Kollaard Associates
Engineers
215 Sanders Street, Unit 1
P.O. Box 189
Kemptville, Ontario K0G 1J0

Civil • Geotechnical •
Structural • Environmental •
Industrial Health & Safety

(613) 860-0923

FAX: (613) 258-0475

REPORT ON

PRELIMINARY SUBSURFACE INVESTIGATION PROPOSED RESIDENTIAL AND COMMERCIAL DEVELOPMENT O'KEEFE COURT AND FALLOWFIELD ROAD OTTAWA, ONTARIO

Submitted to:

Phoenix Homes
18 Bentley Avenue
Nepean, Ontario
K2E 6T8

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August 10, 2006 060445

Phoenix Homes
18 Bentley Avenue
Nepean, Ontario
K2E 6T8

Attention: Mr. Bill Buchanan

RE: PRELIMINARY SUBSURFACE INVESTIGATION
PROPOSED RESIDENTIAL AND
COMMERCIAL DEVELOPMENT
O'KEEFE COURT AND FALLOWFIELD ROAD
OTTAWA, ONTARIO

Dear Sirs:

This report presents the results of a preliminary subsurface investigation carried out at the site of the proposed residential and commercial development between O'Keefe Court and Fallowfield Road in the City of Ottawa, Ontario. 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 preliminary design of the project, including construction considerations, which could influence design decisions.

PROJECT DESCRIPTION AND SITE

The development site in question consists of about a 10 hectare, triangular shaped property located on the south side of O'Keefe Court and bordered on the southeast and southwest by Fallowfield

Road, in the City of Ottawa, Ontario (see Key Plan, Figure 1). It is understood that a yet determined portion of the site will be developed for the construction of single family dwellings and/or rowhouses with the remaining portion used for commercial development. The dwellings are likely to be of wood frame construction with full depth conventional concrete foundations. Details regarding the proposed commercial development at the site was not available at the time of this report. The development will be provided with full municipal services and local roadways.

The ground surface across the site is relatively flat with most of the site being open grassed fields with scattered young trees and shrubs. Wooded areas exist at the west end of the site and in the central portion of the site near the south property line. A water course runs north/south through about the middle of the site

Based on a review of the surficial geology map for the site area and the results of previous geotechnical investigations carried out in proximity of the site, it is expected that the site is underlain by glacial till deposits in the east portion and marine deposited sensitive silty clay over glacial till in the west.

SUBSURFACE INVESTIGATION

The fieldwork for this investigation was carried out on July 7, 2006 at which time twenty test pits were put down across the site. The test pits were advanced to depths of some 0.6 to 3.8 metres below the existing ground surface. The subsurface conditions encountered in the test pits were classified based on visual and tactile examination of the materials exposed on the sides and bottom of the test pits. In situ vane shear testing was carried out within the softer portions of silty clay material encountered to measure the undrained shear strength of that material. The groundwater conditions were observed in the open test pits at the time of excavating.

The field work was supervised throughout by a member of our field engineering staff who directed the test pitting operation, cared for the samples obtained and logged the test pits.

A detailed account of the subsurface conditions encountered at each of the test pits is provided in the attached Table I Record of Test Pits following the text of this report. The approximate locations of the test pits are shown on the Site Plan, Figure 2.

SUBSURFACE CONDITIONS

General

As previously indicated, the soil and groundwater conditions encountered at the test pits put down for this investigation are given in Table 1 Record of Test Pits following the text of this report. 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 than the test pit locations may vary from the conditions encountered in the test pits. In addition to soil and bedrock variability, fill of variable physical and chemical composition may be present over portions of the site.

The soil and bedrock 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 Kollaard Associates Inc. 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 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 presents an overview of the subsurface conditions encountered in the test holes advanced during this investigation.

Fill

Test pits 8 to 20 inclusive encountered a layer of fill from the surface. At the test pit locations the fill is some 0.3 to 2.7 metres in thickness and in general consists of grey brown silty clay, sand, gravel, and cobbles with topsoil, concrete, asphaltic concrete, bricks and wire.

Topsoil

From the surface or beneath the fill materials all of the test pits except test pits 8 and 9 encountered a layer of topsoil. The topsoil thickness varies across the site and ranges in thickness from about 0.1 to 0.5 metres at the test pit locations. 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.

Sand/Silty Sand

Beneath the fill materials or topsoil, test pits 4, 5, 6, 7 and 14 encountered a layer of red brown to yellow brown sand to silty sand. The sand/silty sand layer is some 0.4 to 0.7 metres in thickness at the test pits. The sand/silty sand layer was full penetrated at the test pit locations at depths of some 0.7 to 1.8 metres below the existing ground surface.

Silty Clay

A deposit of grey brown to grey silty clay was encountered beneath the fill, topsoil, sand and/or silty sand at test pits 2, 3 and 9 to 19 inclusive. Where fully penetrated at test pits 2, 3, 10 and 19 the silty clay deposit is some 0.2 to 1.5 metres in thickness. Test pits 9 and 11 to 18 were terminated in the silty

clay material at depths of some 3.2 to 3.8 metres below the existing ground surface. In situ vane shear tests were carried out in the softer silty clay material encountered and gave undrained shear strength values ranging from 52 to 110 kilopascals indicating a stiff to very stiff consistency.

Glacial Till

Beneath the fill, topsoil, sands and/or silty clay test pits 1 to 8 inclusive and 10, 19 and 20 encountered a deposit of yellow brown to grey brown glacial till. The glacial till consists of gravel, cobbles and

boulders in a matrix of silty sand with a trace to some clay. All of the test pits, except test pit 8, were terminated in the glacial till at depths of some 1.3 to 3.3 metres below the existing ground surface. Based on tactile examination of the glacial till in the walls and bottom of the test pits and on the difficulty to advance the test pits in the glacial till it is considered that the glacial till is in a compact to dense state of packing.

Bedrock

Bedrock was encountered beneath the glacial till at test pit 8 at a depth of about 0.6 metres below the existing ground surface.

Groundwater

Seepage was encountered into most of the test pits during excavating on July 7, 2006 at depths of about 1.4 to 3.3 metres below the existing ground surface. It should be noted that the groundwater levels may be higher during wet periods of the year such as the early spring.

PROPOSED RESIDENTIAL AND COMMERCIAL DEVELOPMENT

General

This section of the report provides engineering guidelines on the geotechnical aspects of the project based on our interpretation of the test hole information and project requirements. It is stressed that the information in the following sections is provided for the guidance of the designers for the preliminary design of the project 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 retained 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 from materials from off site sources are outside the terms of reference for this report and have not been investigated or addressed.

Foundations for Proposed Rowhouses, Single Family Dwellings and Commercial Buildings

From a geotechnical point of view with regards to preliminary foundation design, the site can be divided into three areas: east, central and west, respectively. The east and west areas are represented by test pits 1 to 8 , 10, 19 and 20. The east and west areas are underlain by native materials consisting of relatively thin layers of sands and silty clay overlying glacial till or bedrock. The central area is represented by test pits 9 and 11 to 18. The central area is underlain by a significant layer of fill materials together with a deposit of silty clay. Due to the combined thickness of the fill materials and silty clay deposit the total thickness of the silty clay was not penetrated at the test pits in the central area.

East and West Areas

For the proposed rowhouses, single family dwellings and light commercial buildings founded beneath the fill and topsoil in the undisturbed, sands, silty clay, glacial till or bedrock, or on engineered fill used to replace existing fill materials, a maximum allowable bearing pressure of 150 kilopascals may be used for preliminary design of footings using the total dead and live loads which will be carried by the footings. Provided that any loose and disturbed soil is removed from the bearing surfaces prior to pouring concrete, the settlement of the footings should be less than 25 millimetres.

No grade raise restrictions adjacent to foundations or limit for footing size are necessary for the east and west areas from a geotechnical point of view.

For seismic design purposes for the east and west areas a foundation factor, F, of 1.0 should be used in accordance with the 1997 OBC Section 4.1.9.1, Table 4.1.9.1.C.

Central Area

The central area is characterized by a surficial layer of fill materials typically some 1.0 to 2.7 metres in thickness and an underlying deposit of silty clay of unknown total thickness. For areas underlain by silty clay it is usual that footing size and the height of landscape fill adjacent to foundations would be restricted and that the allowable bearing pressure for foundation design would be limited. The limited information obtained from the test pits indicate that the silty clay deposit within the central area is stiff to very stiff in consistency and based on that information the design of foundations would be similar as indicated above for the east and west areas. However, in view of the unknown depth of the silty clay deposit and that silty clay deposits typically decrease in strength with depth, it is possible that firm to soft silty clay exists within the central area. Should soft to firm silty clay exist, it will likely have a restrictive affect on the design of foundations and allowable landscape grade raises adjacent to foundations within the central area Accordingly, it is considered that information on the

thickness and consistency of the silty clay deposit within the central area should be determined prior to final design planning.

All exterior footings and those in any unheated parts of the structures at this site should be provided with at least 1.5 metres of earth cover for normal frost protection purposes. Where it is not possible to provide at least 1.5 metres of earth cover, frost protection should be provided with the use of a suitable rigid insulation. All structures with a basement should be provided with a conventional, perforated perimeter exterior drain within a 150 millimetre thick surround of 20 millimetre minus crushed stone installed at founding level and positively drained to a storm sewer.

For predictable performance of concrete floor slabs on grade all exiting fill and topsoil and any deleterious materials should be removed from within the proposed building areas. The subgrade should then be inspected by geotechnical personnel and any soft of loose areas observed should be subexcavated and replaced with suitable granular materials. Material used to raise the approved subgrade to within 150 millimetres of the underside of the concrete slab should consist of sand or sand and gravel meeting the Ontario Provincial Standards Specifications (OPSS) for Granular B Type I or crushed stone meeting OPSS grading requirements for Granular B Type II. A 150 millimetre base course of OPSS Granular A should be provided immediately beneath the floor slab. All of the granular materials should be placed in maximum 250 millimetre thick loose lifts and be compacted to at least 95 percent of the standard Proctor maximum dry density for the materials used.

The native soils at this site are considered to be highly frost susceptible. As such, to prevent possible foundation frost jacking, the backfill against unheated walls or isolated walls or piers 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 using non-frost susceptible granular material for the upper about 0.6 metre portion of backfill.

Where the backfill 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 maximum dry density value.

In view of the substantial thickness of the existing fill materials at the site, it is expected that engineered fill will be required to replace the existing fill and raise the subgrade to proposed footing founding levels. In preparation for engineered fill construction all of the existing fill and topsoil, and any alluvium (in the area of the existing water course), should be removed to expose the underlying undisturbed native sand, silty clay or glacial. The engineered fill should consist of crushed stone meeting OPSS requirements for Granular A or Granular B Type II and should be compacted in maximum 200 millimetre thick lifts to at least 95 percent of the standard Proctor maximum dry density. To allow the spread of load beneath the footings, the engineered fill should extend down and out from the edges of the footings at 1 horizontal to 1 vertical, or flatter. The excavations for the structures 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 founding level be composed of virgin material only.

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

SITE SERVICES

Excavation

The excavations for the site services will be carried out through fill, topsoil, sands, silty clay, glacial till and depending on depths, 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 within 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. If excavations extend below the water table in silty sand or sandy soil, some loss of ground and groundwater inflow may occur, requiring flatter side slopes to be used. Cobbles and boulders, some of which could be large may exist within the glacial till.

Bedrock was encountered in test pit 8 at about 0.6 metres depth and practical refusal was encountered in most of the test pits in the east area of the site at depths of about 2.6 to 3.1 metres below the existing ground surface. As such, it is expected that bedrock may be encountered during excavating for site services. Small amounts of bedrock removal, if required, can most likely be carried out by 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.

Pipe Bedding and Cover Materials

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 sub-excavation of any 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 or Granular B Type I (with a maximum particle size of 25 millimetres).

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.

Trench Backfill

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

In areas where the service trench will be located below or in close proximity to existing or future roadway areas, acceptable native materials should be used as backfill between the roadway subgrade level and the depth of seasonal frost penetration (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. 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. In general, the existing fill materials could be used as trench backfill provided all deleterious materials such as any soft clay, topsoil, large boulders, asphaltic concrete , wood, wire, styrofoam, etc. are culled prior to use.

The silty clay and glacial till overburden deposits at this site are sensitive to changes in moisture content. In addition, 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.

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 below or in close proximity to existing or future roadways, driveways, sidewalks, or any other type of permanent structure.

The permanent lowering of the groundwater level at the site can be caused by drainage through the granular bedding/backfill within the sewer trenches. Groundwater lowering can cause stress within any softer silty clay materials which may underlie a portion of the site and in turn result in settlement of underlying footings/foundations. To minimize the possibility of groundwater lowering at this site due to the presence of the proposed sewers, it is considered that clay dykes should be provided within sewer trenches at about 150 metre spacing. Details for construction of the proposed clay dykes are shown in the attached Figure 3.

ROADWAYS

Subgrade Preparation

In preparation for roadway construction, the topsoil and any soft, wet or deleterious material should be removed from the roadway area. It may be possible to leave in place any existing fill materials provided that they do not contain significant amounts of organic or deleterious materials and that the materials have been inspected and approved by the geotechnical engineer. The subgrade surface should then be proof rolled with a large steel drum roller and inspected and approved by geotechnical personnel. Any soft areas evident from the proof rolling should be subexcavated and replaced with suitable earth borrow material.

Fill sections along the proposed roadway should be brought up to proposed roadway subgrade level using acceptable earth borrow material. The earth borrow should be placed in maximum 300 millimetre thick lifts and should be compacted to at least 95 percent of the standard Proctor maximum dry density using suitable compaction equipment.

The subgrade surface should be shaped and crowned to promote drainage of the roadway granulars.

Pavement Structure

It is suggested that provision be made for the following minimum pavement structure for local residential roadways:

80 millimetres of Asphaltic Concrete
(40 millimetres of HL3 over 40 millimetre of HL8), over

150 millimetres of OPSS Granular A base, over

300 millimetres of OPSS Granular B Type II subbase
(50 or 100 millimetre minus crushed stone)

Where the pavement structure will carry buses or heavy truck traffic, the subbase thickness should be increased to 450 millimetres and the asphaltic concrete thickness increased to 100 millimetres.

The pavement granular materials should be compacted in maximum 300 millimetre thick lifts to at least 100 percent of the standard Proctor maximum dry density using suitable vibratory compaction equipment.

In areas where the new pavement will abut existing pavement, the depths of the granular materials should taper up or down at 5 horizontal to 1 vertical, or flatter, to match the depths of the granular material(s) exposed in the existing pavement.

The above pavement structure assumes that the trench backfill is adequately compacted and that the roadway subgrade surface is prepared as described in this report. If the roadway subgrade surface 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 to incorporate a non-woven geotextile separator between the roadway subgrade surface and the granular subbase material. The adequacy of the design pavement thickness should be assessed by geotechnical personnel at the time of construction.

TREE PLANTING

It should be noted that any soft silty clay soils at the site are highly 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.

WATER COURSE SLOPE STABILITY EVALUATION

As mentioned above a water course exists running north/south through about the centre of the site. A reconnaissance of the slopes of the water course was carried out to observe the general condition of the slopes. At the time of the reconnaissance visit the height and inclination of the water course slopes were measured using a hand clinometre and level and the degree of erosion of the water course channel was observed. The results of the measurements indicate that the water course slopes are typically some 3.5 metres high and inclined at about 10 to 15 degrees to the horizontal on the east side and some 2. metres high and inclined at about 10 to 12 degrees to the horizontal on the west side The water course channel walls are near vertical and some 1 to 1.5 metres high. A relatively wide flood plain exists between the water course channel and the toe of the slopes. The slopes

including the relatively steep water course channel walls are well vegetated. Some minor localized erosion of the water course channel walls was observed.

Based on the results of the slope reconnaissance it is considered that the water course side slopes are stable and have a factor of safety greater than 1.5. In view of the stable condition of the slopes and the minor erosion conditions, no construction set back from the crest of the existing water course slopes is considered necessary for the design of the proposed development.

ADDITIONAL INVESTIGATION AND CONSTRUCTION OBSERVATIONS

As indicated above it is considered that the central portion of the site may be underlain by softer silty clay materials. Accordingly, prior to final design planning it is strongly suggested that additional subsurface investigation be carried out by means of a series of boreholes to determine if any soft or firm silty clay exists at depth in the central area of the site.

In view of the relatively wide spacing between test pits and the substantial thickness of fill encountered at the site, it is suggested that additional site specific investigations be carried out for the final design of each of the proposed commercial buildings.

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 preliminary and final reports 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 single family dwellings, rowhouses and commercial buildings should be inspected by Kollaard Associates Inc. 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.

The subgrade surfaces for the site services and roadways should be inspected by geotechnical personnel. In situ density testing should be carried out on the service pipe bedding and backfill and the roadway granular materials.

The native soils at this site will be sensitive to disturbance 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.

We trust that this report provides sufficient information for your present purposes. If you have any questions concerning this information or if we can be of further assistance to you for the final design investigations at this site, please do not hesitate to contact our office.

Yours truly,

KOLLAARD ASSOCIATES INC.

C.R. Morey, P. Eng.

Attachments: Table I, Record of Test pits
Table II, Order of Water Demand for Common Trees
Figures 1 to 3

TABLE I

RECORD OF TEST PITS
PRELIMINARY GEOTECHNICAL INVESTIGATION
O'KEEFE COURT
CITY OF OTTAWA, ONTARIO

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP1	0.00 – 0.30	TOPSOIL
	0.30 – 1.32	Grey brown silty sand, some gravel, cobbles, boulders, trace clay (GLACIAL TILL)
	1.32	End of test pit
Test pit dry, July 7, 2006.		
TP2	0.00 – 0.33	TOPSOIL
	0.33 – 0.76	Very stiff grey brown SILTY CLAY
	0.76 – 2.80	Grey brown silty sand, some gravel, cobbles, boulders, trace clay (GLACIAL TILL)
	2.80	End of test pit, refusal on large boulder or bedrock
Water observed in test pit at about 2.8 metres below existing ground surface, July 7, 2006.		
TP3	0.00 – 0.38	TOPSOIL
	0.38 – 0.69	Very stiff grey brown SILTY CLAY
	0.69 – 2.60	Grey brown silty sand, gravel, cobbles, trace clay (GLACIAL TILL)
	2.60	End of test pit, refusal on large boulder or bedrock
Water observed in test pit at about 2.0 metres below existing ground surface, July 7, 2006.		

TABLE I (CONTINUED)

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP4	0.00 – 0.33	TOPSOIL
	0.33 – 0.74	Red brown SILTY SAND, some gravel, trace clay
	0.74 – 3.10	Grey brown silty sand, some gravel, cobbles, trace clay (GLACIAL TILL)
	3.10	End of test pit, refusal on large boulder or bedrock

Water observed in test pit at about 2.1 metres below existing ground surface, July 7, 2006.

TP5	0.00 – 0.30	TOPSOIL
	0.30 – 1.02	Red brown to yellow brown SILTY SAND, trace gravel
	1.02 – 3.00	Grey brown silty sand, some gravel, cobbles, boulders, trace clay (GLACIAL TILL)
	3.00	End of test pit, refusal on large boulder or bedrock

Water observed in test pit at about 1.4 metres below existing ground surface, July 7, 2006.

TP6	0.00 – 0.30	TOPSOIL
	0.30 – 1.00	Red brown fine SAND, trace silt, some gravel
	1.00 – 2.80	Grey brown silty sand, some gravel, cobbles (GLACIAL TILL)
	2.80	End of test pit, refusal on large boulder or bedrock

Test pit dry, July 7, 2006.

TABLE I (CONTINUED)

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP7	0.00 – 0.36	TOPSOIL
	0.36 – 0.79	Red brown fine SAND, trace gravel
	0.79 – 2.70	Grey brown silty sand, some gravel (GLACIAL TILL)
	2.70	End of test pit, refusal on large boulder or bedrock
Test pit dry, July 7, 2006.		
TP8	0.00 – 0.61	Topsoil, gravel, wire, asphaltic concrete (FILL)
	0.61	Refusal, BEDROCK
Test pit dry, July 7, 2006.		
TP9	0.00 – 0.28	Topsoil, gravel, cobbles, styrofoam, wood, clay tile, brick, asphaltic concrete, boulders (FILL)
	0.28 – 3.60	Very stiff grey brown SILTY CLAY
	3.60	End of test pit
Test pit dry, July 7, 2006.		

TABLE I (CONTINUED)

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP10	0.00 – 2.30	Grey brown silty clay, some topsoil, gravel, boulders, concrete, asphaltic concrete (FILL)
	2.30 – 2.40	TOPSOIL
	2.40 – 2.60	Very stiff grey brown SILTY CLAY
	2.60 – 3.30	Grey brown silty clay, some gravel, boulders (GLACIAL TILL)
	3.30	End of test pit

Test pit dry, July 7, 2006.

TP11	0.00 – 1.80	Grey brown silty clay, gravel, cobbles (FILL)
	1.80 – 1.90	TOPSOIL
	1.90 – 3.60	Very stiff grey brown SILTY CLAY
	3.60	End of test pit

Water observed in test pit at about 3.3 metres below existing ground surface, July 7, 2006.

TP12	0.00 – 2.74	Topsoil, clay, gravel, asphaltic concrete (FILL)
	2.74 – 2.90	TOPSOIL
	2.90 – 3.80	Stiff grey SILTY CLAY
	3.80	End of test pit

In Situ Undrained Shear Strength Test Results

Depth (metres)	Cu (kilopascals)
2.90	52

Water observed in test pit at about 3.5 metres below existing ground surface, July 7, 2006.

TABLE I (CONTINUED)

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP16	0.00 – 2.13	Topsoil, sand, clay, gravel, asphaltic concrete (FILL)
	2.13 – 2.44	TOPSOIL
	2.44 – 3.30	Stiff grey SILTY CLAY
	3.30	End of test pit

In Situ Undrained Shear Strength Test Results

Depth (metres)	Cu (kilopascals)
2.44	90

Water observed in test pit at about 2.7 metres below existing ground surface, July 7, 2006.

TP17	0.00 – 2.13	Grey brown silty sand, topsoil, cobbles, asphaltic concrete, wire, concrete, glass (FILL)
	2.13 – 2.44	TOPSOIL
	2.44 – 3.20	Grey SILTY CLAY
	3.20	End of test pit

Water observed in test pit at about 2.7 metres below existing ground surface, July 7, 2006.

TP18	0.00 – 2.13	Topsoil, clay, gravel, cobbles, boulders (FILL)
	2.13 – 2.60	TOPSOIL
	2.60 – 3.40	Grey SILTY CLAY
	3.40	End of test pit

Water observed in test pit at about 2.4 metres below existing ground surface, July 7, 2006.

TABLE I (CONTINUED)

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP13	0.00 – 1.90	Grey brown silty clay, topsoil, asphaltic concrete, brick (FILL)
	1.90 – 2.20	TOPSOIL
	2.20 – 3.50	Very stiff grey brown SILTY CLAY
	3.50	End of test pit

Water observed in test pit at about 2.6 metres below existing ground surface, July 7, 2006.

TP14	0.00 – 1.02	Topsoil, gravel, clay, asphaltic concrete, wood, brick (FILL)
	1.02 – 1.22	TOPSOIL
	1.22 – 1.83	Grey brown fine to medium SAND
	1.83 – 3.30	Very stiff grey brown SILTY CLAY
	3.30	End of test pit

Water observed in test pit at about 1.5 metres below existing ground surface, July 7, 2006.

TP15	0.00 – 2.10	Topsoil, clay, gravel, boulders, brick (FILL)
	2.10 – 2.20	TOPSOIL
	2.20 – 3.40	Very stiff grey SILTY CLAY
	3.40	End of test pit

In Situ Undrained Shear Strength Test Results

Depth (metres)	Cu (kilopascals)
3.40	110

Water observed in test pit at about 3.0 metres below existing ground surface, July 7, 2006.

TABLE I (CONTINUED)

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP19	0.00 – 1.22	Topsoil, sand, clay, gravel, boulders, wood (FILL)
	1.22 – 1.52	TOPSOIL
	1.52 – 2.01	Very stiff grey brown SILTY CLAY
	2.01 – 3.30	Grey brown silty sand, some clay, gravel, cobbles, boulders (GLACIAL TILL)
	3.30	End of test pit

Water observed in test pit at about 2.1 metres below existing ground surface, July 7, 2006.

TP20	0.00 – 0.48	Topsoil, gravel (FILL)
	0.48 – 0.79	TOPSOIL
	0.79 – 2.40	Yellow brown to grey brown silty sand, gravel, cobbles, trace clay (GLACIAL TILL)
	2.40	End of test pit

Test pit dry, July 7, 2006.

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

Deciduous Conifer

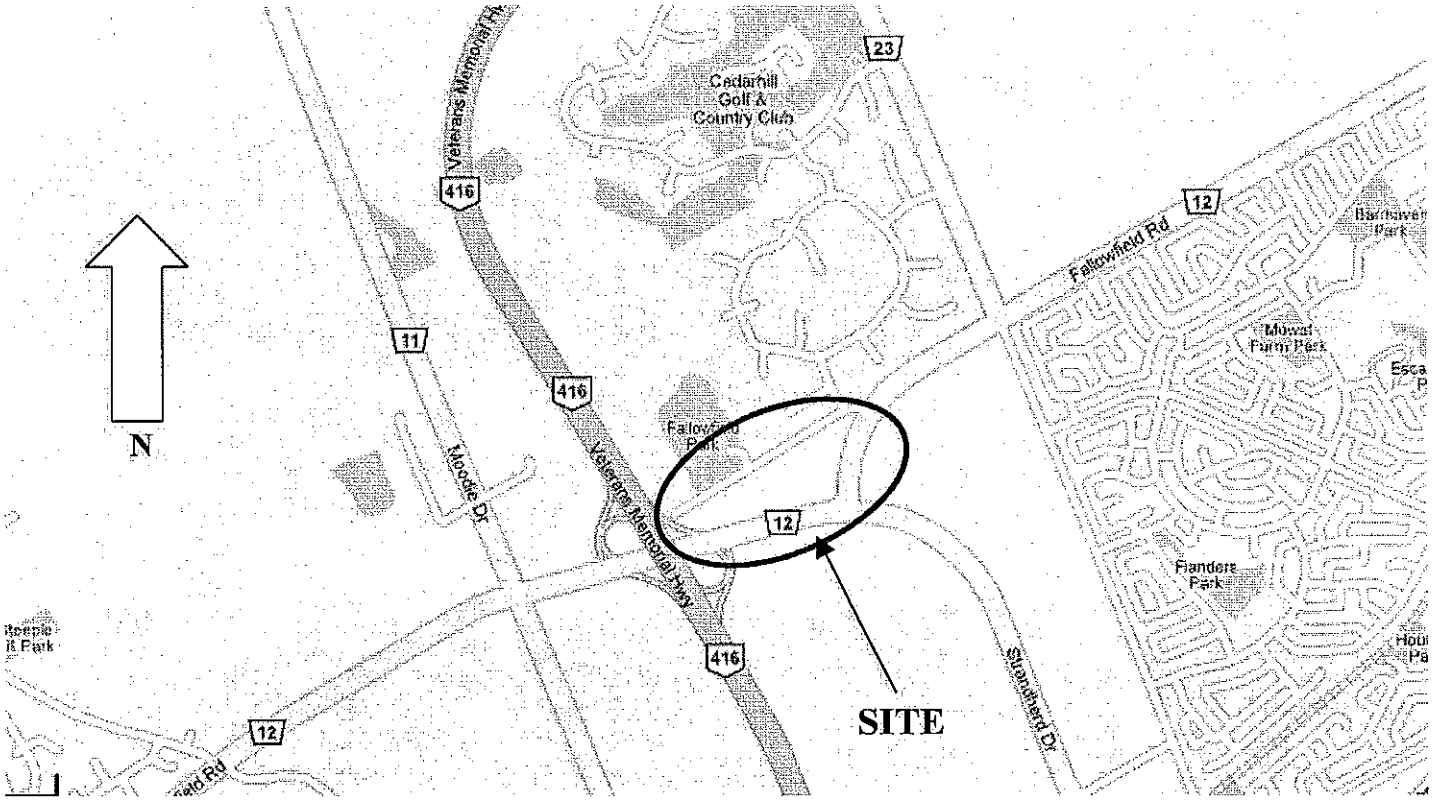
Larch

Evergreen Conifers

Spruce
Fir
Pine

KEY PLAN

FIGURE 1



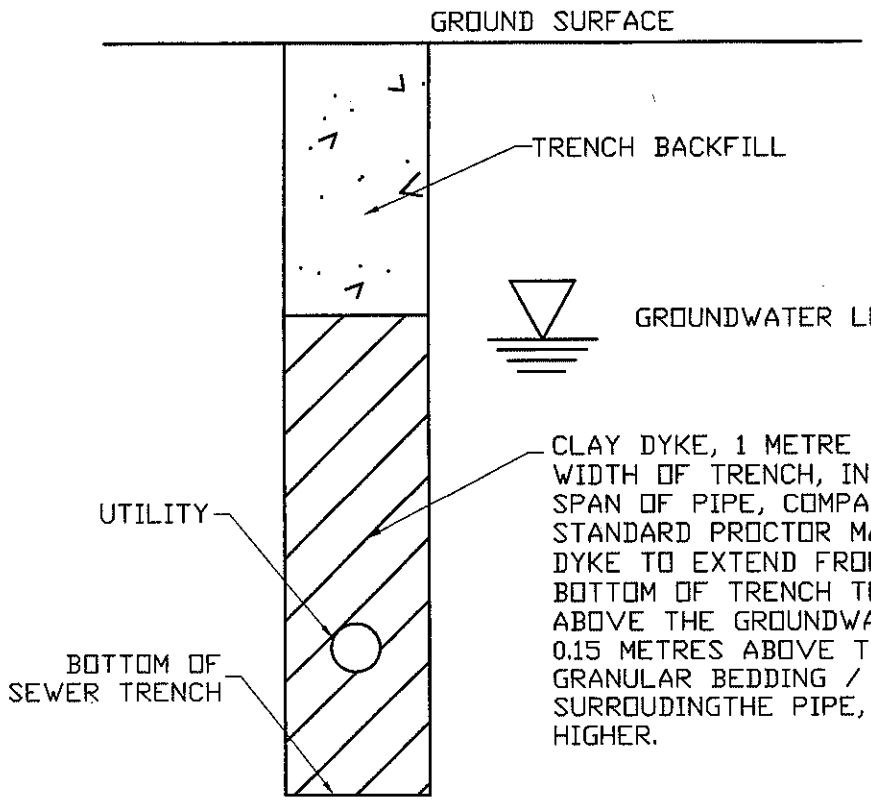
NOT TO SCALE

Kollaard Associates
Engineers

Project No. 060445

Date August 2006

FIGURE 3



REV.	NAME	DATE	DESCRIPTION

Kollaard Associates
Engineers
PO. BOX 189, 215 SANDERS ST
KEMPTVILLE ONTARIO
K0G 1J0 FAX (613) 258-0475
http://www.kollaard.ca
(613) 860-0923
info@kollaard.ca

CLIENT: PHOENIX HOMES

PROJECT: GEOTECHNICAL INVESTIGATION

LOCATION

O'KEEFE COURT
AND
FALLOWFIELD ROAD
OTTAWA, ONTARIO

DESIGNED BY:	DATE:
DM	AUGUST 2006
DRAWN BY:	SCALE:
DM	NTS

KOLLAARD FILE NUMBER: 060445

Kollaard Associates
Engineers
215 Sanders Street, Unit 1
P.O. Box 189
Kemptville, Ontario K0G 1J0

Civil • Geotechnical •
Structural • Environmental •
Industrial Health & Safety
(613) 860-0923
FAX: (613) 258-0475

March 5, 2008 080069

Phoenix Homes
18 Bentley Avenue
Nepean, Ontario
K2E 6T8

Attention: Mr. Bill Buchanan

RE: ADDITIONAL SUBSURFACE INVESTIGATION
PROPOSED RESIDENTIAL AND
COMMERCIAL DEVELOPMENT
O'KEEFE COURT AND FALLOWFIELD ROAD
OTTAWA, ONTARIO

Dear Sirs:

This letter presents the results of an additional subsurface investigation carried out at the site of the proposed residential and commercial development between O'Keefe Court and Fallowfield Road in the City of Ottawa, Ontario further to the preliminary subsurface investigation carried out at the site by Kollaard Associates Inc. in August 2006. The purpose of this present investigation was to check for the presence of any firm to soft silty clay in the area of the site identified during the preliminary subsurface investigation as underlain by a silty clay deposit.

BACKGROUND

The results of the above mentioned preliminary subsurface investigation are provided in the Kollaard Associates Inc. Report No. 060445, entitled "Preliminary Subsurface Investigation, Proposed Residential and Commercial Development, O'Keefe Court and Fallowfield Road, Ottawa, Ontario" dated August 2006. That report should be read in conjunction with this present letter.

A series of some 20 test pits were put down at the site for the previous subsurface investigation. Nine of those test pits, numbered 9 and 11 to 18, put down within the "central" portion of the site encountered silty clay material and were terminated in the silty clay at depths of some 3.2 to 3.8 metres below the existing ground surface. Although, the silty clay material is stiff in consistency to the depth encountered at the test pits, in view that the full depth of the silty clay was not penetrated and that silty clay deposits typically decrease in strength with depth, it was considered possible that firm to soft clay exits within the "central" area of the site.

PROCEDURE

To check for the presence of any firm to soft silty clay material within the "central portion" of the site, two boreholes were put down at the site on February 15, 2008, using a truck mounted drill rig supplied and operated by OGS Inc. of Almonte, Ontario. The boreholes, numbered 1 and 2, were advance to some 5.5 and 4.4 metres, respectively, below the existing ground surface. Borehole 1 was put down in close proximity of previous test pit 12 and borehole 2 was put down in close proximity of previous test pit 15, as shown on the attached site plan, Figure 1.

The boreholes were detailed sampled and tested below the level at which the adjacent previous test pits had been terminated, using a conventional 50 millimetre OD split spoon sampler in conjunction with standard penetration testing. A standpipe was installed in each of the boreholes for subsequent water level measuring and sampling.

Water levels were measured and water samples obtained at the standpipes on February 27, 2008. A water sample from each standpipe was delivered to Accutest Laboratories Ltd. in Ottawa, Ontario for sulphate testing.

A detailed account of the subsurface conditions encountered at the boreholes is provided in the attached Record of Borehole sheets.

SUBSURFACE CONDITIONS

General

As previously indicated, the soil and groundwater conditions encountered at the boreholes put down for this investigation are given on the attached Record of Borehole Sheets. The borehole 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.

Silty Clay

As indicated above the boreholes were sampled and tested below about the level at which the adjacent previous test pits were terminated. Accordingly, borehole 1 was sampled and tested below about 4.0 metres depth and borehole 2 was sampled and tested below about 2.4 metres depth. Boreholes 1 and 2 encountered stiff to very stiff, grey brown to grey silty clay to depths of some 4.0 to 5.0 metres and 2.4 to 3.4 metres, respectively below the existing ground surface.

Glacial Till

Beneath the silty clay both of the boreholes encountered a deposit of glacial till. The glacial till consist of gravel, cobbles and boulders in a matrix of silty sand with a trace of clay. Standard penetration tests carried out in the glacial till material gave values of 8 and 37 blows for 0.3 metres, indicating a loose to compact state of packing.

Borehole 2 was terminated in the glacial till at depth of about 4.4 metres below the existing ground surface. Borehole 1 was terminated at a depth of about 5.5 metres below the existing ground surface on refusal to auger advancement on a large boulder or the upper surface of the bedrock.

Groundwater

The water level was measured at the borehole standpipes on February 19, 2008. At that time the water level at borehole 1 was measured at about 2.7 metres below the existing ground surface and at borehole 2 at about 1.0 metre below the existing ground surface.

The results of the laboratory testing of the water samples obtained from the standpipes gave values of 88 and 169 milligrams per litre for sulphate. Based on the above test results a negligible to mild attack of groundwater on concrete can be expected. Accordingly, normal Portland cement in a ratio of 0.5 water to cement may be used for buried concrete elements.

DISCUSSION

Based on the results of this additional investigation no presence of soft or firm silty clay material is indicated for the site, and no laboratory consolidation testing of the silty clay material is considered warranted. Accordingly, it is considered that the guidelines for foundation design for the "east and west areas" of the site outlined in our preliminary subsurface investigation report mentioned above can also be used for foundation design for rowhouses, single family dwellings and light commercial buildings within the "central area" of the site.

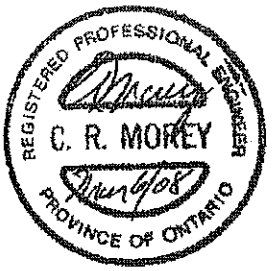
As suggested in the preliminary subsurface investigation report, for final design of any proposed commercial buildings, site/building specific subsurface investigation should be considered in view of the potential for substantial fill thicknesses within proposed building areas.

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

Yours truly,

Kollaard Associates Inc.

C. R. Morey, P. Eng.



Attachments: Record of Borehole Sheets
Figure 1

File 080069

Kollaard Associates
Engineers

PO. Box 189, 215 SANDERS ST
KEMPTVILLE, ONTARIO
K0G 1J0 FAX (613) 258-0475
http://www.kollaard.ca

(613) 860-0923
info@kollaard.ca

RECORD OF BOREHOLE BH1

CLIENT: PHOENIX HOMES

ADDITIONAL SUBSURFACE INVESTIGATION
PROPOSED DEVELOPMENT
FALLOWFIELD ROAD AND O'KEEFE COURT, OTTAWA, ON.

PROJECT No.: 080069
DATE OF DRILLING
FEBRUARY 15, 2008

LOCATION: SEE FIGURE 1

DEPTH (m) / WATER LEVEL	STRATA DESCRIPTION	STRATA PLOT	ELEV. / DEPTH	MOISTURE CONTENT (%) 20 40 60 80	SAMPLE & TEST DEPTH	N-VALUE BLOWS/0.3m	SHEAR VANE kPa	VANE REMOLD kPa	COMMENTS
	Probably topsoil, clay, gravel, asphaltic concrete (FILL)		0.00						Auger cuttings
	Probably TOPSOIL								
	Probably stiff grey brown SILTY CLAY								
	Stiff grey SILTY CLAY, trace sand and gravel		3.96		3.96-4.56	7			
	Compact, grey silty sand, some gravel, cobbles and boulders, trace clay (GLACIAL TILL)		5.02		5.20-5.50	16 / 0.15m 50 / 0.15m			
	End of Borehole -Refusal to advance in glacial till or bedrock at about 5.5 metres below existing ground surface, backfilled with auger cuttings.		5.50						

Water level in standpipe at about 2.7 metres depth, February 19, 2008.

DRILL RIG: TRACK MOUNTED CME 55 AUGER: 200 mm HOLLOW STEM.

Kollaard Associates
Engineers

PO. BOX 189, 215 SANDERS ST
KEMPTVILLE, ONTARIO
K0G 1J0 FAX (613) 258-0475
http://www.kollaard.ca

(613) 868-0923
info@kollaard.ca

RECORD OF BOREHOLE BH2

CLIENT: PHOENIX HOMES

ADDITIONAL SUBSURFACE INVESTIGATION
PROPOSED DEVELOPMENT
FALLOWFIELD ROAD AND O'KEEFE COURT, OTTAWA, ON.

PROJECT No.: 080069
DATE OF DRILLING
FEBRUARY 15, 2008

LOCATION: SEE FIGURE 1

DEPTH (m) / WATER LEVEL	STRATA DESCRIPTION	STRATA PLOT	ELEV. / DEPTH	MOISTURE CONTENT (%) 20 40 60 80	SAMPLE & TEST DEPTH	N-VALUE BLOWS/0.3m	SHEAR VANE kPa	VANE REMOLD kPa	COMMENTS
	Probably topsoil, clay, gravel, boulders and brick (FILL)		0.00						Auger cuttings
	Probably TOPSOIL		2.20						
	Probably very stiff grey brown SILTY CLAY		2.30						
	Very stiff grey brown SILTY CLAY (WEATHERED CRUST)		2.44		2.44 -3.05	13			
					3.05 -3.65	8			
	Compact, grey silty sand, some gravel, cobbles and boulders, trace clay (GLACIAL TILL)		3.35		3.81 -4.42	37			
	End of Borehole -backfilled with auger cuttings.		4.42						Water level in standpipe at about 1.8 metre depth, February 19, 2008

DRILL RIG: TRACK MOUNTED CME 55 AUGER: 200 mm HOLLOW STEM.

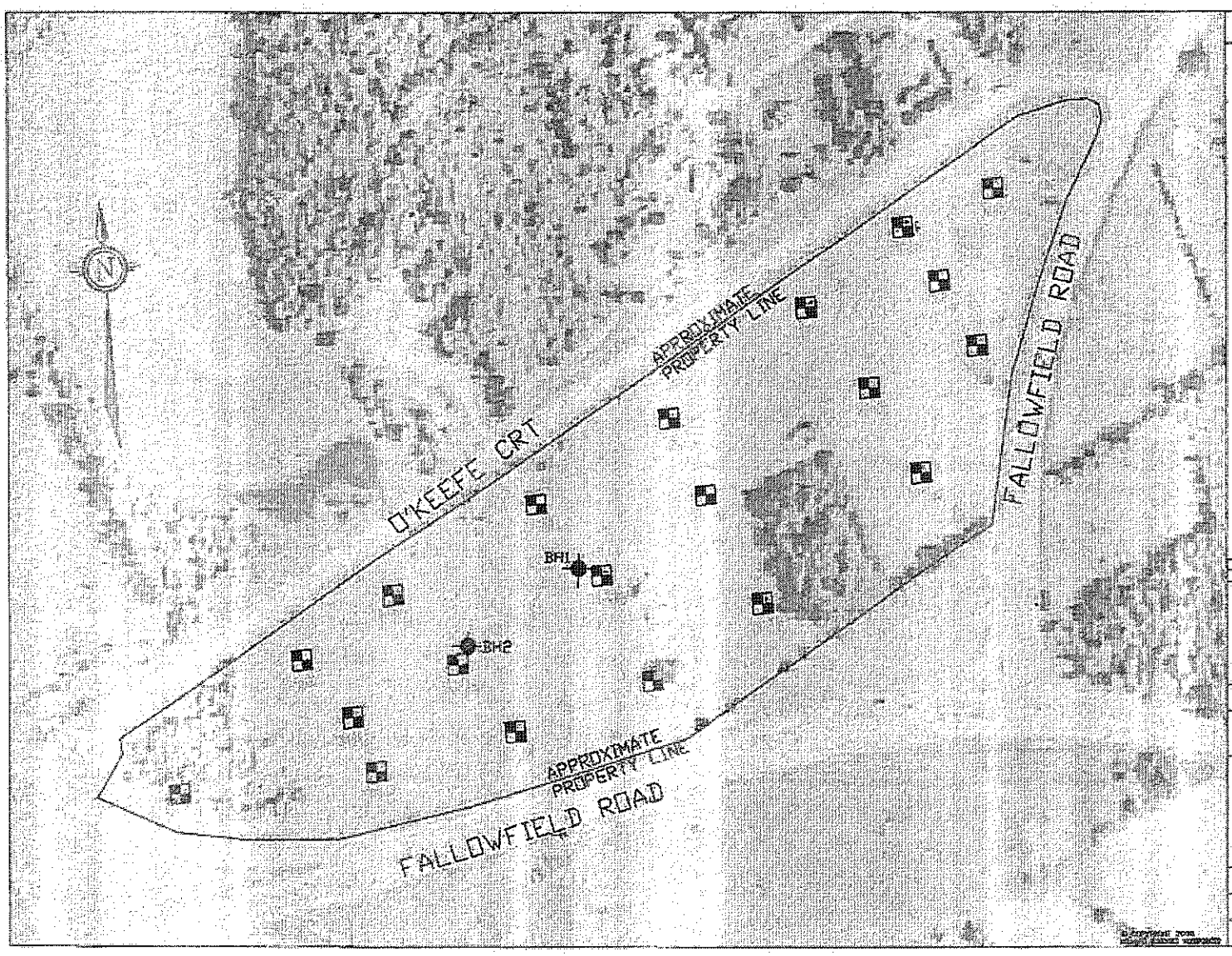


FIGURE 1

LEGEND

Approximate Borehole Location Present Investigation

Approximate Test Pit Location previous investigation by Kollaard Associates Inc., August 2006.

REFERENCE PLAN:
City of Ottawa mapping website.

SPECIAL NOTE:
This drawing to be read in conjuction with accompanying letter.

REV.	INIT.	DATE	DESCRIPTION

Kollaard Associates
Engineers
PO Box 189, 215 Sanders St
Kemptville Ontario
K0G 1J0 Tel (613) 258-0625 Fax (613) 258-0475
http://www.kollaard.ca
(613) 860-0923
info@kollaard.ca

CLIENT: PHOENIX HOMES

PROJECT: ADDITIONAL SUBSURFACE INVESTIGATION

LOCATION: FALLOWFIELD ROAD AND O'KEEFE COURT CITY OF OTTAWA ONTARIO

DESIGNED BY:	DATE:
DT	FEBRUARY 21, 2008
DRAWN BY:	SCALE:
DT	1:2500

KOLLAARD FILE NUMBER: 080069

The typical Micro-Cell site, consisting of a concrete pad approximately 3.0 metres X 3.0 metres, may be permitted at a minimum setback of 3.0 metres from property line.

The typical cell site, consisting of a self-support tower, facilities shed, and compound area of approximately 12 metres X 20 metres, may be permitted at a minimum setback of 8.0 metres from property line to the limit of the compound area.

The same relocation requirements in the Telecommunications Industry Master Agreement must apply to any of these installations proposed to be placed at the reduced setbacks noted above.

All other types, including both guyed and self-supporting towers, shall be set back a minimum of 14.0 metres. This setback shall be to the nearest part of the installation, whether above or below ground (i.e. guy wire concrete anchors). Where there is any concern for the safety and operational integrity of the provincial highway due to the size or height of the installation proposed, the Ministry may request a report prepared by a Professional Engineer certified by the Province of Ontario.

All telecommunication towers must be designed to collapse within themselves so it will not fall onto the highway right-of-way.

4.28 Wrecking Yards

Under the authority of The Public Transportation and Highway Improvement Act and The Highway Traffic Act, the Ministry exercises control over wrecking yards located within the controlled area adjacent to Provincial Highways.

Building and land use, entrance and sign permits are required and the applicant must comply with all requirements of the Ministry's Vehicle Licensing Office.

Applicant Subject to Conditions

The Ministry will require the following:

1) the wrecking operations and equipment shall be screened from the highway by natural means or by a fence at least 2m in height and shall be maintained in a manner satisfactory to the Ministry. Wrecking yards must not be located in low spots, valleys or adjacent to a fill where they are not screened from view,

2) the location and operation of the wrecking yard shall be carried out in accordance with all municipal by-laws and restrictions,

3) no drains from the wrecking yard or buildings shall be directed to a highway drainage system.

5 ADMINISTRATION

5.1 Applications and Permits

The Public Transportation and Highway Improvement Act places the onus on the individual to secure a permit from the Minister. This must be done before any of the activities described in the "Permit Required" Section.

5.2 Applications Adjacent to Controlled Access Highways

The Field Services Engineer may refer all applications adjacent to controlled-access highways to the Regional Director. The Field Services Engineer may also refer complex/controversial applications to the Regional Director for consideration.

5.3 Applicant to be Advised of Restrictions

Applicants must be fully advised of the restrictions regarding buildings and land use at sites adjacent to a provincial highway. Work must not start before a permit is obtained.

5.4 Change of Ownership

When a permit is issued and the building or property to which it applies changes ownership before the works authorized by the permit commences, the permit shall be void. The new owner or other person concerned must apply for a new permit before work commences. If work has started, the permit remains in force.

The Field Services Engineer will consider each application as recommended by the Corridor Management Officer.

When an application for building and land permit has been recommended for approval, the Corridor Management Officer shall forward the application to the Field Services Engineer for signature.

5.5 Field Inspection

When the works under a permit commence, it is the responsibility of the Corridor Management Officer to ensure that the construction of any buildings/structures is in the location approved by the Ministry. It is essential that MTO Staff including Maintenance Co-ordinators and Superintendents report to the Corridor Management Officer any variation from the conditions of the permit. When a variation has been identified, the Field Services Engineer shall refer to Procedure Regarding Infractions, Chapter 1.

5.6 Application For Building And Land Use Permit

Number: PH-A-20 95-01

Name: Application for Building and Land Use Permit/Entrance Permit

Number of Copies: Three

5.7 Building and Land Use Permit

Number: PH-A-41 95-04

Number of Copies: Three

Destination of Copies:

1) Original – Applicant
2) Photo copy – Maintenance staff or Co-ordinator
3) Photo copy – Area Office copy

5.8 Permit Fee

Refer to Ministry Directive B-7.

APPENDICES

TABLE OF TYPE, CLASSIFICATION AND SETBACK DISTANCE

Note: - * to be referred to the Regional Director.

TYPE OF USE	CLASSIFICATION	SETBACK P/L	Class 1 and 2 P/L
*Amusement Park	Land Use - Commercial	14m	14m
Arena	Building - Commercial	14m	14m
Ball Park	Land Use - Commercial	14m	14m
Band Stand	Building - Commercial	14m	14m
Barn - Private	Building - Residential	14m	14m
Barn - Public Sale	Building - Commercial	14m	14m
Booster Station - telephone, gas, oil, etc	Structure - Commercial	14m	14m
Bleachers	Building - Commercial	14m	14m
Bowling Alley	Building - Commercial	14m	14m
Bowling Green	Land Use - Commercial	14m	14m
Bus Passenger Shelter	Structure - Commercial/ Residential	1m	1m
Bus Terminal	Building - Commercial	20m	14m
Car Sales	Building - Commercial	14m	14m
Cemetery (including pets)	Building - Commercial	14m	14m
(Graves)	Land Use - Commercial	27m	27m
Church	Building - Commercial	14m	14m
Chip Truck Stand	Building - Commercial	14m	14m
Community Building	Building - Commercial	14m	14m
Dog Kennel	Building - Commercial	14m	14m
*Drive-In Theatre	Structure - Commercial	14m	14m

TYPE OF USE	CLASSIFICATION	SETBACK P/L	Class 1 and 2 P/L
Driving Range Tee	Structure - Commercial	14m	14m
Earth Berm (toe of slope)	Land Use - Commercial/ Residential	0.3m	0.3m
Explosive, storage	Building – Commercial	As required by Legislation	
Factory	Building - Commercial	14m	14m
*Fair Ground	Land Use - Commercial	14m	14m
- Building, rides			
Fence	Structure	0.3m	0.3m
Fire Hall	Building - Commercial	14m	14m
Foundation	Building - Residential	8m	14m
	Building - Commercial	14m	14m
Fruit/Produce Stand	Building - Commercial	14m	14m
Funeral Home	Building - Commercial	14m	14m
Garage	Building - Residential	8m	14m
	Building- Commercial	14m	14m
Gasoline Pump Island and Attendant Booth	Structure - Commercial	6m	14m
Gasoline Canopy / Shelter	Structure - Commercial	3m	14m
Gates	Structure	0.3m	14m
Golf Course Green	Land Use - Commercial	20m	14m
Golf Course Tee	Land Use - Commercial	8m	14m
Grand Stand	Building - Commercial	14m	14m
Greenhouse	Building - Commercial	14m	14m
Hedge/Planting	Land Use	0.3m	0.3m
Heliport	Land Use - Commercial	14m	14m
Hospital	Building - Commercial	14m	14m
Hotel	Building - Commercial	14m	14m
Hydro Sub Station	Structure - Commercial	14m	14m

TYPE OF USE	CLASSIFICATION	SETBACK P/L	Class 1 and 2 P/L
Illumination-Light Standard	Structure - Commercial	0.3m	0.3m
Implement Sales / Service	Building - Commercial	14m	14m
Junk Yard	Land Use - Commercial	45m	45m
Landfill Site	Land Use - Commercial	45m	45m
Library	Building - Commercial	14m	14m
Lumber Yard	Building - Commercial	14m	14m
Mail Box (Super / Group)	Structure	0.3m	0.3m
Manure Pit	Land Use	14m	14m
Marquee	Structure - Commercial	14m	14m
Mausoleum	Structure - Commercial	14m	14m
Meter Station			
- pipe line, gas, oil	Structure - Commercial	14m	14m
Monument	Structure - Commercial/	14m	14m
Motel	Building - Commercial	14m	14m
Newspaper Dispenser	Structure - Commercial	0.3m	0.3m
Noise Attenuation Structure	Structure	0.3m	0.3m
Parking Lot	Land Use - Commercial	3m	3m
Pipe Line	Structure - Commercial	3m	14m
*Pit and Quarries	Land Use	30m	30m
Pond			
-Detention/Retention	Land Use	14m	14m
-Other	Land Use - Residential	8m	14m
	Land Use - Commercial	14m	14m
Power / Transmission Line	Structure - Commercial	0.3m	14m
Pumping Station	Building - Commercial	14m	14m
*Race Track	Land Use - Commercial	14m	14m
Radio/Television Station/ Tower	Structure - Commercial	14m	14m

TYPE OF USE	CLASSIFICATION	SETBACK	Class 1 and 2
		P/L	P/L
Residential Dwelling	Building - Residential	8m	14m
- more than 5 units	Building - Commercial	14m	14m
- Class 1 and 2 highways	Building - Commercial	14m	14m
Restaurant	Building - Commercial	14m	14m
Retaining wall	Structure – Residential/ Commercial	0.3m	14m
Roads	Private	8m	14m
- not essential to future viability of development			
Road	Private	8m	14m
- essential to future viability of development			
Road	Municipal	8m	8m
- ROW wide enough to permit relocation road outside 14 m setback in future			
Road	Municipal	8m	14m
- ROW not wide enough to permit relocation road outside 14m setback in future			
Satellite Dish	Structure - Residential/	8m	8m
	Commercial	14m	14m
School	Building - Commercial	14m	14m
Septic Tank	Structure - Residential/ Commercial	8m	14m
Septic Bed	Structure - Residential/ Commercial	3m	14m
Service Station	Building - Commercial	14m	14m
Sewage Plant	Structure - Commercial	14m	14m

Kollaard Associates
Engineers
210 Prescott Street, Unit 1
P.O. Box 189
Kemptville, Ontario K0G 1J0

Civil • Geotechnical •
Structural • Environmental •
Hydrogeology
(613) 860-0923
FAX: (613) 258-0475

June 17, 2013 130399

DCR Phoenix Homes
18 Bentley Avenue
Nepean, Ontario
K0A 2Z0

Attention: Mr. Mike Boucher

RE: ADDITIONAL GEOTECHNICAL GUIDELINES
PROPOSED CHANGE OF USE FROM RESIDENTIAL AND COMMERCIAL DEVELOPMENT TO BUSINESS PARK INDUSTRIAL ZONE
O'KEEFE COURT AND FALLOWFIELD ROAD
OTTAWA, ONTARIO

Dear Sirs:

This letter is intended to provide additional guidelines for the proposed development at the site between O'Keefe Court and Fallowfield Road in the City of Ottawa, Ontario further to the preliminary subsurface investigation in August 2006 and additional subsurface investigation in March 2008. Based on information provided by Ms. Meredith Lynes, a planner for MMM Group Limited, the proposed development for the site will change from residential and commercial development to commercial/business park development.

Kollaard Associates previously completed the preliminary subsurface investigation report and additional subsurface investigation letter for a development at the above location consisting of proposed residential and commercial development. Since the preparation of that report and letter, it is understood that revised plans for development have been made to consist of Commercial / Business Park Development, including office uses, hotel and associated secondary uses, and a place of worship. The proposed developments seek to include building structures between 4 to 12 storeys in height. In view of the proposed development changes, the City of Ottawa requested that a review of the geotechnical investigations provided by Kollaard Associates be carried out to verify if the proposed development changes might influence the conclusions of the geotechnical reports.

Soil Background Information

The results of the above mentioned preliminary subsurface investigation and additional subsurface investigation letter are provided in the Kollaard Associates Inc. Report No. 060445, entitled "Preliminary Subsurface Investigation, Proposed Residential and Commercial Development, O'Keefe Court and Fallowfield Road, Ottawa, Ontario", dated August 2006 and Additional Subsurface Investigation, Report No. 080069, Proposed Residential and Commercial Development, O'Keefe Court and Fallowfield Road, Ottawa, Ontario, dated March 5, 2008 should be read in conjunction with this present letter. That report and letter indicate, in general, the site is underlain by shallow bedrock, glacial till and silty clay. Based on the results of the test pits and boreholes put down at the site for the investigations, the silty clay is stiff to very stiff in consistency. Beneath the silty clay, both boreholes encountered a deposit of glacial till. The glacial till is in a loose to compact state of packing. Refusal to auger advancement and/or practical refusal was encountered on the surface of bedrock or on large boulders within the boreholes and test pits at depths ranging between about 1.3 to 5.5 metres below the existing ground surface.

Geotechnical Considerations

A review of a planning rationale for this project was provided by Ms. Meredith Lynes, planner for MMM Group Limited. The planning rationale illustrated a proposed plan of subdivision along with a height strategy figure that identifies proposed building heights within each proposed lot within the business park. The review of the planning rationale provided general development information that could influence design considerations from a geotechnical point of view.

As such, Kollaard Associates considers that the following letter provide supplemental Geotechnical Guidelines for the proposed changes to the development at the above noted site.

Proposed Commercial / Business Park Development

Foundations for Proposed Commercial Buildings

From a geotechnical point of view, with the exception of the fill materials and topsoil, the subsurface conditions, in general, encountered at the test pits and boreholes advanced during the investigations are suitable for the support of the proposed commercial buildings on conventional spread footing foundations bearing on either the overburden or the underlying bedrock. It is considered that the excavations for the foundations should be taken down through any surficial fill, topsoil or otherwise deleterious material to expose the undisturbed silty clay, glacial till and/or bedrock.

For the proposed commercial buildings founded beneath the fill and topsoil on the undisturbed native silty clay or glacial till a maximum allowable bearing pressure of 150 kilopascals for serviceability limit states and 350 kilopascals for the factored ultimate bearing resistance.

For the proposed commercial buildings founded beneath the fill and topsoil on the undisturbed bedrock or on engineered fill placed on bedrock an allowable bearing pressure of 500 to 800 kilopascals for serviceability limit states and 1500 kilopascals for the factored ultimate bearing resistance may be used for both strip and pad footings.

As the types of developments and foundation requirements have not been determined at this stage, These preliminary allowable bearing pressures and factored ultimate bearing resistances are subject to changed with more detailed, site specific geotechnical investigations for site specific design purposes.

Seismic Design for the Proposed Commercial Buildings

Based on the limited information from the test pits and the boreholes put down at the site and from information obtained from adjacent sites, 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 A or B. For building permit application purposes, site specific investigations should be carried out to confirm the seismic site response for each lot.

Site Services
No changes

Roadways
No changes

Construction Considerations
No changes

Conclusions

In summary, Kollaard Associates has considered the proposed changes to the development as indicated by MMM Group Limited from a geotechnical point of view. Kollaard Associates considers the proposed Commercial / Business Park Development is feasible from a geotechnical point of view. Kollaard Associates strongly suggests that additional subsurface investigations be carried out on a site per site basis for the final design of each of the proposed buildings.

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

Yours truly,

Kollaard Associates Inc.

Dean Tataryn, B.E.S, EP.

Reviewed by Steve deWit, P. Eng.