, BH-19, and BH-20 at depths ranging from about 0.1 to 0.8 metres below existing grade. The silty sand/sand has a thickness ranging from about 0.6 to 4.7 metres and extends to depths of about 0.8 to 5.0 metres below existing grade.

Standard penetration tests carried out in the native silty sand/sand gave N values ranging from 15 to greater than 50 blows per 0.3 metres of penetration, which reflects a compact to very dense very loose to very dense relative density.

4.5 Glacial Till

Native deposits of glacial till were encountered at all borehole locations from ground surface to 5.0 metres below existing grad. Glacial till is a heterogeneous mixture of all grain sizes; however, at this site, the glacial till can generally be described as brown to grey silty sand, trace clay and some gravel and grey to brown sandy silty gravel with trace clay and possible cobbles and brown to grey sand and gravel, trace clay and some silt with possible cobbles and brown to grey silty sandy gravel with trace clay and possible cobbles. All boreholes were terminated within the glacial till at a depth of about 5.2 metres below existing grade.

Standard penetration tests carried out in the glacial till gave N values ranging from 6 to greater than 50 blows per 0.3 metres of penetration, which reflects a loose to very dense relative density.

4.6 Gradation Analysis and Moisture Content

The results of grain size distribution and hydrometer testing carried out on selected samples are provided in Appendix B and summarized in Tables 4.1 and 4.2 respectively.

Table 4.1 – Summary of Grain Size Distribution Testing

Location	Sample Number	Sample Depth (ft)	Test Type	Gravel (%)	Sand (%)	Silt & Clay (%)
BH-4	2	2.5-4.5	Grain	1.0	80.6	18.4
BH-9	3	5-7	Grain	2.4	80.6	17
BH-17	4	7.5-9.5	Grain	2.0	65.8	32.1
BH-19	5	10-12	Grain	4.7	29.6	65.7

Table 4.2 – Summary of Hydrometer Testing

Location	Sample Number	Sample Depth (ft)	Test Type	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
BH-1	2	2.5-4.5	Hydro	12	44	34.2	9.8
BH-1	4	7.5-9.5	Hydro	35	25	31.9	8.1
BH-4	6	12.5-14.5	Hydro	10	56	26	8.0
BH-6	3	5-7	Hydro	44	36	11.1	8.9
BH-8	5	10-12	Hydro	52	36	3.8	8.2
BH-14	4	7.5-9.5	Hydro	32	30	29.2	8.8
BH-18	6	12.5-14.5	Hydro	48	23	23.7	5.3
BH-20	3	5-7	Hydro	21	13	40.3	6.3

Moisture content testing on the samples indicates moisture contents ranging from about 6.7 to 20.4 percent.

4.7 Groundwater Level

The groundwater levels measured in the well screen installed in selected boreholes are summarized in Table 4.3.

Table 4.3 – Groundwater Levels

Location	Well Screen Formation	Date	Depth Below Surface Grade (metres)
BH-1	Native Glacial Till	April 25, 2022	0.54
BH-2	Native Glacial Till	April 25, 2022	0.05
BH-4	Native Silty Sand/Glacial Till	April 25, 2022	0.73
BH-5	Native Glacial Till	April 25, 2022	0.12
BH-8	Native Glacial Till	April 25, 2022	0.39
BH-13	Native Silty Sand	April 25, 2022	0.04
BH-15	Native Glacial Till	April 25, 2022	0.18
BH-17	Native Silty Sand/Glacial Till	April 25, 2022	0.45
BH-18	Native Glacial Till	April 25, 2022	-0.33 (above grade)
BH-19	Native Glacial Till	April 25, 2022	0.15

It should be noted that the groundwater levels may be higher during wet periods of the year such as the early spring or following periods of precipitation.

4.8 Infiltration Rates

The infiltration rates tested are summarized in Table 4.4 and provided in Appendix D.

Table 4.4 – Infiltration Rates

Test Number	Infiltration Rate (mm/hr)	Test Depth (metres below ground surface)	Location Coordinates
1	0.96	1m	44.42235N, 80.10648W
2	111.37*	1m	44.42356N, 80.10193W
3	0.71	1m	44.42471N, 80.10479W
4	1.56	1m	44.42561N, 80.10202W
5	0.59	1m	44.42607N, 80.10828W

**Approximately 2-inch layer of permeable, clean gravel was encountered at the bottom of the test hole. Water was able to flow freely through this layer during the test, which resulted in a significantly higher K value.*

4.9 Soil Chemistry Relating to Corrosion

The results of chemical testing of various soil samples are summarized in Table 4.5 and provided in Appendix C.

Table 4.5 – Summary of Chemistry Relating to Corrosion (Soil)

Borehole	Sample Number	pH	Sulphate Content (micrograms per gram)	Chloride Content (micrograms per gram)	Electrical Conductivity (microsiemens per centimetre)	Electrical Resistivity (Ohm centimetres)
BH-2	3	8.05	46	6.0	0.129	7750
BH-9	4	7.91	22	<5.0	0.112	8900
BH-11	3	8.04	47	5.6	0.126	7960
BH-15	4	7.99	97	<5.0	0.183	5470

5.0 RECOMMENDATIONS AND GUIDELINES

5.1 General

The information in the following sections is provided for the guidance of the design engineers and is intended for the design of this project only. Contractors bidding on or undertaking the works should examine the factual results of the investigation, satisfy themselves as to the adequacy of the information for construction, and make their own interpretation of the factual data as it affects their construction techniques, schedule, safety and equipment capabilities. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions.

The National Building Code of Canada 2015 Guidelines (hereafter NBCC 2015), the 2012 Ontario Building Code (OBC 2012) and the 4th edition of the Canadian Foundation Engineering Manual, 2006 (hereafter CFEM 2006) were considered for these recommendations. Based on the collected information on boreholes BH-01 to BH-20, the geotechnical recommendations are presented in the following sections.

The development design details were not available at the time of preparation of this report.

5.2 Residential Dwellings

5.2.1 Excavation

The excavation for the proposed additions will be carried out through topsoil, weathered/disturbed material, silty sand/sand, and glacial till. The sides of the excavation should be sloped in accordance with the requirements in Ontario Regulation 213/91 under the Occupational Health and Safety Act. According to the act, soils at this site can be classified as Type 3. That is, open cut excavations within overburden deposits should be carried out with side slopes of 1 horizontal to 1 vertical, or flatter. Where excavation side slopes cannot be accommodated due to space constraints, a shoring system may be required. Additional guidelines for the design and selection of a suitable shoring system could be provided as the design progresses.

In the event that a granular pad is necessary below the foundations, the excavations should be sized to accommodate a pad of imported granular material which extends at least 0.6 metres horizontally beyond the edge of the footings and down and out from this point at 1 horizontal to 1 vertical, or flatter.

Cobbles and boulders should be anticipated within the glacial till. As such, where excavation within glacial till is anticipated, an allowance should be made for removal of boulders from the glacial till during excavation. Further, additional material may be required to fill any voids left from the removal of boulders.

Depending on construction methodology, it may be necessary to lower the groundwater level in the native deposits to about 0.3 metres below the base of the excavation. Below the groundwater level, sloughing of the sandy overburden soils into the excavation should be anticipated, along with disturbance to the soils in the bottom of the excavation. Sloughing of the excavation side slopes below the groundwater level could be reduced, where necessary, by a shoring system installed along the sides of the excavation to below the level of the excavation in combination with pumping from within the excavation.

Groundwater inflow, if any, from the overburden deposits should be controlled by pumping from filtered sumps within the excavation. It is not expected that short term pumping during excavation will have a significant effect on nearby structures and services. It is anticipated that groundwater inflow from the overburden deposits into the excavations could be handled from within the excavations.

It is noted that groundwater levels and surface water flows can increase during wet periods of the year such as the early spring or following periods of precipitation.

5.2.2 Groundwater and Pumping Management

Possible groundwater inflow from the overburden deposits into the excavations could be controlled by pumping from filtered sumps within the excavations. It is not expected that short term pumping during excavation will have any significant affect on nearby structures and services.

It is noted that possible well points may be required during construction due to the high groundwater levels observed.

5.2.3 Subgrade Preparation and Placement of Engineered Fill

Any existing topsoil, organic material, fill, and/or weathered/disturbed soil should be removed from below the proposed structures.

Imported granular material (engineered fill) should be used to raise the grade in areas where the proposed founding level is above the level of the native soil, or where sub-excavation of material is required below proposed founding level. The engineered fill should consist of granular material meeting Ontario Provincial Standard Specifications (OPSS) requirements for Granular B Type II and should be compacted in maximum 200-millimetre-thick lifts to at least 95 percent of the standard Proctor maximum dry density. To allow spread of load beneath the footings, the engineered fill should extend horizontally at least 0.6 metres beyond the footings and then down and out from the edges

of the footings at 1 horizontal to 1 vertical, or flatter. The excavations should be sized to accommodate this fill placement.

5.2.4 Spread Footing Design

In general, the native silty sand/sand and glacial till and/or engineered fill above the native soils is considered suitable to support residential structures founded on conventional spread footing foundations. For this project, we have assumed that the footings will not extend to a depth beyond the weathered crust. The topsoil and weathered/disturbed material are not considered suitable for the support of the proposed structures or concrete floor slabs and should be removed from the proposed building areas.

For design purposes, footings bearing on the native, undisturbed glacial till material, or on a pad of engineered fill above native, undisturbed glacial till should be sized using a geotechnical reaction at Serviceability Limit State (SLS) of 125 kilopascals and a factored geotechnical resistance at Ultimate Limit State (ULS) of 250 kilopascals. For footings bearing directly on the native undisturbed silty sand/sand or on a pad of engineered fill above native, undisturbed silty sand/sand, a geotechnical reaction at SLS of 90 kilopascals and a factored geotechnical resistance at ULS of 150 kilopascals could be used.

The post construction total and differential settlement of footings should be less than 25 and 15 millimetres respectively, provided that all loose or disturbed soil is removed from the bearing surface and provided that any engineered fill material is compacted to the required density.

To reduce the potential for cracking in the footings, foundation walls, and concrete slabs on grade where the footings transition between different subgrade materials, the foundation walls should be reinforced for a distance of 3 metres on both sides of the transition areas or as recommended by the structural engineer.

5.2.5 Frost Protection of Foundations

All exterior footings should be provided with at least 1.5 metres of earth cover for frost protection purposes. Isolated, unheated exterior footings adjacent to surfaces which are cleaned of snow cover during the winter months should be provided with a minimum of 1.8 metres of earth cover. Alternatively, the required frost protection could be provided by means of a combination of earth cover and extruded polystyrene insulation. Further details regarding the insulation of foundations could be provided at the detailed design stage, if necessary.

5.2.6 Foundation Wall Backfill and Drainage

In accordance with the Ontario Building Code, the following alternatives could be considered for drainage of the foundation walls:

- Damp proof the exterior of the foundation walls and backfill the walls with free draining, non-frost susceptible sand or sand and gravel such as that meeting OPSS requirements for Granular B Type I or II. OR
- Damp proof the exterior of the foundation walls and install an approved proprietary drainage system on the exterior of the foundation walls and backfill the walls with native material or imported soil. It is pointed out that the moisture content of the native material may be above the optimum moisture content for compaction. As such, in areas where hard surfacing will abut the buildings, it is suggested that imported sand or sand and gravel be used for foundation backfill material to reduce the potential for post construction settlement of the backfill and damage to the hard surfacing.

The backfill should be compacted in maximum 300 millimetres thick lifts to at least 95 percent of the standard Proctor dry density value using suitable vibratory compaction equipment.

A perforated plastic foundation drain with a surround of clear crushed stone should be installed on the exterior of the foundation walls. A nonwoven geotextile should be placed between the top of the clear stone and any sandy foundation wall backfill material to avoid loss of sand backfill into the voids in the clear stone (and possible post construction settlement of the ground around the houses). The top of the drain should be located below the bottom of the floor slab. The drain should outlet to a sump from which the water is pumped or should drain by gravity to a storm sewer or other suitable outlet.

5.2.7 Garage Foundation and Pier Backfill

The backfill against isolated (unheated) walls or piers should consist of free draining, non-frost susceptible material, such as sand/sand and gravel meeting OPSS Granular B Type I or II requirements. The backfill should be compacted in maximum 300 millimetres thick lifts to at least 95 percent of the standard Proctor dry density value using suitable vibratory compaction equipment. Other measures to prevent frost jacking of these foundation elements could be provided, if required.

5.2.8 Concrete Slab Support

The basement floor should be kept as high as possible due to the high groundwater levels at this site. It is recommended that the underside of footing level be a minimum of 0.3 metre above the measured groundwater level. This may pose some construction constraints as the measured groundwater levels are at/near existing grade. In addition to perimeter drainage, underfloor drainage and/or a waterproof system may be required. In addition, uplift of the floor slab should be considered in the design.

To provide predictable settlement performance of the underground slab, all topsoil, fill material, disturbed soil, and other deleterious materials should be removed from the slab area.

The base for the floor slab should consist of 19-millimetre clear crushed stone. Allowance should be made for between 150 and 200 millimetres of base material. Nominal compaction of the clear stone is recommended to consolidate the material into place.

If clear crushed stone is used below the floor slab, underfloor drains are not considered essential provided that drains are installed to link any hydraulically isolated areas in the basement. The drains should outlet by gravity to a sump from which the water is pumped or drained by gravity to a storm sewer or other suitable outlet.

The ACI 302.1R-04 “Guide for Concrete Floor and Slab Construction” should be referenced for design purposes.

A polyethylene vapour retarder is recommended below the floor slabs.

5.2.9 Seismic Site Classification

According to Table 4.1.8.4.A of the Ontario Building Code, 2012, Site Class C should be used for the seismic design of the structures bearing on native soils or on engineered fill material over native soils.

In our opinion the soils at this site are not considered to be liquefiable or collapsible under seismic loads.

5.3 Lateral Earth Pressures

The static “At Rest” thrust (P_o) acting on the walls should be calculated using the following formula:

$$P_o = 0.5 K_o \gamma H^2$$

where;

- P_o : Static at rest thrust component (kN/m);
- γ : Moist material unit weight (kN/ m³);
- K_o : “At Rest” earth pressure coefficient;
- H : Wall height (m).

Seismic shaking can increase the forces on the retaining walls. The total “At Rest” thrust acting on the wall (P_{oe}) during a seismic event should be calculated using the following formula:

$$P_{oe} = 0.5 K_{oe} \gamma H^2$$

where;

- P_{oe} : Total “At rest” thrust (kN/m);
- γ : Moist material unit weight (kN/m³);
- K_o : “At Rest” earth pressure coefficient;
- K_{oe} : Dynamic at rest earth pressure coefficient;
- H : Wall height (m).

The static thrust component (P_o) acts at a point located $H/3$ above the base of the walls. During seismic shaking, the total “At Rest” thrust (P_{oe}) acts at a point located about $H/2$ above the base of the wall. It should be noted that the total “At Rest” thrust, P_{oe} , is composed of a static component and a dynamic component.

For design purposes, the parameters provided in Table 5.1 can be used to calculate the thrust acting on the wall during static and seismic loading conditions.

Table 5.1 – Summary of Design Parameters (Building Foundation and Retaining Walls)

Parameter	OPSS Granular B Type II
Material Unit Weight, γ (kN/m ³)	22
Estimated Friction Angle (degrees)	38
“At Rest” Earth Pressure Coefficient K_o , assuming horizontal backfill behind the structure	0.38
Dynamic “At Rest” Earth Pressure Coefficient K_{oe} , assuming horizontal backfill behind the structure	0.38 ¹

According to the 2015 National Building Code, the peak ground acceleration (PGA) for the site is 0.06 for firm ground conditions (i.e., for Site Class C). The dynamic at rest earth pressure coefficient was calculated using the method suggested by Mononobe and Okabe, assuming a horizontal coefficient k_h of 0.06 (taken as the PGA) and assuming that the vertical seismic coefficient k_v is zero, the calculated dynamic “At Rest” earth pressure coefficient (K_{oe}) during a seismic event would not exceed the static “At Rest” earth pressure coefficient (K_o) calculated using conventional earth pressure theory. In other words, although it is expected that seismic shaking will increase the earth pressures acting on the walls, there is a level of conservatism in the static “At Rest” earth pressure coefficient K_o , that cover both static and dynamic conditions (for the relatively low PGA specified).

5.4 Site Services

5.4.1 Excavation

Based on the available subsurface information, the excavations for the services within the site will be carried out through topsoil, weathered/disturbed material, silty sand/sand and glacial till.

The sides of the excavations within overburden soils should be sloped in accordance with the requirements in Ontario Regulation 213/91 under the Occupational Health and Safety Act. According to the Act, the soils at this site can be classified as Type 3 soils. Therefore, for design purposes, allowance should be made for 1 horizontal to 1 vertical, or flatter, excavation slopes within the native soils at this site.

As an alternative to sloping the excavations, all services installations could be carried out within a tightly fitting, braced steel trench box, which is specifically designed for this purpose.

The groundwater inflow should be controlled throughout the excavation and pipe laying operations by pumping from sumps within the excavation. Notwithstanding, some disturbance and loosening of the subgrade materials could occur, and allowance should be made for sub-excavation and additional pipe bedding (sub-bedding) material, as discussed later in this report.

5.4.2 Groundwater Pumping

Possible groundwater inflow from the overburden deposits into the excavations could be controlled by pumping from filtered sumps within the excavations. It is not expected that short term pumping during excavation will have any significant affect on nearby structures and services.

The groundwater handling should be carried out in accordance with provincial and local regulations. To reduce the groundwater pumping requirements, we suggest that the excavation be planned for the dry period of the year (i.e. June to September).

Suitable detention and filtration will be required before discharging water. The contractor should be required to submit an excavation and groundwater management plan for review. As noted above, a well point system may be required in advance of construction to lower the groundwater level.

Depending on the depth of proposed services and groundwater level at the time of construction, an Environmental Activity and Sector Registry (EASR) in accordance with Environmental Protection Act Part II or a Category 3 Permit to Take Water may be required.

Further details could be provided as the design progresses.

5.4.3 Pipe Bedding and Cover

The bedding for the sanitary sewers, storm sewers and watermains should be in accordance with OPSD 802.010 and 802.031 for flexible and rigid pipes, respectively. The pipe bedding should consist of at least 150 millimetres of well graded crushed stone meeting OPSS requirements for Granular A. OPSS documents allow recycled asphaltic concrete and concrete to be used in Granular A and Granular B Type II material.

Since the source of recycled material cannot be determined, it is suggested that any granular materials used in the service trenches be composed of virgin (i.e., not recycled) material only.

Allowance should be made for subexcavation of any existing fill, organic deposits, or disturbed material encountered at subgrade level.

Allowance should be made to place a subbedding layer composed of 150 to 300 millimetres of OPSS Granular B Type II in areas where wet silty sand is encountered at the pipe subgrade level to reduce the potential for disturbance.

Cover material, from pipe spring line to at least 300 millimetres above the top of the pipe, should consist of granular material, such as OPSS Granular A.

The use of clear crushed stone should not be permitted for the installation of site services, since it could exacerbate groundwater lowering of the overburden materials due to “French Drain” effects.

The subbedding, bedding and cover materials should be compacted in maximum 200-millimetre-thick lifts to at least 95 percent of the standard Proctor maximum dry density using suitable vibratory compaction equipment.

5.4.4 Trench Backfill

The general backfilling procedures should be carried out in a manner that is compatible with the future use of the area above the service trenches.

In areas where the service trench will be located below or in close proximity to existing or future roadway areas, acceptable native materials should be used as backfill between the roadway subgrade level and the depth of seasonal frost penetration in order to reduce the potential for differential frost heaving between the area over the trench and the adjacent section of roadway. Where native backfill is used, it should match the native materials exposed on the trench walls. Backfill below the zone of seasonal frost penetration could consist of either acceptable native material or imported granular material conforming to OPSS Granular B Type I. The depth of frost penetration in areas that are kept clear of snow and where trench backfill consists of broadly graded shattered rock fill or earth fill is expected to be about 1.8 metres. It is our experience, however, that the frost penetration can be as much as 2.4 metres when the trench backfill consists solely of relatively open graded rock fill. Where cover requirements are not practicable, the pipes could be protected from frost using a combination of earth cover and insulation. Further details regarding insulation could be provided, if required.

It is anticipated that most of the inorganic overburden materials encountered during the subsurface investigation will be acceptable for reuse as trench backfill. Topsoil or other organic material should be wasted from the trench. If blast rock is used as backfill within the service trench, it should be mostly 300 millimetres, or smaller, in size and should be well graded. To prevent ingress of fine material into voids in the blast rock, the upper surface of the blast rock should be covered with a thin layer of well graded crushed stone (e.g., OPSS Granular B Type II).

To minimize future settlement of the backfill and achieve an acceptable subgrade for the roadways, curbs, driveways, etc., the trench backfill should be compacted in maximum 300-millimetre-thick lifts to at least 95 percent of the standard Proctor dry density value. Rock fill should be placed in maximum 500-millimetre-thick lifts and compacted with a large drum roller, the haulage and spreading equipment, or a combination of both. The specified density for compaction of the backfill materials may be reduced where the trench backfill is not located below or in close proximity to existing or future areas of hard surfacing and/or structures.

5.4.5 Seepage Barriers

The granular bedding in the service trench could act as a “French Drain”, which could promote groundwater lowering. As such, we suggest that seepage barriers be installed along the service trenches at strategic locations at a horizontal spacing of about 100 metres and where the property meets the existing road. The seepage barriers should begin at subgrade level and extend vertically through the granular pipe bedding and granular surround to within the native backfill materials, and horizontally across the full width of the service trench excavation. The seepage barriers could consist of 1.5-metre-wide dykes of compacted silty clay. The silty clay should be compacted in maximum 300-millimetre-thick lifts to at least 95 percent of the standard Proctor dry density value. The locations of the seepage barriers could be provided as the design progresses.

5.5 Roadway Recommendations

5.5.1 Subgrade Preparation

In preparation for roadway construction at this site, all surficial topsoil, fill material and any soft, wet, or deleterious materials should be removed from the proposed roadway areas.

Prior to placing granular material for the internal roads, the exposed subgrade should be inspected and approved by geotechnical personnel.

Any soft areas should be subexcavated and replaced with suitable (dry) earth borrow or well shattered and graded rock fill material that is frost compatible with the materials exposed on the sides of the area of subexcavation.

Similarly, should it be necessary to raise the roadway grades at this site, material which meets OPSS specifications for Select Subgrade Material, earth borrow, or well shattered and graded rock fill material may be used.

The select subgrade material or earth borrow should be placed in maximum 300-millimetre-thick lifts and compacted to at least 95 percent of the standard Proctor maximum dry density value using vibratory compaction equipment. Rock fill should also be placed in thin lifts and suitably compacted either with a large drum roller, the haulage and spreading equipment, or a combination of both.

Truck traffic should be avoided on the native soil subgrade and the trench backfill within the roadways especially under wet conditions.

5.5.2 Pavement Structure

For the internal roadways, the following minimum pavement structure should be used:

- 100 millimetres of hot mix asphaltic concrete (40 millimetres of Superpave 12.5 (Traffic Level B) or HL3 over 60 millimetres of Superpave 19.0 (Traffic Level B)) or HL8, over
- 150 millimetres of OPSS Granular A base over
- 450 millimetres of OPSS Granular B, Type II subbase

The above pavement structure assumes that any trench backfill is adequately compacted, and that the access roadway and parking lot subgrade surfaces are prepared as described in this report. If the subgrade surfaces become disturbed or wetted due to construction operations or precipitation, the granular subbase thickness given above may not be adequate and it may be necessary to increase the thickness of the subbase and/or to incorporate a woven geotextile separator between the subgrade surfaces and the granular subbase material. The adequacy of the design pavement thickness should be assessed by geotechnical personnel at the time of construction.

If the granular pavement materials are to be used by construction traffic, it may be necessary to increase the thickness of the granular subbase layer, install a woven geotextile separator between the roadway subgrade surface and the granular subbase material, or a combination of both, to prevent pumping and disturbance to the subbase material. The contractor should be made responsible for their construction access.

5.5.3 Asphalt Cement Type

Performance grade PG 58-34 asphalt cement should be specified for Superpave asphaltic concrete mixes.

5.5.4 Pavement Transitions

As part of the roadway reconstruction, the new pavement will abut the existing pavement at North Street and Highway 26. The following is suggested to improve the performance of the joint between the new and the existing pavements:

- Neatly saw cut the existing asphaltic concrete;
- Remove the asphaltic concrete and slope the bottom of the excavation within the existing granular base and subbase at 1 horizontal to 1 vertical, or flatter, to avoid undermining the existing asphaltic concrete.
- To avoid cracking of the asphaltic concrete due to an abrupt change in the thickness of the roadway granular materials where new pavement areas join with the existing pavements, the granular depths should taper up or down at 5 horizontal to 1 vertical, or flatter, to match the existing pavement structure.
- Remove (mill off) 40 to 50 millimetres of the existing asphaltic concrete to a distance of 300 millimetres at the joint and tack coat the asphaltic concrete at the joint in accordance with the requirements in OPSS 310.

5.5.5 Pavement Drainage

Adequate drainage of the pavement granular materials and subgrade is important for the long-term performance of the pavement at this site. The subgrade surfaces should be crowned and shaped to drain to the ditches and/or catch basins to promote drainage of the pavement granular materials. Catch basins should be equipped with minimum 3-metre-long stub drains extending in two directions at the subgrade level.

5.5.6 Granular Material Compaction

The granular base and subbase materials should be compacted in maximum 300-millimetre-thick lifts to at least 99 percent of the standard Proctor maximum dry density value.

6.0 ADDITIONAL CONSIDERATIONS

6.1 Corrosion of Buried Concrete and Steel

The measured sulphate concentration in the samples of soil obtained from boreholes BH-2, BH-9, BH-11 and BH-15, were between 22 and 97 micrograms per gram. According to the Canadian Standards Association “Concrete Materials and Methods of Concrete Construction” (CSA A23.1-14 Table 3), the concentration of sulphate in the soil sample obtained is considered to have less than the minimum concentration for “moderate” sulfate exposure. As a result, any concrete that will be in contact with the soil can be batched with general-use (GU) cement.

Other factors (structurally reinforced or non-structurally reinforced, freeze-thaw environment, chloride exposure, agricultural environment) should be considered in selecting the Class of Exposure and associated air entrainment and concrete mix proportions for any concrete.

Based on the resistivity and pH of the sample, the soil can be classified as non-aggressive to towards unprotected steel. The manufacturer of any buried steel elements that will be in contact with the soil and groundwater should be consulted to ensure that the durability of the intended product is appropriate. It is noted that the corrosivity of the groundwater could vary throughout the year due to the application of de-icing chemicals.

6.2 Effects of Construction Induced Vibration

Some of the construction operations (such as excavation, granular material compaction, etc.) will cause ground vibration on and off on the site. The vibrations will attenuate with distance from the source but may be felt at nearby structures. Assuming that any excavating is carried out in accordance with the guidelines in this report, the magnitude of the vibrations will be much less than that required to cause damage to the nearby structures or services in good condition but may be felt at the nearby structures. We recommend that preconstruction surveys be carried out on the adjacent structures so that any damage claims can be addressed in a fair manner.

6.3 Abandonment of Standpipe Piezometers

All monitoring wells installed as part of this investigation should be decommissioned by a licensed well technician in accordance with Ontario Regulation 903. The well abandonment could be carried out in advance of or during construction.

6.4 Excess Soil Management Plan

This report does not constitute an excess soil management plan. The disposal requirements for excess soil from the site have not been assessed.

6.5 Design Review and Construction Observation

It is recommended that the final design drawings be reviewed by the geotechnical engineer to ensure that the guidelines provided in this report have been interpreted as intended.

The engagement of the services of the geotechnical consultant during construction is recommended to confirm that the subsurface conditions throughout the proposed excavations do not materially differ from those given in the report and that the construction activities do not adversely affect the intent of the design. The subgrade surfaces for the dwellings and internal roads should be inspected by experienced geotechnical personnel to ensure that suitable materials have been reached and properly prepared. The placing and compaction of earth fill and imported granular materials should be inspected to ensure that the materials used conform to the grading and compaction specifications.

7.0 CLOSURE

We trust this report provides sufficient information for your present purposes. If you have any questions concerning this report, please do not hesitate to contact our office.



Greg Davidson, P.Eng.
Project Manager
greg.davidson@allrockconsulting.com



Scott Allen, P.Eng.
Project Manager – Founder
scott.allen@allrockconsulting.com

Figure 1 – Borehole Location Plan



NOTES:

REFERENCE DWG TITLE: PLAN OF SUBDIVISION	
COMPLETED BY: MAINLINE PLANNING SERVICES INC.	
DATE ON DWG: 06-11	REFERENCE PROJECT: BRIDLE PARK

DWG TITLE: BOREHOLE LOCATION PLAN	
PROJECT: BRIDLE PARK SUBDIVISION	
CLIENT: CROZIER CONSULTING ENGINEERS	
DWG NO: BH_22021	PROJECT NO: 22021
DRAWN BY: N. GROVES	CHECKED BY: S. ALLEN
DATE: 02/17/2022	SCALE:



AllRock

Consulting Ltd

www.allrockconsulting.com

24 Brydon Drive, Unit #5, Toronto, ON, M9W 5R6

Appendix A

Record of Borehole Sheets

CLIENT Crozier Consulting Engineers
PROJECT NUMBER 22021
DATE STARTED 4/1/22 **COMPLETED** 4/1/22
DRILLING CONTRACTOR Landshark Drilling
DRILLING METHOD Solid Stem 2"
LOGGED BY A.S. **CHECKED BY** G.D.
NOTES

PROJECT NAME Bridle Park Development
PROJECT LOCATION Stayner, Clearview
GROUND ELEVATION _____ **HOLE SIZE** _____
GROUND WATER LEVELS:
AT TIME OF DRILLING ---
AT END OF DRILLING ---
▽ AFTER DRILLING 0.54 m

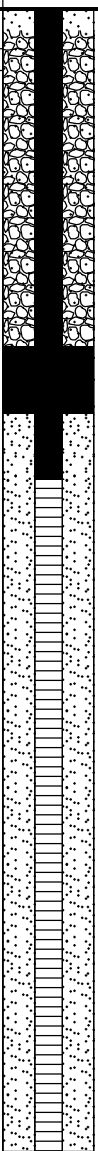
GENERAL BH / TP / WELL BRIDLE PARK - STAYNER LOGS-DESKTOP-77URD5P-2-DESKTOP-77URD5P.GPJ GINT STD CANADA LAB.GDT 4/28/22

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	SS 1	67	1-1-3-6 (4)		0.20 Dark brown, silty sand, trace to some clay, contains organic materials (TOPSOIL) Brown, silty gravelly sand, trace to some clay (WEATHERED/DISTURBED MATERIAL) ▽	Stickup protective casing
1	SS 2	92	6-10-13-19 (23)		0.89 Brown to grey silty sand, some gravel and trace clay, and grey to brown sandy silty gravel with trace clay and possible cobbles (GLACIAL TILL)	Auger cuttings 51mm diameter, well PVC riser
2	SS 3	100	13-17-28-29 (45)			Bentonite seal
3	SS 4	100	18-23-17-23 (40)			
	SS 5	100	20-20-20-26 (40)			
4	SS 6	100	14-17-22-28 (39)			
5	SS 7	100	13-15-17-31 (32)		5.20	Filter sand 51mm diameter, 3.05m long well PVC screen

Bottom of borehole at 5.20 meters.

CLIENT Crozier Consulting Engineers **PROJECT NAME** Bridle Park Development
PROJECT NUMBER 22021 **PROJECT LOCATION** Stayner, Clearview
DATE STARTED 3/31/22 **COMPLETED** 3/31/22 **GROUND ELEVATION** _____ **HOLE SIZE** _____
DRILLING CONTRACTOR Landshark Drilling **GROUND WATER LEVELS:**
DRILLING METHOD Solid Stem 2" **AT TIME OF DRILLING** ---
LOGGED BY A.S. **CHECKED BY** G.D. **AT END OF DRILLING** ---
NOTES _____ **▼ AFTER DRILLING** 0.05 m

GENERAL BH / TP / WELL BRIDLE PARK - STAYNER LOGS-DESKTOP-77URD5P-2-DESKTOP-77URD5P.GPJ GINT STD CANADA LAB.GDT 4/28/22

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	SS 1	75	3-5-10-18 (15)		Dark brown, silty sand, trace to some clay, contains organic materials (TOPSOIL)	 Stickup protective casing Auger cuttings 51mm diameter, well PVC riser Bentonite seal Filter sand 51mm diameter, 3.05m long well PVC screen
1	SS 2	87	6-20-27-41 (47)		Brown, silty gravelly sand, trace to some clay (WEATHERED/DISTURBED MATERIAL)	
					Brown to grey sandy silt/ silty sand, trace to some gravel and clay with possible cobbles (GLACIAL TILL)	
2	SS 3	49	21-51			
	SS 4	67	39-51			
3	SS 5	100	26-28-33-51 (61)			
	SS 6	100	20-26-39-37 (65)			
4						
	SS 7	100	17-14-16-31 (30)			
5						

Bottom of borehole at 5.20 meters.

CLIENT Crozier Consulting Engineers

PROJECT NAME Bridle Park Development

PROJECT NUMBER 22021

PROJECT LOCATION Stayner, Clearview

DATE STARTED 4/1/22 COMPLETED 4/1/22

GROUND ELEVATION _____ HOLE SIZE _____

DRILLING CONTRACTOR Landshark Drilling

GROUND WATER LEVELS:

DRILLING METHOD Solid Stem 2"

AT TIME OF DRILLING ---

LOGGED BY A.S. CHECKED BY G.D.

AT END OF DRILLING ---

NOTES _____

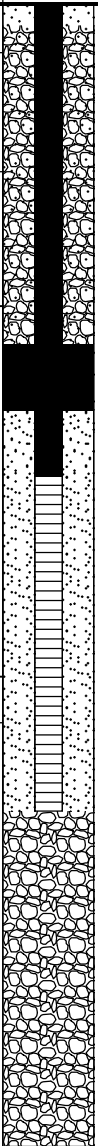
AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION
	SS 1	100	1-1-2-3 (3)		Dark brown, silty sand, trace to some clay, contains organic materials (TOPSOIL) 0.38
					Brown, silty gravelly sand, trace to some clay (WEATHERED/DISTURBED MATERIAL) 0.61
					Brown to grey sandy silt/ silty sand, trace to some gravel and clay with possible cobbles (GLACIAL TILL)
1	SS 2	100	2-7-10-14 (17)		
2	SS 3	100	7-7-11-15 (18)		
3	SS 4	100	9-14-19-26 (33)		
	SS 5	100	18-26-44-52 (70)		
4	SS 6	100	25-33-31-30 (64)		
5	SS 7	59	17-25-28-34 (53)		
					5.20

Bottom of borehole at 5.20 meters.

CLIENT Crozier Consulting Engineers	PROJECT NAME Bridle Park Development
PROJECT NUMBER 22021	PROJECT LOCATION Stayner, Clearview
DATE STARTED 4/1/22	COMPLETED 4/1/22
DRILLING CONTRACTOR Landshark Drilling	GROUND ELEVATION _____
DRILLING METHOD Solid Stem 2"	HOLE SIZE _____
LOGGED BY A.S.	CHECKED BY G.D.
NOTES	GROUND WATER LEVELS:
	AT TIME OF DRILLING ---
	AT END OF DRILLING ---
	▼ AFTER DRILLING 0.73 m

GENERAL BH / TP / WELL BRIDLE PARK - STAYNER LOGS-DESKTOP-77URD5P-2-DESKTOP-77URD5P.GPJ GINT STD CANADA LAB.GDT 4/28/22

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	SS 1	92	1-2-1-2 (3)		0.22 Dark brown, silty sand, trace to some clay, contains organic materials (TOPSOIL)	 Stickup protective casing Auger cuttings 51mm diameter, well PVC riser Bentonite seal Filter sand 51mm diameter, 1.52m long well PVC screen Cave in
					Brown, silty gravelly sand, trace to some clay (WEATHERED/DISTURBED MATERIAL)	
1	SS 2	100	3-7-16-18 (23)		0.76 ▼ Brown, fine to coarse grained SAND, trace gravel and some silt	
					1.37 Brown to grey CLAYEY SILTY SAND	
2	SS 3	100	5-8-14-22 (22)		3.05 Brown, SILTY SAND	
					3.26 Brown to grey, silty sand, some gravel and trace clay with possible cobbles (GLACIAL TILL)	
3	SS 4	100	7-11-15-21 (26)		3.26 Brown, SILTY SAND	
					3.26 Brown, SILTY SAND	
4	SS 6	100	23-34-43-50 (77)		3.26 Brown, SILTY SAND	
					3.26 Brown, SILTY SAND	
5	SS 7	100	19-26-29-31 (55)		5.20	

Bottom of borehole at 5.20 meters.

CLIENT Crozier Consulting Engineers **PROJECT NAME** Bridle Park Development
PROJECT NUMBER 22021 **PROJECT LOCATION** Stayner, Clearview
DATE STARTED 4/1/22 **COMPLETED** 4/1/22 **GROUND ELEVATION** _____ **HOLE SIZE** _____
DRILLING CONTRACTOR Landshark Drilling **GROUND WATER LEVELS:**
DRILLING METHOD Solid Stem 2" **AT TIME OF DRILLING** ---
LOGGED BY A.S. **CHECKED BY** G.D. **AT END OF DRILLING** ---
NOTES _____ **▼ AFTER DRILLING** 0.12 m

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	SS 1	54	4-6-10-16 (16)		0.15 ▼ Dark brown, silty sand, trace to some clay, contains organic materials (TOPSOIL) Brown to grey sandy silt/ silty sand, trace to some gravel and clay with possible cobbles (GLACIAL TILL)	Stickup protective casing
1	SS 2	75	6-13-17-28 (30)			Auger cuttings
	SS 3	100	13-19-30-32 (49)			51mm diameter, well PVC riser
2	SS 4	100	13-14-16-16 (30)			Bentonite seal
	SS 5	100	9-14-15-18 (29)			
3	SS 6	100	16-20-20-36 (40)			
	SS 7	61	45-50			Filter sand
5						51mm diameter, 3.05m long well PVC screen

Bottom of borehole at 5.20 meters.

CLIENT Crozier Consulting Engineers
PROJECT NUMBER 22021
DATE STARTED 4/1/22 **COMPLETED** 4/1/22
DRILLING CONTRACTOR Landshark Drilling
DRILLING METHOD Solid Stem 2"
LOGGED BY A.S. **CHECKED BY** G.D.
NOTES _____

PROJECT NAME Bridle Park Development
PROJECT LOCATION Stayner, Clearview
GROUND ELEVATION _____ **HOLE SIZE** _____
GROUND WATER LEVELS:
AT TIME OF DRILLING ---
AT END OF DRILLING ---
AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION
					0.19 Dark brown, silty sand, trace to some clay, contains organic materials (TOPSOIL)
	SS 1	72	2-3-6-12 (9)		Brown, SILTY SAND
					0.71
1	SS 2	100	8-13-13-17 (26)		Brown to grey sand and gravel, some silt, trace clay with possible cobbles (GLACIAL TILL)
2	SS 3	100	24-23-31-35 (54)		
3	SS 4	67	16-35-36-50 (71)		
4	SS 5	100	10-17-18-22 (35)		
5	SS 6	100	13-18-19-23 (37)		
5	SS 7	100	15-20-20-16 (40)		
					5.20

Bottom of borehole at 5.20 meters.

CLIENT Crozier Consulting Engineers

PROJECT NAME Bridle Park Development

PROJECT NUMBER 22021

PROJECT LOCATION Stayner, Clearview

DATE STARTED 3/31/22 COMPLETED 3/31/22

GROUND ELEVATION _____ HOLE SIZE _____

DRILLING CONTRACTOR Landshark Drilling

GROUND WATER LEVELS:

DRILLING METHOD Solid Stem 2"

AT TIME OF DRILLING ---

LOGGED BY A.S. CHECKED BY G.D.

AT END OF DRILLING ---

NOTES _____

AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION
					0.20
	SS 1	100	2-4-6-7 (10)		Brown, silty gravelly sand, trace to some clay (WEATHERED/DISTURBED MATERIAL)
1	SS 2	90	4-6-10-15 (16)		Brown to grey sandy silt/ silty sand, trace to some gravel and clay with possible cobbles (GLACIAL TILL)
2	SS 3	100	8-12-24-41 (36)		
3	SS 4	87	20-31-38-40 (69)		
4	SS 5	100	15-25-23-19 (48)		
5	SS 6	100	14-16-26-27 (42)		
5	SS 7	87	20-24-31-35 (55)		
					5.20

Bottom of borehole at 5.20 meters.

CLIENT <u>Crozier Consulting Engineers</u> PROJECT NUMBER <u>22021</u> DATE STARTED <u>3/31/22</u> COMPLETED <u>3/31/22</u> DRILLING CONTRACTOR <u>Landshark Drilling</u> DRILLING METHOD <u>Solid Stem 2"</u> LOGGED BY <u>A.S.</u> CHECKED BY <u>G.D.</u> NOTES _____	PROJECT NAME <u>Bridle Park Development</u> PROJECT LOCATION <u>Stayner, Clearview</u> GROUND ELEVATION _____ HOLE SIZE _____ GROUND WATER LEVELS: AT TIME OF DRILLING --- AT END OF DRILLING --- ▼ AFTER DRILLING <u>0.39 m</u>
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GENERAL BH / TP / WELL BRIDLE PARK - STAYNER LOGS-DESKTOP-77URD5P-2-DESKTOP-77URD5P.GPJ GINT STD CANADA LAB.GDT 4/28/22

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	SS 1	85	2-2-3-7 (5)		0.19 Dark brown, silty sand, trace to some clay, contains organic materials (TOPSOIL) ▼ Brown, SILTY SAND	Stickup protective casing
1	SS 2	92	10-18-21-18 (39)		0.86 Brown to grey sand and gravel, trace clay and silt with possible cobbles (GLACIAL TILL)	Auger cuttings
2	SS 3	36	8-9-9-13 (18)			51mm diameter, well PVC riser
3	SS 4	92	38-28-37-40 (65)			Bentonite seal
4	SS 5	100	18-21-26-30 (47)			Filter sand
5	SS 6	100	6-9-11-14 (20)			51mm diameter, 1.52m long well PVC screen
5	SS 7	100	23-23-28-46 (51)		5.20	Cave in

Bottom of borehole at 5.20 meters.

CLIENT Crozier Consulting Engineers

PROJECT NAME Bridle Park Development

PROJECT NUMBER 22021

PROJECT LOCATION Stayner, Clearview

DATE STARTED 3/31/22 COMPLETED 3/31/22

GROUND ELEVATION _____ HOLE SIZE _____

DRILLING CONTRACTOR Landshark Drilling

GROUND WATER LEVELS:

DRILLING METHOD Solid Stem 2"

AT TIME OF DRILLING ---

LOGGED BY A.S. CHECKED BY G.D.

AT END OF DRILLING ---

NOTES _____

AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION
					Dark brown, silty sand, trace to some clay, contains organic materials (TOPSOIL)
	SS 1	100	1-1-1-2 (2)		Brown to grey, fine to coarse grained SAND, some silt and trace gravel
1	SS 2	100	3-5-11-13 (16)		
	SS 3	100	12-15-26-40 (41)		
2	SS 4	100	12-18-27-40 (45)		
3	SS 5	100	9-31-53 (84)		Brown to grey sandy silt/ silty sand, trace to some gravel and clay with possible cobbles (GLACIAL TILL)
	SS 6	100	20-31-36-48 (67)		
4	SS 7	100	16-20-25-31 (45)		
5					Bottom of borehole at 5.20 meters.

CLIENT Crozier Consulting Engineers

PROJECT NUMBER 22021

DATE STARTED 3/30/22 **COMPLETED** 3/30/22

DRILLING CONTRACTOR Landshark Drilling

DRILLING METHOD Solid Stem 2"

LOGGED BY A.S. **CHECKED BY** G.D.

NOTES _____

PROJECT NAME Bridle Park Development

PROJECT LOCATION Stayner, Clearview

GROUND ELEVATION _____ **HOLE SIZE** _____

GROUND WATER LEVELS:

AT TIME OF DRILLING ---

AT END OF DRILLING ---

AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION
					0.13 Dark brown, silty sand, trace to some clay, contains organic materials (TOPSOIL)
	SS 1	54	1-1-3-5 (4)		Brown to grey sandy silt/ silty sand, trace to some gravel and clay with possible cobbles (GLACIAL TILL)
1	SS 2	100	7-14-25-35 (39)		
2	SS 3	79	26-41-37-41 (78)		
3	SS 4	100	20-21-21-22 (42)		
	SS 5	59	10-15-14-22 (29)		
4	SS 6	92	17-19-17-13 (36)		
5	SS 7	100	11-13-14-28 (27)		
					5.20

Bottom of borehole at 5.20 meters.

CLIENT Crozier Consulting Engineers

PROJECT NAME Bridle Park Development

PROJECT NUMBER 22021

PROJECT LOCATION Stayner, Clearview

DATE STARTED 3/30/22 COMPLETED 3/30/22

GROUND ELEVATION _____ HOLE SIZE _____

DRILLING CONTRACTOR Landshark Drilling

GROUND WATER LEVELS:

DRILLING METHOD Solid Stem 2"

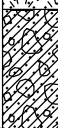
AT TIME OF DRILLING ---

LOGGED BY A.S. CHECKED BY G.D.

AT END OF DRILLING ---

NOTES _____

AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION
	SS 1	38	0-0-1-3 (1)		0.07 Dark brown, silty sand, trace to some clay, contains organic materials (TOPSOIL) Brown to grey sandy silt/ silty sand, trace to some gravel and clay with possible cobbles (GLACIAL TILL)
1	SS 2	87	4-7-8-15 (15)		
2	SS 3	49	16-34-49-50 (83)		
3	SS 4	100	29-37-38-48 (75)		
4	SS 5	84	17-21-26-31 (47)		
5	SS 6	100	14-20-28-34 (48)		
	SS 7	92	18-19-22-26 (41)		
					5.20 Bottom of borehole at 5.20 meters.

CLIENT Crozier Consulting Engineers

PROJECT NAME Bridle Park Development

PROJECT NUMBER 22021

PROJECT LOCATION Stayner, Clearview

DATE STARTED 3/30/22 COMPLETED 3/30/22

GROUND ELEVATION _____ HOLE SIZE _____

DRILLING CONTRACTOR Landshark Drilling

GROUND WATER LEVELS:

DRILLING METHOD Solid Stem 2"

AT TIME OF DRILLING ---

LOGGED BY A.S. CHECKED BY G.D.

AT END OF DRILLING ---

NOTES _____

AFTER DRILLING ---

GENERAL BH / TP / WELL BRIDLE PARK - STAYNER LOGS-DESKTOP-77URD5P-2-DESKTOP-77URD5P.GPJ GINT STD CANADA LAB.GDT 4/28/22

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION
					0.20 Dark brown, silty sand, trace to some clay, contains organic materials (TOPSOIL)
	SS 1	100	1-2-2-4 (4)		Brown, SILTY SAND
1					0.89
	SS 2	100	10-8-8-10 (16)		Brown to grey sandy silt/ silty sand, trace to some gravel and clay with possible cobbles (GLACIAL TILL)
2					
	SS 3	75	4-7-12-25 (19)		
3					
	SS 4	100	22-29-38-24 (67)		
4					
	SS 5	100	14-17-20-24 (37)		
5					
	SS 6	100	29-16-20-31 (36)		
	SS 7	49	9-11-11-17 (22)		
					5.20

Bottom of borehole at 5.20 meters.

CLIENT Crozier Consulting Engineers **PROJECT NAME** Bridle Park Development
PROJECT NUMBER 22021 **PROJECT LOCATION** Stayner, Clearview
DATE STARTED 3/31/22 **COMPLETED** 3/31/22 **GROUND ELEVATION** _____ **HOLE SIZE** _____
DRILLING CONTRACTOR Landshark Drilling **GROUND WATER LEVELS:**
DRILLING METHOD Solid Stem 2" **AT TIME OF DRILLING** ---
LOGGED BY A.S. **CHECKED BY** G.D. **AT END OF DRILLING** ---
NOTES _____ **▼ AFTER DRILLING** 0.04 m

GENERAL BH / TP / WELL BRIDLE PARK - STAYNER LOGS-DESKTOP-77URD5P-2-DESKTOP-77URD5P.GPJ GINT STD CANADA LAB.GDT 4/28/22

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
					▼ Dark brown, silty sand, trace to some clay, contains organic materials (TOPSOIL)	Stickup protective casing
	SS 1	100	1-2-3-5 (5)		0.36 Brown to grey, SILTY SAND, trace to some gravel and clay	Auger cuttings
1	SS 2	100	4-7-13-10 (20)			51mm diameter, well PVC riser Bentonite seal
2	SS 3	100	7-7-8-19 (15)			
3	SS 4	100	13-19-24-26 (43)			Filter sand 51mm diameter, 1.52m long well PVC screen
	SS 5	100	9-12-16-17 (28)			
4	SS 6	100	9-14-18-23 (32)			
5	SS 7	100	8-5-4-5 (9)		5.03 Brown to grey sandy silt/ silty sand, trace to some gravel and clay with possible cobbles (GLACIAL TILL)	
					5.20 Bottom of borehole at 5.20 meters.	Cave in



AllRock Consulting Ltd.
24 Brydon Drive, Unit #5
Toronto, ON, M9W 5R6

BORING NUMBER BH-14

PAGE 1 OF 1

CLIENT Crozier Consulting Engineers

PROJECT NAME Bridle Park Development

PROJECT NUMBER 22021

PROJECT LOCATION Stayner, Clearview

DATE STARTED 3/29/22 COMPLETED 3/29/22

GROUND ELEVATION _____ HOLE SIZE _____

DRILLING CONTRACTOR Landshark Drilling

GROUND WATER LEVELS:

DRILLING METHOD Solid Stem 2"

AT TIME OF DRILLING ---

LOGGED BY A.S. CHECKED BY G.D.

AT END OF DRILLING ---

NOTES _____

AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION
	SS 1	49	3-6-8-10 (14)		Brown to grey silty sandy gravel with trace clay with possible cobbles (GLACIAL TILL)
1	SS 2	67	3-10-13-22 (23)		
2	SS 3	41	11-22-27-28 (49)		
3	SS 4	84	10-10-13-16 (23)		
	SS 5	100	6-8-8-11 (16)		
4	SS 6	41	3-5-17-21 (22)		
5	SS 7	100	9-15-16-21 (31)		
5.20					Bottom of borehole at 5.20 meters.

GENERAL BH / TP / WELL BRIDLE PARK - STAYNER LOGS-DESKTOP-77URD5P-2-DESKTOP-77URD5P.GPJ GINT STD CANADA LAB.GDT 4/28/22

CLIENT Crozier Consulting Engineers

PROJECT NAME Bridle Park Development

PROJECT NUMBER 22021

PROJECT LOCATION Stayner, Clearview

DATE STARTED 3/29/22 **COMPLETED** 3/29/22

GROUND ELEVATION _____ HOLE SIZE _____

DRILLING CONTRACTOR Landshark Drilling

GROUND WATER LEVELS:

DRILLING METHOD Solid Stem 2"

AT TIME OF DRILLING ---

LOGGED BY A.S. CHECKED BY G.D.

AT END OF DRILLING ---

NOTES _____

▽ AFTER DRILLING 0.18 m

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM	
1	SS 1	100	1-2-7-9 (9)		0.28 Dark brown, silty sand, trace to some clay, contains organic materials (TOPSOIL)		Stickup protective casing
					Brown, silty gravelly sand, trace to some clay (WEATHERED/DISTURBED MATERIAL)		Auger cuttings
2	SS 2	67	11-17-23-33 (40)		0.91		51mm diameter, well PVC riser
					Brown to grey sandy silt/ silty sand, trace to some gravel and clay with possible cobbles (GLACIAL TILL)		
3	SS 3	84	14-25-39-47 (64)				Bentonite seal
4	SS 4	84	22-28-30-29 (58)				Filter sand 51mm diameter, 3.05m long well PVC screen
5	SS 5	100	14-16-18-24 (34)				
6	SS 6	100	12-19-23-31 (42)				
7	SS 7	75	13-20-32-36 (52)		5.20		

Bottom of borehole at 5.20 meters.

GENERAL BH / TP / WELL BRIDLE PARK - STAYNER LOGS-DESKTOP-77URD5P-2-DESKTOP-77URD5P.GPJ GINT STD CANADA LAB.GDT 4/28/22

CLIENT Crozier Consulting Engineers

PROJECT NAME Bridle Park Development

PROJECT NUMBER 22021

PROJECT LOCATION Stayner, Clearview

DATE STARTED 3/29/22 COMPLETED 3/29/22

GROUND ELEVATION _____ HOLE SIZE _____

DRILLING CONTRACTOR Landshark Drilling

GROUND WATER LEVELS:

DRILLING METHOD Solid Stem 2"

AT TIME OF DRILLING ---

LOGGED BY A.S. CHECKED BY G.D.

AT END OF DRILLING ---

NOTES _____

AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION
	SS 1	84	2-2-5-9 (7)		0.10 Dark brown, silty sand, trace to some clay, contains organic materials (TOPSOIL) Brown and grey, SILTY SAND, trace gravel
1	SS 2	75	2-7-14-16 (21)		
2	SS 3	100	14-20-38-30 (58)		
3	SS 4	100	3-6-8-11 (14)		2.32 Brown to grey sandy silt/ silty sand, trace to some gravel and clay with possible cobbles (GLACIAL TILL)
4	SS 5	100	4-8-10-15 (18)		
5	SS 6	100	3-4-6-8 (10)		
	SS 7	100	3-3-4-6 (7)		5.20 Bottom of borehole at 5.20 meters.

CLIENT Crozier Consulting Engineers

PROJECT NAME Bridle Park Development

PROJECT NUMBER 22021

PROJECT LOCATION Stayner, Clearview

DATE STARTED 3/29/22 COMPLETED 3/29/22 GROUND ELEVATION _____ HOLE SIZE _____

DRILLING CONTRACTOR Landshark Drilling **GROUND WATER LEVELS:**

DRILLING METHOD Solid Stem 2" **AT TIME OF DRILLING** ---

LOGGED BY A.S. CHECKED BY G.D. AT END OF DRILLING ---

NOTES _____ AFTER DRILLING 0.45 m

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM	
	SS 1	100	2-1-2-3 (3)		0.28 Dark brown, silty sand, trace to some clay, contains organic materials (TOPSOIL) Brown, SILTY SAND, trace gravel		Stickup protective casing
1	SS 2	100	4-7-8-17 (15)				Auger cuttings
2	SS 3	100	12-14-19-25 (33)				Bentonite seal
3	SS 4	100	5-12-19-23 (31)				Filter sand
4	SS 5	100	8-13-18-23 (31)				51mm diameter, 3.05m long well PVC screen
5	SS 6	100	12-15-25-22 (40)				
	SS 7	100	5-8-12-15 (20)		4.98 Brown to grey sandy silt/ silty sand, trace to some gravel and clay with possible cobbles (GLACIAL TILL)		
					5.20 Bottom of borehole at 5.20 meters.		

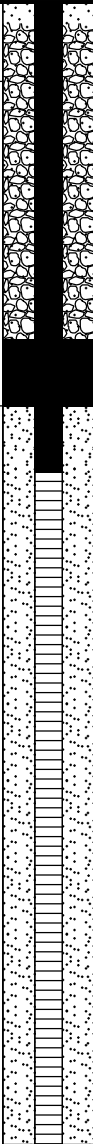
CLIENT Crozier Consulting Engineers **PROJECT NAME** Bridle Park Development
PROJECT NUMBER 22021 **PROJECT LOCATION** Stayner, Clearview
DATE STARTED 3/28/22 **COMPLETED** 3/28/22 **GROUND ELEVATION** _____ **HOLE SIZE** _____
DRILLING CONTRACTOR Landshark Drilling **GROUND WATER LEVELS:**
DRILLING METHOD Solid Stem 2" **AT TIME OF DRILLING** ---
LOGGED BY A.S. **CHECKED BY** G.D. **AT END OF DRILLING** ---
NOTES _____ **▼ AFTER DRILLING** 0.00 m

GENERAL BH / TP / WELL BRIDLE PARK - STAYNER LOGS-DESKTOP-77URD5P-2-DESKTOP-77URD5P.GPJ GINT STD CANADA LAB.GDT 4/28/22

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
					0.03 0.10	
	SS 1	16	4-8-9-11 (17)		Dark brown, silty sand, trace to some clay, contains organic materials (TOPSOIL)	Stickup protective casing
					Brown, silty sand, trace to some clay and organic material (WEATHERED/DISTURBED MATERIAL)	
					Brown to grey sandy silty gravel with trace clay with possible cobbles (GLACIAL TILL)	
1	SS 2	100	8-16-14-12 (30)			Auger cuttings
						51mm diameter, well PVC riser
2	SS 3	100	10-12-16-19 (28)			Bentonite seal
3	SS 4	100	9-9-9-16 (18)			
					Water pooling in this area. The groundwater level is 0.33m above the existing grade	
4	SS 5	100	2-2-4-3 (6)			
						Filter sand
						51mm diameter, 3.05m long well PVC screen
5	SS 6	84	13-19-18-24 (37)			
					5.20	

Bottom of borehole at 5.20 meters.

CLIENT <u>Crozier Consulting Engineers</u>	PROJECT NAME <u>Bridle Park Development</u>
PROJECT NUMBER <u>22021</u>	PROJECT LOCATION <u>Stayner, Clearview</u>
DATE STARTED <u>3/28/22</u> COMPLETED <u>3/28/22</u>	GROUND ELEVATION _____ HOLE SIZE _____
DRILLING CONTRACTOR <u>Landshark Drilling</u>	GROUND WATER LEVELS:
DRILLING METHOD <u>Solid Stem 2"</u>	AT TIME OF DRILLING <u>---</u>
LOGGED BY <u>A.S.</u> CHECKED BY <u>G.D.</u>	AT END OF DRILLING <u>---</u>
NOTES _____	▼ AFTER DRILLING <u>0.15 m</u>

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	SS 1	100	3-2-4-7 (6)		▼ Dark brown, silty sand, trace to some clay, contains organic materials (TOPSOIL)	 Stickup protective casing Auger cuttings 51mm diameter, well PVC riser Bentonite seal Filter sand 51mm diameter, 3.05m long well PVC screen
1	SS 2	100	6-8-14-18 (22)		Brown to grey SILTY SAND, trace to some clay	
2	SS 3	100	4-8-10-14 (18)		1.83 Brown to grey, sandy silt, trace gravel with possible cobbles (GLACIAL TILL)	
3	SS 4	100	7-8-13-19 (21)			
	SS 5	100	5-7-10-14 (17)			
4	SS 6	100	6-8-9-17 (17)			
5	SS 7	100	6-10-13-17 (23)			
					5.20 Bottom of borehole at 5.20 meters.	

CLIENT Crozier Consulting Engineers

PROJECT NAME Bridle Park Development

PROJECT NUMBER 22021

PROJECT LOCATION Stayner, Clearview

DATE STARTED 3/29/22 COMPLETED 3/29/22

GROUND ELEVATION _____ HOLE SIZE _____

DRILLING CONTRACTOR Landshark Drilling

GROUND WATER LEVELS:

DRILLING METHOD Solid Stem 2"

AT TIME OF DRILLING ---

LOGGED BY A.S. CHECKED BY G.D.

AT END OF DRILLING ---

NOTES _____

AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION
	SS 1	100	2-4-4-11 (8)		Dark brown, silty sand, trace to some clay, contains organic materials (TOPSOIL)
1	SS 2	100	10-12-13-10 (25)		Brown to grey SILTY SAND, trace to some clay
2	SS 3	100	7-8-9-5 (17)		Brown to grey gravelly silt, some sand, trace clay with possible cobbles (GLACIAL TILL)
3	SS 4	100	4-5-6-9 (11)		
4	SS 5	100	5-6-9-10 (15)		
5	SS 6	100	5-10-17-17 (27)		
	SS 7	100	10-22-29-26 (51)		
					
					
					
					
					
					
					
					

Bottom of borehole at 5.20 meters.

Appendix B

Laboratory Test Results



AllRock Consulting Ltd
24 Brydon Drive, Unit #5
M9W 5R6, Toronto, Ont.

Project: Bridle Park Development
Client: Crozier Consulting Engineers
Sample No. BH4
Date Sampled April 1, 2022

Project Number 22021
Sample Classification: _____
Sample Depth 2.5-4.5 ft
Date Tested: April 6, 2022

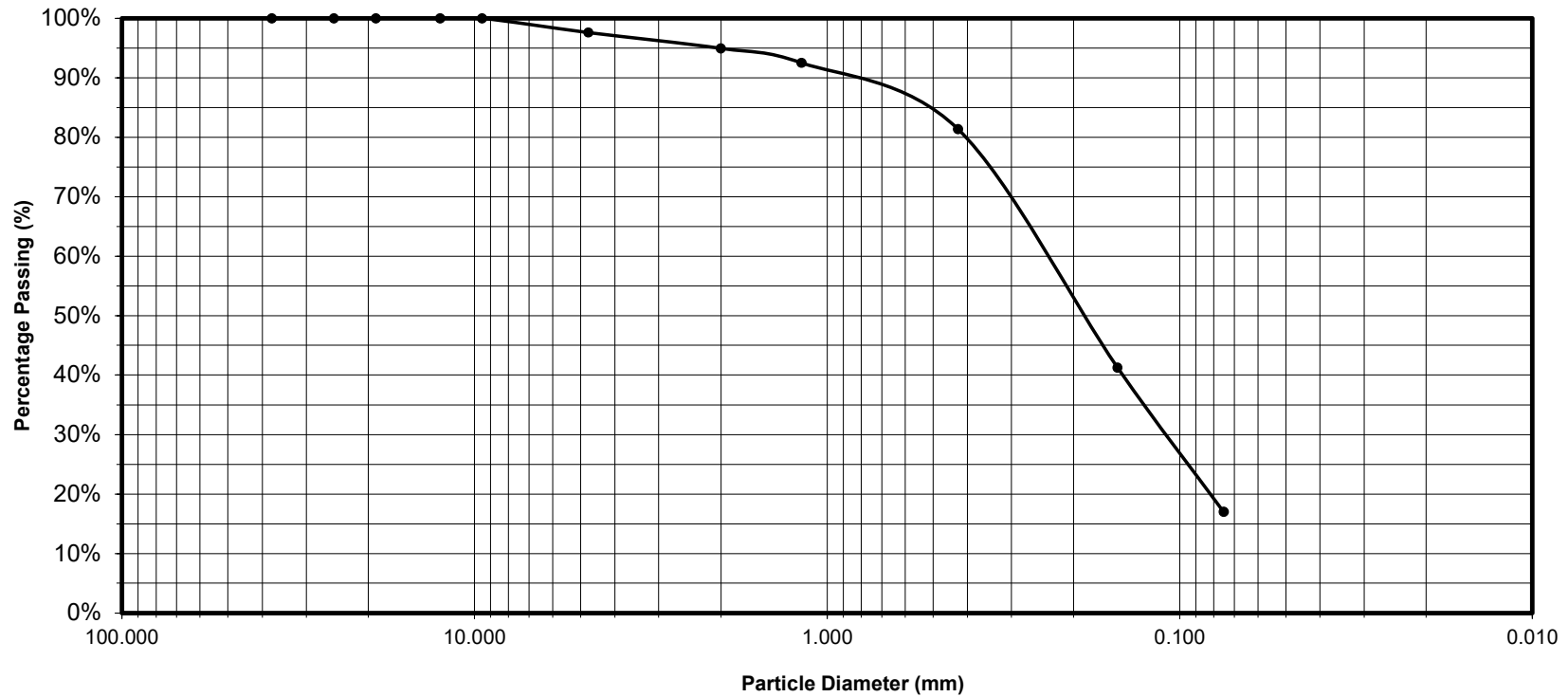




AllRock Consulting Ltd
24 Brydon Drive, Unit #5
M9W 5R6, Toronto, Ont.

Project: Bridle Park Development
Client: Crozier Consulting Engineers
Sample No. BH9
Date Sampled April 1, 2022

Project Number 22021
Sample Classification: _____
Sample Depth 5-7 ft
Date Tested: April 6, 2022





Sieve Analysis

LS-602

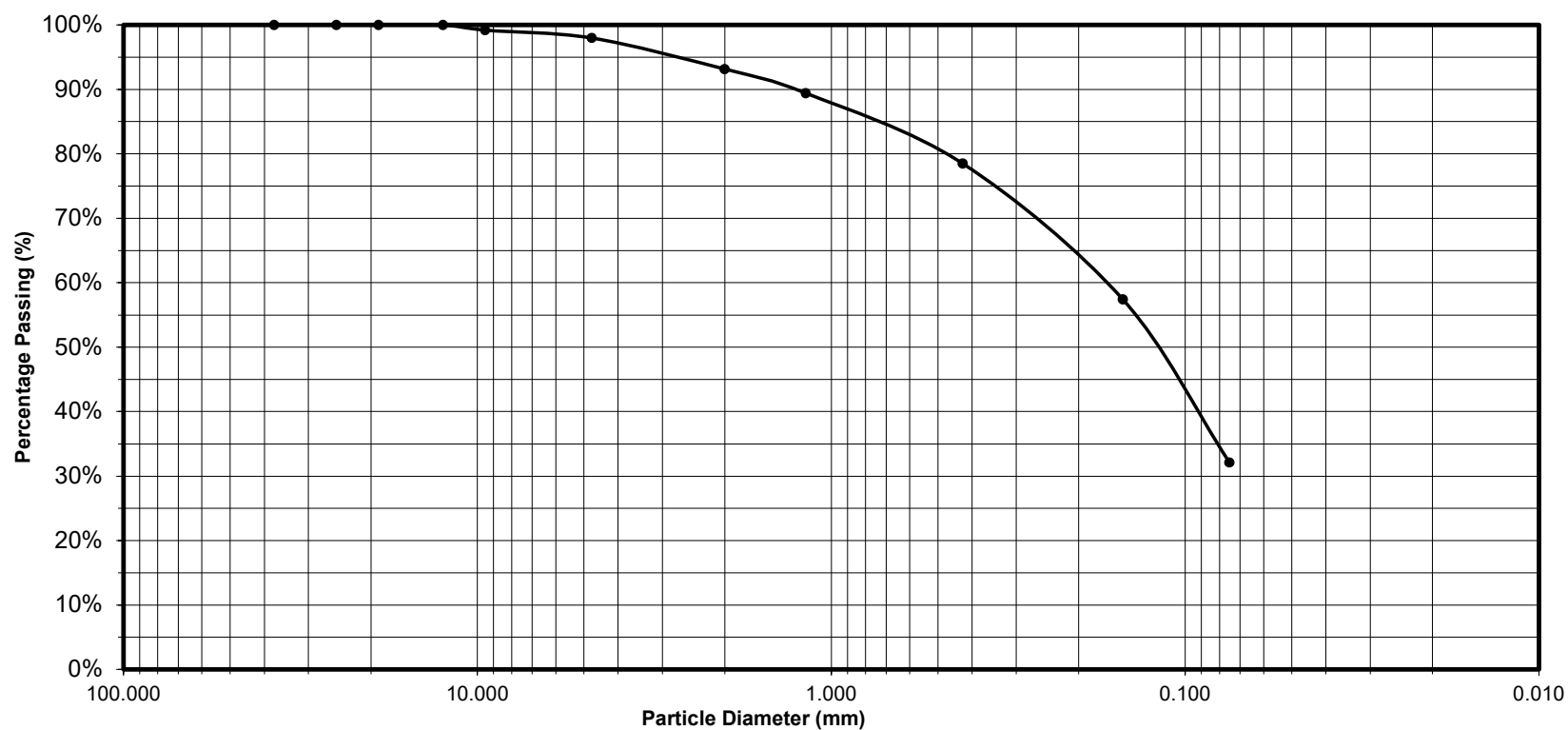


AllRock Consulting Ltd

24 Brydon Drive, Unit #5
M9W 5R6, Toronto, Ont.

Project: Bridle Park Development
Client: Crozier Consulting Engineers
Sample No. BH17
Date Sampled April 1, 2022

Project Number 22021
Sample Classification:
Sample Depth 7.5-9.5ft
Date Tested: April 6, 2022





Sieve Analysis

LS-602

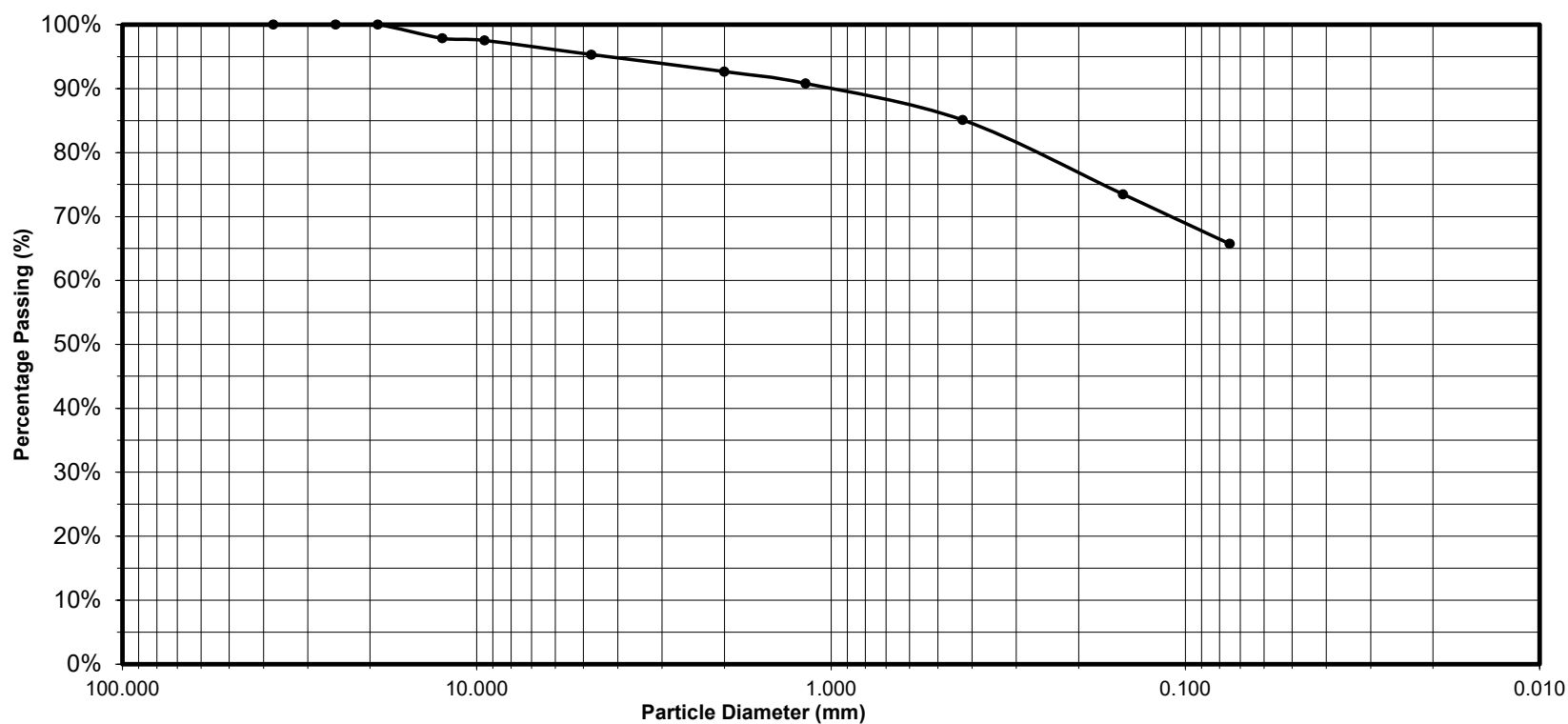


AllRock Consulting Ltd

24 Brydon Drive, Unit #5
M9W 5R6, Toronto, Ont.

Project: Bridle Park Development
Client: Crozier Consulting Engineers
Sample No. BH19
Date Sampled April 1, 2022

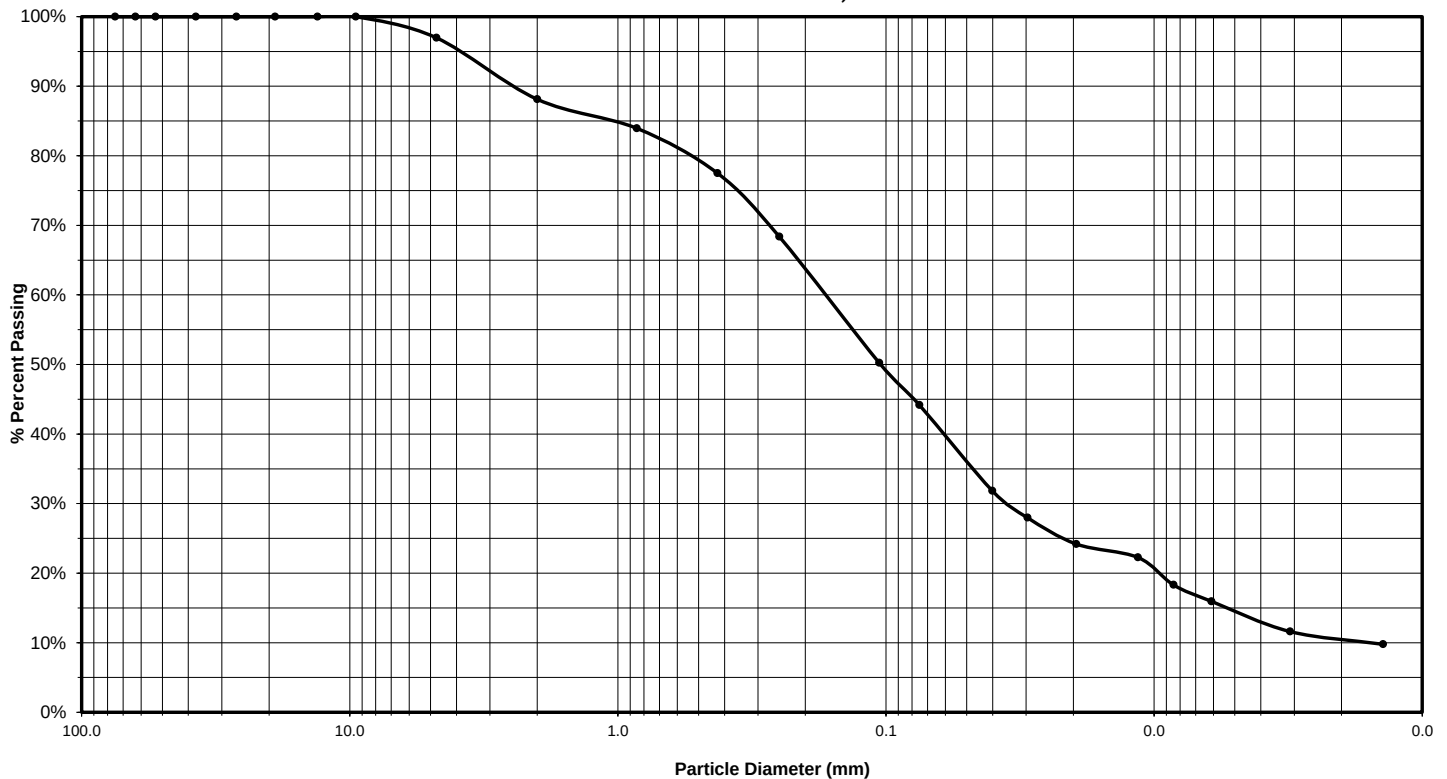
Project Number 22021
Sample Classification:
Sample Depth 10-12ft
Date Tested: April 6, 2022



Project Information	
Project Name:	Bridle Park Development
Project No.:	22021
Client:	Crozier Consulting Engineers
Borehole / Test Pit No.:	1
Sample Depth:	2.5-4.5 ft
Sample No.:	1
Sampled By:	AS
Date Sampled:	Friday, April 1, 2022
Sample Description:	
Sample Natural M/C %:	NOT TESTED
Tested By:	AH
Date Reviewed:	Friday, April 8, 2022
Reviewed By:	AH
Date Reviewed:	Thursday, April 14, 2022

Grain Size Analysis		Hydrometer Analysis	
Sieve Size (mm)	% Passing	Diameter (mm)	% Passing
75.0	100%	0.040101423	31.8%
63.0	100%	0.029658364	28.0%
53.0	100%	0.01950707	24.2%
37.5	100%	0.011486431	22.3%
26.5	100%	0.008462838	18.3%
19.0	100%	0.006109439	15.9%
13.2	100%	0.003111769	11.6%
9.5	100%	0.00139885	9.8%
4.8	97%		
2.0	88%		
0.850	84%		
0.425	77%		
0.250	68%		
0.106	50%		
0.075	44%		

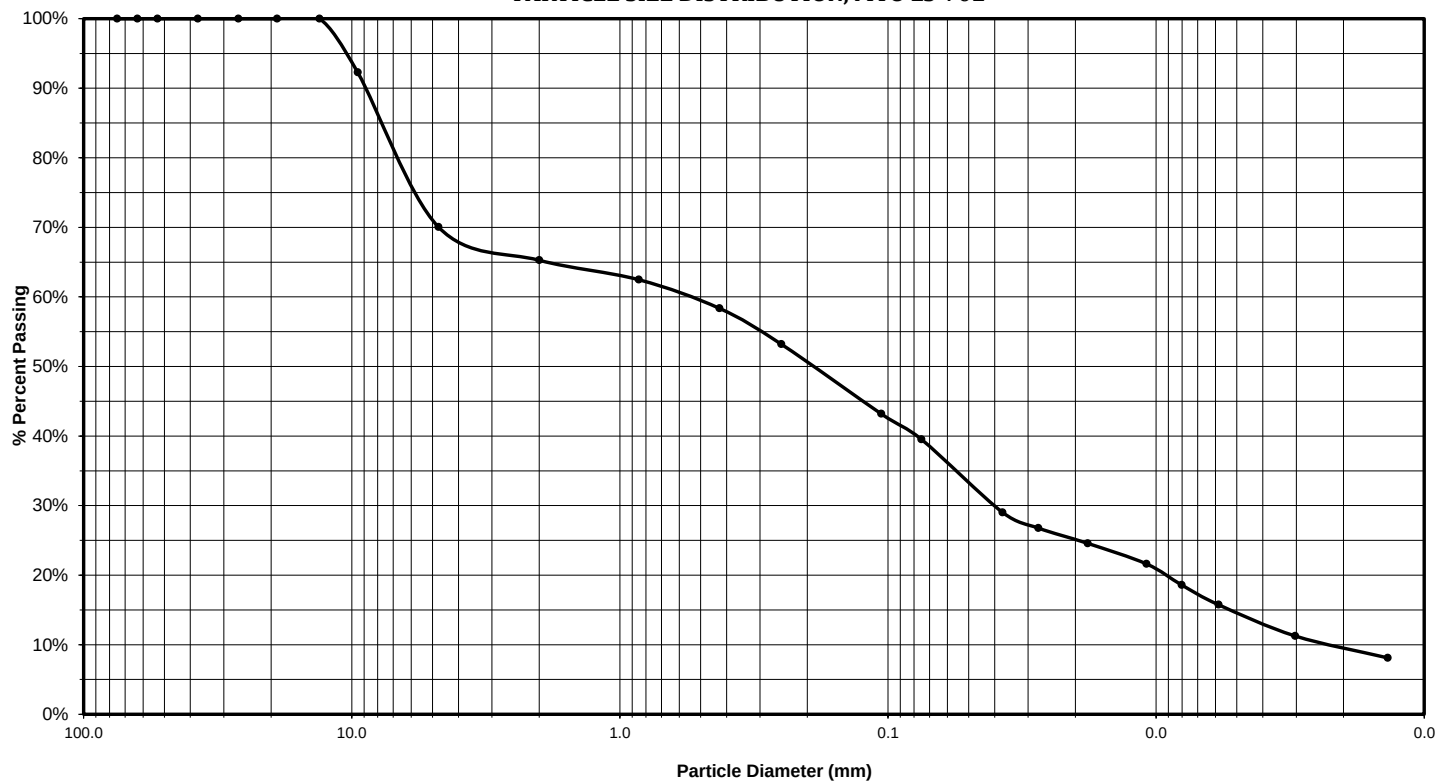
PARTICLE SIZE DISTRIBUTION, MTO LS-702



Project Information	
Project Name:	Bridle Park Development
Project No.:	22021
Client:	Crozier Consulting Engineers
Borehole / Test Pit No.:	1
Sample Depth:	7.5-9.5 ft
Sample No.:	2
Sampled By:	AS
Date Sampled:	Friday, April 1, 2022
Sample Description:	
Sample Natural M/C %:	NOT TESTED
Tested By:	AH
Date Reviewed:	Friday, April 8, 2022
Reviewed By:	AH
Date Reviewed:	Thursday, April 14, 2022

Grain Size Analysis		Hydrometer Analysis	
Sieve Size (mm)	% Passing	Diameter (mm)	% Passing
75.0	100%	0.037381868	29.0%
63.0	100%	0.027494799	26.8%
53.0	100%	0.017998502	24.6%
37.5	100%	0.010855764	21.6%
26.5	100%	0.008021566	18.6%
19.0	100%	0.005853602	15.8%
13.2	100%	0.003029238	11.3%
9.5	92%	0.00136866	8.1%
4.8	70%		
2.0	65%		
0.850	62%		
0.425	58%		
0.250	53%		
0.106	43%		
0.075	40%		

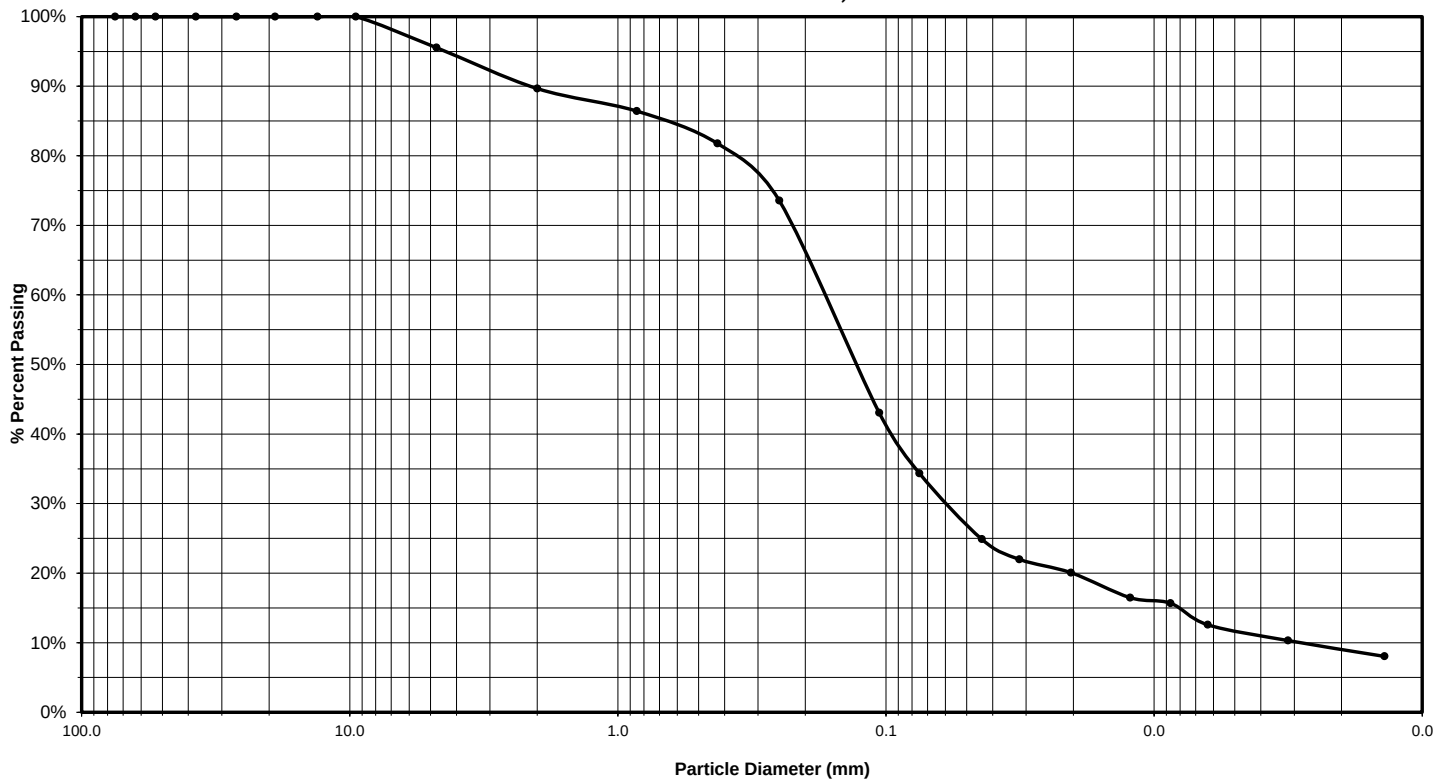
PARTICLE SIZE DISTRIBUTION, MTO LS-702



Project Information	
Project Name:	Bridle Park Development
Project No.:	22021
Client:	Crozier Consulting Engineers
Borehole / Test Pit No.:	4
Sample Depth:	12.5-14.5 ft
Sample No.:	3
Sampled By:	AS
Date Sampled:	Friday, April 1, 2022
Sample Description:	
Sample Natural M/C %:	9.2
Tested By:	AH
Date Reviewed:	Friday, April 8, 2022
Reviewed By:	AH
Date Reviewed:	Thursday, April 14, 2022

Grain Size Analysis		Hydrometer Analysis	
Sieve Size (mm)	% Passing	Diameter (mm)	% Passing
75.0	100%	0.043922817	24.9%
63.0	100%	0.031794109	22.0%
53.0	100%	0.020409139	20.1%
37.5	100%	0.012283286	16.5%
26.5	100%	0.008692035	15.7%
19.0	100%	0.006305828	12.6%
13.2	100%	0.003166237	10.3%
9.5	100%	0.001382786	8.0%
4.8	96%		
2.0	90%		
0.850	86%		
0.425	82%		
0.250	74%		
0.106	43%		
0.075	34%		

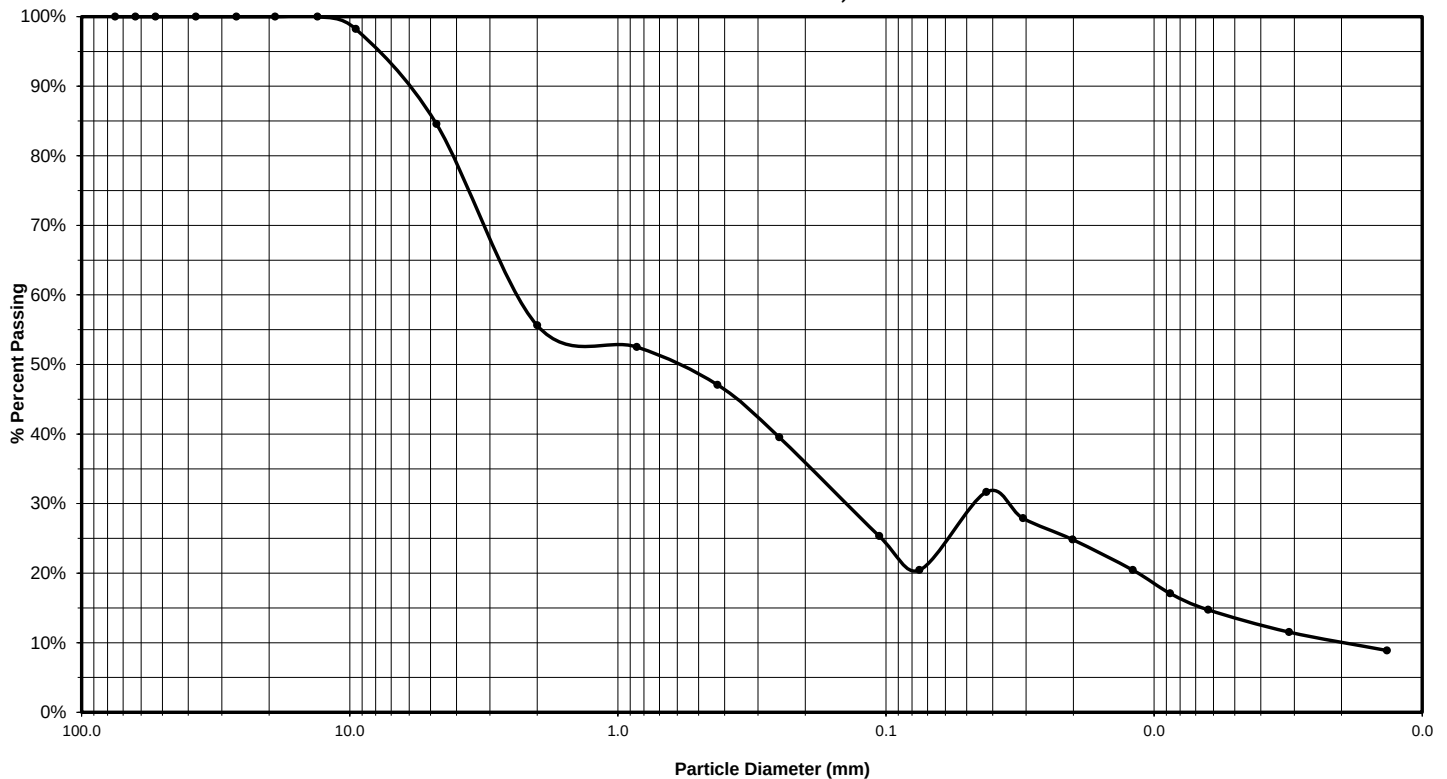
PARTICLE SIZE DISTRIBUTION, MTO LS-702



Project Information	
Project Name:	Bridle Park Development
Project No.:	22021
Client:	Crozier Consulting Engineers
Borehole / Test Pit No.:	6
Sample Depth:	5-7 ft
Sample No.:	4
Sampled By:	AS
Date Sampled:	Tuesday, January 4, 2022
Sample Description:	
Sample Natural M/C %:	6.7
Tested By:	AH
Date Reviewed:	Friday, April 8, 2022
Reviewed By:	AH
Date Reviewed:	Thursday, April 14, 2022

Grain Size Analysis		Hydrometer Analysis	
Sieve Size (mm)	% Passing	Diameter (mm)	% Passing
75.0	100%	0.042267095	31.7%
63.0	100%	0.030840514	27.9%
53.0	100%	0.020123283	24.8%
37.5	100%	0.012010944	20.4%
26.5	100%	0.00871299	17.1%
19.0	100%	0.006288301	14.7%
13.2	100%	0.003139404	11.5%
9.5	98%	0.001353443	8.9%
4.8	85%		
2.0	56%		
0.850	53%		
0.425	47%		
0.250	40%		
0.106	25%		
0.075	20%		

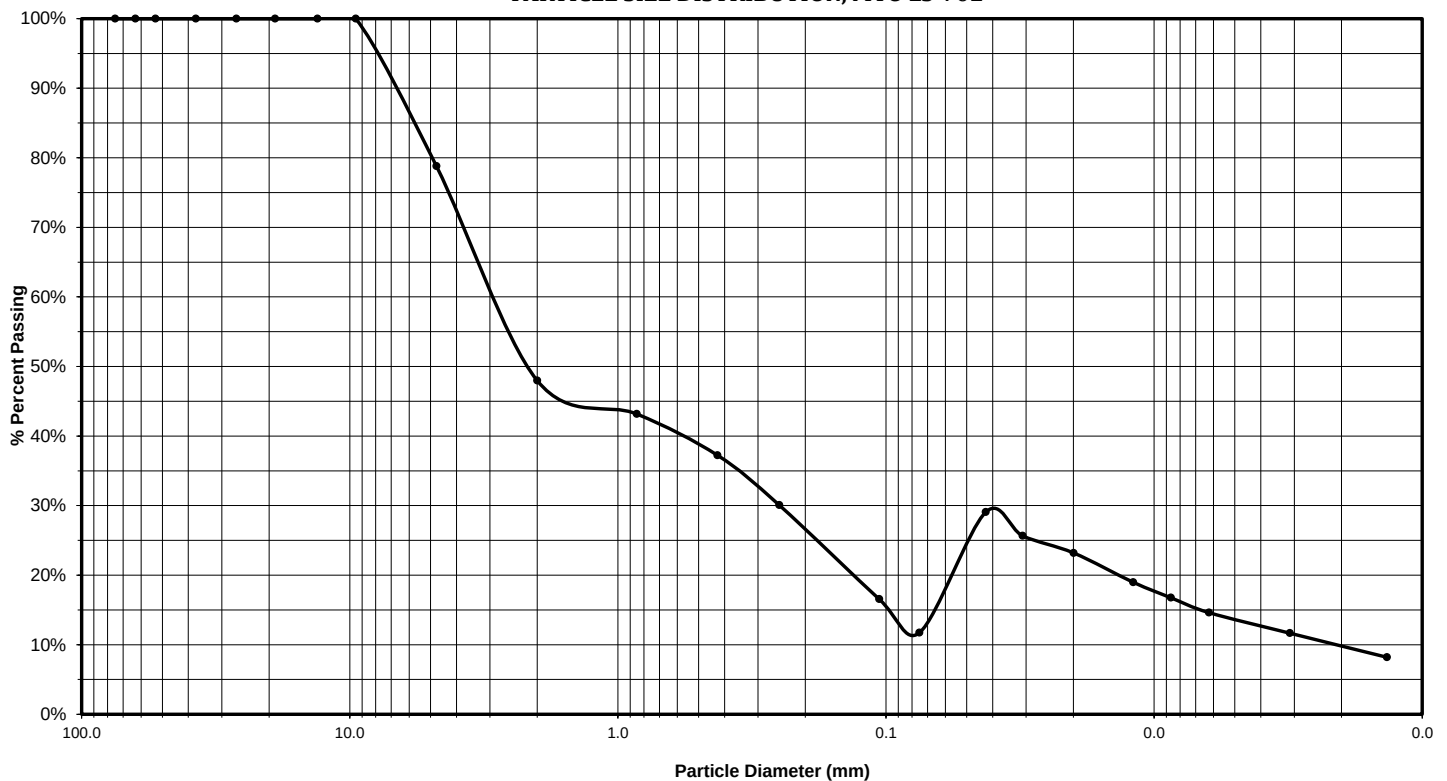
PARTICLE SIZE DISTRIBUTION, MTO LS-702



Project Information	
Project Name:	Bridle Park Development
Project No.:	22021
Client:	Crozier Consulting Engineers
Borehole / Test Pit No.:	8
Sample Depth:	10-12 ft
Sample No.:	5
Date Sampled:	Friday, April 1, 2022
Sampled By:	AS
Sample Description:	
Sample Natural M/C %:	6.8
Tested By:	AH
Date Reviewed:	Friday, April 8, 2022
Reviewed By:	AH
Date Reviewed:	Thursday, April 14, 2022

Grain Size Analysis		Hydrometer Analysis	
Sieve Size (mm)	% Passing	Diameter (mm)	% Passing
75.0	100%	0.0424704	29.1%
63.0	100%	0.0309142	25.7%
53.0	100%	0.019955157	23.2%
37.5	100%	0.011967757	19.0%
26.5	100%	0.008654086	16.8%
19.0	100%	0.006239798	14.6%
13.2	100%	0.003116261	11.7%
9.5	100%	0.001353443	8.2%
4.8	79%		
2.0	48%		
0.850	43%		
0.425	37%		
0.250	30%		
0.106	17%		
0.075	12%		

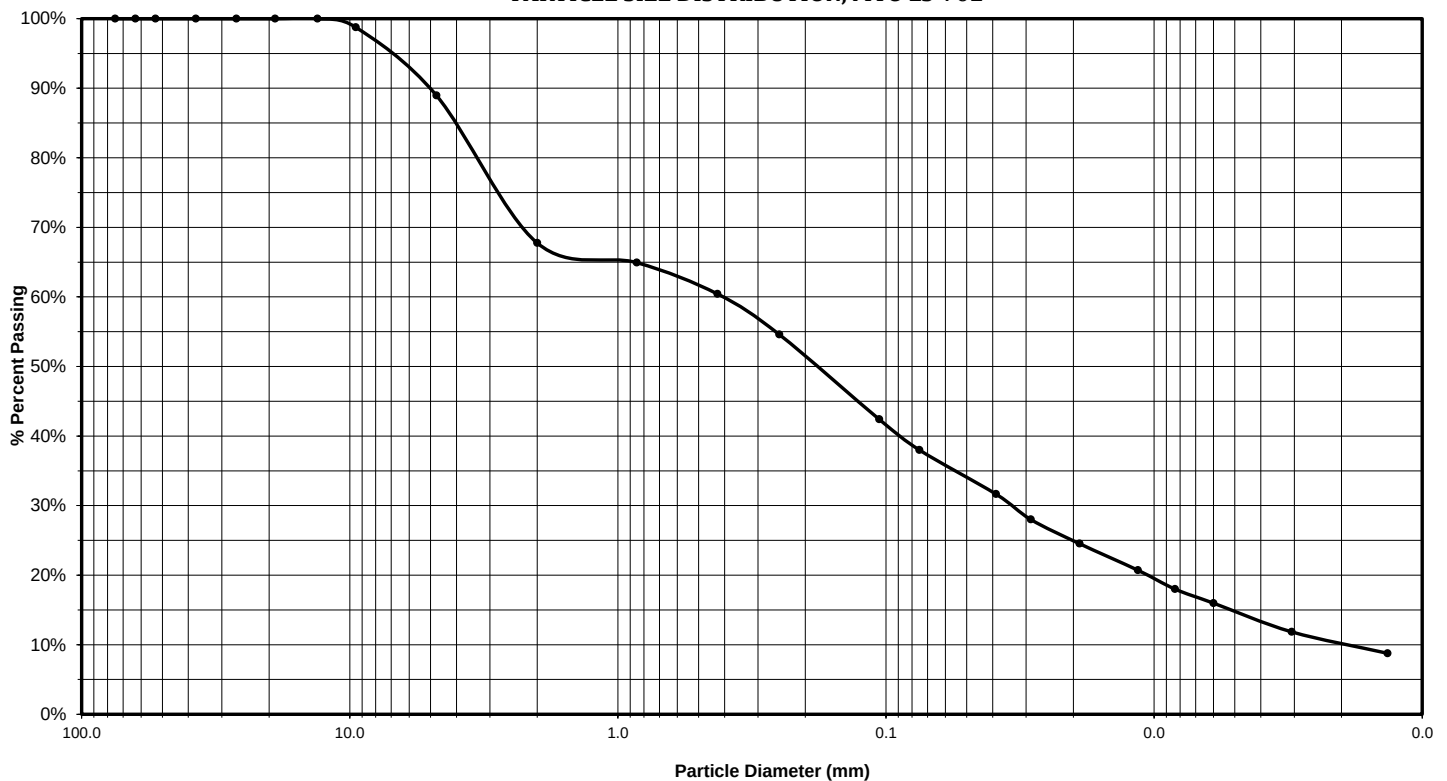
PARTICLE SIZE DISTRIBUTION, MTO LS-702



Project Information	
Project Name:	Bridle Park Development
Project No.:	22021
Client:	Crozier Consulting Engineers
Borehole / Test Pit No.:	14
Sample Depth:	7.5-9.5
Sample No.:	6
Sampled By:	AS
Date Sampled:	Tuesday, January 4, 2022
Sample Description:	
Sample Natural M/C %:	8.0
Tested By:	AH
Date Tested:	Friday, April 8, 2022
Reviewed By:	AH
Date Reviewed:	Thursday, April 14, 2022

Grain Size Analysis		Hydrometer Analysis	
Sieve Size (mm)	% Passing	Diameter (mm)	% Passing
75.0	100%	0.038877048	31.6%
63.0	100%	0.028840512	28.0%
53.0	100%	0.018976976	24.5%
37.5	100%	0.011486431	20.7%
26.5	100%	0.008360518	18.0%
19.0	100%	0.006001544	16.0%
13.2	100%	0.003065747	11.8%
9.5	99%	0.00134572	8.8%
4.8	89%		
2.0	68%		
0.850	65%		
0.425	60%		
0.250	55%		
0.106	42%		
0.075	38%		

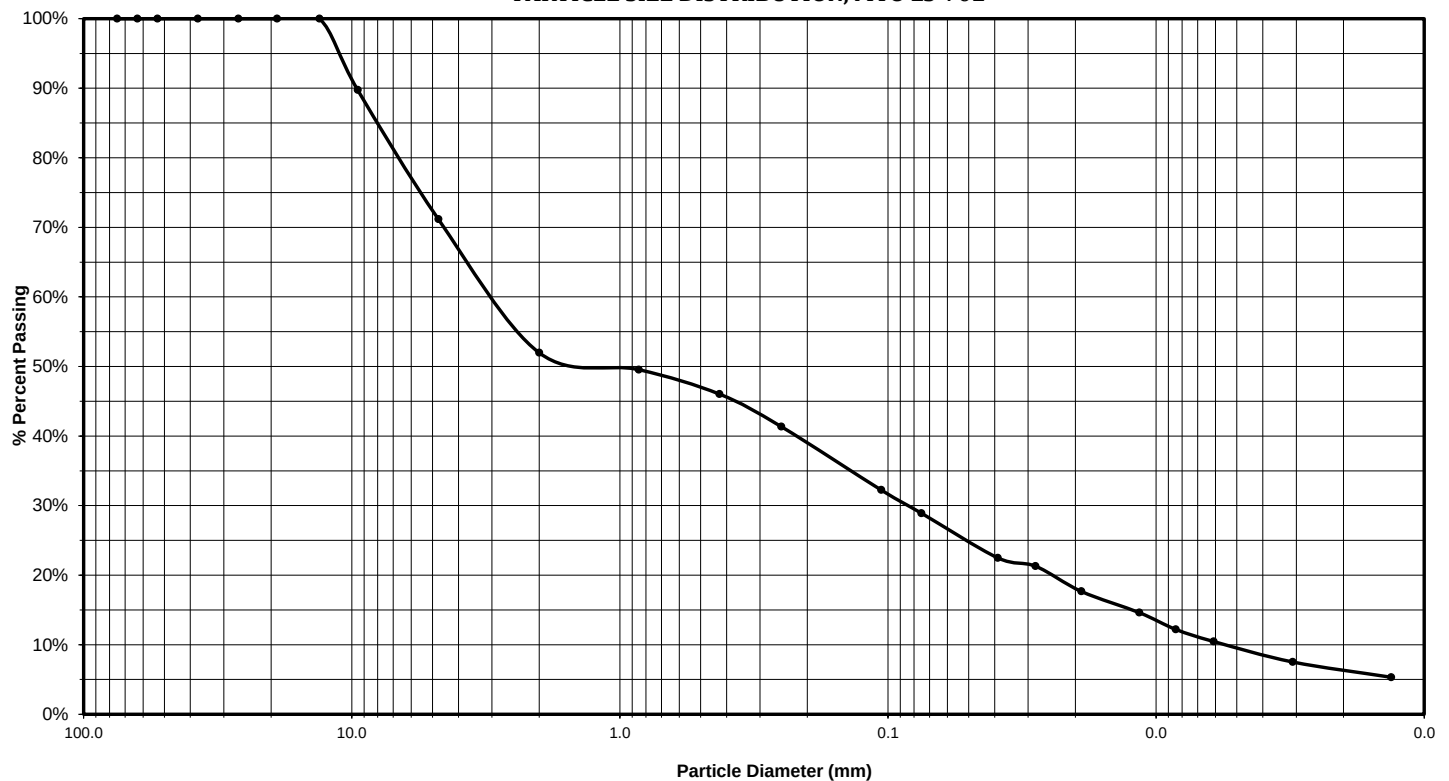
PARTICLE SIZE DISTRIBUTION, MTO LS-702



Project Information	
Project Name:	Bridle Park Development
Project No.:	22021
Client:	Crozier Consulting Engineers
Borehole / Test Pit No.:	18
Sample Depth:	12.5-14.5 ft
Sample No.:	7
Sampled By:	AS
Date Sampled:	Friday, April 1, 2022
Sample Description:	
Sample Natural M/C %:	7.6
Tested By:	AH
Date Reviewed:	Tuesday, April 12, 2022
Reviewed By:	AH
Date Reviewed:	Thursday, April 14, 2022

Grain Size Analysis		Hydrometer Analysis	
Sieve Size (mm)	% Passing	Diameter (mm)	% Passing
75.0	100%	0.038934995	22.5%
63.0	100%	0.028158998	21.3%
53.0	100%	0.019009238	17.7%
37.5	100%	0.011548796	14.6%
26.5	100%	0.008452503	12.2%
19.0	100%	0.006099384	10.5%
13.2	100%	0.003092944	7.5%
9.5	90%	0.001328848	5.3%
4.8	71%		
2.0	52%		
0.850	50%		
0.425	46%		
0.250	41%		
0.106	32%		
0.075	29%		

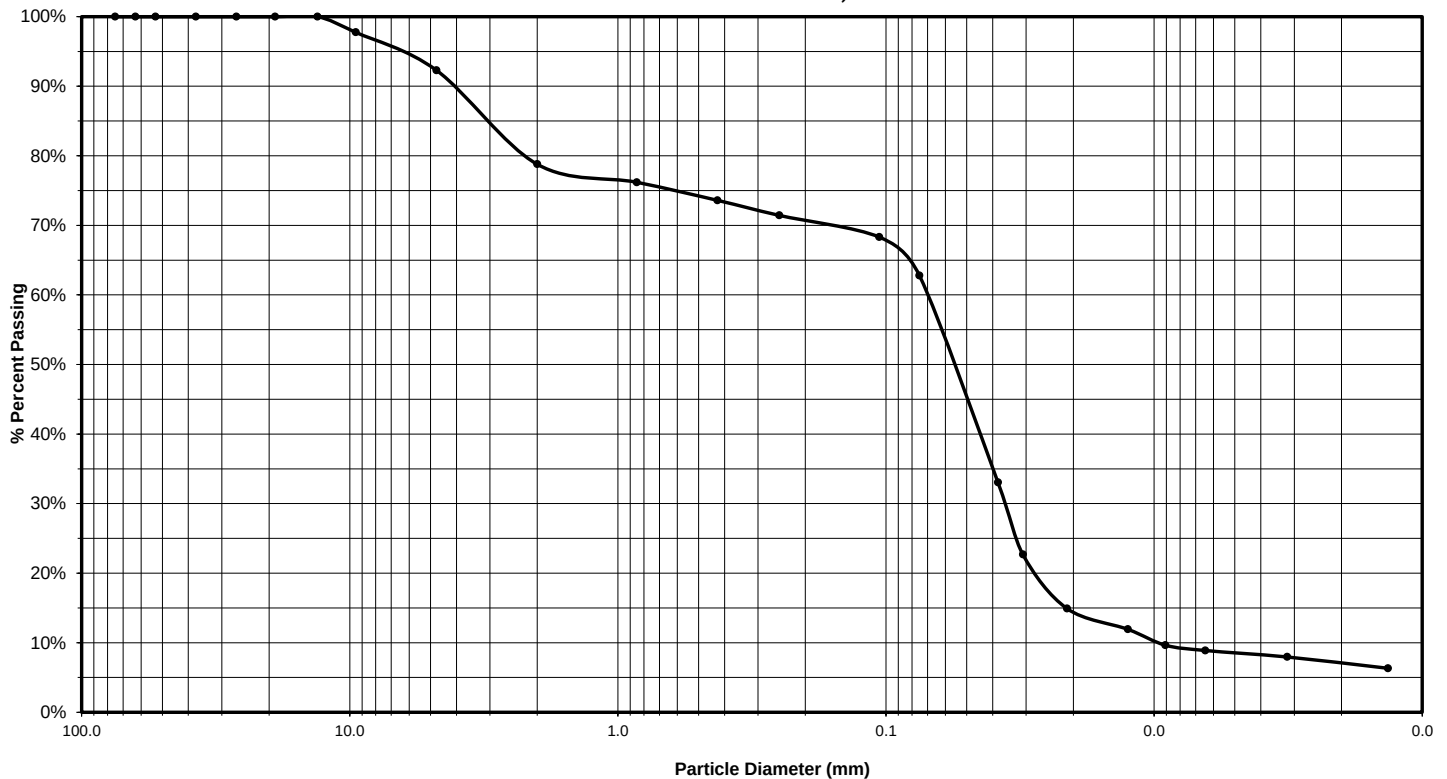
PARTICLE SIZE DISTRIBUTION, MTO LS-702



Project Information	
Project Name:	Bridle Park Development
Project No.:	22021
Client:	Crozier Consulting Engineers
Borehole / Test Pit No.:	20
Sample Depth:	5-7 ft
Sample No.:	8
Sampled By:	AS
Date Sampled:	Friday, April 1, 2022
Sample Description:	
Sample Natural M/C %:	19.4
Tested By:	AH
Date Reviewed:	Tuesday, April 12, 2022
Reviewed By:	AH
Date Reviewed:	Thursday, April 14, 2022

Grain Size Analysis		Hydrometer Analysis	
Sieve Size (mm)	% Passing	Diameter (mm)	% Passing
75.0	100%	0.038224218	33.0%
63.0	100%	0.030848176	22.7%
53.0	100%	0.021128885	14.9%
37.5	100%	0.012528193	11.9%
26.5	100%	0.009083873	9.7%
19.0	100%	0.006439439	8.9%
13.2	100%	0.003189407	7.9%
9.5	98%	0.001341464	6.3%
4.8	92%		
2.0	79%		
0.850	76%		
0.425	74%		
0.250	71%		
0.106	68%		
0.075	63%		

PARTICLE SIZE DISTRIBUTION, MTO LS-702



Appendix C

ALS Corrosion Test Results



ALLROCK CONSULTING LIMITED
ATTN: Akhila Srinivasan
5-24 Brydon Avenue
Toronto ON M9W 5R6

Date Received: 06-APR-22
Report Date: 14-APR-22 06:44 (MT)
Version: FINAL

Client Phone: 647-528-4659

Certificate of Analysis

Lab Work Order #: L2697339

Project P.O. #: 22021/STAYNER BRIDLE PARK

Job Reference: 22021/STAYNER BRIDLE PARK

C of C Numbers:

Legal Site Desc:

Costas Farassoglou
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 190 Colonnade Road, Unit 7, Ottawa, ON K2E 7J5 Canada | Phone: +1 613 225 8279 | Fax: +1 613 225 2801
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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters		Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2697339-1 BH2 5-7FT Sampled By: CLIENT on 01-APR-22 @ 16:30 Matrix: SOIL Physical Tests Conductivity % Moisture pH Redox Potential Resistivity Leachable Anions & Nutrients Chloride Anions and Nutrients Sulphate Inorganic Parameters Acid Volatile Sulphides								
		0.129		0.0040	mS/cm		12-APR-22	R5762035
		6.06		0.25	%	07-APR-22	08-APR-22	R5757874
		8.05		0.10	pH units		08-APR-22	R5759520
		291		-1000	mV		13-APR-22	R5762455
		7750		1.0	ohm*cm		12-APR-22	
		6.0		5.0	ug/g	08-APR-22	11-APR-22	R5761555
		46		20	ug/g	08-APR-22	11-APR-22	R5761555
		0.28	AVSH	0.20	mg/kg	07-APR-22	07-APR-22	R5758382
L2697339-2 BH9 7.5-9.5FT Sampled By: CLIENT on 01-APR-22 @ 16:30 Matrix: SOIL Physical Tests Conductivity % Moisture pH Redox Potential Resistivity Leachable Anions & Nutrients Chloride Anions and Nutrients Sulphate Inorganic Parameters Acid Volatile Sulphides								
		0.112	FR5	0.0080	mS/cm		12-APR-22	R5762082
		16.5		0.25	%	07-APR-22	08-APR-22	R5757874
		7.91		0.10	pH units		08-APR-22	R5759520
		282		-1000	mV		13-APR-22	R5762455
		8900		1.0	ohm*cm		12-APR-22	
		<5.0		5.0	ug/g	11-APR-22	12-APR-22	R5762273
		22		20	ug/g	11-APR-22	12-APR-22	R5762273
		<0.20	AVSH	0.20	mg/kg	07-APR-22	07-APR-22	R5758382
L2697339-3 BH11 5-7FT Sampled By: CLIENT on 01-APR-22 @ 16:30 Matrix: SOIL Physical Tests Conductivity % Moisture pH Redox Potential Resistivity Leachable Anions & Nutrients Chloride Anions and Nutrients Sulphate Inorganic Parameters Acid Volatile Sulphides								
		0.126		0.0040	mS/cm		12-APR-22	R5762035
		7.92		0.25	%	07-APR-22	08-APR-22	R5757874
		8.04		0.10	pH units		08-APR-22	R5759520
		278		-1000	mV		13-APR-22	R5762455
		7960		1.0	ohm*cm		12-APR-22	
		5.6		5.0	ug/g	08-APR-22	11-APR-22	R5761555
		47		20	ug/g	08-APR-22	11-APR-22	R5761555
		0.31	AVSH	0.20	mg/kg	07-APR-22	07-APR-22	R5758382
L2697339-4 BH15 7.5-9.5FT Sampled By: CLIENT on 01-APR-22 @ 16:30 Matrix: SOIL								

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Sample Details/Parameters		Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2697339-4	BH15 7.5-9.5FT							
Sampled By:	CLIENT on 01-APR-22 @ 16:30							
Matrix:	SOIL							
Physical Tests								
Conductivity		0.183		0.0040	mS/cm		12-APR-22	R5762035
% Moisture		7.05		0.25	%	07-APR-22	08-APR-22	R5757874
pH		7.99		0.10	pH units		08-APR-22	R5759520
Redox Potential		285		-1000	mV		13-APR-22	R5762455
Resistivity		5470		1.0	ohm*cm		12-APR-22	
Leachable Anions & Nutrients								
Chloride		<5.0		5.0	ug/g	08-APR-22	11-APR-22	R5761555
Anions and Nutrients								
Sulphate		97		20	ug/g	08-APR-22	11-APR-22	R5761555
Inorganic Parameters								
Acid Volatile Sulphides		<0.20	AVSH	0.20	mg/kg	07-APR-22	07-APR-22	R5758382

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Sample Parameter Qualifier key listed:

Qualifier	Description
AVSH	Acid Volatile Sulfide analysis was conducted on soil sample with > 5% headspace. Air exposure can cause sulfide oxidation and low bias.
FR5	As per applicable reference method(s), soil:water ratio for Fixed Ratio Leach was modified to 1:5 due to high soil organic content.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CL-R511-WT	Soil	Chloride-O.Reg 153/04 (July 2011)	EPA 300.0
5 grams of dried soil is mixed with 10 grams of distilled water for a minimum of 30 minutes. The extract is filtered and analyzed by ion chromatography.			
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011 and as of November 30, 2020), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).			
EC-WT	Soil	Conductivity (EC)	MOEE E3138
A representative subsample is tumbled with de-ionized (DI) water. The ratio of water to soil is 2:1 v/w. After tumbling the sample is then analyzed by a conductivity meter.			
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).			
MOISTURE-WT	Soil	% Moisture	CCME PHC in Soil - Tier 1 (mod)
PH-WT	Soil	pH	MOEE E3137A
A minimum 10g portion of the sample is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil and then analyzed using a pH meter and electrode.			
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).			
REDOX-POTENTIAL-WT	Soil	Redox Potential	APHA 2580
This analysis is carried out in accordance with the procedure described in the "APHA" method 2580 "Oxidation-Reduction Potential" 2012. Samples are extracted at a fixed ratio with DI water. Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.			
RESISTIVITY-CALC-WT	Soil	Resistivity Calculation	APHA 2510 B
"Soil Resistivity (calculated)" is determined as the inverse of the conductivity of a 2:1 water:soil leachate (dry weight). This method is intended as a rapid approximation for Soil Resistivity. Where high accuracy results are required, direct measurement of Soil Resistivity by the Wenner Four-Electrode Method (ASTM G57) is recommended.			
SO4-WT	Soil	Sulphate	EPA 300.0
5 grams of soil is mixed with 50 mL of distilled water for a minimum of 30 minutes. The extract is filtered and analyzed by ion chromatography.			
SULPHIDE-WT	Soil	Sulphide, Acid Volatile	APHA 4500S2J
This analysis is carried out in accordance with the method described in APHA 4500 S2-J. Hydrochloric acid is added to sediment samples within a purge and trap system. The evolved hydrogen sulphide (H2S) is carried into a basic solution by inert gas. The acid volatile sulfide is then determined colourimetrically.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

- mg/kg - milligrams per kilogram based on dry weight of sample*
- mg/kg wwwt - milligrams per kilogram based on wet weight of sample*
- mg/kg lwt - milligrams per kilogram based on lipid weight of sample*
- mg/L - unit of concentration based on volume, parts per million.*
- < - Less than.*
- D.L. - The reporting limit.*
- N/A - Result not available. Refer to qualifier code and definition for explanation.*

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

MOISTURE-WT Soil

Quality Control Report

Workorder: L2697339

Report Date: 14-APR-22

Page 2 of 4

Client: ALLROCK CONSULTING LIMITED
5-24 Brydon Avenue
Toronto ON M9W 5R6

Contact: Akhila Srinivasan

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MOISTURE-WT		Soil						
Batch	R5757874							
WG3714574-3	DUP	L2697409-1						
% Moisture		13.2	13.3		%	1.0	20	08-APR-22
WG3714574-2	LCS							
% Moisture			99.4		%		90-110	08-APR-22
WG3714574-1	MB							
% Moisture			<0.25		%		0.25	08-APR-22
PH-WT		Soil						
Batch	R5759520							
WG3715042-1	DUP	L2697699-21						
pH		7.82	7.78	J	pH units	0.04	0.3	08-APR-22
WG3715318-1	LCS							
pH			7.01		pH units		6.9-7.1	08-APR-22
REDOX-POTENTIAL-WT		Soil						
Batch	R5762455							
WG3716982-1	CRM	WT-REDOX						
Redox Potential			103.4		%		90-110	13-APR-22
WG3715051-1	DUP	L2697339-1						
Redox Potential		291	280		mV	3.9	25	13-APR-22
SO4-WT		Soil						
Batch	R5761555							
WG3715270-3	CRM	AN-CRM-WT						
Sulphate			95.7		%		60-140	11-APR-22
WG3715270-4	DUP	WG3715270-5						
Sulphate		47	46		ug/g	2.3	25	11-APR-22
WG3715270-2	LCS							
Sulphate			100.0		%		70-130	11-APR-22
WG3715270-1	MB							
Sulphate			<20		ug/g		20	11-APR-22
Batch	R5762273							
WG3716034-8	CRM	AN-CRM-WT						
Sulphate			98.0		%		60-140	12-APR-22
WG3716034-9	DUP	WG3716034-10						
Sulphate		76	78		ug/g	1.7	25	12-APR-22
WG3716034-7	LCS							
Sulphate			99.0		%		70-130	12-APR-22
WG3716034-6	MB							
Sulphate			<20		ug/g		20	12-APR-22

Quality Control Report

Workorder: L2697339

Report Date: 14-APR-22

Page 3 of 4

Client: ALLROCK CONSULTING LIMITED
5-24 Brydon Avenue
Toronto ON M9W 5R6

Contact: Akhila Srinivasan

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SULPHIDE-WT								
Soil								
Batch	R5758382							
WG3714828-3 DUP		L2697035-1						
Acid Volatile Sulphides		0.47	0.50		mg/kg	6.8	45	07-APR-22
WG3714828-2 LCS								
Acid Volatile Sulphides			77.3		%		70-130	07-APR-22
WG3714828-1 MB								
Acid Volatile Sulphides			<0.20		mg/kg		0.2	07-APR-22

Quality Control Report

Workorder: L2697339

Report Date: 14-APR-22

Client: ALLROCK CONSULTING LIMITED
5-24 Brydon Avenue
Toronto ON M9W 5R6
Contact: Akhila Srinivasan

Page 4 of 4

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes 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 pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

41D)

[illegible]

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

WHITE - LABORATORY COPY

YELLOW - CLIENT COPY

ALX: 24.25 FRONT

Appendix D

Infiltration Test Results



GUEPLH PERMEAMETER TEST



AllRock Consulting Ltd
24 Brydon Drive, Unit #5
Etobicoke, ON. M9W 5R6

Project Information	
Project Name	Bridle Park Development
Project Number	22021
Client	Crozier Consulting Engineers
Test Number	1
Location Coordinates	44.42235N, 80.10648W
Tested By	AD
Date Tested	July 1, 2022
Reviewed By	GD
Date Reviewed	July 29, 2022

Guelph Permeameter Results	
Method Used	Single Head
Reservoir Type Used	Inner
Microscopic Capillary Length Factor Used	0.12
Infiltration Rate (mm/hr)	0.96
Soil Matric Flux Potential (cm ² /min)	2.22E-04



GUEPLH PERMEAMETER TEST



AllRock Consulting Ltd
24 Brydon Drive, Unit #5
Etobicoke, ON. M9W 5R6

Project Information	
Project Name	Bridle Park Development
Project Number	22021
Client	Crozier Consulting Engineers
Test Number	2
Location Coordinates	44.42356N, 80.10193W
Tested By	AD
Date Tested	July 1, 2022
Reviewed By	GD
Date Reviewed	July 29, 2022

Guelph Permeameter Results	
Method Used	Single Head
Reservoir Type Used	Combined
Microscopic Capillary Length Factor Used	0.12
Infiltration Rate (mm/hr)	111.37
Soil Matric Flux Potential (cm ² /min)	2.58E-02



GUEPLH PERMEAMETER TEST



AllRock Consulting Ltd
24 Brydon Drive, Unit #5
Etobicoke, ON. M9W 5R6

Project Information	
Project Name	Bridle Park Development
Project Number	22021
Client	Crozier Consulting Engineers
Test Number	3
Location Coordinates	44.42471N, 80.10479W
Tested By	AD
Date Tested	July 1, 2022
Reviewed By	GD
Date Reviewed	July 29, 2022

Guelph Permeameter Results	
Method Used	Single Head
Reservoir Type Used	Inner
Microscopic Capillary Length Factor Used	0.12
Infiltration Rate (mm/hr)	0.71
Soil Matric Flux Potential (cm ² /min)	1.65E-04



GUEPLH PERMEAMETER TEST



AllRock Consulting Ltd
24 Brydon Drive, Unit #5
Etobicoke, ON. M9W 5R6

Project Information	
Project Name	Bridle Park Development
Project Number	22021
Client	Crozier Consulting Engineers
Test Number	4
Location Coordinates	44.42561N, 80.10202W
Tested By	AD
Date Tested	July 1, 2022
Reviewed By	GD
Date Reviewed	July 29, 2022

Guelph Permeameter Results	
Method Used	Single Head
Reservoir Type Used	Inner
Microscopic Capillary Length Factor Used	0.12
Infiltration Rate (mm/hr)	1.56
Soil Matric Flux Potential (cm ² /min)	3.60E-04



GUEPLH PERMEAMETER TEST



AllRock Consulting Ltd
24 Brydon Drive, Unit #5
Etobicoke, ON. M9W 5R6

Project Information	
Project Name	Bridle Park Development
Project Number	22021
Client	Crozier Consulting Engineers
Test Number	5
Location Coordinates	44.42607N, 80.10828W
Tested By	AD
Date Tested	July 1, 2022
Reviewed By	GD
Date Reviewed	July 29, 2022

Guelph Permeameter Results	
Method Used	Single Head
Reservoir Type Used	Inner
Microscopic Capillary Length Factor Used	0.12
Infiltration Rate (mm/hr)	0.59
Soil Matric Flux Potential (cm ² /min)	1.36E-04