Geotechnical Investigation Report

Proposed Commercial Development
1533 McAdoo's Lane, Kingston, Ontario

Report for
American Iron & Metal

374 Pido Road Peterborough Ontario K9J 6X7 Canada | 11212206 | 01 | Report No 1 | May 28, 2020

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1. Introduction

This report presents the results of a Geotechnical Investigation that was conducted to support design and construction of a proposed commercial redevelopment considered at the municipal address of 1533 McAdoo's Lane, Kingston, Ontario. GHD Limited (GHD) was retained by American Iron & Metal (the Client) to complete this geotechnical investigation. The work conducted for this investigation was carried out in accordance with our proposal PG-4789 dated March 27, 2020 and subsequent email communication with the Client.

It is GHD's understanding that the proposed project will include a 1-storey slab on grade building, an 80' long truck scale, associated servicing and parking/access paved and gravel areas. Information provided to GHD included a site plan illustrating site location, proposed development layout. The proposed final grading for the site was not available to GHD at the time of writing this report.

2. Purpose and Scope

The purpose of this geotechnical investigation is to define the subsurface soil and groundwater conditions at the project site and to develop geotechnical engineering recommendations regarding earthworks construction, backfill material, building foundations, slabs-on-grade, and structure for asphalt paved access/parking areas. The information contained herein must in no way be construed as an opinion of this site's chemical, environmental, or hydrogeological status.

The following scope of work was performed in order to accomplish the foregoing purposes:

1. Underground services were cleared prior to advancing the boreholes.
2. The test pits were located as shown on the Test Hole Plan (Figure 1).
3. The subsurface soils conditions were explored by advancing, sampling and logging a total of fourteen (14) test pits to depths ranging from 0.0 to 1.5 metres (m) below existing grade, at which practical refusal to further excavation was encountered.
4. The ground at the test pit locations was reinstated as close as possible to its original condition upon completion of the fieldwork.
5. Physical laboratory analysis of the encountered material was carried out including grain size analysis and moisture content tests.
6. Geotechnical engineering analysis of acquired field and laboratory data have been compiled in this report outlining our findings, conclusions, and geotechnical engineering recommendations.

3. Field and Laboratory Procedures

A field investigation was conducted under the supervision of GHD staff on April 29, 2020. The work consisted of subsurface exploration by means of advancing and sampling a total of fourteen (14) exploratory test pits to depths ranging from 0.0 to 1.5 m, depths at which practical refusal to further excavation was encountered by the equipment being used. The location of each test pit is illustrated on the attached Test Hole Plan (Figure 1).

A detailed log of each test pit was maintained and representative samples of the materials encountered in the test pits were collected. A detailed log of each test pit is presented in Appendix A.

The test pits were advanced using a track mounted mini excavator. A detailed log of each test pit was maintained, and representative, disturbed samples of the strata penetrated were collected directly from the excavator's bucket. A detailed log of each test pit is presented in Appendix A.

Soil samples obtained from the test pits were inspected in the field immediately upon retrieval for type, texture, and colour. All test pits were backfilled following completion of the fieldwork. All samples were sealed in clean plastic containers and transported to the GHD's laboratory for further visual-tactile examination, and to select appropriate samples for laboratory analysis.

Groundwater measurements and observations were obtained from the open test pits during the excavation operations.

Physical laboratory testing was completed on soil samples, and consisted of moisture content tests on all samples recovered and gradation analyses on a total of four (4) representative soil samples (including hydrometers in two(2) of these samples). The analytical results of the moisture content tests are plotted on the attached logs. The results of the gradation tests are incorporated into the test pit logs, and are presented graphically in Appendix B.

4. Site Location and Surface Conditions

The investigated site is located at municipal address 1533 McAdoo's Lane, in the City of Kingston, Ontario. The Site is situated along the south and east sides of side of McAddo's Lane. The Site is generally flat gently sloping down to the south and west.

The site presently supports a mini golf, a go-kart track, batting cages, and a drive-in theatre. Surrounding properties consist of a gravel pit to the north, a horse racing track to the south, and a mixture of residential, commercial and undeveloped properties to the east and west.

5. Subsurface Conditions

Details of the subsurface conditions encountered at the Site are graphically presented on the test pit logs (Appendix A). It should be noted that the boundaries between the strata have been inferred from the test pit observations and non-continuous samples. They generally represent a transition from one soil type to another, and should not be inferred to represent an exact plane of geological change. Further, conditions may vary between and beyond the boreholes.

The test pits generally encountered a surficial layer of topsoil, over occasional layer of soils consisting of sandy gravel fill or native clayey silt underlain by bedrock. Bedrock refusal was encountered in all of the test pits at depths ranging from 0.0 to 1.5 m. Groundwater seepage and/or accumulation was observed in three (3) test pits (TP-02, TP-05 and TP-13) at depths ranging from 0.8 to 1.5 m.

The following sections describe the soil and groundwater conditions encountered in more detail.

5.1 Topsoil

A layer of surficial topsoil was encountered in all test pits with the exception of test pits TP-06 and TP-10. This topsoil layer ranged from approximately 150 to 760 mm in thickness. This soil was observed to be in a damp, loose state, with a silty, with gravel, highly organic content. As such, it is expected to be devoid of any structural engineering properties.

5.2 Fill

Fill material was observed at the surface in test pit TP-06 and immediately beneath the topsoil in test pits TP-02, TP-03, TP-04, TP-07 and TP-13. Where encountered the fill extended to the full depth of investigation (depth to bedrock refusal). The fill generally consisted of brown sandy gravel, containing same to trace amounts of silt and clay, and was noted to exist in a moist in-situ state.

Moisture content tests conducted on samples of the fill yielded values ranging from 9% to 29% moisture by weight. Grain size distribution analyses conducted on representative samples of the fill suggests the following compositional range: 35 to 63 % gravel, 24 to 50 % sand, and 13 to 15 % silt and clay-sized particles. A hydrometer analysis conducted on one of these samples suggest that the fill contains 11 % silt size particles between 2 and 75 μm in size and 4 % clay size particles smaller than 2 μm.

5.3 Clayey Silt

A layer of clayey silt was encountered beneath the topsoil in test pit TP-05 and extended to the full depth of investigation (depth to bedrock refusal). The clayey silt observed appeared brown in colour and consisted of clayey silt, with sand.

A moisture content test conducted on a sample of the clayey silt yielded a value of 29 % moisture by weight. A grain size distribution analysis conducted on a representative sample of the clayey silt suggests the following composition: 0 % gravel, 21 % sand, and 79 % silt and clay-sized particles. A hydrometer analysis conducted on this sample suggest that the silty clay contains 42 % silt size particles between 2 and 75 μm in size and 37 % clay size particles smaller than 2 μm.

5.4 Bedrock

Practical refusal to further test pit advancement was encountered in all test pits. The test pits confirmed the cause of the practical refusal was bedrock. Depth of practical refusal on each testing pit is provided on the test pit logs and summarized in the following table.

Table 5.1 Depth to Practical Refusal (Bedrock)

Test Pit ID	Depth (m) to Practical Refusal (Bedrock)	Test Pit ID	Depth (m) to Practical Refusal (Bedrock)
TP-01	0.3	TP-08	0.8
TP-02	1.5	TP-09	0.5
TP-03	0.4	TP-10	Surface
TP-04	0.8	TP-11	0.4
TP-05	1.5	TP-12	0.2
TP-06	0.2	TP-13	1.5
TP-07	0.5	TP-14	0.2

The depth at which practical refusal to further excavation was encountered was interpreted by GHD as being the depth of competent bedrock for the purpose of logging the test pits. It is noted that bedrock typically exhibits a certain degree of weathering and fracturing in its upper zone. This weathering effect can increase significantly in shale/limestone bedrock. Note that bedrock conditions below the depth of practical refusal on each test pit was not assessed as part of this investigation.

5.5 Groundwater

Groundwater observations and measurements were recorded upon completing excavation operations at each test pit. Groundwater seepage and/or accumulation was observed in three (3) test pits (TP-02, TP-05 and TP-13) at depths ranging from 0.8 to 1.5 m. Note that groundwater conditions below the depth of practical refusal on each test pit was not assessed as part of this investigation.

It must be noted that groundwater levels are transient and tend to fluctuate with the seasons, periods of precipitation, and temperature.

6. Discussion and Recommendations

Supporting data upon which our recommendations are based have been presented in the foregoing sections of this report. The following recommendations are governed by the physical properties of the subsurface materials that were encountered at the site and assume that they are representative of the overall site conditions. It should be noted that these conclusions and recommendations are intended for use by the designers only. Contractors bidding on or undertaking any work at the Site should examine the factual results of the assessment, satisfy themselves as to the adequacy of the information for construction, and make their own interpretation of this factual data as it affects their proposed construction techniques, equipment capabilities, costs, sequencing, and the like. Comments, techniques, or recommendations pertaining to construction should not be construed as instructions to the contractor.

The test pits generally encountered a surficial layer of topsoil, over occasional layer of soils consisting of sandy gravel fill or native clayey silt underlain by bedrock. Bedrock refusal was encountered in all of the test pits at depths ranging from 0.0 to 1.5 m. Groundwater seepage and/or accumulation was observed in three (3) test pits (TP-02, TP-05 and TP-13) at depths ranging from 0.8 to 1.5 m.

Details regarding our conclusions and recommendations are outlined in the following sections.

6.1 Site Preparation Excavation, Dewatering and Backfill

Any and all topsoil, vegetation, fill, disturbed earth, concrete, organic and organic-bearing material is to be stripped and removed from the building envelope area (including floor slab area) prior to commencing earthwork construction. In proposed pavement areas the materials described above should also be removed full-depth, to achieve maximum pavement performance. As an alternative to full-depth removal in the proposed pavement areas, the Client may instead consider removing these materials to a minimum depth to allow for the new pavement structure (see Section 6.4 of this report), at which point an assessment of the exposed soils by a member of GHD will deem whether further removal and/or placement of suitable geotextile material or other treatment is required. Overly loose, organic, or otherwise deleterious materials will require removal and replacement with an approved backfill material. The subexcavated surface must be proof rolled and/or approved by a member of GHD prior to placement of fill or foundations.

Excavations must be carried out to conform to the manner specified in Ontario Regulation 213/91 and the Occupational Health and Safety Act and Regulations for Construction Projects (OHSA). All excavations above the water table not exceeding 1.2 m in depth may be constructed with unsupported slopes. The soils encountered above the groundwater during the investigation are classed by OHSA as Type 3 soil, requiring unsupported walls of excavations to be sloped to the bottom of the excavation with a gradient of 1 horizontal to 1 vertical (1H: 1V) or flatter, or be retained using a suitably designed shoring system.

It is recommended that chemical testing of representative soil samples be performed prior to removal from the site of any excess soils generated during construction, as this will assess the handling and disposal options available.

Based on the groundwater conditions observed, and the anticipated excavation depths for the proposed development, significant groundwater infiltration into open excavations is not expected. Any groundwater or surficial water infiltration into open excavations above the groundwater table is expected to be controlled by pumping from a sump to an acceptable outlet. Should any excavations extend into the bedrock, groundwater-bearing zones may be encountered within any bedding planes and/or fractures and/or other such conduits within the bedrock.

It is expected that some of the excavation spoils may be suitable for reuse as trench and/or pavement subgrade backfill provided they are free of organics and at a moisture content that will permit adequate compaction (may require prior processing such as aeration to lower the moisture content). A final review and approval to reuse any soils should be made at the time of construction.

Backfill to foundation walls, both on the exterior and interior, and grade raises below foundations, floor slab, under parking areas, and any other areas requiring engineered fill, should be accomplished using well graded Granular "B" Type I material complying with OPSS 1010.

It is recommended that cover backfilling of the underground services be accomplished using Granular "A", sand, or other suitable material as allowed by the Municipality's standards, to a minimum of 300 mm above the pipe. Compaction of this material should attain 100 % SPMDD. It is expected that some of the excavated native soils may be suitable for reuse as trench backfill, conditional upon suitable moisture content (within 2 % of optimum), final review and approval by an experienced geotechnical engineer at the time of construction, and regular monitoring and inspection of such reuse throughout construction. Compaction of any native soil in service trenches is recommended to be a minimum of 98 % of its SPMDD.

6.2 Foundation Design

It is expected that structural loading may be supported on spread and continuous strip footings for column and load bearing walls, respectively. The footings should be placed on the sound bedrock, or on engineered fill placed directly on the sound bedrock.

For design purposes, it is generally recommended that footings constructed on the sound bedrock or engineered fill be proportioned using the following bearing capacities.

Table 6.1 Bearing Pressures for Foundation Design

Parameter	Bearing Pressure			
	Sound Bedrock	Engineering Fill		
		Rock-based Fill (2)	Granular Fill (3)	Earth Borrow Fill (3)
Factored Bearing Capacity at ULS (1)	720 kPa	255 kPa	205 kPa	155 kPa
Bearing Capacity at SLS		150 kPa	120 kPa	90 kPa

Notes:

(1) Resistance factor Φ =0.5 applied to the ULS bearing pressure for design purposes.
(2) At least 1m of Rock-based fill. Quality of material is to be approved prior to use as engineered fill.
(3) At least 0.3m of Granular or Earth Borrow fill. Quality of material is to be approved prior to use as engineered fill.

Any engineered fill upon which footings are placed must be a minimum thickness corresponding to the notes that accompany the above table. Rock-based fill must be completely encapsulated with suitable filter fabric to minimize any migration of fine-grained particles from surrounding soils into the voids within the rock fill. Footings (and foundation walls) placed on engineered fill must be suitably reinforced; as a minimum, and where not already specified in the design drawings, this reinforcing should use 2 continuous runs of 15M rebar throughout the footings, and 2 runs of 15M rebar throughout near the top and bottom of the foundation walls.

The following is recommended for the construction of any engineered fill for the foundations:

1. Remove any and all existing vegetation, topsoil, fill, organics, and organic-bearing soils to the competent, undisturbed native soil from within the area of the proposed engineered fill.
2. The area of the engineered fill should extend horizontally 1m beyond the outside edge of the building foundations and then extend downward at a 1:1 slope to the competent native soil.
3. The base of the engineered fill area must be approved by a member of GHD prior to placement of any fill, to ensure that all unsuitable materials have been removed, that the materials encountered are similar to those observed, and that the subgrade is suitable for the engineered fill.
4. All engineered fill material is to be approved by GHD at the time of construction. Place approved engineered fill, in maximum 300 mm lifts, compacted to 100 % of its SPMDD. Any fill material placed under sufficiently wet conditions should consist of an approved, rock-based fill, with the inclusion of appropriate geotextile fabric around the rock-based fill should the rock fill contain enough voids to warrant.
5. Full time testing and inspection of the engineered fill will be required, to ensure compliance with material and compaction specifications.

All exterior foundations and/or foundations in unheated areas, should be founded at least 1.2 m below the final adjacent grade for frost protection. Foundations and walls exposed to frost action should be backfilled with non-frost susceptible granular material, and positive drainage away from the structure should be ensured.

Under no circumstances should the foundations be placed above organic materials, loose, frozen subgrade, construction debris, or within ponded water. Prior to forming, all foundation excavations must be inspected and approved by a member of GHD's geotechnical group. This will ensure that the foundation bearing material has been prepared properly at the foundation subgrade level and that the soils exposed are similar to those encountered during this investigation.

For design purposes this site is classed as Site Class C for Seismic Site Response, in accordance with the Ontario Building Code.

For foundations constructed in accordance with the foregoing manner, total and differential settlements are estimated to be less than 25 mm.

6.3 Slab on Grade

Floors may generally be constructed as normal slabs-on-grade, on granular fill over native, inorganic subsoils or bedrock. The floor slab should be formed over a base course consisting of at least 150 mm of Granular "A" backfill as per OPSS compacted to a minimum of 100 % of its SPMDD. All grade increases or infilling below the granular "A" should be constructed in accordance with the engineered fill steps provided in Section 6.2 of this report.

6.4 Pavement Design

As the preferred method, it is recommended that the existing fill be fully removed full-depth from beneath all proposed pavement areas, and replaced with an approved backfill material. This will maximize the long-term performance of the pavement structure throughout.

As an alternative to this (to minimize the quantity of sub-excavation and corresponding backfill), the Client may instead consider removing these materials to a minimum depth to allow for the new pavement structure at which point an assessment of the exposed soils by a member of GHD's geotechnical team will deem whether further removal and/or placement of suitable geotextile material or other treatment is required. Overly loose, organic, or otherwise deleterious materials will require removal and replacement with an approved backfill material.

Based on the results of this investigation, we would recommend the following procedures be implemented to prepare the proposed asphalt paved access way and parking areas for its construction:

1. Remove all asphalt, topsoil, fill, organics, organic-bearing materials and other deleterious materials from the planned pavement areas either full depth (preferred), or alternatively to at least the subgrade required to allow the new pavement structure.
2. Inspect and proof roll the subgrade for the purpose of detecting possible zones of overly wet or soft subgrade. Any deleterious areas thus delineated should be replaced with approved granular material compacted to a minimum of 98 % of its SPMDD.
3. If further stabilization of the pavement subgrade is deemed necessary, either sub-excavate to suitable soils and backfill with approved granular material compacted to 98% SPMDD, or place woven geotextile such as Terrafix 200W or Mirafi HP270 on the exposed pavement subgrade surface, after its approval and prior to placement of any subsequent fill.
4. Contour the subgrade surface to prevent ponding of water during the construction and to promote rapid drainage of the sub-base and base course materials.
5. To maximize drainage potential, 150 mm diameter perforated pipe subdrains should be installed below any curb lines. The pipe should be encased in filter fabric and surrounded by clear stone aggregate. It is recommended that the subdrains discharge to a suitable, frost-free outlet.
6. Construct transitions between varying depths of granular base materials at a rate of 1:25 minimum.

The subgrade materials in the proposed pavement areas will consist of fill or native till, depending on the preferred method of construction and corresponding depths of sub-excavation. The frost susceptibility of these soils is assessed as being generally moderate to high. In this regard, the following minimum flexible pavement structures are recommended for the construction of the new access and parking areas.

Table 6.2 Pavement Structure

Profile	Material	Thickness (mm)		In Conformance with OPSS Form
		Light Duty	Heavy Duty	
Asphalt Surface	H.L.3	40	40	1150
Asphalt Base	H.L.8	50	50	
Granular Base	Granular “A”	150	150	1010
Granular Subbase	Granular “B”	300	450	

The following steps are recommended for optimum construction of paved areas:

1. The Granular “A” and “B” courses should be compacted to a minimum 100 % of their respective SPMDD’s.
2. All asphaltic concrete courses should be placed, spread and compacted conforming to OPSS Form 310 or equivalent. All asphaltic concrete should be compacted to a minimum 92.0 % of their respective laboratory Maximum Relative Densities (MRD’s).
3. Adequate drainage should be provided to ensure satisfactory pavement performance.

It is recommended that all fill material be placed in uniform lifts not exceeding 200 mm in thickness before compaction. It is suggested that all granular material used as fill should have an in-situ moisture content within 2 % of their optimum moisture content. All granular materials should be compacted to 100 % SPMDD. Granular materials should consist of Granular “A” and “B” conforming to the requirements of OPSS Form 1010 or equivalent.

The performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure that uniform subgrade moisture and density conditions are achieved as much as practically possible. It is noted that the above recommended pavement structures are for the end use of the project. The most severe loading conditions on pavement areas and the subgrade may occur during construction. As such, during construction of the project the recommended granular depths may not be sufficient to support loadings encountered. Consequently, special provisions such as restricted lanes, half-loads during paving, etc. may be required, especially if construction is carried out during unfavorable weather.

6.5 General Recommendations

6.5.1 Test Pits During Tendering

It is strongly recommended that test pits be excavated at representative locations of this Site during the construction tendering phase, with mandatory attendance of interested contractors. This will allow them to make their own assessments of the groundwater and soil conditions at the Site and how these will affect their proposed construction methods, techniques and schedules.

6.5.2 Subsoil Sensitivity

The native subsoils are susceptible to strength loss or deformation if saturated or disturbed by construction traffic. Therefore, where the subgrade consists of approved soil, care must be taken to protect the exposed subgrade from excess moisture and from construction traffic.

6.5.3 Winter Construction

The subsoils encountered across the site are frost-susceptible and freezing conditions could cause problems to the structures. As preventive measures, the following recommendations are presented:

1. During winter construction, exposed surfaces intended to support foundations must be protected against freezing by means of loose straw and tarpaulins, heating, etc.
2. Care must be exercised so that any sidewalks and/or asphalt pavements do not interfere with the opening of doors during the winter when the soils are subject to frost heave. This problem may be minimized by any one of several means, such as keeping the doors well above outside grade, installing structural slabs at the doors, and by using well-graded backfill and positive drainage, etc.
3. Because of the frost heave potential of the soils during winter, it is recommended that the trenches for exterior underground services be excavated with shallow transition slopes in order to minimize the abrupt change in density between the granular backfill, which is relatively non-frost susceptible, and the more frost-susceptible native soils.

6.5.4 Design Review

Due to the preliminary nature of the design details at the time of this report, GHD's geotechnical group must be allowed to review the foundation design and proposed final grading plans, prior to their finalization. In addition, we strongly recommend that our firm be retained to review the related earthworks specifications when they are available.

Geotechnical inspection and review of foundation excavations and compaction procedures must be carried out to ensure compliance with our recommendations.

7. Statement of Limitations

The attached Statement of Limitations is an integral part of this report. Should questions arise regarding any aspect of this report, please contact our office.

All of Which is Respectfully Submitted,

GHD

Leandro Ramos, P.Eng.

Nyle McIlveen, P.Eng.

STATEMENT OF LIMITATIONS

This report is intended solely for American Iron & Metal, and other parties explicitly identified in the report and is prohibited for use by others without GHD's prior written consent. This report is considered GHD's professional work product and shall remain the sole property of GHD. Any unauthorized reuse, redistribution of or reliance on the report shall be at the Client and recipient's sole risk, without liability to GHD. Client shall defend, indemnify and hold GHD harmless from any liability arising from or related to Client's unauthorized distribution of the report. No portion of this report may be used as a separate entity; it is to be read in its entirety and shall include all supporting drawings and appendices.

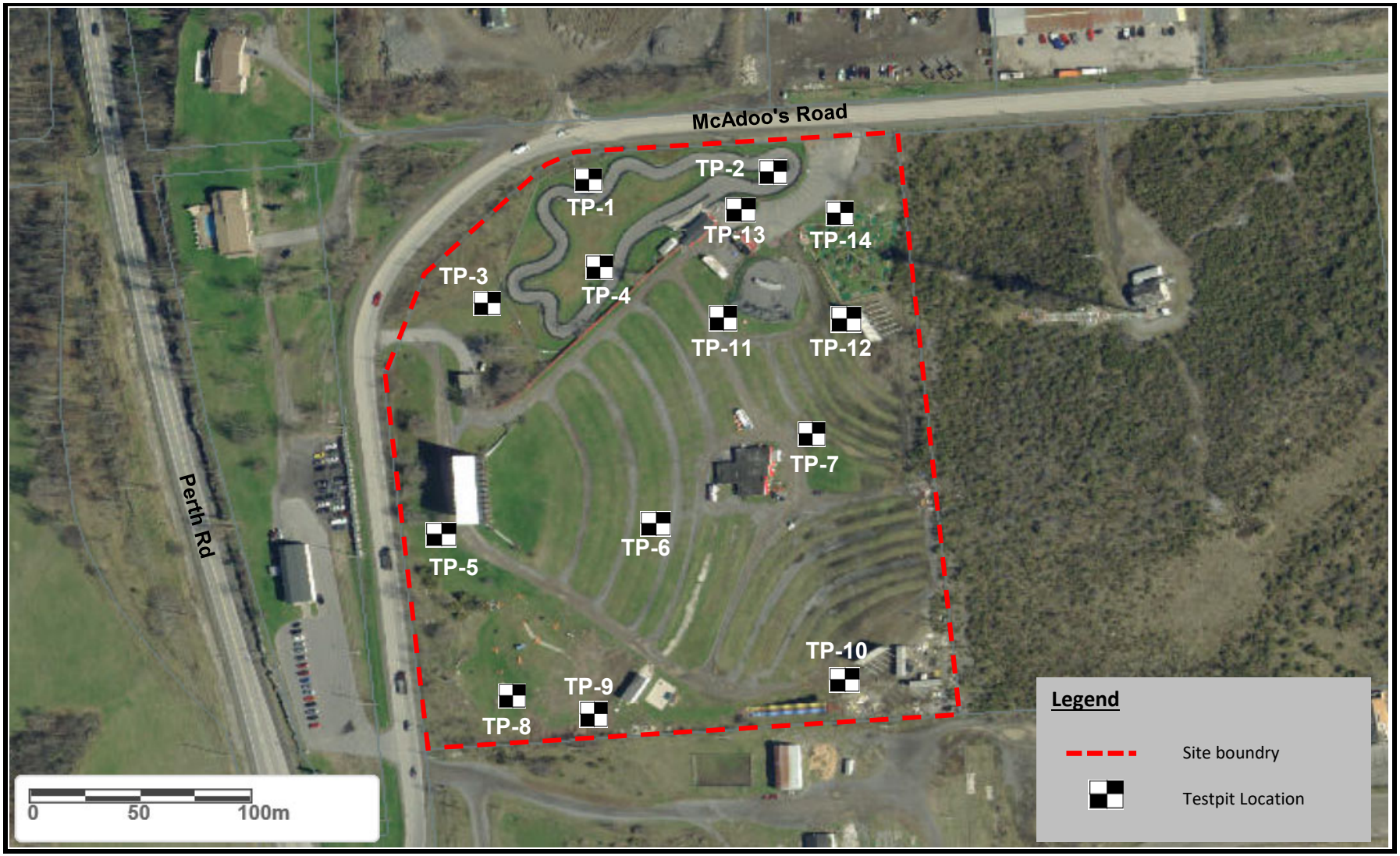
The recommendations made in this report are in accordance with our present understanding of the project, the current site use, ground surface elevations and conditions, and are based on the work scope approved by the Client and described in the report. The services were performed in a manner consistent with that level of care and skill ordinarily exercised by members of geotechnical engineering professions currently practicing under similar conditions in the same locality. No other representations, and no warranties or representations of any kind, either expressed or implied, are made. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

All details of design and construction are rarely known at the time of completion of a geotechnical study. The recommendations and comments made in the study report are based on our subsurface investigation and resulting understanding of the project, as defined at the time of the study. We should be retained to review our recommendations when the drawings and specifications are complete. Without this review, GHD will not be liable for any misunderstanding of our recommendations or their application and adaptation into the final design.

By issuing this report, GHD is the geotechnical engineer of record. It is recommended that GHD be retained during construction of all foundations and during earthwork operations to confirm the conditions of the subsoil are actually similar to those observed during our study. The intent of this requirement is to verify that conditions encountered during construction are consistent with the findings in the report and that inherent knowledge developed as part of our study is correctly carried forward to the construction phases.

It is important to emphasize that a soil investigation is, in fact, a random sampling of a site and the comments included in this report are based on the results obtained at the fourteen (14) borehole locations only. The subsurface conditions confirmed at the 14 borehole locations may vary at other locations. The subsurface conditions can also be significantly modified by construction activities on site (e.g. excavation, dewatering and drainage, blasting, pile driving, etc.). These conditions can also be modified by exposure of soils or bedrock to humidity, dry periods or frost. Soil and groundwater conditions between and beyond the test locations may differ both horizontally and vertically from those encountered at the test locations and conditions may become apparent during construction which could not be detected or anticipated at the time of our investigation. Should any conditions at the site be encountered which differ from those found at the test locations, we request that we be notified immediately in order to permit a reassessment of our recommendations. If changed conditions are identified during construction, no matter how minor, the recommendations in this report shall be considered invalid until sufficient review and written assessment of said conditions by GHD is completed.

Enclosures



Source: Ministry of Natural Resources and Forestry. © Queen's Printer for Ontario, 2020. Note: Property boundary is not a legal survey.

Scale:
Refer to Scale Bar
Coordinate System:
NAD 1983 UTM Zone 18

American Iron and Metal
1533 McAdoo's Lane, Kingston, ON
Geotechnical Investigation

11212206-01
May 2020

TEST HOLE PLAN

FIGURE 1

Appendix A
Test Pit Logs

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-1

TEST PIT No.: TP-01

ELEVATION: Existing Grade

TEST PIT REPORT

Page: 1 of 1

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi

DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling

METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	COMMENTS
		0.0		GROUND SURFACE			
				TOPSOIL (305 mm)			
					GS-1	2	
1		0.3		**BEDROCK** END OF TEST PIT			Testhole was open and dry upon completion at bedrock refusal at 0.3 m.
	0.5						
2							
3							
	1.0						
4							
	1.5						
5							

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)

10 20 30 40 50 60 70 80 90

TEST PIT LOG GEOTECH 11212206-01-FLD-20-04-29, BH LOGS, JG.GPJ GEOLOGIC.GDT 27/5/20

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-2

TEST PIT No.: TP-02

ELEVATION: Existing Grade

TEST PIT REPORT

Page: 1 of 1

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	COMMENTS
		0.0		GROUND SURFACE			
				TOPSOIL (405 mm)			
		0.4		**FILL** - sandy gravel, with silt, trace clay, brown, moist			
	0.5				GS-1	18	
				wet (water seepage)			
	1.0				GS-2	14	
	1.5	1.5		**BEDROCK** END OF TEST PIT			Testhole was open and wet upon completion at bedrock refusal at 1.5 m.

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)

10 20 30 40 50 60 70 80 90

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-3

TEST PIT No.: TP-03

ELEVATION: Existing Grade

TEST PIT REPORT

Page: 1 of 1

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi

DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling

METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	COMMENTS
		0.0		GROUND SURFACE			
				TOPSOIL (305 mm)			
1		0.3		**FILL** - sandy gravel, with silt, trace clay, brown, moist	GS-1	29	
		0.4		**BEDROCK** END OF TEST PIT			Testhole was open and dry upon completion at bedrock refusal at 0.4 m.
	0.5						
2							
3	1.0						
4							
5	1.5						

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)

10 20 30 40 50 60 70 80 90

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-4

TEST PIT No.: TP-04

ELEVATION: Existing Grade

TEST PIT REPORT

Page: 1 of 1

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (w_p w_l) (Field / Lab)	COMMENTS
		0.0		GROUND SURFACE				
				TOPSOIL (610 mm)				
1								
	0.5							
2		0.6		**FILL** - sandy gravel, with silt, trace clay, brown, moist	GS-1	18		
		0.8		**BEDROCK** END OF TEST PIT				Testhole was open and dry upon completion at bedrock refusal at 0.8 m.
3								
	1.0							
4								
5	1.5							

TEST PIT LOG GEOTECH 11212206-01-FLD-20-04-29, BH LOGS, JG.GPJ GEOLOGIC.GDT 27/5/20

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-5

TEST PIT No.: TP-05

ELEVATION: Existing Grade

TEST PIT REPORT

Page: 1 of 1

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	COMMENTS
		0.0		GROUND SURFACE			
				TOPSOIL (610 mm)			
	0.5	0.6		**CLAYEY SILT** - clayey silt, with sand, brown, moist			
	1.0				GS-1	29	GS-1: 21% Sand 42% Silt 37% Clay (<0.002 mm)
	1.5	1.5		wet (minor water seepage at bedrock interface)			
				BEDROCK END OF TEST PIT			Testhole was open and wet upon completion at bedrock refusal at 1.5 m.

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)

10 20 30 40 50 60 70 80 90

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-6

TEST PIT No.: TP-06

ELEVATION: Existing Grade

TEST PIT REPORT

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (w_p w_l) (10 20 30 40 50 60 70 80 90)	COMMENTS
		0.0		GROUND SURFACE				
				FILL - gravelly sand, with silt, brown, moist	GS-1	10		
		0.2		**BEDROCK** END OF TEST PIT				Testhole was open and dry upon completion at bedrock refusal at 0.2 m.
1								
	0.5							
2								
3								
	1.0							
4								
	1.5							
5								

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-7

TEST PIT No.: TP-07

ELEVATION: Existing Grade

TEST PIT REPORT

Page: 1 of 1

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi

DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling

METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth ft	Depth m	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content %	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (%) (10 20 30 40 50 60 70 80 90)	COMMENTS
		0.0		GROUND SURFACE				
				TOPSOIL (150 mm)				
		0.2		**FILL** - gravelly sand, with silt, brown, moist				
1					GS-1	9		GS-1: 35% Gravel 50% Sand 15% Silt and Clay
	0.5	0.5		**BEDROCK** END OF TEST PIT				Testhole was open and dry upon completion at bedrock refusal at 0.5 m.
2								
3	1.0							
4								
5	1.5							

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-8

TEST PIT No.: TP-08

ELEVATION: Existing Grade

TEST PIT REPORT

Page: 1 of 1

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (w_p w_l) (Field / Lab)	COMMENTS
		0.0		GROUND SURFACE				
				TOPSOIL (760 mm) - with gravel				
1								
	0.5							
2					GS-1	9		
		0.8		**BEDROCK** END OF TEST PIT				Testhole was open and dry upon completion at bedrock refusal at 0.8 m.
3								
	1.0							
4								
	1.5							
5								

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-9

TEST PIT No.: TP-09

ELEVATION: Existing Grade

TEST PIT REPORT

Page: 1 of 1

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (w_p w_l) (Field / Lab)	COMMENTS
		0.0		GROUND SURFACE				
				TOPSOIL (510 mm) - with gravel				
					GS-1	7		
	0.5	0.5		**BEDROCK** END OF TEST PIT				Testhole was open and dry upon completion at bedrock refusal at 0.5 m.

Depth scale: 1, 2, 3, 4, 5 (ft); 0.5, 1.0, 1.5 (m)

Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (w_p w_l) (Field / Lab): 10 20 30 40 50 60 70 80 90

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-10

TEST PIT No.: TP-10

ELEVATION: Existing Grade

TEST PIT REPORT

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi

DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling

METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (w_p w_l) — △ Field, □ Lab (10 20 30 40 50 60 70 80 90)	COMMENTS
		0.0		GROUND SURFACE				
				BEDROCK at surface END OF TEST PIT				
1								
	0.5							
2								
3								
	1.0							
4								
	1.5							
5								

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-11

TEST PIT No.: TP-11

ELEVATION: Existing Grade

TEST PIT REPORT

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (w_p w_l) (Field / Lab)	COMMENTS
		0.0		GROUND SURFACE				
				TOPSOIL (350 mm)				
		0.2		with gravel				
1					GS-1	7	○	
		0.4		**BEDROCK** END OF TEST PIT				Testhole was open and dry upon completion at bedrock refusal at 0.4 m.
	0.5							
2								
3								
	1.0							
4								
	1.5							
5								

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-12

TEST PIT No.: TP-12

ELEVATION: Existing Grade

TEST PIT REPORT

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	COMMENTS
		0.0		GROUND SURFACE			
				TOPSOIL (230 mm) - with gravel	GS-1	22	
		0.2		**BEDROCK** END OF TEST PIT			Testhole was open and dry upon completion at bedrock refusal at 0.2 m.
1							
	0.5						
2							
3							
	1.0						
4							
	1.5						
5							

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)

10 20 30 40 50 60 70 80 90

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-13

TEST PIT No.: TP-13

ELEVATION: Existing Grade

TEST PIT REPORT

Page: 1 of 1

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (w_p w_l) (△ Field, □ Lab)	COMMENTS
		0.0		GROUND SURFACE				
				TOPSOIL (150 mm)				
		0.2		**FILL** - sandy gravel, with silt, trace clay, brown, moist				
1					GS-1	9		GS-1: 63% Gravel 24% Sand 13% Silt and Clay
	0.5							
2								
3					GS-2	12		GS-2: 58% Gravel 27% Sand 11% Silt 4% Clay (<0.002 mm)
	1.0							
4		1.2		grey, wet (water seepage)				
	1.5							
5		1.5		**BEDROCK** END OF TEST PIT				Testhole was open and wet upon completion at bedrock refusal at 1.5 m.

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-14

TEST PIT No.: TP-14

ELEVATION: Existing Grade

TEST PIT REPORT

Page: 1 of 1

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (w_p w_l) (△ Field, □ Lab)	COMMENTS
		0.0		GROUND SURFACE				
				TOPSOIL (230 mm) - with gravel	GS-1	13	○	
		0.2		**BEDROCK** END OF TEST PIT				Testhole was open and dry upon completion at bedrock refusal at 0.2 m.

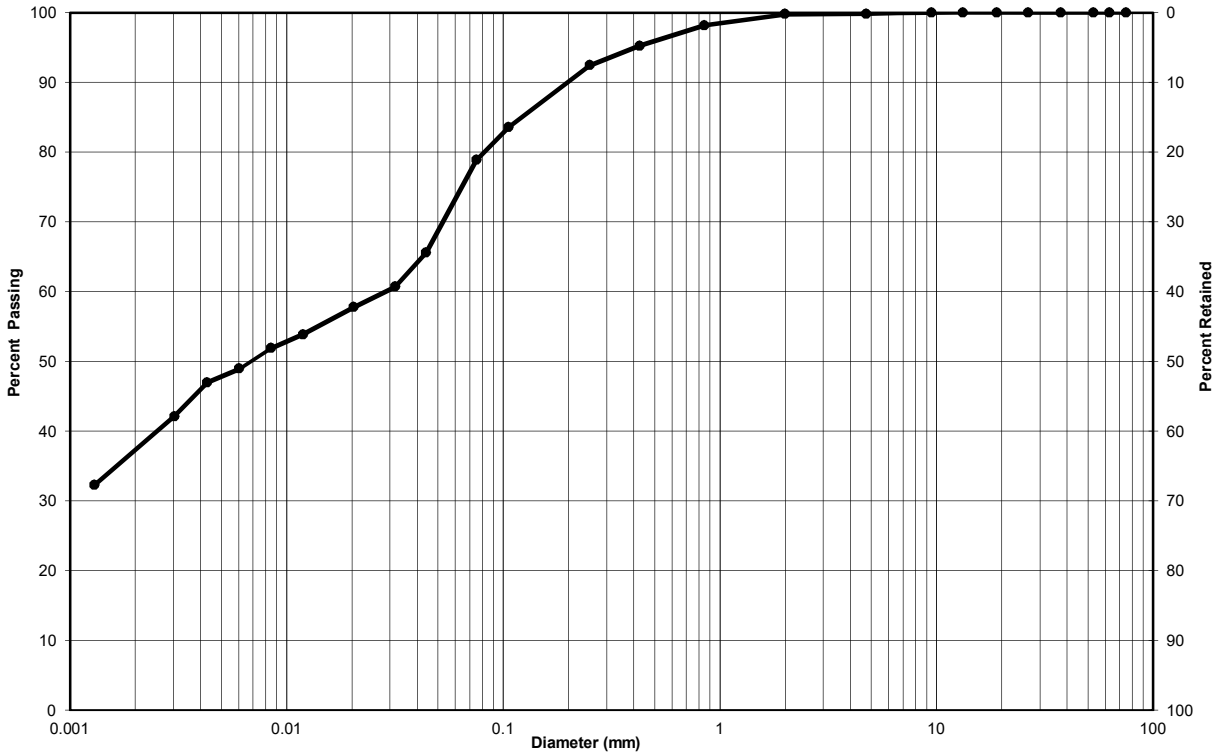
Scale: ft 1, 2, 3, 4, 5; m 0.5, 1.0, 1.5

Appendix B
Physical Laboratory Data

Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client:	American Iron and Metal	**Lab no.:**	SS-20-27
Project/Site:	1533 McAdoos Lane, Kingston	**Project no.:**	11212206-01

Borehole no.:	TP-5	Sample no.:	GS-1
Depth:	1.2 m	Enclosure:	B-1



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel	Sand	Clay & Silt
	0	21	79

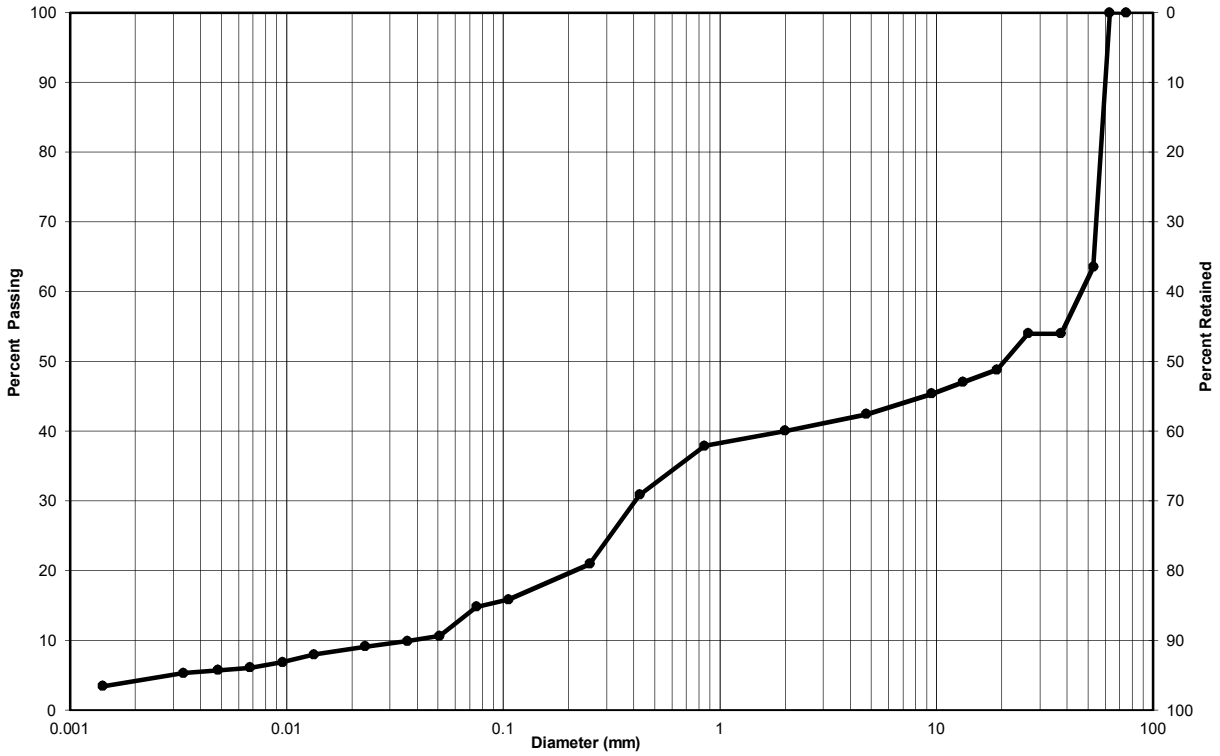
Remarks:

Performed by:	Josh Sullivan	**Date:**	May 14, 2020
Verified by:	Joe Sullivan	**Date:**	May 14, 2020

Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client:	American Iron and Metal	**Lab no.:**	SS-20-27
Project/Site:	1533 McAdoos Lane, Kingston	**Project no.:**	11212206-01

Borehole no.:	TP-13	Sample no.:	GS-2
Depth:	0.9 m	Enclosure:	B-2



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel	Sand	Clay & Silt
	58	27	15

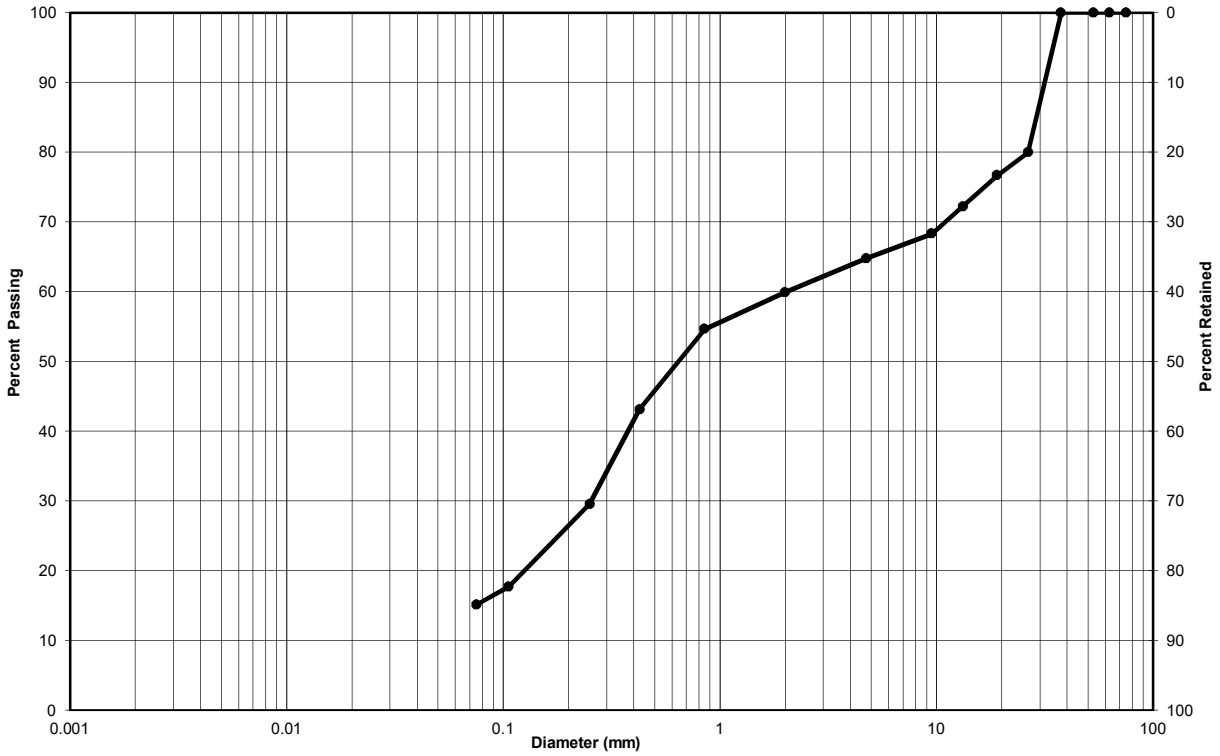
Remarks:

Performed by:	Josh Sullivan	**Date:**	May 14, 2020
Verified by:	Joe Sullivan	**Date:**	May 14, 2020

Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client:	American Iron and Metal	**Lab no.:**	SS-20-27
Project/Site:	1533 McAdoos Lane, Kingston	**Project no.:**	11212206-01

Borehole no.:	TP-7	Sample no.:	GS-1
Depth:	0.3 m	Enclosure:	B-3



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel	Sand	Clay & Silt
	35	50	15

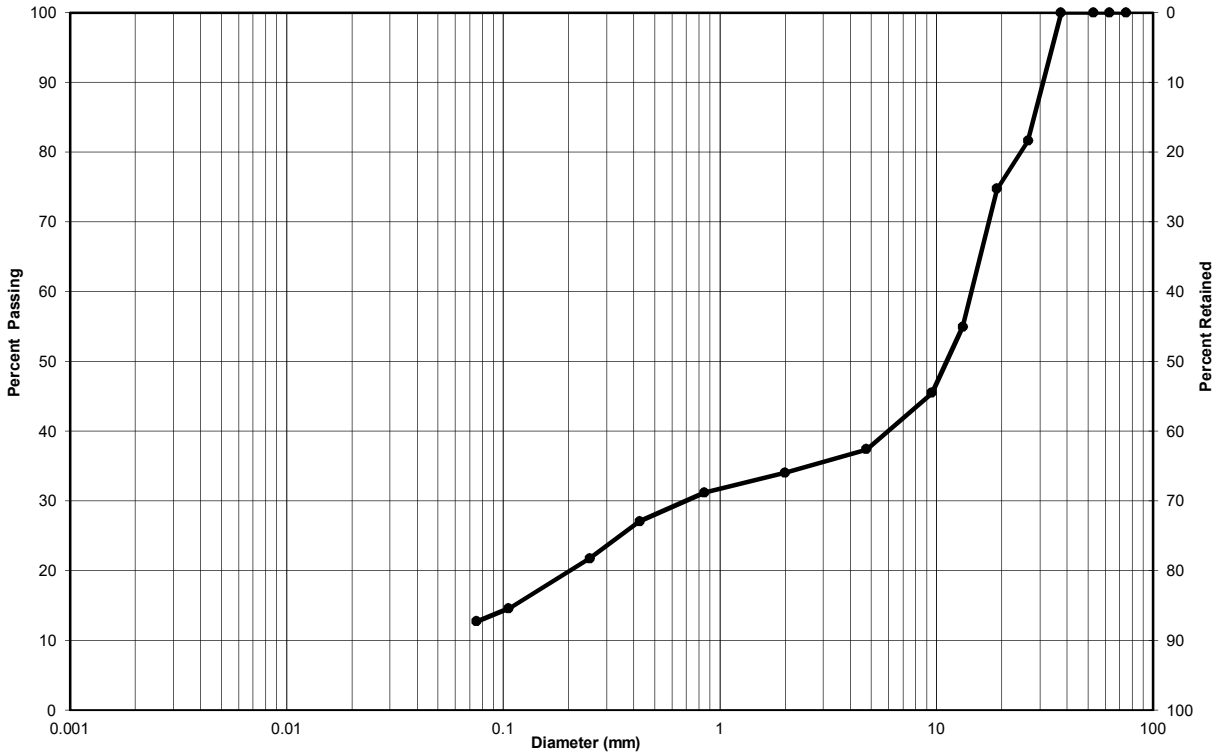
Remarks:

Performed by:	Josh Sullivan	**Date:**	May 14, 2020
Verified by:	Joe Sullivan	**Date:**	May 14, 2020

Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client:	American Iron and Metal	**Lab no.:**	SS-20-27
Project/Site:	1533 McAdoos Lane, Kingston	**Project no.:**	11212206-01

Borehole no.:	TP-13	Sample no.:	GS-1
Depth:	0.3 m	Enclosure:	B-4



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel	Sand	Clay & Silt
	63	24	13

Remarks:

Performed by:	Josh Sullivan	**Date:**	May 14, 2020
Verified by:	Joe Sullivan	**Date:**	May 14, 2020

about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

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