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REPORT ON

GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL BUILDINGS
27 AND 35 SCISSONS ROAD
OTTAWA, ONTARIO

Submitted to:

Olympia Homes
1914 Merivale Road
Ottawa, Ontario
K2G 1E8

Attention: Mr. Wm. Buchanan

DISTRIBUTION

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January 2013

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1.0 INTRODUCTION

This report presents the results of a geotechnical investigation carried out for a proposed residential development on the west side of Scissons Road in the City of Ottawa, Ontario (see Key Plan, Figure 1).

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

This report has been prepared in consideration of the terms and conditions noted in the report and with the assumption that the design of the project will satisfy any applicable codes and standards. Should there be any changes in the design features outlined below, which may relate to the geotechnical considerations, Morey Associates Ltd. (MAL) should be advised in order to review the report recommendations

2.0 BACKGROUND INFORMATION AND SITE GEOLOGY

The site consists of an irregular shaped parcel of land some 0.57 hectares in plan area located on the west side of Scissons Road in the City of Ottawa, Ontario (see Key Plan, Figure 1). It is understood that plans are being prepared to construct a residential subdivision at the site consisting of some 4 blocks of three-storey rowhouse buildings serviced by municipal water main and sanitary sewers. The rowhouse buildings are likely to be of wood frame construction with conventional spread footing foundations. It is further understood that the proposed development will be accessed by a local residential roadway. Surface drainage for the proposed development will be by means of swales, catch basins and storm sewers.

The site is bordered on the north, west and south sides by existing residential development and on the east by Scissons Road. The ground surface at the site is relatively flat. Two single family dwellings with private driveways exist at the site. It is understood that the existing buildings at the site including the foundations will be removed.

A review of the existing surficial geology map for the site indicates that the site is underlain by shallow bedrock with a thin veneer of overburden material. Bedrock geology maps indicate that the bedrock underlying the site consists of limestone of the Ottawa Formation.

3.0 PROCEDURE

The field work for this investigation was carried out on December 11, 2012 at which time 7 test pits, numbered TP1 to TP7 were put down at the site. The test pits were advanced to depths of ranging from about 0.8 to 3.5 metres below the existing ground surface using a rubber tire mounted backhoe supplied and operated by a local excavating contractor.

The subsurface soil conditions at the test pits were identified based on visual and tactile examination of the materials exposed on the walls and bottom of the test pits. Groundwater conditions in the test pits were noted at the time of excavating. The test pits were loosely backfilled with the excavated material upon completion.

The field work was supervised throughout by a member of our engineering staff who located the test pits in the field and logged the subsurface conditions encountered at the test pits. A description of the subsurface conditions encountered at each of the test pits is given in the attached Table I, Record of Test Pits. The approximate locations of the test pits are shown on the attached Site Plan, Figure 2.

A sample of soil obtained from the site was delivered to a chemical laboratory for testing for any indication of potential soil sulphate attack and soil corrosion on buried concrete and steel.

4.0 SUBSURFACE CONDITIONS

4.1 General

As previously indicated, a description of the subsurface conditions encountered at the test pits is provided in the attached Table I, Record of Test Pits. The test pit logs indicate the subsurface conditions at the specific test locations only. Boundaries between zones on the logs are often not distinct, but rather are transitional and have been interpreted. Subsurface conditions at other locations than the test pit locations may vary from the conditions encountered at the test pits.

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

The groundwater conditions described in this report refer only to those observed at the location and date of the observations noted in the report, and on the test pit logs. Groundwater conditions may vary seasonally, or may be affected by construction activities on or in the vicinity of the site.

The following is a brief overview of the subsurface conditions encountered at the test pits.

4.2 Fill and Topsoil

About a 0.6 metre thickness of fill was encountered from the surface at test pit 5. The fill consists of topsoil and grey brown sand. Beneath the fill at test pit 5 and from the surface at all the other test pits about a 0.2 to 0.4 metre thickness of topsoil was encountered. The material was classified as topsoil based on colour and the presence of organic materials and is intended as identification for geotechnical purposes only and does not constitute a statement as to the suitability of this layer for cultivation and sustaining plant growth.

4.3 Sand

Beneath the topsoil at all the test pits a deposit of red brown to yellow brown to grey brown fine to medium sand or medium to coarse sand was encountered. The sand deposit was fully penetrated at all the test pits and found to be some 0.3 to 1.6 metres in thickness. Based on tactile examination and the difficulty to advance the test pits it is considered that the sand is in a loose to compact state of packing.

4.4 Silty Clay

A deposit of silty clay was encountered beneath the sand at test pits 4, 6 and 7. The silty clay has been weathered to a grey brown crust. The silty clay deposit was fully penetrated at the test pits and found to be about 0.2 to 1.5 metres in thickness. Based on visual and tactile examination of the silty clay exposed on the sides and bottom of the test pits, the silty clay encountered at the test pit locations is considered to be very stiff in consistency. Refusal to advance the test pit was met at test pit 7 beneath the silty clay material on what is possibly large boulders or the surface of the bedrock at a depth of about 2.3 metres below the existing ground surface.

4.5 Glacial Till

Beneath the sand layer at test pits 1, 3 and 5 and beneath the silty clay material at test pits 4 and 6 a deposit of grey brown glacial till was encountered. The glacial till consists of gravel, cobbles, boulders in a matrix of silty sand with a trace of clay. Refusal to advance the test pits was met at the test pits within the glacial till material on what is possibly large boulders or the surface of the bedrock at depths ranging from about 1.5 to 3.5 metres below the existing ground surface. Based on tactile examination and the difficulty to advance the test pits it is considered that the glacial till is in a compact state of packing.

4.6 Weathered Bedrock

Beneath the sand deposit at test pit 2 about a 0.2 metre thickness of weathered bedrock was encountered. Test pit 2 met practical refusal to excavating at a depth of about 0.8 metres below the existing ground surface.

4.7 Groundwater

No groundwater seepage in the test pits was observed at the time of excavating. It should be noted that the groundwater levels may be higher during wet periods of the year such as the early spring.

5.0 PROPOSED RESIDENTIAL DEVELOPMENT

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 information from the test pits and the project requirements. It is stressed that the information in the following sections is provided for the guidance of the designers and is intended for this project only. Contractors bidding on or undertaking the works should examine the factual results of the investigation, satisfy themselves as to the adequacy of the information for construction, and make their own interpretation of the factual data as it affects their construction techniques, schedule, safety and equipment capabilities.

The professional services for this project include only the geotechnical aspects of the subsurface conditions at this site. The presence or implications of possible surface and/or subsurface contamination resulting from previous uses or activities at this site or adjacent properties, and/or resulting from the introduction onto the site of materials from off site sources are outside the terms of reference for this report and have not been addressed.

5.2 Foundations for Proposed Rowhouses

With the exception of the fill and topsoil the subsurface conditions encountered at the test pits advanced for this investigation are suitable for support of the proposed rowhouses on spread footing foundations. The excavations for the foundations should be taken down through the fill and topsoil and any deleterious material to expose the native, undisturbed sand, silty clay, glacial till or bedrock.

Footings founded in the native undisturbed sand and/or silty clay and/or glacial till above the groundwater level should be designed using a maximum allowable bearing pressure of 100 kilopascals for serviceability limit states and 150 kilopascals for the factored ultimate bearing resistance. Any footings founded within the native undisturbed sand should be a minimum 0.6 metres in width.

For footings founded on the native undisturbed sand and/or silty clay, the above bearing pressure and resistance are suitable for strip and pad footings up to 0.9 metres in width and 1.5 metres square, respectively, and for a grade raise fill thickness adjacent to the proposed rowhouse foundations of up to 2.5 metres. No maximum footing width or maximum landscape grade raise adjacent to the proposed rowhouse foundations is required for footings bearing of the native undisturbed glacial till or bedrock.

Provided that any loose and disturbed soil is removed from the bearing surfaces prior to pouring concrete, the total and differential settlement of the footings founded on the sand and/or silty clay and/or glacial till should be less than 25 millimetres and 20 millimetres, respectively.

Footings founded all on sound bedrock and above the groundwater level should be designed using a maximum allowable bearing pressure of 300 kilopascals for serviceability limit states and 450 kilopascals for the factored ultimate bearing resistance. Provided that the bedrock bearing surface is cleaned of all loose material prior to pouring concrete the total and differential settlement of the footings founded all on sound bedrock should be negligible.

In view of the presence of the sand, silty clay and glacial till at the site, it is strongly suggested that footings for a proposed rowhouse should be founded all on the sand and/or silty clay and/or glacial till or all on the bedrock subgrade to minimize the potential for foundation wall cracks in overburden to bedrock subgrade transition areas. Where footings are founded on both the sand and/or silty clay and/or glacial till and the bedrock a suitable footing subgrade transition treatment, such as shown in Figure 3, should be used and designed by a structural engineer to resist potential distress from up to 25 millimetres of differential settlement across the transition.

If proposed grade raises adjacent to the proposed building foundations, where footings are founded on or above the silty clay, are greater than 2.0 metres or the footings are wider than given above, the allowable bearing pressure for footings may have to be reduced. Alternatively, the use of light weight fill material, such as extruded polystyrene (EPS), could be used in conjunction with suitable native or imported backfill material (meeting the backfilling requirements outlined in this report) in order to meet the proposed finished grade level.

It is understood that the existing single family dwellings at the site will be demolished as part of the development plan. Any foundations associated with the buildings should be removed from within the area of the proposed rowhouses and the excavation taken down to an undisturbed native subgrade below the level of the previous foundations.

If any fill is required to raise the footings for the proposed buildings to founding level, the fill should consist of imported granular material (engineered fill). The engineered fill should consist of material meeting Ontario Provincial Standard Specifications (OPSS) requirements for Granular A or Granular B Type II and should be compacted in maximum 250 millimetre thick loose lifts to at least 95 percent of the standard Proctor maximum dry density. To allow the spread of load beneath the footings, the engineered fill should extend down and out from the edges of the footing at 1 horizontal to 1 vertical, or flatter. The excavations for the proposed buildings should be sized to accommodate this fill placement. Currently, OPSS documents allow recycled asphaltic concrete to be used in Granular A and Granular B Type II materials. Since the source of recycled material cannot be determined, it is suggested that any granular materials used below the founding level be composed of virgin materials only.

Groundwater inflow from the native soils into the basement excavations during construction, if any should be handled by pumping from sumps within the excavation

5.3 Foundation Walls

All exterior foundation elements and those in any unheated parts of the proposed buildings should be provided with at least 1.5 metres of earth cover for frost protection purposes. Isolated, unheated foundation elements adjacent to surfaces which are cleared of snow cover during winter months should be provided with a minimum 1.8 metres of earth cover. Where less than the required depth of soil cover can be provided, the foundation elements could be protected from frost by using a combination of earth cover and extruded polystyrene rigid insulation. A typical footing frost protection insulation detail could be provided, if required.

Some of the native soils at the site are considered to be frost susceptible. As such, to prevent possible foundation frost jacking of unheated walls and/or isolated walls and to provide drainage for the basement walls, backfill material should consist of free draining, non-frost susceptible material such as sand, or sand and gravel, meeting OPSS Granular B Type I grading requirements. Alternatively, foundations could be backfilled with native material in conjunction with the use of an approved proprietary drainage layer system against the foundation wall. It is pointed out that there is potential for possible frost jacking of the upper portion of some types of these drainage layer systems if frost susceptible material is used as backfill. This could be mitigated by backfilling the upper approximately 0.6 metres with non-frost susceptible granular material.

Where the backfill material will ultimately support a pavement structure or walkway, it is suggested that the foundation wall backfill material be compacted in 250 millimetre thick lifts to 95 percent of the standard Proctor dry density value. In that case any native material proposed for foundation backfill should be inspected and approved by the geotechnical engineer.

For the proposed rowhouses a conventional, perforated perimeter drain should be provided at founding level, leading by gravity flow to a storm sewer. The drain should be provided with a 150 millimetre thick surround of 20 millimetre crushed stone. A suitable geotextile such as Terrifix 270R or equivalent should be provided as a separator between the crushed stone and any sandy backfill material.

5.4 Seismic Design for Proposed Residential Buildings

For Seismic design purposes, in accordance with the 2006 OBC Section 4.1.8.4, Table 4.1.8.4.A., the site classification for seismic site response is Site Class C. That site class has been determined based on the limited investigation carried out at the site. A higher site class designation may result from additional investigation and/or in situ seismic velocity testing of the subsurface materials.

5.5 Potential for Soil Liquefaction

As indicated above the results of the test pits indicate that the native deposits underlying the site consist of unsaturated loose to compact sand, very stiff silty clay, compact glacial till and bedrock. As these materials are not prone to liquefaction, it is considered that no damage to the proposed residential buildings should occur due to liquefaction of the native subgrade under seismic conditions.

5.6 Potential for Sulphate Attack/Corrosion on Buried Concrete and Steel

The results of laboratory testing of the above mentioned soil sample gave a percent sulphate (SO_4) for the soil sample of 0.04 and an ohm-cm resistivity and pH of 8,330 and 7.6, respectively.

The National Research Council of Canada (NRC) recognizes four categories of potential sulphate attack of buried concrete based on percent sulphate in soil. From 0 to 0.10 percent the potential is negligible, from 0.10 to 0.20 percent the potential is mild but positive, from 0.20 to 0.50 percent the potential is considerable and 0.50 percent and greater the potential is severe. Based on the above the soil sample is considered to have a negligible potential for sulphate attack on buried concrete.

The results of the laboratory testing of the soil sample for resistivity and pH indicates the soil sample tested has an underground corrosion rate of about 0.3 loss-oz./ft^2/yr. Based on the findings of Fischer and Bue (1981) underground corrosion rates (loss-oz./ft^2/yr) of 0.30 and less are considered nonaggresive, from 0.30 to 0.75 the rate is considered slightly aggressive, from 0.75 to 2.0 the rate is considered aggressive and 2.0 and greater the rate is considered very aggressive. Accordingly, the above mentioned soil sample is considered to have a nonaggressive corrosion rate on buried steel.

5.7 Trees

It should be noted that the silty clay soils at the site may be sensitive to water depletion by trees of high water demand during periods of dry weather. When trees draw water from the silty clay, the silty clay undergoes shrinkage which can result in settlement of adjacent structures. The zone of influence of a tree is considered to be approximately equal to the mature height of the tree. Therefore, trees which have a high water demand should not be planted closer to structures than the ultimate height of the trees. Table II provides a list of the common trees in decreasing order of water demand and, accordingly, decreasing risk of potential effects on structures.

6.0 SITE SERVICES

6.1 Excavation

The excavations for the site services will be carried out through fill, topsoil, sand, silty clay, glacial till and possibly bedrock. The sides of the excavations in overburden materials should be sloped in accordance with the requirements in Ontario Regulation 213/91 under the Ontario Occupational Health and Safety Act. That is, open cut excavations with overburden deposits should be carried out with side slopes of 1 horizontal to 1 vertical, or flatter. Where space constraints dictate, the excavation and backfilling operations should be carried out within a tightly fitting, braced steel trench box. It is possible that some of the services excavations will extend below the water table in the sand, silty clay and glacial till. Where this occurs, some loss of ground and groundwater inflow may occur, requiring side slopes as flat as 3 horizontal to 1 vertical to be used.

Small amounts of bedrock removal, if required, can most likely be carried out by the use of a large excavator or hoe ramming. If larger amounts of bedrock removal are required it may be more economically feasible to use drill and blasting techniques and should be carried out under the supervision of a blasting specialist engineer. Monitoring of the blasting should be carried out throughout the blasting period to ensure that the blasting meets the limiting vibration criteria established by the specialist engineer. Pre-blast condition surveys of nearby structures and existing utilities are essential.

Groundwater seepage into the excavations, if any, should be handled by pumping from sumps in the excavation.

6.2 Pipe Bedding and Cover Material

It is suggested that the service pipe bedding material consist of at least 150 millimetres of granular material meeting OPSS requirements for Granular A. A provisional allowance should, however, be made for subexcavation of any existing fill or disturbed material encountered at subgrade level. Granular material meeting OPSS specifications for Granular B Type II could be used as a sub-bedding material. The use of clear crushed stone as a bedding or sub-bedding material should not be permitted.

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

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

6.3 Trench Backfill

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

In areas where the service trench will be located below or in close proximity to existing or future roadway areas, acceptable native materials should be used as backfill between the roadway subgrade level and the depth of seasonal frost penetrations (i.e. 1.8 metres below finished grade) in order to reduce the potential for differential frost heaving between the area over the trench and the adjacent section of roadway. Where native backfill is used, it should match the native materials exposed on the trench walls. Some of the native materials from the lower part of the trench excavations may be wet of optimum for compaction. Depending on the weather conditions encountered during construction, some drying of materials and/or recompaction may be required. Any wet materials that cannot be compacted to the required density should either be wasted from the site or should be used outside of existing or future roadway areas. Backfill below the zone of seasonal frost penetration could consist of either acceptable native material or imported granular material conforming to OPSS Granular B Type I.

To minimize future settlement of the backfill and achieve an acceptable subgrade for the roadways, sidewalks, etc., the trench backfill should be compacted in maximum 300 millimetre thick lifts to at least 95 percent of the standard Proctor maximum dry density. The specified density may be reduced where the trench backfill is not located within or in close proximity to existing or future roadways, driveways, sidewalks, or any other type of permanent structure.

7.0 LOCAL RESIDENTIAL ROADWAY AND PARKING AREA PAVEMENTS

In preparation for pavement construction at this site, any fill, topsoil and any soft, wet or deleterious materials should be removed from the proposed roadway and parking areas. The exposed subgrade should be inspected and approved by geotechnical personnel and any soft areas evident should be subexcavated and replaced with suitable earth borrow approved by the geotechnical engineer. The subgrade should be shaped and crowned to promote drainage of the access roadway and parking area granulars. Following approval of the preparation of the subgrade, the pavement granulars may be placed.

For areas of the site that require the subgrade to be raised to the proposed roadways or parking areas subgrade level, it is considered that some of the drier native materials could be used for this purpose or the material could consist of OPSS select subgrade material or OPSS Granular B Type I or Type II. Any materials proposed for this use should be approved by the geotechnical engineer before placement within the roadways and parking area. Materials used for raising the subgrade to proposed access roadway subgrade level should be placed in maximum 300 millimetre thick loose lifts and be compacted to at least 95 percent of the standard Proctor maximum dry density using suitable compaction equipment.

For the proposed local residential roadway the pavement should consist of:

40 millimetres of hot mix asphaltic concrete (HL3) over
40 millimetres of hot mix asphaltic concrete (HL8) over
150 millimetres of OPSS Granular A base over
350 millimetres of OPSS Granular B, Type II subbase

For the proposed light vehicle parking area the pavement should consist of:

50 millimetres of hot mix asphaltic concrete (HL3) over
150 millimetres of OPSS Granular A base over
300 millimetres of OPSS Granular B, Type II subbase

Compaction of the granular pavement materials should be carried out in maximum 300 millimetre thick loose lifts to 100 percent of the standard Proctor maximum dry density value using suitable vibratory compaction equipment.

The above pavement structures will be adequate on an acceptable subgrade, that is, one where any roadway and parking area fill/services trench backfill has been adequately compacted. If the roadway and parking area subgrade is disturbed or wetted due to construction operations or precipitation, the granular thicknesses given above may not be adequate and it may be necessary to increase the thickness of the Granular B Type II subbase and/or incorporate a non-woven geotextile separator between the access roadway and parking area subgrade surface and the granular subbase material.

8.0 CONSTRUCTION CONSIDERATIONS

The engagement of the services of the geotechnical consultant during construction is recommended to confirm that the subsurface conditions throughout the proposed development do not materially differ from those given in the report and that the construction activities do not adversely affect the intent of the design.

All footing areas and any engineered fill areas for the proposed buildings should be inspected by Morey Associates Ltd. to ensure that a suitable subgrade has been reached and properly prepared. The placing and compaction of any granular materials beneath the foundations should be inspected to ensure that the materials used conform to the grading and compaction specifications.

Any depressions at the footing subgrade level due to removal of boulders from within the glacial till should be filled with concrete or well compacted suitable granular material.

The subgrade for the site services and pavement areas should be inspected and approved by geotechnical personnel. In situ compaction testing should be carried out on the service pipe bedding and backfill, and the pavement granular materials to ensure the materials meet the specifications from a compaction point of view.

Any native material proposed to be used as earth fill below the pavement areas should be approved by Morey Associates Ltd. prior to use.

The native soils at this site will be sensitive to disturbance and softening from construction operations, from rainwater or snow melt, and frost. In order to minimize disturbance, construction traffic operating directly on the subgrade should be kept to an absolute minimum and the subgrade should be protected from below freezing temperatures.

9.0 REPORT CONDITIONS AND LIMITATIONS

It is stressed that the information presented in this report is provided for the guidance of the designers and is intended for this project only. The use of this report as a construction document is neither intended nor authorized by Morey Associates Ltd. Contractors bidding on or undertaking the works should examine the factual results of the investigation, satisfy themselves as to the adequacy of the information for construction, and make their own interpretation of the factual data as it affects their construction techniques, schedule, safety and equipment capabilities.

The engineering guidelines provided in this report are based on subsurface data obtained at the specific test locations only. Boundaries between zones on the logs are often not distinct but transitional and were interpreted. Experience indicates that the subsurface soil and groundwater conditions can vary significantly between and beyond the test locations. For this reason, the engineering guidelines given in this report are subject to a field verification of the subsurface soil conditions at the time of construction.

The report recommendations are applicable only to the project described in the report. Any changes in the scope of the project will require a review by Morey Associates Ltd., to ensure compatibility with the engineering guidelines contained in this report.

We trust this report provides sufficient information for your present purposes. If you have any questions concerning this report or if we may be of further service to you, please do not hesitate to contact our office.

Yours truly,
Morey Associates Ltd.

D.G. Morey

D.G. Morey, B.A.Sc. (Civil Eng.)

LICENSED PROFESSIONAL ENGINEER
C.R. MOREY
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Jan 31/13
PROVINCE OF ONTARIO

C. R. Morey, M. Sc. (Eng.), P. Eng

TABLE I

RECORD OF TEST PITS
PROPOSED RESIDENTIAL DEVELOPMENT
SCISSONS ROAD
OTTAWA, ONTARIO

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP1	0.00 – 0.20	TOPSOIL
	0.20 – 0.50	Red brown fine to medium SAND
	0.50 – 1.50	Grey brown silty sand, some gravel, cobbles and boulders, trace clay (GLACIAL TILL)
	1.50	Refusal on large boulder or possible bedrock

No groundwater seepage observed in test pit, December 11, 2012.

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP2	0.00 – 0.30	TOPSOIL
	0.30 – 0.60	Red brown fine to medium SAND, some gravel and cobbles
	0.60 – 0.80	Weathered BEDROCK
	0.80	Refusal on BEDROCK

No groundwater seepage observed in test pit, December 11, 2012.

TABLE I (continued)

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP3	0.00 – 0.30	TOPSOIL
	0.30 – 1.00	Red brown fine to medium SAND
	1.00 – 1.80	Grey brown silty sand, some gravel, cobbles and boulders, trace clay (GLACIAL TILL)
	1.80	Refusal on large boulder or possible bedrock

No groundwater seepage observed in test pit, December 11, 2012.

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP4	0.00 – 0.40	TOPSOIL
	0.40 – 2.00	Yellow brown to grey brown fine to medium SAND
	2.00 – 2.30	Grey brown SILTY CLAY
	2.30 – 3.00	Grey brown silty sand, some gravel, cobbles and boulders, trace clay (GLACIAL TILL)
	3.00	Refusal on large boulder or possible bedrock

No groundwater seepage observed in test pit, December 11, 2012.

TABLE I (continued)

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP5	0.00 – 0.60	Topsoil, sand (FILL)
	0.60 – 0.80	TOPSOIL
	0.80 – 1.50	Grey brown medium to coarse SAND, some gravel
	1.50 – 2.50	Grey brown silty sand, some gravel, cobbles and boulders, trace clay (GLACIAL TILL)
	2.50	Refusal on large boulder or possible bedrock

No groundwater seepage observed in test pit, December 11, 2012.

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP6	0.00 – 0.20	TOPSOIL
	0.20 – 0.80	Yellow brown fine to medium SAND
	0.80 – 1.00	Grey brown SILTY CLAY
	1.00 – 3.50	Grey brown silty sand, some gravel, cobbles and boulders, trace clay (GLACIAL TILL)
	3.50	Refusal on large boulder or possible bedrock

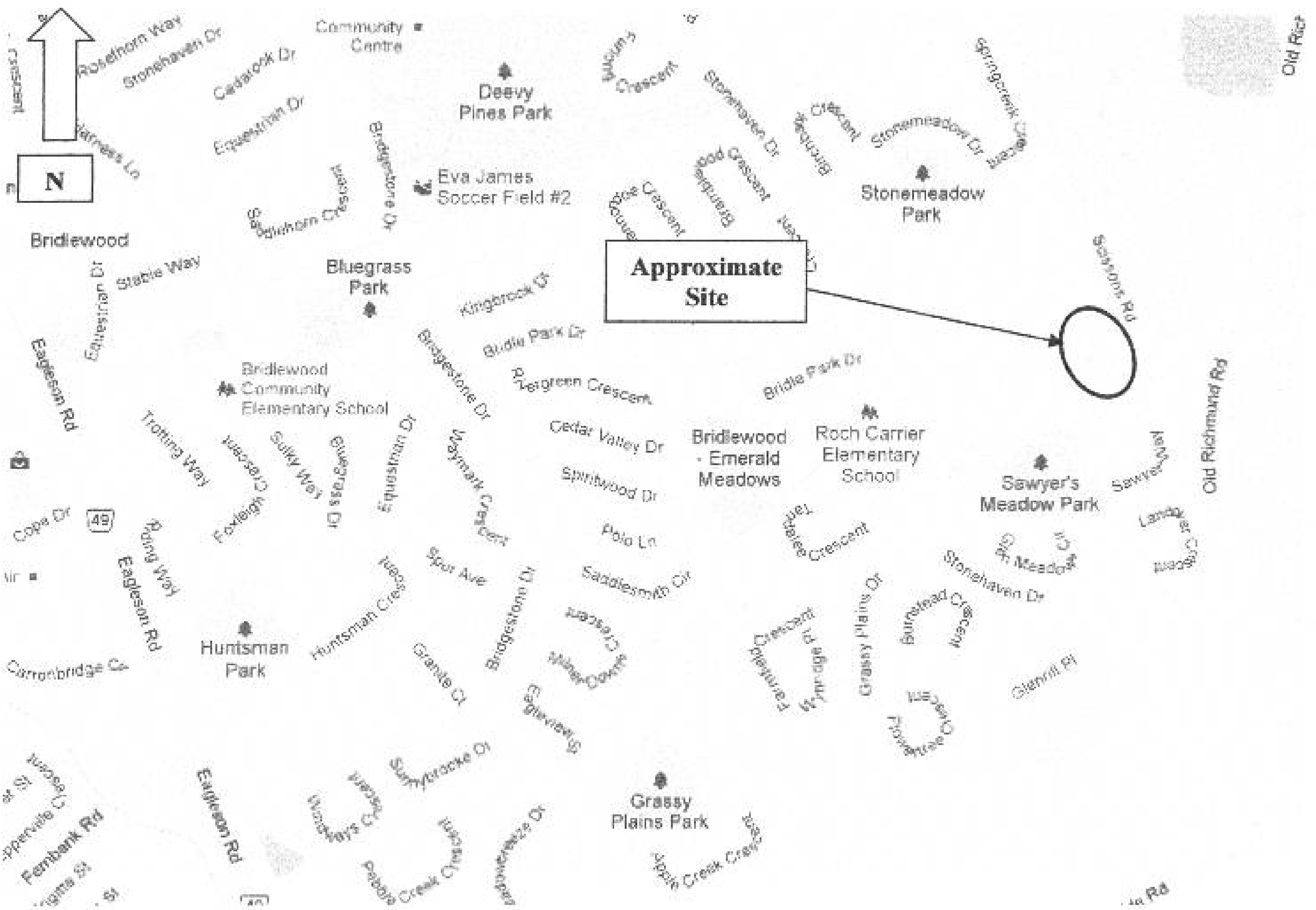
No groundwater seepage observed in test pit, December 11, 2012.

TABLE I (continued)

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP7	0.00 – 0.30	TOPSOIL
	0.30 – 0.80	Red brown fine to medium SAND, some gravel
	0.80 – 2.30	Grey brown SILTY CLAY
	2.30	Refusal on large boulder or possible bedrock

No groundwater seepage observed in test pit, December 11, 2012.

KEY PLAN	FIGURE 1



NOT TO SCALE

MOREY ASSOCIATES LTD.
CONSULTING ENGINEERS

Project No. 012370

Date January 2013

TABLE II

ORDER OF WATER DEMAND FOR COMMON TREES

Some common trees in decreasing order of water demand:

Broad Leaved Deciduous

Poplar
Alder
Aspen
Willow
Elm
Maple
Birch
Ash
Beech
Oak

Decidious Conifer

Larch

Evergreen Conifers

Spruce
Fir
Pine

PROJECT	
PROPOSED RESIDENTIAL DEVELOPMENT	
LOCATION	
SCISSONS ROAD OTTAWA, ONTARIO	

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CLIENT		
OLYMPIA HOMES		
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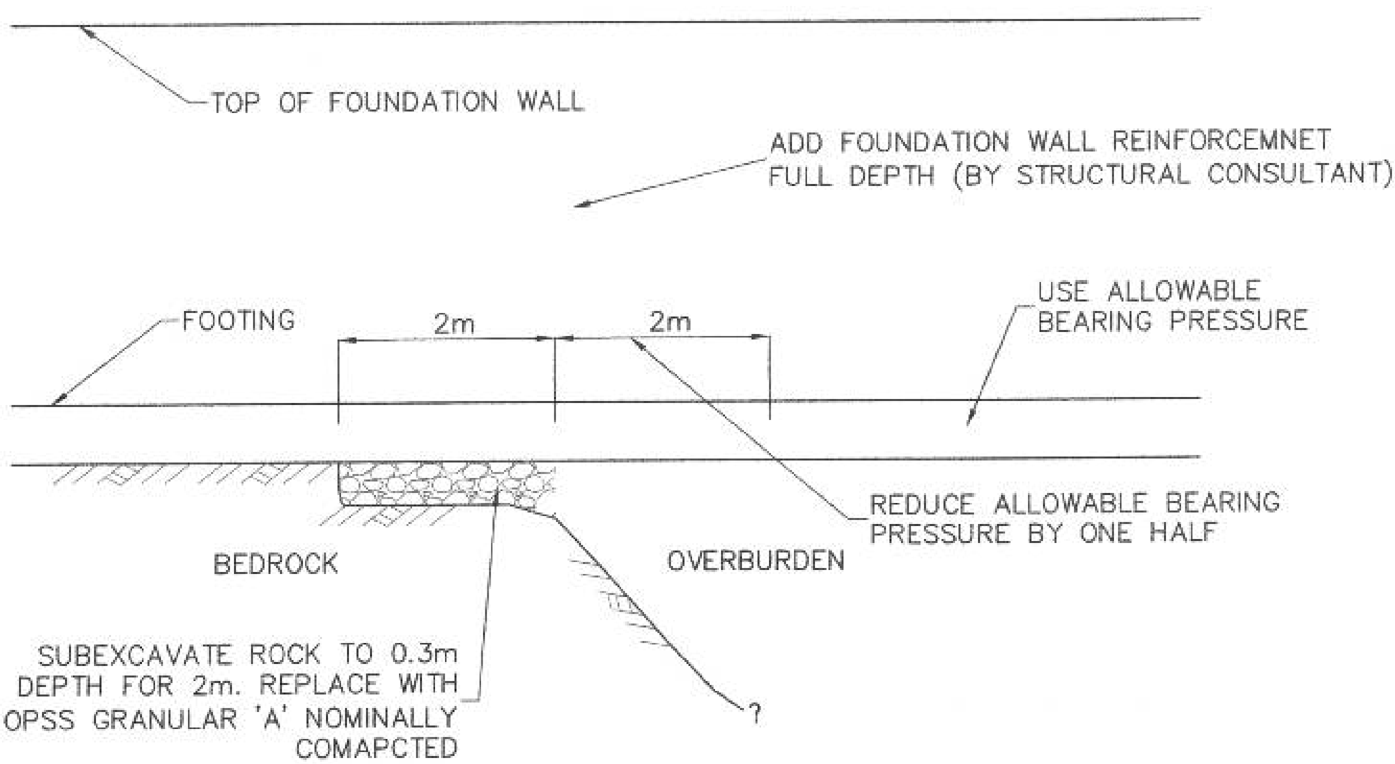
TYPICAL BEDROCK/OVERBURDEN FOOTING TRANSITION DETAIL



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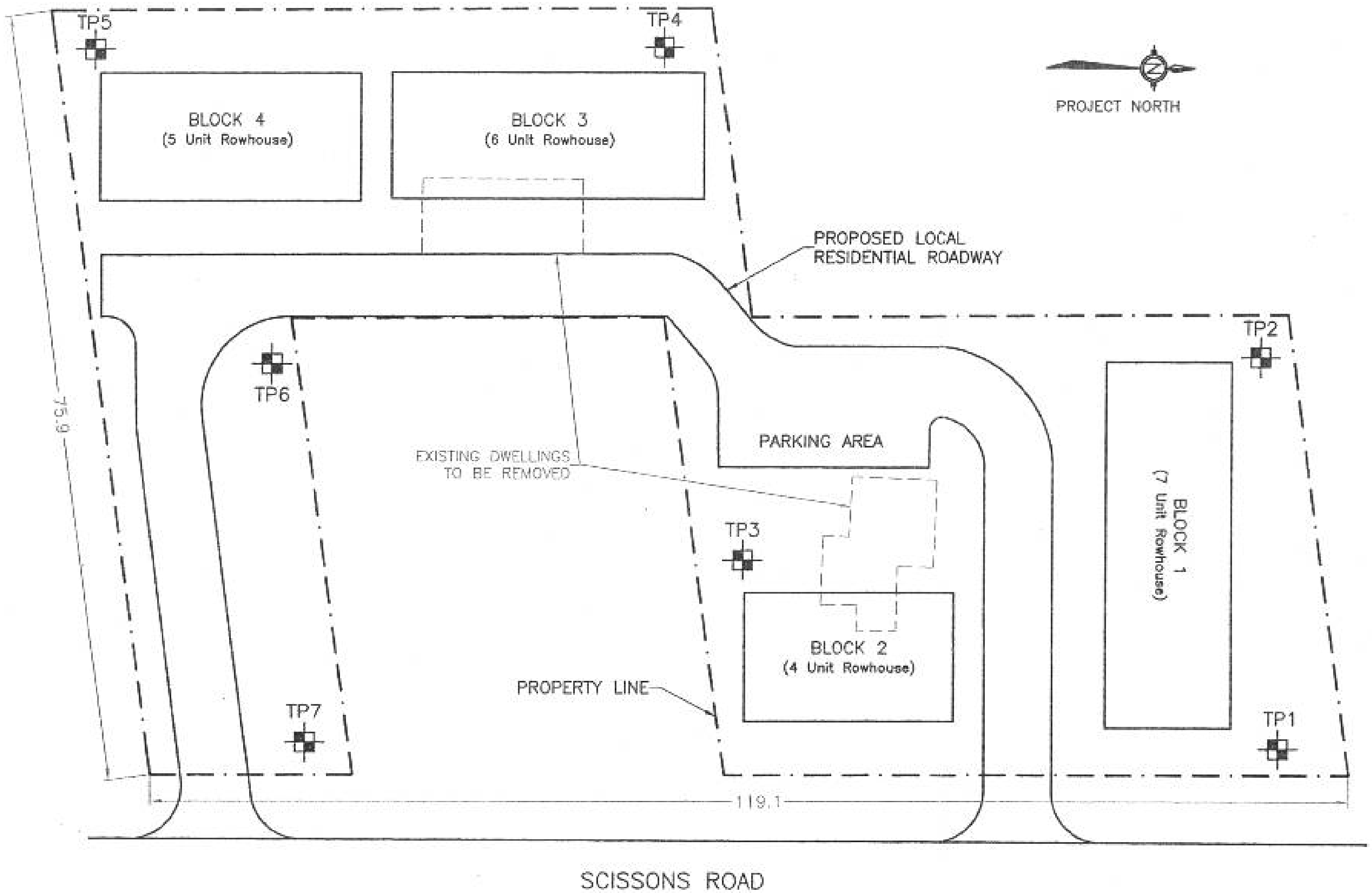

NOTES:
1. All dimensions are in metres. Do not scale drawing.
2. This drawing is to be read in conjunction with the accompanying report.
3. Any changes made to this plan must be verified and approved by Morey Associates Ltd.

TP1 APPROXIMATE MOREY ASSOCIATES LTD. TEST PIT

Reference:
Site plan used for this drawing provided by M.David Blakely Architect Inc., drawing dated October 3, 2012, drawing title "Preliminary Site Plan".

Revision	Drawn By	Date	Description

DRAWING	SITE PLAN, FIGURE 2
LOCATION	SCISSONS ROAD OTTAWA, ONTARIO
PROJECT	PROPOSED RESIDENTIAL DEVELOPMENT
CLIENT	OLYMPIA HOMES

DATE	DRAWING No.	DRAWN BY	SCALE	FILE NO.
January 2013	1 of 1	DGM	1:600	012370

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