March 2016

# REPORT ON

# Geotechnical Investigation
# Proposed Residential Development
# 404 Eden Avenue
# Ottawa, Ontario

**Submitted to:**
404 Eden Ltd.
5689 Power Road
Ottawa, Ontario
K1G 3N4

REPORT

A world of capabilities delivered locally

**Report Number:** 1650401

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# Table of Contents

# 1.0 INTRODUCTION

This report presents the results of a geotechnical investigation carried out for a proposed residential development to be located at 404 Eden Avenue in Ottawa, Ontario.

The purpose of this geotechnical investigation was to assess the general subsurface conditions in the area of the proposed development by means of three test pits. Based on an interpretation of the factual information obtained, and a review of existing information available for the site, a general description of the subsurface conditions is presented. These interpreted subsurface conditions and available project details were used to prepare engineering guidelines on the geotechnical design aspects of the project, including construction considerations which could influence design decisions.

The reader is referred to the “Important Information and Limitation of This Report” which follows the text but forms and integral part of this report.

## 2.0 DESCRIPTION OF PROJECT AND SITE

Plans are being prepared for a proposed residential development to be located at 404 Eden Avenue in Ottawa, Ontario (for location see Key Plan inset, Figure 1).

The following is known about the project and site:

- The site is trapezoidal in shape and measures approximately 52 metres by 17 metres;
- The proposed residential development will consist of 13 residential apartments within a four-storey low-rise building;
- The structure will have a single basement level;
- The building will measure about 32 metres by 13 metres in plan area;
- Parking will be provided in the basement level below; and,
- The existing site currently contains a two-storey house, and is bound to the east by Eden Avenue, to the north by commercial developments, and to the west and south by residential developments.

Based on the results of previous investigations carried out in the general area of the site, as well as a review of published geology mapping, the subsurface conditions on this site are expected to consist of up to 2 metres of fill and/or glacial till overlying bedrock. The depth to the bedrock surface generally increases from the south to the north. Bedrock geology mapping indicates the bedrock on this site to consist of interbedded limestone and dolomite of the Gull River Formation.

# 3.0 PROCEDURE

The fieldwork for this investigation was carried out on February 17, 2016. At that time, 3 test pits (numbered 15-1, 15-2, and 15-3) were put down at the approximate locations shown on Figure 1.

The test pits were excavated using a rubber-tire backhoe supplied and operated by Glenn Wright Excavating of Ottawa, Ontario. The test pits were all advanced to the bedrock surface, which was encountered at depths ranging from approximately 0.8 to 1.2 metres below the existing ground surface.

The soil exposed on the sides of the test pits were classified by visual and tactile examination. The groundwater seepage conditions were observed in the open test pits and the test pits were loosely backfilled upon completion of excavating and sampling.

The fieldwork was supervised by a member of our technical staff who located the test pits, directed the excavating operations, logged the test pits and samples, and took custody of the samples retrieved.

Upon completion of the fieldwork, samples of the soils encountered in the test pits were transported to our laboratory for examination by the project engineer.

One sample of soil from test pit 15-3 was submitted to Exova Environmental Ontario Laboratories for chemical analysis related to potential corrosion of buried steel elements and potential sulphate attack on buried concrete elements.

The borehole locations were selected and marked in the field relative to existing site features. The borehole elevations were surveyed by Golder Associates personnel using a local benchmark, which consisted of the floor slab of the existing building, which was assigned a local Elevation of 100.00 metres.

# 4.0 SUBSURFACE CONDITIONS

Detailed information on the subsurface conditions encountered in the test pits is presented on the Record of Test Pits provided in Table 1. The results of the basic chemical analysis carried out on a sample of soil from test pit 15-3 are provided in Appendix A.

The following provides a brief summary of the subsurface conditions encountered within the test pits.

A layer of topsoil exists at the ground surface at test pits 15-1 and 15-2. At the test pit locations, the topsoil has a thickness of about 300 and 400 millimetres, respectively.

Test pit 15-3 was advanced through the pavement structure of the driveway of the existing house. The pavement structure consists of about 40 millimetres of gravelly sand base/subbase.

The topsoil in test pits 15-1 and 15-2 is underlain by fill that extends to depths of about 0.8 and 1.2 metres, respectively, below the existing ground surface. The fill generally consists of gravelly sand, and gravelly sandy silt to silty sand to clayey silt. The fill also contains metal, glass, cobbles, and boulders.

A deposit of glacial till exists below the pavement structure in test pit 15-3. Within this test pit, the glacial till extends to a depth of about 1.2 metres below the existing ground surface. The glacial till generally consists of a heterogeneous mixture of gravel, cobbles, and boulders in a matrix of silty sand.

The bedrock surface was encountered at depths ranging from about 0.8 to 1.2 metres below the existing ground surface.

The test pits were observed to be dry at the time of excavation (i.e., the groundwater level was not encountered). It should be noted that the groundwater level was measured to be at a depth of about 2.7 metres below the existing ground surface in a borehole that was advanced just to the north of this site.

Groundwater levels are expected to fluctuate seasonally. Higher groundwater levels are expected during wet periods of the year, such as spring.

# 5.0 DISCUSSION

## 5.1 General

This section of the report provides engineering guidelines on the geotechnical design aspects of the project based on our interpretation of the available information described herein and project requirements.

Reference should be made to the "Important Information and Limitations of this Report" which follows the text of this report but forms an integral part of this document.

## 5.2 Site Grading

In general, the subsurface conditions on this site consist of topsoil, pavement structure, and fill underlain by a discontinuous deposit of glacial till. The overburden is underlain by shallow bedrock at depths from about 0.8 to 1.2 metres below the existing ground surface. The test pits were observed to be dry upon completion.

From a foundation design perspective, no practical restrictions apply to the thickness of grade raise fill that may be placed on this site.

For predictable performance of the structures, roadways, and site services, preparation for filling the site should include stripping the existing topsoil and fill. The topsoil and fill are not suitable as general fill and should be stockpiled separately for re-use in landscaping applications only.

## 5.3 Excavations

Excavations for the basement level, foundations, and site services will be through topsoil, pavement structure, fill, and into the native glacial till and limestone bedrock.

No unusual problems are anticipated in excavating the overburden soils using conventional hydraulic excavating equipment, recognizing that large cobbles and boulders should be expected within the fill and glacial till. Boulders larger than 0.3 metres in size should be removed from the walls of the excavations for worker safety.

Provided that the groundwater level is not encountered during excavation (which is expected to be the case for the overburden soils), the Occupational Health and Safety Act (OHSA) of Ontario indicates that side slopes in the overburden soils could be sloped at 1 horizontal to 1 vertical (i.e., Type 3 soils), or flatter.

Where shallow excavation of the sound bedrock is required (e.g., for sewers or deeper footings), it is anticipated that the bedrock removal could be carried out using mechanical methods (e.g., hoe ramming), potentially in conjunction with closely spaced line drilling. Where larger volumes of bedrock removal are required, blasting may be more economical and could also be considered as a means of bedrock removal.

Near vertical trench walls in the bedrock should stand unsupported for the construction period.

The blasting (if required) should be controlled to limit the peak particle velocities at all adjacent structures or services such that blast induced damage will be avoided. This will require blast designs by a specialist in this field.

A pre-construction survey should be carried out of all of the surrounding structures. Selected existing interior and exterior cracks in the structures should be identified during the pre-construction survey and should be monitored for lateral or shear movements by means of pins, glass plate telltales and/or movement telltales.

If blasting, the contractor should be required to submit a complete and detailed blasting design and monitoring proposal prepared by a blasting/vibrations specialist prior to commencing blasting. This would have to be reviewed and accepted in relation to the requirements of the blasting specifications.

The contractor should be limited to only small controlled shots if blasting is required. The following frequency dependent peak vibration limits at the nearest structures and services are suggested.

| Frequency Range (Hz) | Vibration Limits (millimetres/second) |
|---|---|
| < 10 | 5 |
| 10 to 40 | 5 to 50 (sliding scale) |
| > 40 | 50 |

It is recommended that the monitoring of ground vibration intensities (peak ground vibrations and accelerations) from the blasting operations be carried out both in the ground adjacent to the closest structures and within the structures themselves.

Based on boreholes in the near vicinity of the site, the groundwater is expected to be at a depth of about 2.5 to 3.0 metres below the existing ground surface; therefore some groundwater infiltration into the excavation should be expected. Water that accumulates in the bottom of the excavations (e.g., from perched groundwater, surface water, or precipitation) can be handled by pumping from well filtered sumps established in the floor of the excavations. The pumping volumes are not known at this time as it depends on the size of the excavation, the time of year the excavating takes place, and the contractor's schedule. A Permit-To-Take-Water (PTTW) will be required if pumping volumes are anticipated to be greater than 50,000 Litres per day.

## 5.4 Foundations

Based on the drawings provided, the basement floor slab is proposed to be at about 3.1 metres below the existing ground surface. This being the case, it is considered that the structure can be supported on conventional spread footings placed on or within the bedrock.

The factored bearing resistance at Ultimate Limit States (ULS) for spread footing foundations founded on or within the bedrock may be taken as 500 kilopascals. Provided the bedrock surface is acceptably cleaned of soil or loose bedrock (i.e., any bedrock that can easily be removed with a hydraulic excavator), the settlement of footings at the corresponding service (unfactored) load levels will be less than 25 millimetres and therefore Serviceability Limit States (SLS) need not be considered in the foundation design. Accordingly, the post construction settlement of structural elements which derive their support from footings bearing on bedrock should be negligible.

## 5.5 Seismic Design

The seismic design provisions of the 2012 Ontario Building Code depend, in part, on the shear wave velocity of the upper 30 metres of soil and/or bedrock below founding level. Based on the 2012 Ontario Building Code methodology, this site can be assigned a Site Class of C, acknowledging that this requirement does not apply to ground oriented residential structures designed per part 9 of the Ontario Building Code. A more favourable Site Class value could likely be assigned if shear wave velocity testing were carried out.

## 5.6 Basement Floor Slabs

In preparation the construction of the basement floor slab, all loose, wet, and disturbed material should be removed from beneath the floor slab. Provision should be made for at least 200 millimetres of 19 millimetre clear crushed stone to form the base of the floor slab. The underslab fill should be compacted to at least 95 percent of the material's standard Proctor maximum dry density using suitable vibratory compaction equipment.

To prevent hydrostatic pressure build up beneath the floor slab, it is suggested that the granular base for the floor slab be drained. This could be achieved by providing a hydraulic link between the underfloor fill and the exterior drainage system.

## 5.7 Frost Protection

All perimeter and exterior foundation elements or interior foundation elements in unheated areas should be provided with a minimum of 1.5 metres of earth cover for frost protection purposes. Isolated, unheated exterior footings adjacent to surfaces which are cleared of snow cover during winter months should be provided with a minimum of 1.8 metres of earth cover.

It is expected that these requirements will be satisfied for all of the structure footings due to the deep founding levels required to accommodate the below-grade parking.

## 5.8 Basement Wall Backfill

The soils at this site are frost susceptible and should not be used as backfill directly against exterior, unheated, or well insulated foundation elements. To avoid problems with frost adhesion and heaving, these foundation elements should be backfilled with non-frost susceptible sand or sand and gravel conforming to the requirements for OPSS Granular B Type I. Alternatively, a bond break such as the Platon system sheeting could be placed against the foundation walls.

To avoid ground settlements around the foundations, which could affect site grading and drainage, all of the backfill materials should be placed in maximum 0.3 metre thick lifts and compacted to at least 95 percent of the material's standard Proctor maximum dry density.

Drainage of the wall backfill should be provided by means of a perforated pipe subdrain in a surround of 19 millimetre clear stone, fully wrapped in geotextile, which leads by gravity drainage to an adjacent storm sewer or sump pit. Conventional damp proofing of the basement walls is appropriate with the above design approach.

If the foundations will be designed in accordance with Part 4 of the Ontario Building Code, further guidelines on the foundation wall design will be required.

## 5.9 Site Servicing

At least 150 millimetres of OPSS Granular A should be used as pipe bedding for sewer and water pipes. Where a bedrock subgrade is encountered at the bedding level, the Granular A bedding should be thickened to 300 millimetres. Where unavoidable disturbance to the subgrade surface occurs, it may be necessary to place a sub-bedding layer consisting of 300 millimetres of compacted OPSS Granular B Type II beneath the Granular A. The bedding material should in all cases extend to the spring line of the pipe and should be compacted to at least 95 percent of the material's standard Proctor maximum dry density. The use of clear crushed stone as a bedding layer should not be permitted anywhere on this project since fine particles from the sandy backfill materials or surrounding soil could potentially migrate into the voids in the clear crushed stone and cause loss of lateral pipe support.

Cover material, from the spring line of the pipe to at least 300 millimetres above the top of pipe, should consist of OPSS Granular A or Granular B Type I with a maximum particle size of 25 millimetres. The cover material should be compacted to at least 95 percent of the material's standard Proctor maximum dry density.

It should generally be possible to re-use the inorganic overburden materials as trench backfill. Where the trench will be covered with hard surfaced areas, the type of native material placed in the frost zone (between subgrade level and 1.8 metres depth) should match the soil exposed on the trench walls for frost heave compatibility. Trench backfill should be placed in maximum 300 millimetre thick lifts and should be compacted to at least 95 percent of the material's standard Proctor maximum dry density using suitable compaction equipment.

Well fractured or well broken bedrock will be acceptable as backfill for the lower portion of the service trenches in areas where the excavation is in rock. The rock fill, however, should only be placed from at least 300 millimetres above the pipes to minimize damage due to impact or point load. The rock fill should be limited to a maximum of 300 millimetres in size.

# 6.0 ADDITIONAL CONSIDERATIONS

The test pits excavated and filled on site constitute zones of disturbance to the surficial soils. These disturbed areas could affect the performance of structures and pavements. If the test pit locations are located within these areas, the backfill soil in the test pits will need to be removed and replaced with engineered fill.

The soils at this site are sensitive to disturbance from ponded water, construction traffic, and frost.

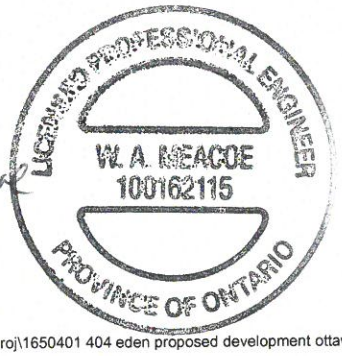
All footing and subgrade areas should be inspected by experienced geotechnical personnel prior to filling or concreting to ensure that bedrock having adequate bearing capacity have been reached and that the bearing surfaces have been properly prepared. The placing and compaction of any engineered fill as well as sewer bedding and backfill should be inspected to ensure that the materials used conform to the specifications from both a grading and compaction view point.

At the time of the writing of this report, only preliminary details for the proposed development were available. Golder Associates should be retained to review the final drawings and specifications for this project prior to tendering to ensure that the guidelines in this report have been adequately interpreted.

## 7.0 CLOSURE

We trust that this report meets your current needs. If you have any questions, or if we may be of further assistance, please do not hesitate to contact the undersigned.

**GOLDER ASSOCIATES LTD.**




Alex Meacoe, P.Eng.
Geotechnical Engineer

Troy Skinner, P.Eng.
Associate, Geotechnical Engineer

WAM/TMS/ob

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## IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT

**Standard of Care:** Golder Associates Ltd. (Golder) has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practicing under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

**Basis and Use of the Report:** This report has been prepared for the specific site, design objective, development and purpose described to Golder by the Client, **404 Eden Ltd.** The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. Any change of site conditions, purpose, development plans or if the project is not initiated within eighteen months of the date of the report may alter the validity of the report. Golder cannot be responsible for use of this report, or portions thereof, unless Golder is requested to review and, if necessary, revise the report.

The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without Golder's express written consent. If the report was prepared to be included for a specific permit application process, then the client may authorize the use of this report for such purpose by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process, provided this report is not noted to be a draft or preliminary report, and is specifically relevant to the project for which the application is being made. Any other use of this report by others is prohibited and is without responsibility to Golder. The report, all plans, data, drawings and other documents as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder, who authorizes only the Client and Approved Users to make copies of the report, but only in such quantities as are reasonably necessary for the use of the report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make available the report or any portion thereof to any other party without the express written permission of Golder. The Client acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client cannot rely upon the electronic media versions of Golder's report or other work products.

The report is of a summary nature and is not intended to stand alone without reference to the instructions given to Golder by the Client, communications between Golder and the Client, and to any other reports prepared by Golder for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. Golder cannot be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

**Soil, Rock and Groundwater Conditions:** Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, Golder does not warrant or guarantee the exactness of the descriptions.

## IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT (cont'd)

Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that Golder interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. **The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report.** The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

**Sample Disposal:** Golder will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

**Follow-Up and Construction Services:** All details of the design were not known at the time of submission of Golder's report. Golder should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of Golder's report.

During construction, Golder should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of Golder's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in Golder's report. Adequate field review, observation and testing during construction are necessary for Golder to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, Golder's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

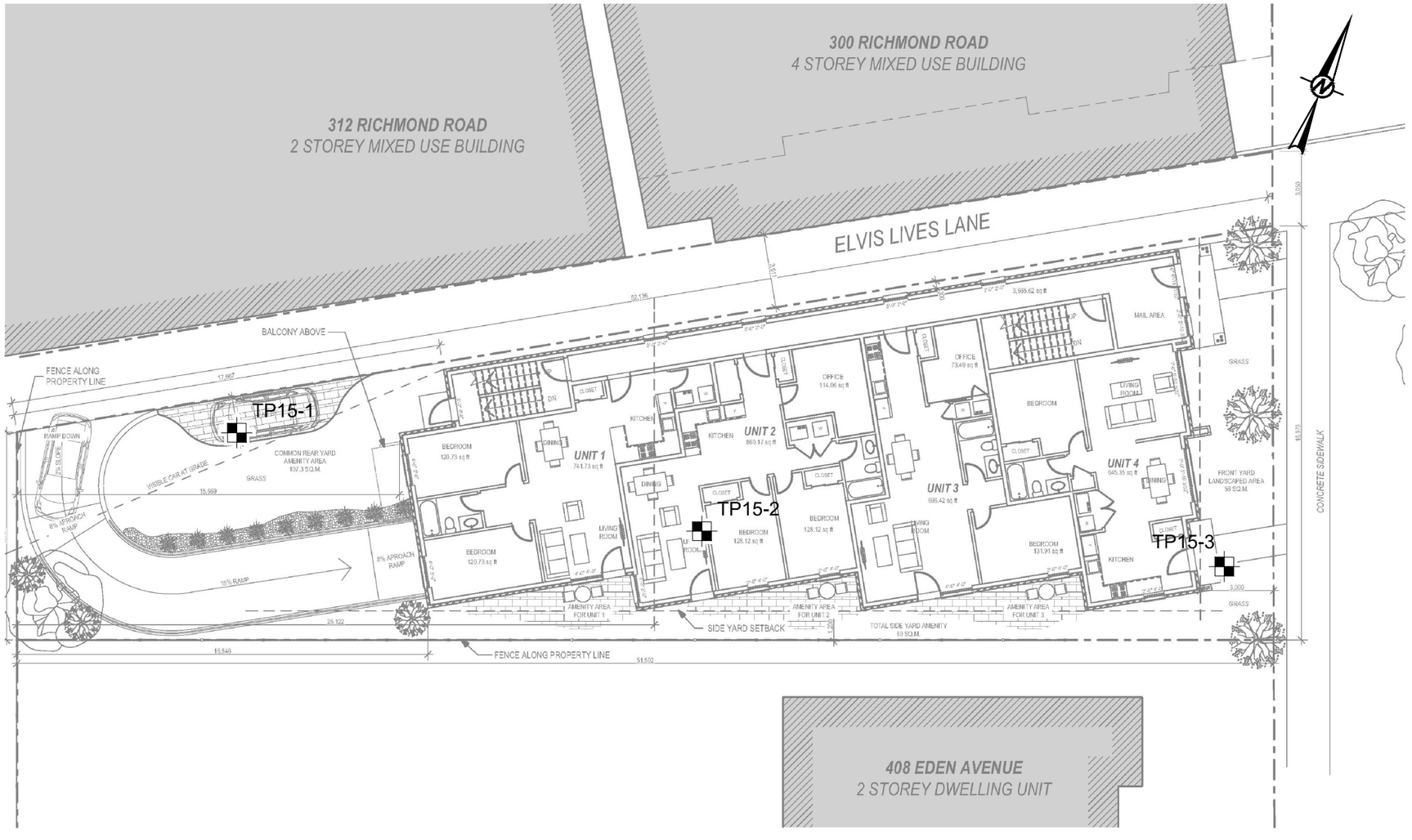
**Changed Conditions and Drainage:** Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that Golder be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that Golder be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. Golder takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.

**TABLE 1**

**RECORD OF TEST PITS**

| Test Pit Number (Elevation) | Depth (metres) | Description |
|---|---|---|
| TP 15-1 (99.09) | 0.00 – 0.30 | FILL/TOPSOIL - (ML) Sandy SILT; brown |
| | 0.30 – 0.50 | FILL - (SW) Gravelly SAND; grey, crushed; non-cohesive, moist |
| | 0.50 – 0.80 | FILL - (SM) SILTY SAND; brown, contains metal, glass; non-cohesive, moist |
| | 0.80 | END OF TEST PIT – Refusal on BEDROCK |
| | | Sample: 1, 2, 3 — Depth (m): 0.20, 0.40, 0.60 |
| TP 15-2 (99.23) | 0.00 – 0.40 | FILL/TOPSOIL - (ML) Sandy SILT, trace gravel; reddish brown |
| | 0.40 – 0.80 | FILL - (ML-SM) Gravelly sandy SILT to SILTY SAND; brown, contains cobbles and boulders; non-cohesive, moist |
| | 0.80 – 1.15 | FILL - (ML) Gravelly sandy SILT to CLAYEY SILT; brown, contains cobbles and boulders (ROCK FILL); non-cohesive, moist |
| | 1.15 | END OF TEST PIT – Refusal on BEDROCK |
| | | Sample: 1, 2, 3 — Depth (m): 0.15, 0.40, 0.90 |
| TP 15-3 (98.9) | 0.00 – 0.04 | ASPHALTIC CONCRETE |
| | 0.04 – 0.40 | FILL - (SW) Gravelly SAND, brown (PAVEMENT STRUCTURE), non-cohesive, moist |
| | 0.40 – 1.20 | (SM) SILTY SAND some gravel to gravelly; grey brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist |
| | 1.20 | END OF TEST PIT – Refusal on BEDROCK |
| | | Sample: 1 — Depth (m): 0.7 |




**KEY MAP**


SCALE: 1:15,000 m

**LEGEND**

APPROXIMATE TEST PIT LOCATION

APPROXIMATE PROPERTY BOUNDARY

**NOTE(S)**

1. THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GOLDER ASSOCIATES LTD. REPORT No. 1650401

**REFERENCE(S)**

BASE INFORMATION PROVIDED IN A PDF FORMAT BY ROBERTSON MARTIN ARCHITECTS.

0 5 10
1:200 METRES

CLIENT
404 EDEN LTD.

PROJECT
GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
404 EDEN AVENUE, OTTAWA, ONTARIO

TITLE
**SITE PLAN**

CONSULTANT

Golder Associates

| | |
|---|---|
| YYYY-MM-DD | 2016-02-25 |
| DESIGNED | ---- |
| PREPARED | MLF |
| REVIEWED | WAM |
| APPROVED | TMS |

| PROJECT NO. | PGASE | REV. | FIGURE |
|---|---|---|---|
| 1650401 | 1000 | A | 1 |

# APPENDIX A

## Results of Basic Chemical Analysis
## Exova Report Number 4602461

**EXOVA ENVIRONMENTAL ONTARIO**

# Certificate of Analysis


Client: Golder Associates Ltd. (Ottawa)
1931 Robertson Road
Ottawa, ON
K2H 5B7
Attention: Mr. Alex Meacoe
PO#:
Invoice to: Golder Associates Ltd. (Ottawa)


Report Number: 1602461
Date Submitted: 2016-02-19
Date Reported: 2016-02-24
Project: 1650401
COC #: 805581

| | | | | | |
|---|---|---|---|---|---|
| | | | | Lab I.D. | 1227599 |
| | | | | Sample Matrix | Soil |
| | | | | Sample Type | |
| | | | | Sampling Date | 2016-02-18 |
| | | | | Sample I.D. | TP 15-3 sa1 0.7 |
| **Group** | **Analyte** | **MRL** | **Units** | **Guideline** | |
| Agri. - Soil | pH | 2.0 | | | 8.0 |
| General Chemistry | Cl | 0.002 | % | | 0.004 |
| | Electrical Conductivity | 0.05 | mS/cm | | 0.25 |
| | Resistivity | 1 | ohm-cm | | 4170 |
| | SO4 | 0.01 | % | | <0.01 |

**Guideline =** *** = Guideline Exceedence**

All analysis completed in Ottawa, Ontario (unless otherwise indicated by ** which indicates analysis was completed in Mississauga, Ontario).
Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

At Golder Associates we strive to be the most respected global group of companies specializing in ground engineering and environmental services. Employee owned since our formation in 1960, we have created a unique culture with pride in ownership, resulting in long-term organizational stability. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees now operating from offices located throughout Africa, Asia, Australasia, Europe, North America and South America.


| | |
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