

Consulting Engineers

28 Concourse Gate, Unit 1
Ottawa, Ontario
Canada K2E 7T7
Tel: (613) 226-7381
Fax: (613) 226-6344

Geotechnical Engineering
Environmental Engineering
Hydrogeology
Geological Engineering
Materials Testing
Building Science

www.patersongroup.ca

March 18, 2009
File: PG1823-LET.01

Novatech Engineering Consultants
200-240 Michael Cowpland Drive
Ottawa, Ontario
K2M 1P6

Attention: **Mr. Mark Bissett**

Subject: **Preliminary Geotechnical Investigation
Proposed Residential Development - Burke and Maxwell Properties
March Road - Ottawa**

Dear Sir,

Paterson Group (Paterson) was commissioned by Novatech Engineering Consultants to conduct a preliminary geotechnical investigation for the proposed residential development to be located along March Road, in the City of Ottawa, Ontario. The following letter report presents our findings and recommendations.

1.0 Field Observations

The subject site is currently vacant and grass covered. The site slopes gradually downward from the west toward to the east portion of the subject site.

Twelve (12) test pits were excavated, using a hydraulic shovel at selected locations across the subject site. The locations of the test pits are shown on Drawing PG1823-1 - Test Hole Location Plan attached to this letter.

Generally, the subsoil conditions at the test hole locations consist of topsoil underlain by very stiff brown silty clay, silty sand/sandy silt, glacial till and/or bedrock. Practical refusal to excavation was encountered between 0.7 to 3.2 m below surface at all test hole locations.

Groundwater was encountered at TPs 2, 7 to 11 varying in depths between 1 to 2.5 m during our field investigation. TPs 1, 3 to 6, and 12 were dry at the time of excavation. Groundwater levels fluctuate seasonally and may be encountered at higher or lower levels during construction.

2.0 Preliminary Geotechnical Assessment

From a geotechnical perspective, the subject site is suitable for the proposed residential development.

Site Preparation and Fill Placement

Topsoil and deleterious fill, such as those containing organic materials, should be stripped from under any building and other settlement sensitive structures.

Fill used for grading beneath the proposed building footprint, unless otherwise specified, should consist of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. The fill should be tested and approved prior to delivery to the site. It should be placed in lifts no greater than 300 mm thick and compacted using suitable compaction equipment for the lift thickness. Fill placed beneath the building should be compacted to at least 98% of its standard Proctor maximum dry density (SPMDD).

Non-specified existing fill along with site-excavated soil can be used as general landscaping fill where settlement of the ground surface is of minor concern. These materials should be spread in thin lifts and at least compacted by the tracks of the spreading equipment to minimize voids. If these materials are to be used to build up the subgrade level for areas to be paved, they should be compacted in thin lifts to a minimum density of 95% of their respective SPMDD. Non-specified existing fill and site-excavated soils are not suitable for use as backfill against foundation walls.

Bedrock Removal

Bedrock removal can be accomplished by hoe ramming where only a small quantity of the bedrock needs to be removed. Sound bedrock may be removed by line drilling and controlled blasting. Prior to considering blasting, the blasting effects on the existing buildings and structures should be considered. As a general guideline, peak particle velocities should not exceed 50 mm/sec (measured at the structure) during the blasting program to reduce the risks of damages to the existing structures. Blasting close to freshly placed concrete should also be closely controlled.

The blasting operations should be carried out under the supervision of a licensed professional engineer who is also a blasting expert.

A pre-blast or preconstruction survey of the existing surrounding structures should be carried out prior to commencing site activities. The extent of the survey should be determined by the blasting consultant and should be sufficient to respond to any inquiries/claims related to the blasting operations.

Foundation Design

A bearing resistance value at serviceability limit states (SLS) of **150 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **225 kPa** can be used for footings, up to 3 m wide, placed on an undisturbed, silty clay or glacial till bearing surfaces. Footings placed on an undisturbed, compact silty sand/sandy silt bearing surface can be designed using a bearing resistance value at SLS of **100 kPa** and a factored bearing resistance value at ULS of **200 kPa**. Footings placed on a clean, weathered bedrock can be designed using a bearing resistance value at SLS of **500 kPa** and a factored bearing resistance value at ULS of **750 kPa**. A geotechnical resistance factor of 0.5 was applied to the bearing resistance values at ULS.

An undisturbed soil bearing surface consists of a surface from which all topsoil and deleterious materials, such as loose, frozen or disturbed soil, whether in situ or not, have been removed, in the dry, prior to the placement of concrete for footings.

A clean, weathered bedrock surface consists of one from which all topsoil, soils, deleterious materials and loose rock have been removed prior to concrete placement.

The bearing resistance values at SLS will be subjected to potential post-construction total and differential settlements of 25 and 20 mm, respectively for the expected soil bearing mediums. Footings bearing on an acceptable bedrock bearing surface and designed using the bearing resistance values provided herein will be subjected to negligible potential post-construction total and differential settlements.

A maximum permissible grade raise of 2 m is available in soil bearing areas for the subject site.

Design for Earthquakes

The site class for seismic site response can be taken as Class C for the shallow foundations bearing on very stiff silty clay or glacial till at the subject site. The soils underlying the subject site are not susceptible to liquefaction. A higher site class, such as Class A or B could be applicable for this site, but would have to be determined based on site-specific seismic testing, such as near-surface reflection/refraction. Reference should be made to the latest revision of the 2006 Ontario Building Code for a full discussion of the earthquake design requirements.

Basement Slab

With the removal of all topsoil within the footprint of the proposed building, the native soil surface will be considered to be an acceptable subgrade on which to commence backfilling for floor slab construction.

Any soft areas should be removed and backfilled with appropriate backfill material. OPSS Granular B Type II, with a maximum particle size of 50 mm, are recommended for backfilling below the floor slab. It is recommended that the upper 200 mm of sub-slab fill consist of a 19 mm clear crushed stone material. All backfill materials within the footprint of the proposed buildings should be placed in maximum 300 mm thick loose layers. The fill should be compacted to at least 98% of its SPMDD.

Pavement Structure

Car only parking areas and access lanes are anticipated at this site. The proposed pavement structures are shown in Tables 1 and 2.

Table 1 - Recommended Pavement Structure - Driveways	
Thickness mm	Material Description
50	WEAR COURSE - HL-3 or HL3-Fine Driveway Grade Asphaltic Concrete
150	BASE - OPSS Granular A Crushed Stone
300	SUBBASE - OPSS Granular B Type II
SUBGRADE - Either in situ soil, fill or OPSS Granular B Type II material placed over in situ soil or fill.	

Table 2 - Recommended Pavement Structure - Local Residential Roadways	
Thickness (mm)	Material Description
40	Wear Course - Superpave 12.5 Asphaltic Concrete
50	Binder Course - Superpave 19.0 Asphaltic Concrete
150	BASE - OPSS Granular A Crushed Stone
400	SUBBASE - OPSS Granular B Type II
	SUBGRADE - Either fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil or fill

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project. If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type II material.

The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 100% of the material's SPMDD using suitable compaction equipment.

Pavement Structure Drainage

Satisfactory performance of the pavement structure is largely dependent on keeping the contact zone between the subgrade material and the base stone in a dry condition. Failure to provide adequate drainage under conditions of heavy wheel loading can result in the fine subgrade soil being pumped into the voids in the stone subbase, thereby reducing its load carrying capacity.

In areas where the subgrade soil consists of silty clay. Consideration should be given to installing subdrains at each catch basin installed. These drains should be at least 3 m long and should extend in four orthogonal directions or longitudinally when placed along a curb. The clear stone surrounding the drainage lines or the pipe itself, should be wrapped with a suitable filter cloth. The subdrain inverts should be approximately 300 mm below subgrade level. The subgrade surface should be crowned to promote water flow to the drainage lines.

3.0 Design and Construction Precautions

Foundation Drainage and Backfill

It is recommended that a perimeter foundation drainage system be provided for the proposed structures. The system should consist of a 100 mm to 150 mm diameter perforated corrugated plastic pipe, surrounded on all sides by 150 mm of 10 mm clear crushed stone, placed at the footing level around the exterior perimeter of the structure. The pipe should have a positive outlet, such as a gravity connection to the storm sewer.

Backfill against the exterior sides of the foundation walls should consist of free-draining non frost susceptible granular materials. The greater part of the site excavated materials will be frost susceptible and, as such, are not recommended for re-use as backfill against the foundation walls. Imported granular materials, such as clean sand or OPSS Granular B Type I granular material, should be used for this purpose.

Protection of Footings Against Frost Action

Perimeter footings of heated structures should be insulated against the deleterious effect of frost action. A minimum 1.5 m thick soil cover (or insulation equivalent) should be provided in this regard. A minimum 2.1 m thick soil cover (or insulation equivalent) should be provided for other exterior unheated footings, such as those for isolated exterior piers.

Excavation Side Slopes

The side slopes of excavations in the soil and fill overburden materials should either be cut back at acceptable slopes or should be retained by shoring systems from the start of the excavation until the structure is backfilled. It is assumed that sufficient room will be available for the greater part of the excavation to be undertaken by open-cut methods (i.e. unsupported excavations).

The excavation side slopes above the groundwater level extending to a maximum depth of 3 m should be cut back at 1H:1V or flatter. The flatter slope is required for excavation below groundwater level. The subsoil at this site is considered to be mainly Type 2 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects.

Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should be kept away from the excavation sides.

Slopes in excess of 3 m in height should be periodically inspected by the geotechnical consultant in order to detect if the slopes are exhibiting signs of distress.

It is recommended that a trench box be used at all times to protect personnel working in trenches with steep or vertical sides. It is expected that services will be installed by "cut and cover" methods and excavations will not be left open for extended periods of time.

Groundwater Control

The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding medium.

It is anticipated that pumping from open sumps will be sufficient to control the groundwater influx through the sides of the excavations.

4.0 Recommendations

It is a requirement for the design data provided herein to be applicable that an acceptable materials testing and observation program, including the aspects shown below, be performed by the geotechnical consultant.

- Observation of all bearing surfaces prior to the placement of concrete.
- Sampling and testing of the concrete and fill materials used.
- Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.
- Observation of all subgrades prior to backfilling and follow-up field density tests to determine the level of compaction achieved.
- Sampling and testing of the bituminous concrete including mix design reviews.

Upon demand, a report confirming that these works have been conducted in general accordance with our recommendations could be issued following the completion of a satisfactory materials testing and observation program by the geotechnical consultant.

5.0 Statement of Limitations


The recommendations made in this report are in accordance with our present understanding of the project. The client should be aware that any information pertaining to soils and all test hole logs are furnished as a matter of general information only and test hole descriptions or logs are not to be interpreted as descriptive of conditions at locations other than those of the test holes.

The preliminary recommendations provided herein should only be used by the design professionals associated with this project. They are not intended for contractors bidding on or undertaking the work.


The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than Novatech Engineering Consultants or their agent(s) is not authorized without review by this firm for the applicability of our recommendations to the altered use of the report.

Best Regards,

Paterson Group Inc.



David J. Gilbert, P.Eng.



Carlos P. Da Silva, P.Eng

Attachments

- Soil Profile and Test Data Sheets
- Drawing PG1823-1 - Test Hole Location Plan

Report Distribution

- Novatech Engineering Consultants (3 copies)
- Paterson Group (1 copy)

DATUM Ground surface elevations provided by Novatech Engineering Consultants Ltd.

FILE NO. **PG1823**

REMARKS

HOLE NO. **TP 1**

BORINGS BY Hydraulic Shovel

DATE 9 Feb 09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	88.10					
TOPSOIL												
0.18												
Brown SILTY SAND trace organic matter		G	1									
0.55												
GLACIAL TILL: Brown silty sand with gravel, cobbles and boulders												
0.70												
End of Test Pit												
Practical refusal to excavation on inferred bedrock surface @ 0.70m depth												
(TP dry upon completion)												

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

Preliminary Geotechnical Investigation
Proposed Residential Development - March Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Novatech Engineering Consultants Ltd.

FILE NO. **PG1823**

REMARKS

HOLE NO. **TP 2**

BORINGS BY Hydraulic Shovel

DATE 9 Feb 09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction	
		TYPE	NUMBER	% RECOVERY	N VALUE OF ROD			○ Water Content %	20	40	60		80
GROUND SURFACE						0	88.57						
TOPSOIL	0.25												
Very stiff, brown SILTY CLAY - grey by 0.75m depth	[Hatched Pattern]	G	1										
		G	2			1	87.57						157
						2	86.57						177
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles and boulders	2.90												
End of Test Pit	3.20					3	85.57						
Practical refusal to excavation on inferred bedrock surface @ 3.20m depth (Open hole GWL @ 1.4m depth)													

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

DATUM Ground surface elevations provided by Novatech Engineering Consultants Ltd.

FILE NO. **PG1823**

REMARKS

HOLE NO. **TP 3**

BORINGS BY Hydraulic Shovel

DATE 9 Feb 09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	85.48					
TOPSOIL	0.18											
Brown SILTY CLAY	0.47	G	1									
		G	2									
GLACIAL TILL: Brown silty clay with sand, gravel, cobbles and boulders						1	84.48					
End of Test Pit	1.90											
Practical refusal to excavation on inferred bedrock surface @ 1.90m depth (TP dry upon completion)												
								20	40	60	80	100
								Shear Strength (kPa)				
								▲ Undisturbed △ Remoulded				

DATUM Ground surface elevations provided by Novatech Engineering Consultants Ltd.

FILE NO. **PG1823**

REMARKS

HOLE NO. **TP 4**

BORINGS BY Hydraulic Shovel

DATE 9 Feb 09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
GROUND SURFACE						0	88.13	20	40	60	80	
TOPSOIL	0.20											
Brown SILTY SAND	0.50	G	1									
GLACIAL TILL: Grey clayey silt, some gravel, trace sand, cobbles and boulders	1.40	G	2			1	87.13					
End of Test Pit Practical refusal to excavation on inferred bedrock surface @ 1.40m depth (TP dry upon completion)												

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

DATUM Ground surface elevations provided by Novatech Engineering Consultants Ltd.

FILE NO. **PG1823**

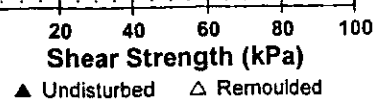
REMARKS

HOLE NO. **TP 5**

BORINGS BY Hydraulic Shovel

DATE 9 Feb 09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE OF ROD			○ Water Content %				
GROUND SURFACE						0	88.50	20	40	60	80	
TOPSOIL	0.26											
Brown SANDY SILT, trace gravel	G	1										
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles and boulders	G	2				1	87.50					
End of Test Pit Practical refusal to excavation on inferred bedrock surface @ 1.15m depth (TP dry upon completion)	1.15											



DATUM Ground surface elevations provided by Novatech Engineering Consultants Ltd.

FILE NO. **PG1823**

REMARKS

HOLE NO. **TP 6**

BORINGS BY Hydraulic Shovel

DATE 9 Feb 09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
GROUND SURFACE								20	40	60	80	
TOPSOIL	0.25					0	89.10					
Brown SILTY CLAY	0.85	G	1									
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles and boulders	2.20	G	2			1	88.10					
End of Test Pit						2	87.10					
Practical refusal to excavation on inferred bedrock surface @ 2.20m depth (TP dry upon completion)												

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

DATUM Ground surface elevations provided by Novatech Engineering Consultants Ltd.

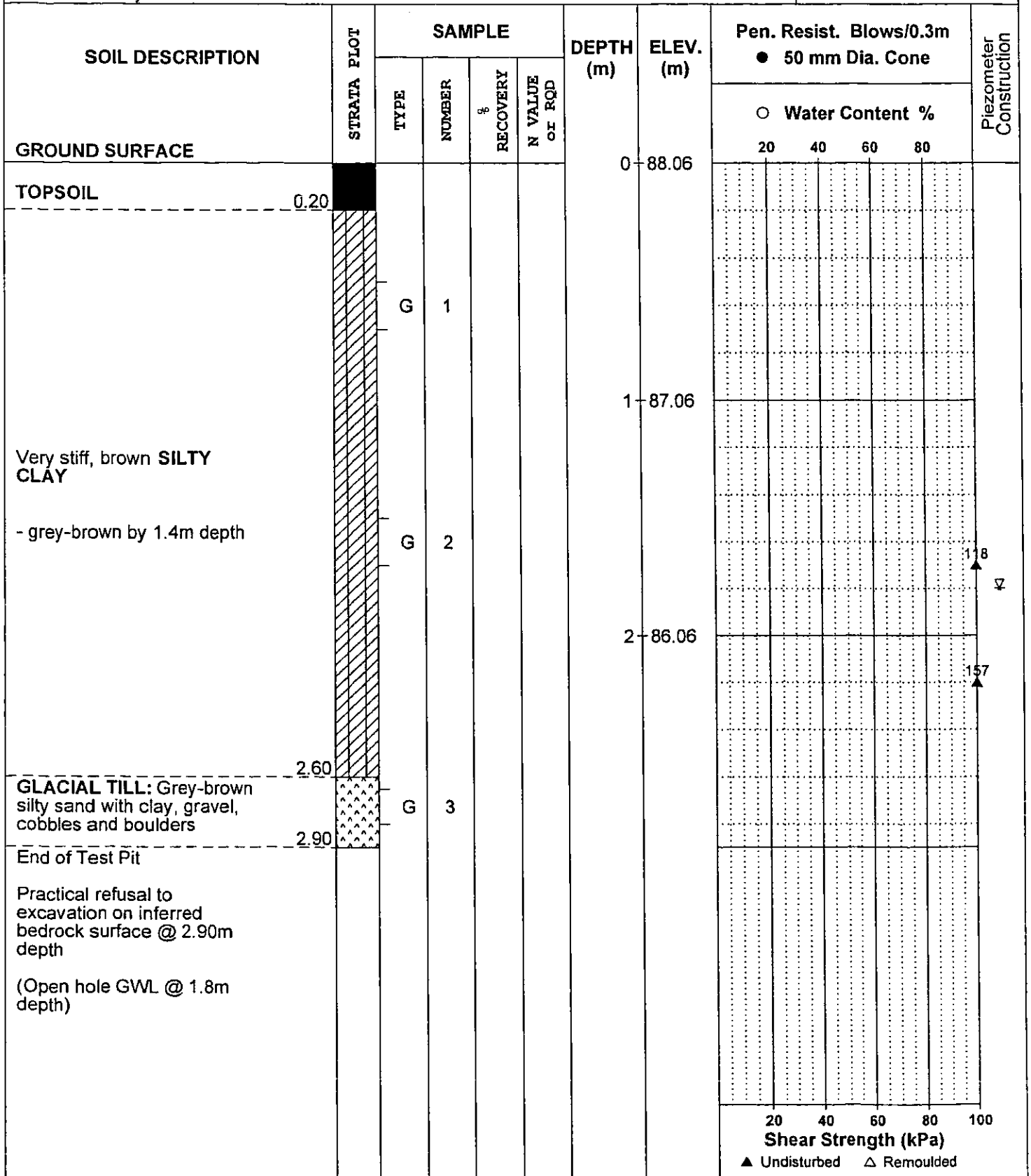
FILE NO. **PG1823**

REMARKS

HOLE NO. **TP 7**

BORINGS BY Hydraulic Shovel

DATE 9 Feb 09



DATUM Ground surface elevations provided by Novatech Engineering Consultants Ltd.

FILE NO. **PG1823**

REMARKS

HOLE NO. **TP 8**

BORINGS BY Hydraulic Shovel

DATE 9 Feb 09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
GROUND SURFACE								20	40	60	80	
TOPSOIL	0.25					0	89.86					
Brown SANDY SILT, trace organic matter	0.60	G	1									
Brown SILTY CLAY	1.40	G	2			1	88.86					∇
End of Test Pit Practical refusal to excavation on inferred bedrock surface @ 1.40m depth (Open hole GWL @ 1.1m depth)												

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

DATUM Ground surface elevations provided by Novatech Engineering Consultants Ltd.

FILE NO. **PG1823**

REMARKS

HOLE NO. **TP 9**

BORINGS BY Hydraulic Shovel

DATE 9 Feb 09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE OR RQD			○ Water Content %				
GROUND SURFACE						0	91.42	20	40	60	80	
TOPSOIL	0.20											
Brown SILTY CLAY		G	1			1	90.42					
GLACIAL TILL: Grey-brown clayey silt with gravel, cobbles and boulders, trace sand	1.30	G	2			2	89.42					✓
End of Test Pit Practical refusal to excavation on inferred bedrock surface @ 2.30m depth (Open hole GWL @ 1.9m depth)	2.30											

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

DATUM Ground surface elevations provided by Novatech Engineering Consultants Ltd.

FILE NO. **PG1823**

REMARKS

HOLE NO. **TP10**

BORINGS BY Hydraulic Shovel

DATE 9 Feb 09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE OF ROD			○ Water Content %				
GROUND SURFACE						0	90.76	20	40	60	80	
TOPSOIL	0.20											
Brown SANDY SILT, some organic matter	0.70	G	1									
GLACIAL TILL: Grey silty sand with gravel, cobbles and boulders	2.90	G	2			1	89.76					
		G	3			2	88.76					
End of Test Pit												
Practical refusal to excavation on inferred bedrock surface @ 2.90m depth (Open hole GWL @ 2.5m depth)												

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

DATUM Ground surface elevations provided by Novatech Engineering Consultants Ltd.

FILE NO. **PG1823**

REMARKS

HOLE NO. **TP11**

BORINGS BY Hydraulic Shovel

DATE 9 Feb 09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
GROUND SURFACE								20	40	60	80	
TOPSOIL						0	90.22					
0.25 Brown SILTY SAND , some organic matter		G	1									
0.90 GLACIAL TILL: Grey-brown silty sand with clay and gravel		G	2			1	89.22					▽
1.20 End of Test Pit Practical refusal to excavation on inferred bedrock surface @ 1.20m depth (Open hole GWL @ 1.0m depth)												

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

Preliminary Geotechnical Investigation
Proposed Residential Development - March Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Novatech Engineering Consultants Ltd.

FILE NO. **PG1823**

REMARKS

HOLE NO. **TP12**

BORINGS BY Hydraulic Shovel

DATE 9 Feb 09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
GROUND SURFACE						0	89.26	20	40	60	80	
TOPSOIL	0.20											
Brown SILTY SAND	1.00											
GLACIAL TILL: Grey silty sand with clay and gravel	1.60					1	88.26					
End of Test Pit Practical refusal to excavation on inferred bedrock surface @ 1.60m depth (TP dry upon completion)												

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

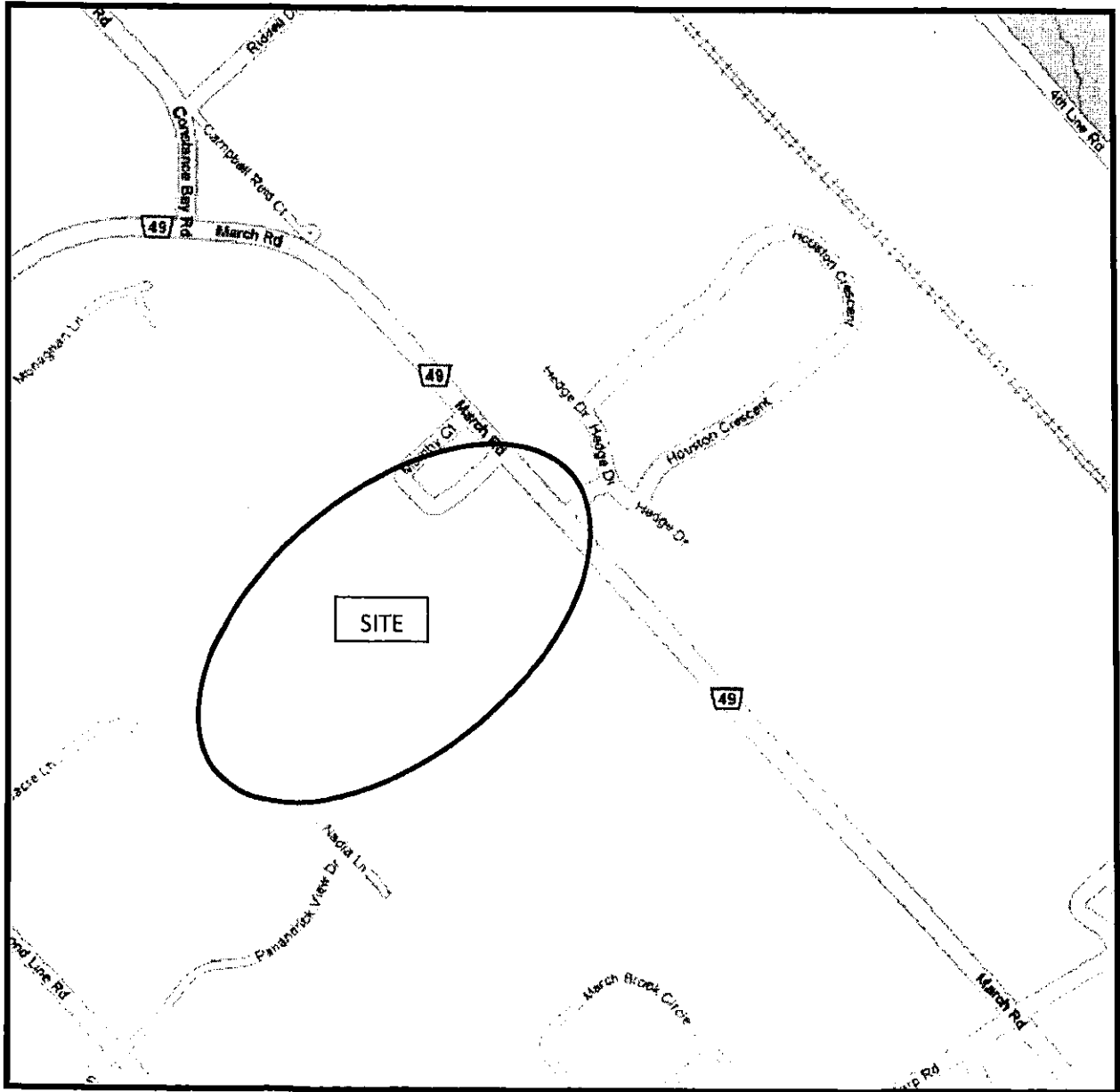
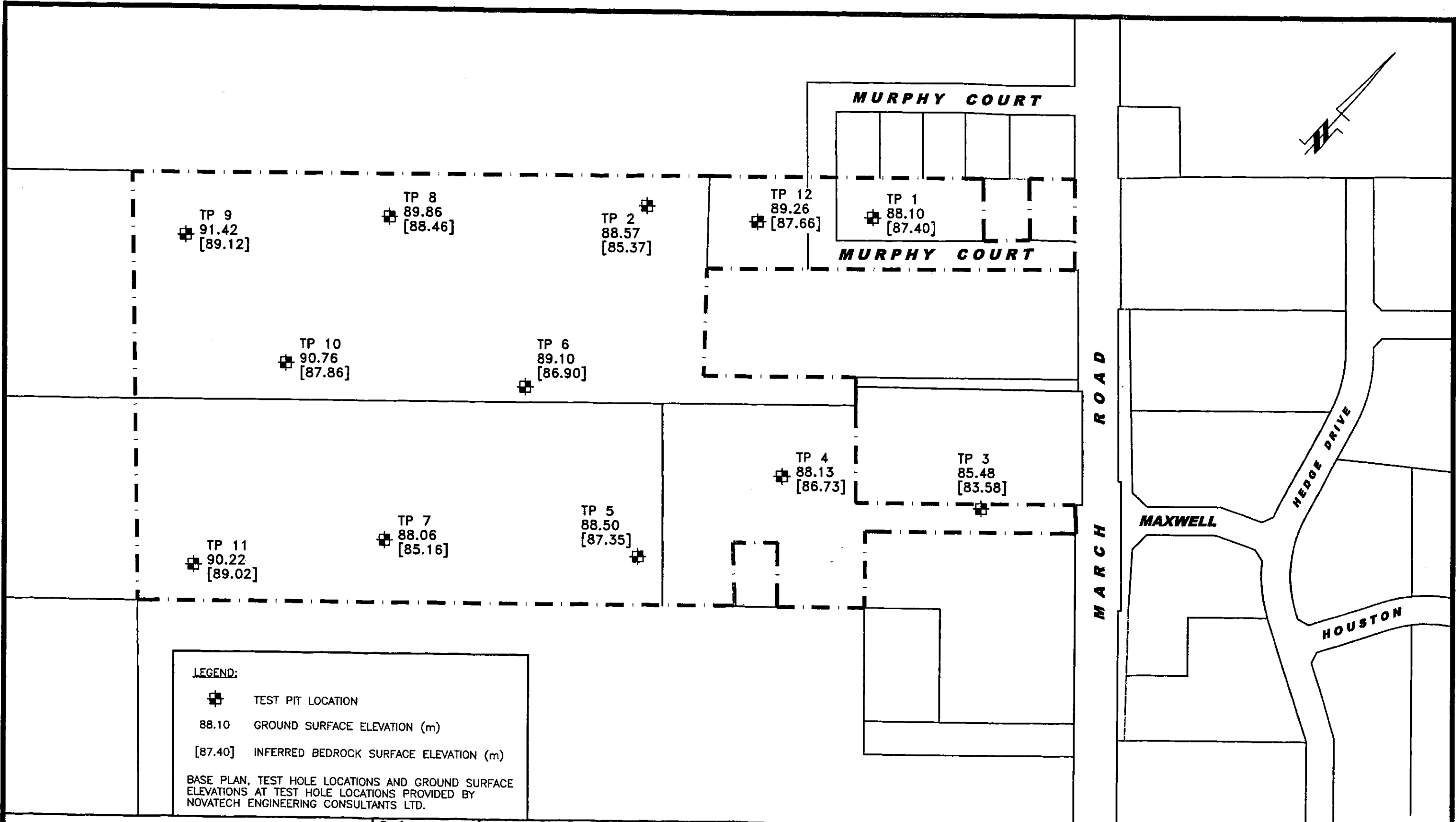


FIGURE 1
KEY PLAN



LEGEND:

TEST PIT LOCATION
 88.10 GROUND SURFACE ELEVATION (m)
 [87.40] INFERRED BEDROCK SURFACE ELEVATION (m)

BASE PLAN, TEST HOLE LOCATIONS AND GROUND SURFACE ELEVATIONS AT TEST HOLE LOCATIONS PROVIDED BY NOVATECH ENGINEERING CONSULTANTS LTD.

patersongroup
 consulting engineers
 28 Concourse Gate, Unit 1, Ottawa, Ontario K2E 7T7

Scale: 1:2500
 Des.:
 Dwn: MPG
 Chkd: DG

NOVATECH ENGINEERING CONSULTANTS LTD.
 GEOTECHNICAL INVESTIGATION
 PROPOSED RESIDENTIAL DEVELOPMENT—MARCH ROAD
 OTTAWA, ONTARIO

TEST HOLE LOCATION PLAN

Dwg. No. PG1823-1
 Report No.: PG1823-1
 Date: 02/2009