P.O. Box 74087, RPO Beechwood, Ottawa, On., K1M 2H9
Phone: (613) 899 0834
Compaction testing - Geotec. Engineering - Soils Inspections

Yuri Mendez
Engineering

Ottawa, January 30, 2025

Denis Michaud
denis@henryinvestments.ca

Reference: City of Ottawa comments under item 46 in the letter dated January 15, 2025 concerning file numbers D02-02-24-0084 & D07-12-24-0177 subject "Minor Zoning By-law Amendment and Site Plan Control Complex 73, 79 and 83 Ste-Cecile Street".

Subject: response to the referenced comments.

A revised report is issued to respond to the referenced comments. This letter describes the additions to the revised report in response to the comments.

For ease of reference, the comments in the subject letter are below along with our responses:

1. A description of the proposed devlopment.
   - The description is in the executive summary added to the report;
2. A detailed description of the objectives, scope, and limitations of the investigation.
   - This is part of the executive summary added to the report and a statement of limitations is added as section 12;
3. An executive sumamry providing brief overview of the key findings, conclusions, and recommendations of the report..
   - An executive summary is at the beginning of the report having a summary of findings and recommendations;
4. Identification and assessment of potential geotechnical risks and hazards, such as landslides, liquefaction, or settlement.
   - Part III recommendations has been tailored to reflect particular risks and challenges regarding the implementation of foundations and construction due to the presence of peat and high groundwater.
5. Specific recommendations for foundation design, including types of foundations, bearing capacities, and any special construction considerations.
   - Sections 5 to 5.8 have those recommendations.
6. Guidance on construction practices, including excavation, dewatering, and soil stabilization techniques.

- Section 8 discusses excavation and dewatering challenges. Section 11 further discusses the risks in connection with construction tasks as they relate to dewatering for other buildings.

7. Recommendations for monitoring and maintaining the site during and after construction to ensure long-term stability.

   - Only a pre-construction survey of neighboring properties has been suggested to protect the developer and the neighbors. The long-term stability is largely in connection with neighboring properties as they may be affected by dewatering discussed in several sections of the report.

Do not hesitate to contact us if you have any questions.

Yuri Mendez, M. Eng, P. Eng

Subsurface Investigation Report

73, 79 and 83 Ste Cecile St., Ottawa, ON, K4A 3N6

Abstract

The subsurface conditions at 73, 79 and 83 Ste Cecile St., in the City of Ottawa, ON was investigated via sampling and field testing in 3 boreholes for the sole purpose of development of a 4-Storey Apartment Building by Henry Investments Inc. The boreholes were located along the outside perimeter of the residential dwellings existing at this site as shown in figure 1 in page 7. The site was found to be underlain by fill to a 6.1 to 6.75 m depth in turn underlain by dense silty sand to sampler refusal depths up to 8.84 to 12. 95 m. on boulders an/or bedrock.

Yuri Mendez M. Eng., P. Eng.

Report number: 59-HII-R1[1]
January 30, 2025

Yuri Mendez
Engineering

196 Britannia Road
Ottawa, On. K2B 5W9

Phone: 613-899-0834
e-mail: yuri@ymendez.ca

PO Box 74087
RPO Beechwood
Ottawa, ON, K1M 2H9

[1]For the account of Henry Investments Inc. (HII) as per email proposal dated October 21 and 24, 2022..

This page is intentionally left blank

Contents

1 Executive Summary

This document reports the findings of subsurface investigation 59-HII-R1 completed at 73, 79 and 83 Ste Cecile St., in the City of Ottawa, ON for the sole purpose of development of a 4-Storey Apartment Building by Henry Investments Inc. having extents and geometry shown in figure 1 in page 7.

The investigation was carried out by advancing 3 boreholess through overburden soils using available exploration techniques for engineering purposes. The information reviewed also includes readily available geologic information from the Geological Survey of Canada (GSC).

Key information about the subsurface conditions across the proposed development area is presented and includes design and construction recommendations and also the physical and mechanical properties of the geotechnical material encountered.

The overburden materials are estimated to be 12 m in thickness above the bedrock. The near-surface materials were found to consist of dark brown peat up to a 6.5 m depth underlain by dense silty sand.

The ground water table is estimated to be at a 2.5 m depth.

The dark brown peat materials and the presence of the water table at 2.5 m depth pose numerous challenges for development. Among those challenges are the inadequacy of peat to support foundations and the potential settlements that will result from lowering the water table.

It is expected that the brown peat will be removed and replaced with engineered fill on which to found conventional shallow foundations provided the issues in connection with excavating the peat and dewaterring are addressed or that a deep foundation alternative is used such as push piers or drilled pears. Interior slabs for basement laying at 1.5 m or greater depth from the surface grade can bear on the peat materials at that depth due to consolidation.

Part I
Investigation

2 Sampling and Testing

The field and laboratory program set out in our proposal is guided by the following standards:

- ASTM D 420-98 Standard Guide to Site Characterization for Engineering Design and Construction Purposes,
- ASTM D5434 - 12 Standard Guide for Field Logging of Subsurface Explorations of Soil and Rock,
- ASTM D1586 - 11 Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils,

- ASTM D1586 - 11 based Dynamic Cone Penetration Test (DCPT),
- ASTM D2573 - 08 Standard Test Method for Field Vane Shear Test in Cohesive Soil.

The ASTM D1586 tests were completed using an "auto safety" hammer rated at 60% energy.

In view of the absence of soft to firm clays encountered during the field operations the ASTM D2573 - 08 "Standard Test Method for Field Vane Shear Test in Cohesive Soil" tests were removed from the original field program.

The field program consisted in sampling the subsurface profile using boreholess located as shown in fig. 1 in page 7 along with field review, assessments and classification of samples.

The borehole elevations were estimated based on their location using elevation data in a plan of survey issued for this site. The program included in addition a laboratory review of samples recovered from the field and one sample submitted to a local laboratory to investigate soluble ions concentration, PH and resistivity.

The soil sampling and field testing at each location are shown in the soil profile testing and sampling logs (BH) in the appendices.

Part II
Findings

3 Physical Settings, Strata and Topography

The site consists on three residential lots within a city block. The general topography is flat. It consists on the 73, 79 and 83 Ste Cecile St. parcels in the City of Ottawa, ON. Figure 1 in page 7 shows a plan view of the site displaying the approximate test hole locations and depth.

It can be seen in the testhole logs in appendix A that the site is covered by roughly 6 m of fill including very soft peat underlain by dense silty sand. The materials underlying the dense sand consist of either inferred dense sand and/or dense soils extending to depths of practical refusal to DCPT. DCPT refusals can occur on bedrock and or/boulders.

The geology data base by Belanger J. R. 1998 suggests 3 to 5 m of overburden soils underlain by interbedded limestone and shale bedrock at this site.

4 Surface and Subsurface Materials

The arrangement of strata found in our investigation is shown in the borehole logs in appendix A. Generally, the native geotechnical materials at this site were found to consist of dense silty sand at roughly 6 m overlain by peat and

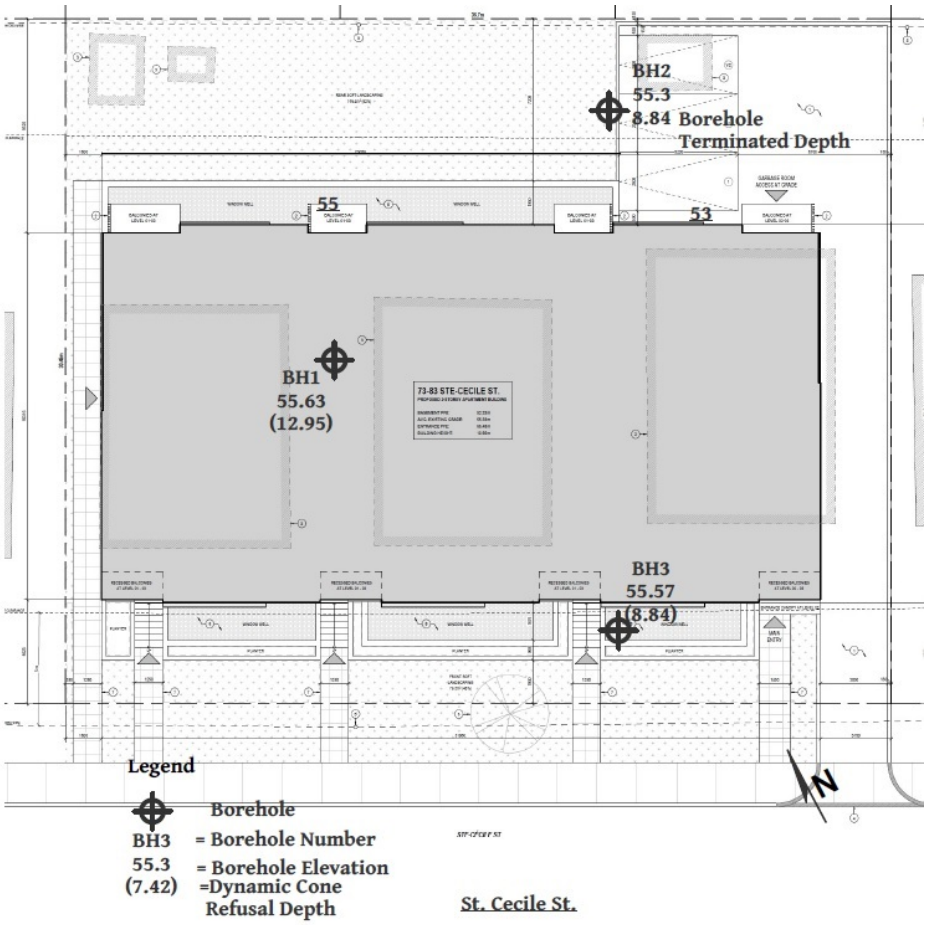

Figure 1: Test hole Locations Plan

fill. The desnse silty sand is underlain by dense soils to DCPT refusals on either bedrock or boulders.

4.1 Fill

Non engineered fill are not adequate materials to bear foundations for development.

4.2 Dense Silty Sand

Dense silty sand can provide bearing for relatively light structures. These materials can be subject to caving where excavations exceed the depth of the water table.

4.3 DCPT Tested Strata

The mechanical properties of materials to the 12.95 m depth of the DCPT tests completed in all 3 boreholes can be estimated based on its results shown in the borehole logs in appendix A. The DCPT test results are indicative of dense soils.

4.4 Groundwater and Moisture

The water level was measured on December 05, 2022 in environmental wells installed in BH1, BH2 and BH3 at 2.77, 2.26 and 2.6 m depth respectively and shown in the boreholes logs. Ground water measurements in stand pipe installations often require numerous assessments in combination with boreholes data.

The water level measurements obtained on December 05, 2022 represent the best available information at this time. The water table is thus approximately at a 52.96 m elevation (± 2.5 m depth). Moisture contents vary above the ground water table.

4.5 Freezing Index, Frost Depth and Frost Susceptibility

The soil materials encountered at this site are frost susceptible and thus will heave upon exposure to freezing temperatures. Heaving destroys the mechanical properties of soils so that any soil which has been frozen is considered disturbed.

Part III
Geotechnical Recommendations

The following set of recommendations result from sampling and testing outlined in section 2 and from geotechnical engineering evaluation and assessments.

In view of the fill materials to a depth exceeding 6 m encountered at this site and the proposed founding depth at approximately 3 m beneath finished grade, it is expected that the fill will be excavated and removed *or* that a deep foundation alternative will be used.

Engineered fill can be used to buildup the subgrade under the proposed structure.

5 Foundations General

Generally speaking, OBC building code-compliant Part 9 and Part 4 residential buildings can be founded on shallow spread footings. It is expected that the brown peat will be removed and replaced with engineered fill on which to found conventional shallow foundations provided the issues in connection with excavating the peat and dewatering are addressed or that a deep foundation alternative is used such as push piers or drilled pears. Interior non-load bearing slabs for basement laying at 1.5 m or greater depth from the surface grade can bear on the peat materials at that depth due to consolidation.

5.1 Bearing Capacity of Strip and/or Pad Footings

The following bearing capacity can be used for any repair and/or new foundations placed on undisturbed dense silty sand:

- 200 kPa at service limit (SLS).
- 300 kPa for factored loads (ULS).

The above bearing capacity can also be used for new footings placed on newly placed granular fill compacted to 100% of its Proctor Standard Density.

5.2 Restrictions for Grading/Terracing/Grade Raises

The proposed development is not expected to require grade raises. Post development grades are expected to be within 30 cm of the exisitng grade. Grade raises will not affect the foundations of the proposed building, however, a review of grading should be completed once grading plans are available ass a level of precaution for nearby houuses.

5.3 Settlements

For new footings loaded as provided in section 5.1 building settlements for foundations on undisturbed dense silty sand are not to exceed service limit values (SLS) of 25 mm and 20 mm total and differential settlements respectively at this site.

5.4 Deep Foundation Alternatives

Where building loads can not be accommodated with the bearing capacity described in section 5.1 deep foundations, such as driven or bored piles need to be considered.

Piles are generally driven to refusal and/or drilled to bedrock and proof tested.

Specific geotechnical resistance for specific pile systems and locations will be provided if requested as part of this report.

5.5 Piles and/or Micropiles

Piles are expected to be driven or pushed to a refusal criteria which is measured at the surface and thus this section is tailored to assess the mechanical properties of the geotechnical materials at depth in the soil profile which can assist in the identification of refusal depth and the design. Please refer to the boreholes logs in the appendices and note:

- Refusal to auger cone penetration tests are reached in all boreholes at 8.8 to 13 m depth. Strength at these refusal depths is expected to meet the refusal requirements for most point-bearing pile systems. Helical piles will generally not penetrate refusal depths so that torque resistance would be determined by the soil layers above.

5.6 Frost Protection for Foundations

Shallow foundations in section 5.1 on frost susceptible soils are considered to be frost protected when placed at sufficient depth to prevent supporting soils from freezing. Foundations in the perimeter of heated buildings where snow is not cleared are considered frost protected at 1.5 m depth (as having a soil cover of 1.5 m). Foundations away from heated buildings or in areas where snow is cleared, need to be at about 1.8 m depth to be frost protected. On the alternative frost protection can be provided by using foundation insulation for shallower foundations.

5.7 Foundation Insulation

To meet the required frost protection in section 5.6 for foundations for canopies or other structures in the perimeter of the building and in unheated areas in otherwise heated buildings 50 mm of extruded polystyrene insulation (XPS) type V, VI or VII meet foundation insulation requirements for the freezing index in the Ottawa area.

5.8 Foundation Wall Damproofing and Drainage

Appendix C.1 presents page 2 of NRC Construction Evaluation Reports CCMC 12658-R showing damproofing and foundation wall drainage system details sat-

isfying the provisions under OBC 2012 and suitable for the conditions found at this site. Other available similar systems having the components shown in CCMC 12658-R may be used. Foundation drainage must be provided to daylight or a positive outlet, or sump.

6 Site Class for Seismic Design

At this site, the geotechnical testing completed are indicative of a Vs(30) exceeding 360 m/s. As such, site class C is assigned under the provisions in section 4.1.8.4 of the Ontario Building Code 2012 (OBC 2012) for seismic design.

7 Roadbed Soils and Pavement Structure

Generally, for low volume roads, the pavement structure to be placed on native soils or engineered roadbed at this site may consist of 400 mm of OPSS granular B, 150 mm of OPSS Granular A and up to 75 mm of asphalt.

For parking lots, pavement structure to be placed on native soils or engineered roadbed at this site may consist of 300 mm of OPSS granular B, 150 mm of OPSS Granular A and 50 mm of asphalt. This thicknesses will vary depending on expected traffic at different locations.

8 Excavations, Open Cuts, Trenches and Safety

Typically, the main concern when excavating soils or rock is the stability of the sides of excavations. The stability of the sides is achieved by either cutting the sides to safe slopes or by providing shoring. It is also an issue of safety because of imminent hazards to the safety of workers and to property. As such, excavations are governed by the provisions in the Occupational Health and Safety Act of Ontario (O. Reg. 213/91). The application of O. Reg. 213/91 requires a classification of soils in one or several of four types (type I to type IV).

At this site for all excavations to a 2 m depth, soils can be considered type III under O. Reg. 213/91 and type IV for deeper excavations. As such, the following key aspects of O. Reg. 213/91 are applicable to this site:

1. For excavations up to 2 m (soil types III):
    - Safe open cut is 1 vertical to 1 horizontal.
2. For excavations deeper than 2 m (soil types IV):
    - Engineered shoring is required.
3. Where the safe open cut in item 1 is not provided, either the shoring systems described in O. Reg. 213/91 or engineered shoring systems need be used.

Information regarding physical and mechanical properties of subsurface materials which will be required for shoring design are provided in this report.

Note also that since excavation and safety are usually in control of the contractor, *shoring design and construction is done by the contractor.*

8.1 Dewatering of Excavations

In view of the discussion in section 4.4 water and the sand materials susceptible to caving, inflow within excavations will not be controllable from open sumps. A well point system along the perimeter of the site may be required. Dewatering however may induce excessive settlements due to the presence of very soft peat.

9 Underground Corrosion

For the resistivity, PH and soluble ions concentrations found at this site and shown in the Paracel Laboratories certificate of analysis in appendix B.1, the soils are mildly corrosive. Resistivity, PH and soluble ions testing was completed in a representative sample at 6.75 m depth in BH1. After Romanoff (1957)[2], the following corrosion rates can be used:

1. For carbon steel:
   - 16 μm/year for the first 2 years,
   - 12 μm/year, thereafter.
2. For galvanized metal:
   - 4.6 μm/year for the first 2 years,
   - 3.2 μm/year until depletion of zinc,
   - 12 μm/year for carbon steel.

10 Potential of Sulphate Attack to Concrete

For the sulphate content less than 0.1% in soil encountered at this site, there are no restrictions to the cement type which can be used for underground structures. This refers to restrictions associated with sulphate attack only.

11 Special Issues or Concerns

This investigation revealed difficult excavation challenges due to very soft fill materials and high ground water table with respect to the expected depth of excavations to reach native soils.

[2]Romanoff's work for the U. S. National Bureau of Standards is authoritative in underground corrosion

11.1 Impacts to Other Buildings During and After Construction

Water table draw-down will increase the effective stress under neighboring houses and will cause additional settlements due to the very weak founding materials encountered at this site. In addition the caving susceptibility of the fine sand encountered at this site creates a susceptible bottom of the excavation due to the pressure head difference between the perimeter of the excavation and the interior of the excavation.

The issues below arise from the conditions encountered:

1. water table draw-down is to be minimized to avoid excessive settlement of neighboring properties;

2. in view of the issue in 1, the shoring system needs to be relatively impervious *and* be of sufficient depth with respect to the bottom of the excavation to sufficiently increase the head loss between the interior of the excavation and its perimeter. Sheet piles driven into the bedrock are believed to be the best alternative at this time.

11.2 Pre-Construction Survey

As noted during the investigation the house at this site and nearby houses exhibit substantial foundation settlements and cracking. A pre-construction survey to map cracks and other defects is recommended to have a level of protection against possible claims for damage due to construction.

Disclaimer

Henry Investments Inc. HII and other professionals understand that soils and groundwater information in this report has been collected in boreholess guided by standards and practice guidelines generally accepted for engineering characterization of ground conditions in Ontario and in no case boreholes data and their interpretation warrant understanding of conditions away from the boreholes locations. HII accepts that as development will have spread away from the boreholess other designers will need the best opinion from the geotechnical consultant based on the findings of the investigation so that any statements which could be implicitly or explicitly depart from the conditions at boreholes may be given to fulfill this need in good faith as best available opinion with the information available at the time without any warranties.

12 Limitations

This report was prepared by Yuri Mendez for the account of Henry Investments Inc. (HII), for review by its designated consultants, financial institutions, and government agencies.

The content of the report reflects the judgment of Yuri Mendez P.Eng., in light of the information available to him at the time of preparation.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering.

The reports may also have been prepared prior to revisions to the project size, location or scope, so they may not reflect or be coordinated with post-preparation changes to the project.

Yuri Mendez accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

User Agreement

Acknowledgment of Duties

In this 59-HII-R1 report, Yuri Mendez Engineering (YME) has pursued to fulfill every aspect of the obligations of professional engineers. As a part of those duties, from field work, operations, testing, analyses, application of knowledge and report, YME has ensured that it meats a high standard of Geotechnical engineering practice and care in the province of Ontario. Obligations under R.R.O. 1990, Reg. 941: Professional Engineers Act, R.S.O. 1990, c. P.28, further referred to as Reg. 941 which are of immediate interest to this service are:

"77. 7. A practitioner shall,

i. act towards other practitioners with courtesy and good faith,

ii. not accept an engagement to review the work of another practitioner for the same employer except with the knowledge of the other practitioner or except where the connection of the other practitioner with the work has been terminated,

iii. not maliciously injure the reputation or business of another practitioner,

8. A practitioner shall maintain the honour and integrity of the practitioner's profession and without fear or favour expose before the proper tribunals unprofessional, dishonest or unethical conduct by any other practitioner."

Communications

59-HII-R1 is to be used solely in connection with the development of a 4-Storey Apartment Building by Henry Investments Inc. (HII) and thus subject of communications amongst other professionals (OP), government bodies and authorities, and HII for that purpose. YME demands great care in precluding damage to the integrity of this professional work which may arise from careless communications from engineers of Canada. OP and HII acknowledge understanding that where any such communication occur in connection with this report, they are bound by this agreement as an extension to the standard of care embodied in R.R.O. 1990, Reg. 941 and thus accept that any correspondence from OP or the public seen to add any bad connotations to the breadth, depth, typesetting, typography, formal semantics and scope of this report or otherwise diminish the breadth of services and knowledge delivered in this report which in any way raise concerns or insecurities to the qualities and/or the *reasonable completeness* delivered to HII in this report will be forwarded to YME.

Reasonable Completeness

OP and Henry Investments Inc. acknowledge understanding that said care and said standard has been applied equality to the reasonable completeness of this report relative to the information available from the field program and acknowledge understanding that is neither feasible nor possible to convey geotechnical information in this report that would cover for every possible consideration by OP and/or HII and that upon issuance it will be subject to reviews which may trigger the need to add information which at the discretion of YME will

be added when considered within the practice obligations under Reg. 941. The geotechnical information here provided is thus envisioned as to cover for the scope and breadth of design figures and assessments generally foreseeable as needed by other designers at the time of issuance and which could be amended as needed within the context of services provided by other designers. YME agrees to issue revised versions of this 59-HII-R1 report by adding R# to each revision where # is the number of the revision. OP covenant to conduct all communications in connection with these reviews following great care to preclude the suggestion of a breach to the reasonable completeness acknowledged herein. Written communications which may trigger reviews under this agreement will be acknowledged as requests for "review under the 59-HII-R1 report user agreement". This reasonable completeness is also relative to the scope of services generally accepted in geotechnical engineering work in Ontario

Errors

Where errors are found during reviews under the 59-HII-R1 report user agreement, OP covenant great care in communications to preclude the suggestion of a breach to the duties acknowledge herein which could induce damages to YME. Communications triggered by errors or any such communication which would render the person doing the request in a position of technical authority above the author implies an unauthorized review and constitute a serious breach of the code of ethics under Reg. 941 and damages to YME and so subject to disciplinary measures and/or liability for damages to YME. HII is thus acquainted that correction of errors will be made and acknowledged by YME as they may arise in any professional work but in no way OP will purport or render such corrections as omissions departing away from the correction of errors set forth in this agreement. Where communications in connection with the correction of errors process set forth in this agreement raise concerns or insecurities to the qualities and/or the reasonable completeness delivered to HII in this report occur, HII covenants to inform YME. HII is acquainted that such corrections are part of the natural processes associated with the applied sciences nature of this report and so typified explicitly in this agreement to protect YME from inappropriate manipulation of those processes by OP and others.

Disclaimer

HII and OP understand that soils and groundwater information in this report has been collected in boreholess guided by standards and practice guidelines generally accepted for engineering characterization of ground conditions in Ontario and in no case boreholes data and their interpretation warrant understanding of conditions away from the boreholes locations. HII accepts that as development will have spread away from the boreholess other designers will need the best opinion from the geotechnical consultant based on the findings of the investigation so that any statements which could be implicitly or explicitly depart from the conditions at boreholes may be given to fulfill this need in good faith as best available opinion with the information available at the time without any warranties.

Report 59-HII-R1
This page is intentionally left blank

Part IV
Appendices

A Borehole Logs

Report 59-HII-R1
This page is intentionally left blank

Project:	**Proposed Four Storey Apartment Building**	YME Yuri Mendez Engineering.
Location: **73, 79 and 83 Ste. Cecile St.**	Client: **Henry Investments Inc.**	**Test Hole No.: BH1 of 3**
Job No.: **59-HI**	Test Hole Type: **7" OD Auger.**	Date: **November 24, 2022**
"7" OD Auger."	SPT Hammer Type: **Safety auto hammer**	Logged By: **Yuri Mendez**

Depth (m)	Elevation (m)	Lithology and color	Material Description	Samples or Blows/Ft	Water	Elevation (m)	Depth (m)	Shear Strength (kPa)	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Rock Quality RQD %	Laboratory Tests: Other Lab Tests
0	0		Fill: Granular A			0	0				
0.25							0.25				
0.5	-0.5		Fill			-0.5	0.5				
0.75							0.75				
1	-1			11		-1	1				
1.25							1.25				
1.5	-1.5		Fill: very dark brown plastic peat. Sampler down by weight.			-1.5	1.5				
1.75							1.75				
2	-2					-2	2				
2.25							2.25				
2.5	-2.5				▼	-2.5	2.5				
2.75							2.75				
3	-3					-3	3				
3.25							3.25				
3.5	-3.5					-3.5	3.5				
3.75							3.75				
4	-4					-4	4				
4.25							4.25				
4.5	-4.5					-4.5	4.5				
4.75							4.75				
5	-5					-5	5				
5.25			Fill: Dark gray silty sand with gravel				5.25				
5.5	-5.5			12		-5.5	5.5				
5.75							5.75				
6	-6		Fill: Dark gray sandy gravel	22		-6	6				
6.25							6.25				
6.5	-6.5					-6.5	6.5				
6.75			Dense gray silty sand. Coming up the augers. Disturbed unreliable blowcounts.				6.75				
7	-7			4		-7	7				
7.25							7.25				
7.5	-7.5					-7.5	7.5				
7.75							7.75				
8	-8		Inferred dense sand. Strata tested using Dynamic Cone Penetration Test (DCPT)	2		-8	8				
8.25				8			8.25				
8.5	-8.5			29		-8.5	8.5				
8.75				31			8.75				
9	-9			18		-9	9				
9.25				21			9.25				
9.5	-9.5			21		-9.5	9.5				
9.75				27			9.75				
10	-10			20		-10	10				
10.25				18			10.25				
10.5	-10.5			16		-10.5	10.5				
10.75				19			10.75				
11	-11			23		-11	11				
11.25				24			11.25				
11.5	-11.5			32		-11.5	11.5				
11.75				21			11.75				
12	-12			>>100		-12	12				
12.25			Cone Penetration Refusal at 12.95 m depth.				12.25				
12.5	-12.5					-12.5	12.5				
12.75							12.75				

S = Sample for lab review and moisture content

▼ Interpreted water level

Project:	**Proposed Four Storey Apartment Building**	YME Yuri Mendez Engineering.
Location: **73, 79 and 83 Ste. Cecile St.**	Client: **Henry Investments Inc.**	**Test Hole No.: BH2 of 3**
Job No.: **59-HI**	Test Hole Type: **7" OD Auger.**	Date: **November 24, 2022**
"7" OD Auger."	SPT Hammer Type: **Safety auto hammer**	Logged By: **Yuri Mendez**

Depth (m)	Elevation (m)	Lithology and color	Material Description	Samples or Blows/Ft	Water	Elevation (m)	Depth (m)	Shear Strength (kPa)	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Rock Quality RQD %	Laboratory Tests: Other Lab Tests
0	0		Fill: sandy gravel with clay			0	0				
0.25							0.25				
0.5	-0.5					-0.5	0.5				
0.75							0.75				
1	-1					-1	1				
1.25							1.25				
1.5	-1.5					-1.5	1.5				
1.75							1.75				
2	-2					-2	2				
2.25			Fill: very dark brown plastic peat. Sampler down by weight.				2.25				
2.5	-2.5				▼	-2.5	2.5				
2.75							2.75				
3	-3					-3	3				
3.25							3.25				
3.5	-3.5					-3.5	3.5				
3.75							3.75				
4	-4					-4	4				
4.25							4.25				
4.5	-4.5					-4.5	4.5				
4.75							4.75				
5	-5					-5	5				
5.25			Fill: Dark gray sandy gravel				5.25				
5.5	-5.5			4		-5.5	5.5				
5.75							5.75				
6	-6					-6	6				
6.25				8			6.25				
6.5	-6.5					-6.5	6.5				
6.75							6.75				
7	-7		Dense gray silty sand. Coming up the augers. Disturbed unreliable blowcounts.	24		-7	7				
7.25				22			7.25				
7.5	-7.5			20		-7.5	7.5				
7.75				27			7.75				
8	-8		Inferred dense sand. Strata tested using Dynamic Cone Penetration Test (DCPT)	30		-8	8				
8.25				43			8.25				
8.5	-8.5		Cone Penetration Test terminated at 8.84			-8.5	8.5				
8.75							8.75				

S = Sample for lab review and moisture content

▼ Interpreted water level

Project:	**Proposed Four Storey Apartment Building**	YME Yuri Mendez Engineering.
Location: **73, 79 and 83 Ste. Cecile St.**	Client: **Henry Investments Inc.**	**Test Hole No.: BH3 of 3**
Job No.: **59-HI**	Test Hole Type: **7" OD Auger.**	Date: **November 24, 2022**
"7" OD Auger."	SPT Hammer Type: **Safety auto hammer**	Logged By: **Yuri Mendez**

Depth (m)	Elevation (m)	Lithology and color	Material Description	Samples or Blows/Ft	Water	Elevation (m)	Depth (m)	Shear Strength (kPa)	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Rock Quality RQD %	Laboratory Tests: Other Lab Tests
0	0		Asphalt			0	0				
0.25							0.25				
0.5	-0.5		Fill: Brown gravely and silty sand			-0.5	0.5				
0.75							0.75				
1	-1		Fill: augered through			-1	1				
1.25							1.25				
1.5	-1.5					-1.5	1.5				
1.75							1.75				
2	-2					-2	2				
2.25							2.25				
2.5	-2.5				▼	-2.5	2.5				
2.75							2.75				
3	-3					-3	3				
3.25							3.25				
3.5	-3.5					-3.5	3.5				
3.75							3.75				
4	-4					-4	4				
4.25							4.25				
4.5	-4.5					-4.5	4.5				
4.75			Fill: gray sand	6			4.75				
5	-5		Fill: Dark gray sandy gravel			-5	5				
5.25							5.25				
5.5	-5.5					-5.5	5.5				
5.75							5.75				
6	-6					-6	6				
6.25			Dense gray silty sand. Coming up the augers. Disturbed unreliable blowcounts.				6.25				
6.5	-6.5					-6.5	6.5				
6.75							6.75				
7	-7					-7	7				
7.25				8			7.25				
7.5	-7.5		Inferred dense sand. Strata tested using Dynamic Cone Penetration Test (DCPT)	11		-7.5	7.5				
7.75				9			7.75				
8	-8			10		-8	8				
8.25				32			8.25				
8.5	-8.5			>>100		-8.5	8.5				
8.75			Cone Penetration Refusal at 8.84 m depth.				8.75				

S = Sample for lab review and moisture content

▼ Interpreted water level

Report 59-HII-R1
This page is intentionally left blank

Appendix

B Resistivity, PH and Soluble Salts Test

PARACEL LABORATORIES LTD.

Order #: 2249155

Certificate of Analysis

Report Date: 08-Dec-2022

Client: Geoseismic

Order Date: 29-Nov-2022

Client PO:

Project Description: 79 Ste Cecile

	Client ID:	BH1 SS9	-	-	-		
	Sample Date:	24-Nov-22 09:00	-	-	-	-	-
	Sample ID:	2249155-01	-	-	-		
	Matrix:	Soil	-	-	-		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	81.5	-	-	-	-	-
General Inorganics							
pH	0.05 pH Units	7.45	-	-	-	-	-
Resistivity	0.1 Ohm.m	51.3	-	-	-	-	-
Anions							
Chloride	5 ug/g	58	-	-	-	-	-
Sulphate	5 ug/g	59	-	-	-	-	-

Appendix

C Foundation Drainage

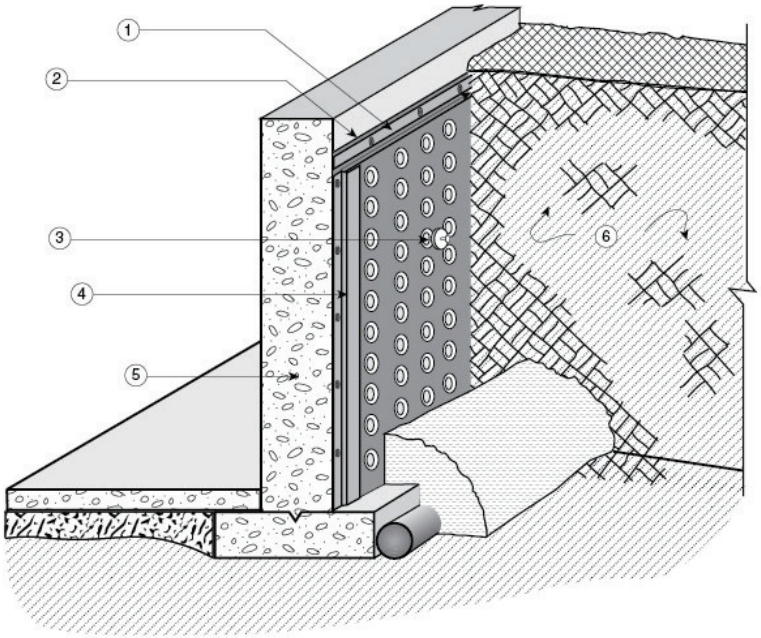

Figure 1. "Cosella-Dörken DELTA®-MS and DELTA®-MS CLEAR Dampproofing Membranes" – face in contact with the soil

1. **termination bar**
2. **caulking (behind membrane)**
3. **fastener**
4. **mould strip**
5. **concrete foundation**
6. **backfill**

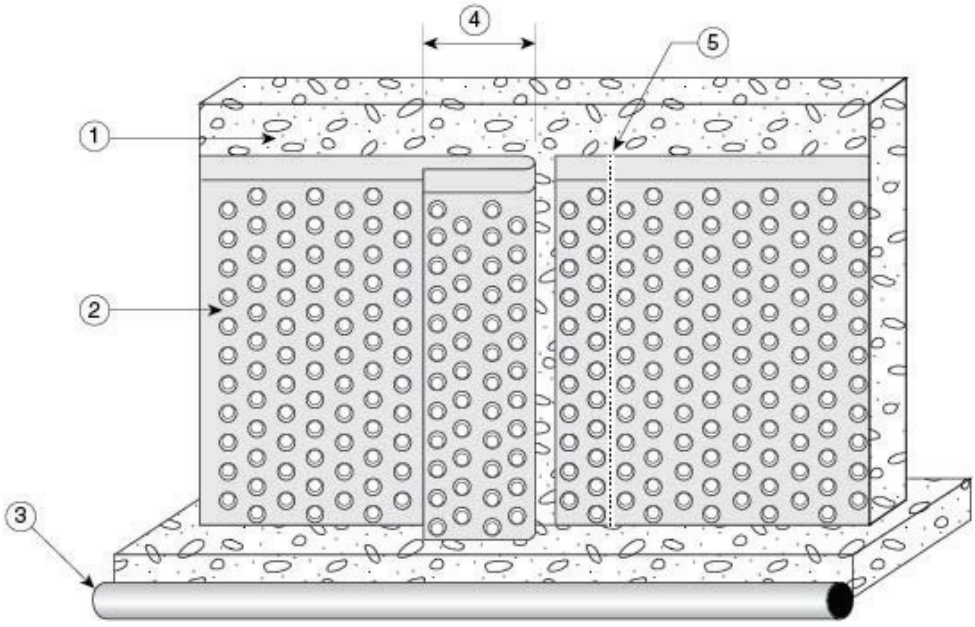

Figure 2. "Cosella-Dörken DELTA®-MS and DELTA®-MS CLEAR Dampproofing Membranes" – face in contact with the wall

1. **concrete foundation**
2. **membrane**
3. **drainage tile**
4. **minimum 6" overlap**
5. **caulking**