

GEOTECHNICAL No:

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**GEOTECHNICAL INVESTIGATION  
FIFTY ROAD WATERMAIN  
FIFTY ROAD  
HAMILTON, ONTARIO  
for  
CITY OF HAMILTON**



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PML Ref.: 06HF033  
Report: 1

Ms. Susan Jacob  
City of Hamilton  
71 Main Street West  
Hamilton, Ontario  
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Dear Ms. Jacob

**Geotechnical Investigation  
Fifty Road Watermain  
Fifty Road  
Hamilton, Ontario**

This report documents the results of the geotechnical investigation and geoenvironmental study recently completed in connection with this project. Written authorization to proceed with this assignment was provided with Purchase Order 32048 dated July 10, 2006.

The project involves construction of a 1,300 m long watermain on Fifty Road, in Hamilton, Ontario. We understand the watermain will be 400 mm in diameter. The current design calls for the watermain to be located along the east side of Fifty Road between Barton Street and the South Service Road. Preliminary design called for this section of the watermain to be on the west side of Fifty Road and follow the north side of South Service Road, cross the QEW about 310 m east of the intersection with Fifty Road and extend about 200 m to the north along the north side of North Service Road.

The design calls for the depth of cover over the watermain to be 1.8 m except at the QEW crossing where the obvert is to be 5 m below the road grade. The design also calls for tunnelling and/or jack and bore procedures to be employed at the QEW and CNR crossings.

The purpose of the geotechnical investigation was to investigate the composition and pertinent engineering properties of the soil along the watermain alignment and provide geotechnical recommendations for design and construction of the watermain. This will include the method of installation (jack and bore or tunnelling) at the CN and QEW crossings, as well as settlement monitoring and a contingency plan to deal with excessive settlements should they occur during installation of the watermain at the CN and QEW crossings.

The objectives of the geoenvironmental component of the study are to characterize the environmental properties of soil in order to develop a management plan for off site disposal of excess material generated during excavation for construction of the watermain.

The field investigation involved a total of 15 boreholes along the alignment; three boreholes at the QEW crossing were drilled to depths of 9.6 m and two boreholes at the CNR crossing were terminated at a depth of 6.1 m. The remaining holes were drilled to depths of 4.5 to 5.0 m.



The subsurface stratigraphy revealed in the boreholes typically comprised a thin layer of topsoil and fill overlying shale bedrock from Barton Street to about 200 m east of Fifty Road along the South Service Road. Clay/clay till was identified below the surficial materials in the remaining holes to the north.

Groundwater was detected in the shale, 2 to 3 m below grade during drilling.

Detailed comments and recommendations concerning excavation and backfilling of the trench excavation (section 5.1 to 5.4), installation of the watermain below the QEW and CNR (section 5.5), monitoring of ground movements below the tunnelled section (section 5.6), design of the entry pits and thrust blocks (section 5.7 and 5.8), pavement restoration (section 5.9), the corrosivity of the soil (section 5.10) and soluble sulphate attack on concrete (section 5.11) are provided in the text of the report.

Detailed comments concerning management of excess materials excavated during installation of the watermain are provided in section 6; specific comments are provided in section 6.5.

We trust these brief comments are sufficient and look forward to any questions you may have.

Sincerely

Peto MacCallum Ltd.

A handwritten signature in blue ink, appearing to read "D. Kerr", is written over a light blue horizontal line.

Dennis W. Kerr, MEng., P.Eng.  
Principal Consultant  
Geotechnical and Geoenvironmental Services  
Hamilton

DWK:lad



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Log of Boreholes 1 to 15

Drawings 1 and 2 - Borehole Location Plan

Drawings 3A to 3D - Soil Profile

Appendix A - Geotechnical Laboratory Test Results; Figure A 1 – Photograph of Rock Core;  
Figure A2 – Particle Size Distribution; Figure A3 – Plasticity Chart

Appendix B - Corrosivity and Sulphate Attack Laboratory Test Results; Table B1 - Summary of  
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Appendix C - Results of Geoenvironmental Laboratory Testing; Table C1 - Samples Submitted for  
Chemical Testing; Table C2 - Summary of Chemical Test Data; Certificates of  
Analyses



## **1. INTRODUCTION**

This report documents the results of the geotechnical investigation and geoenvironmental study recently completed in connection with this project. Written authorization to proceed with this assignment was provided with Purchase Order 32048 dated July 10, 2006.

The project involves construction of a 400 mm diameter, 1,300 m long watermain on Fifty Road, in Hamilton, Ontario. The current design calls for the watermain to be located along the east side of Fifty Road between Barton Street and the South Service Road and follow the north side of South Service Road, cross the QEW about 310 m east of the intersection with Fifty Road and extend about 200 m to the north along the north side of North Service Road.

The design calls for the depth of cover over the watermain to be 1.8 m except at the QEW crossing where the obvert is to be 5 m below the road grade. The design also calls for tunnelling and/or jack and bore procedures to be employed at the QEW and CNR crossings.

The purpose of the geotechnical investigation was to investigate the composition and pertinent engineering properties of the soil along the watermain alignment and provide geotechnical recommendations for design and construction of the watermain. This will include the method of installation (jack and bore or tunnelling) at the CN and QEW crossings, as well as settlement monitoring and a contingency plan to deal with excessive settlements should they occur during installation of the watermain at the CN and QEW crossings.

The objectives of the geoenvironmental component of the study are to characterize the environmental properties of soil in order to develop a management plan for off site disposal of excess material generated during excavation for construction of the watermain.

## **2. INVESTIGATION PROCEDURES**

The field work was carried out on July 5th to 7th, 10th, and 21st, 2006 and consisted of a total of 15 boreholes. Boreholes 4 and 5 located at the CN crossing as well as 7 and 8 located at the South Service Road crossing south of the QEW were terminated at depths of 6.1 m; Boreholes 11



to 13 located along the QEW crossing were extended to 9.6 m. The remaining boreholes were terminated at depths of 4.5 to 5.0 m. One borehole (Borehole 12) was located within the MTO right-of-way near the entrance ramp from the Fifty Road interchange. The location of the boreholes are shown on Drawings 1 and 2, appended.

The borehole locations were established in the field by PML. Ground surface elevations were provided by the City of Hamilton, in an email dated July 27, 2006.

The boreholes were advanced using continuous flight solid stem augers, powered by a truck-mounted CME-75 drill rig, supplied and operated by a specialist drilling contractor, working under the full time supervision of a member of our engineering staff. Borehole 5 was cored (NXL core size) from depths of 3.0 to 6.0 m.

Representative samples of the overburden were recovered at frequent depth intervals using a conventional split-spoon sampler during drilling. Standard penetration tests were conducted simultaneously with the sampling operation to assess the strength characteristics of the substrata.

Piezometers were installed in Boreholes 4 (CN crossing) and 7 (Fifty Road crossing at intersection with South Service Road) as well as 11, 12, and 13 (QEW crossing) to enable monitoring of the groundwater level.

The groundwater conditions in the boreholes were closely monitored during the course of the drilling operation. The water level in the piezometers was monitored several times since installation.

All of the recovered samples were returned to our laboratory for detailed visual examination, classification and routine moisture content determinations. Samples from Boreholes 5 and 12 were also selected for corrosion analysis. In addition, samples from Boreholes 11 and 12 were selected for 'routine' MTO testing: Atterberg Limits, specific gravity, and sieve and hydrometer testing.



Samples were also submitted to Maxxam Analytics Inc. for laboratory testing to assess the environmental properties of the soil. Details concerning the sampling and testing protocol are provided in Section 6.

### **3. SUMMARIZED SUBSURFACE CONDITIONS**

Reference is made to the appended Log of Borehole sheets for details of the subsurface conditions including soil classifications, inferred stratigraphy, standard penetration test N values, groundwater observations, the results of laboratory moisture content determinations and Atterberg Limits tests. The soil profile identified along the alignment of the watermain is provided on Drawings 3A to 3D.

The subsurface stratigraphy revealed in the boreholes typically comprised a pavement structure, and/or gravel fill or topsoil, overlying native silty clay till, and weathered shale bedrock.

The pavement structure was identified in Boreholes 1 to 5 located within the paved surface of Fifty Road between Barton Street and the CN Railway. The total thickness of the pavement structure in Borehole 1 was 2150 mm and it ranged from 340 to 760 mm in Boreholes 2 to 5. The surface layer of asphaltic concrete ranged in thickness from 120 to 230 mm. The composition of the material below the asphalt was variable. In Borehole 1 there was 1.9 m of granular A type slag and in Borehole 5 there was 0.28 m of Granular A type crushed limestone. Boreholes 2 and 3 also contain Granular A type crushed limestone. However, the granular material in these boreholes is in two layers ranging in thickness from 230 to 330 mm, separated by a 80 to 90 mm layer of asphaltic concrete (total thickness 610 and 640 mm).

Below the surficial asphaltic concrete in Borehole 4 was a 190 mm layer of tar and chip, overlying a 260 mm thick layer of black to brown clayey silt fill.

Boreholes 6, 13, 14, and 15 were located in the gravel shoulder of Fifty Road and the North Service Road. A 150 to 1350 mm surficial layer of sand and gravel fill, described to be grey Granular A type crushed limestone, was penetrated in these boreholes.



The remaining boreholes were located in a grassed area off of the road and shoulder. Boreholes 7 to 11 were located on the north side of the South Service Road; these boreholes revealed a surficial topsoil layer ranging in thickness from 150 mm in Boreholes 7 to 10, to 800 mm in Borehole 11. The topsoil was described as dark brown clayey silt, very low organic.

Locally in Borehole 12 there was a 1.4 m layer of dark brown clayey silt fill on the surface. This clayey silt fill contained occasional inclusions of topsoil and a trace of black coal.

Below the pavement structure in Borehole 5 was 1.6 m of fill material consisting of 0.9 m of silty clay, underlain by 0.7 m of silty sand.

Boreholes 9 to 15 encountered deposits of silty clay till and clayey silt till below the topsoil or granular fill. South of the QEW (Boreholes 9 to 12) the till is very stiff to hard and stiff to very stiff to the north (Boreholes 13 to 15). The till was described as brown to grey, silty clay or clayey silt, with trace to some sand and gravel, low plastic and generally drier than plastic limit (DTPL). Boreholes 10 and 12 to 15 were terminated in the till at depths of 4.5 to 9.6 m, elevation 73.3 to 78.8.

Locally, in Boreholes 11, 13, and 14 there were layers of silt, sand and clay. In Borehole 11 at a depth of 4.75 m, elevation 79.1, there was a 0.8 m layer of damp grey silt with a trace of sand. Below the surficial fill in Borehole 13 there was a 0.2 m layer of brown sandy silt with decayed woody organics, over a 1.5 m layer of brown fine to medium grained sand. Borehole 14 encountered a 1.0 m layer of brown silty clay, located below the surficial sand and gravel fill at a depth of 0.15 m.

In Borehole 11 the till is underlain by hard reddish brown clayey silt till/weathered red shale complex contacted at 8.5 m depth, elevation 75.4. The borehole was terminated within the till/shale complex at a depth of 9.6 m, elevation 74.3.

Weathered red and grey shale was contacted in Boreholes 1 to 9 at depths of about 0.15 to 2.6 m, and between elevations 81.8 to 91.0. These boreholes were terminated in shale at depths of 4.6 to 6.1 m, elevations 79.4 to 87.2.



The bedrock is described as weathered red and grey shale with grey layers. Based on the standard penetration test results, the upper 1.0 to 1.5 m is judged to be very weathered, becoming weathered below this level. The bedrock core retrieved from Borehole 5 exhibited an RQD of 57 with 95 to 100% recovery. The upper 2.4 m of the core contained seven 20 to 40 mm thick grey limy layers; the lower 600 mm of the core was a grey limestone like layer.

Geologic maps indicate it is Queenston Shale; hard grey limy layers are prevalent in this rock formation.

A photograph of the rock core is provided on Figure A1, Appendix A. It is noteworthy that the photograph was taken after portions of the core had been submitted for testing and therefore some sections are not included.

Water was observed in Boreholes 1, 3, 7, and 8 upon completion of drilling. The depth of the water ranged from 2.3 to 3.2 m, elevation 82.5 to 89.5. The groundwater appears to originate from seepage through fissures in the bedrock.

The water level measured in the piezometers installed in Boreholes 4, 7, 11 to 13 are summarized in the table below:

Borehole	Date	Depth (m)	Elevation
4	July 10/06	3.2	85.5
4	Aug. 12/06	2.9	85.8
4	Aug. 28/06	3.5	85.2
7	July 7/06	1.5	84.3
7	July 10/06	0.7	85.0
7	July 17/06	0.4	85.3
7	July 25/06	0.5	85.3
7	Aug. 28/06	0.8	84.9
11	July 7/06	1.7	82.2
11	July 10/06	1.5	82.4
11	July 17/06	1.4	82.5
11	July 25/06	1.3	82.6
11	Aug. 28/06	1.1	82.8



Borehole	Date	Depth (m)	Elevation
12	July 25/06	Dry	-
12	Aug. 28/06	6.6	76.3
13	July 7/06	Dry	-
13	July 14/06	Dry	-
13	Aug. 28/06	7.3	76.1

Groundwater levels may fluctuate subject to seasonal variations and precipitation patterns.

#### 4. LABORATORY TEST RESULTS

##### 4.1 Soil Properties

Representative samples from Boreholes 11 and 12, located within the MTO right-of-way, were selected to determine the specific gravity, Atterberg limits, and gradation of the soil at and above the proposed depth of the watermain crossing of the QEW.

The test results of the gradation analysis and Atterberg Limits tests are provided on Figures A2 (Particle Size Distribution Chart) and A3 (Plasticity Chart) in Appendix A. The specific gravity of the soil was 2.74.

##### 4.2 Corrosivity Assessment and Sulphate Attack on Concrete

Four representative soil samples were submitted to AGAT Laboratories Ltd. for analysis of the potential for sulphate attack on concrete and corrosivity of the soils along the study corridor. The test results are summarized in Tables B1 to B3 in Appendix B. A copy of the Certificate of Analysis is also provided in Appendix B.

#### 5. ENGINEERING DISCUSSION AND RECOMMENDATIONS

The project involves construction of a 1,300 m long watermain on Fifty Road, in Hamilton, Ontario. We understand the watermain will be 400 mm in diameter. The current design calls for the watermain to be located along the east side of Fifty Road between Barton Street and the South



Service Road and follow the north side of South Service Road, cross the QEW about 310 m east of the intersection with Fifty Road and extend about 200 m to the north along the north side of North Service Road.

The design calls for the depth of cover over the watermain to be 1.8 m except at the QEW crossing where the obvert is to be 5 m below the road grade. The design also calls for tunnelling and/or jack and bore procedures to be employed at the QEW and CNR crossings.

The preliminary design called for the section between Barton Street and South Service Road to be located on the west side of Fifty Road. Hence the boreholes in this section of the watermain alignment were drilled on the west side of the road. Since shale bedrock was contacted at shallow depth along this section of the proposed watermain, it is unlikely that the change in alignment will be significant from a geotechnical perspective.

The subsurface stratigraphy revealed in boreholes drilled between Barton Street and the north side of the North Service Road at Fifty Road (Boreholes 1 to 8) generally comprised a surficial pavement structure or topsoil and thin fill layer overlying bedrock; the bedrock was contacted at depths of 0.15 to 2.2 m (typically 0.6 to 1.6 m).

Borehole 9 drilled about 180 m east of Fifty Road penetrated 2.2 m of very stiff to hard clay till below the topsoil and encountered bedrock at a depth of 2.6 m. The material exposed in Boreholes 10 (located 75 m west of the QEW crossing) to 15 primarily comprised stiff to very stiff clay/silt till.

### **5.1 Trench Excavation**

Excavation through the pavement structure, topsoil, fill, and native overburden soils to the proposed invert level is expected to be relatively straight forward using conventional equipment. The materials are classified as Type 3 soils according to the Occupational Health and Safety Act criteria. Therefore, trench sidewalls for open cut excavations should be cut at an inclination of 1 horizontal to 1 vertical (1H:1V), to the surface of the bedrock.



Based on our assessment of bedrock characteristics as well as our general field experience, it is considered that excavation of the shale should be possible using a large hydraulic hoe equipped with a rock bucket. Heavy duty ripping and local jack-hammering may be required to penetrate bands of hard grey shale. Progressively more difficult conditions should be anticipated with increasing depth of excavation into the shale. The shale is classified as bedrock according to the Occupational Health and Safety Act criteria and the trench/sidewalls for open cut excavations could be cut near vertical.

Excavation sideslopes should be continuously examined for evidence of instability, particularly following periods of heavy rain, thawing or when the trench has been left open for extended periods of time for evidence of instability and/or loose rock fragments and appropriate remedial action taken when required to ensure the continued stability of the trench slope and the safety of workers in the trench.

It may be necessary to flatten the sideslopes if excessively loose/soft conditions or concentrated seepage zones are encountered locally.

Foundations of heavily loaded/settlement sensitive structures and/or utilities located within close proximity to the excavation may require underpinning to preserve the integrity of these structures. Further, temporary support systems should be provided at locations where space limitations, soil conditions and/or excavation depths do not permit construction of inclined slopes. If necessary, further recommendations for underpinning and braced excavations can be provided.

All work should be carried out in accordance with the Occupational Health and Safety Act (Ontario Regulation 213/91) and with local regulations.

## **5.2 Groundwater Control**

Groundwater seepage through the fractures in the shale was detected in four of the holes drilled south of the North Service Road at depths of 2 to 3 m, decreasing from elevation 89.5 at Barton Street to 82.5 at the North Service Road.



The water level measured in the piezometers installed in Boreholes 4 and 7 was near elevation 85.8 and 85.3, respectively.

Groundwater was not detected in the remaining boreholes during drilling; it was measured at elevation 82.8 in the piezometer installed in Borehole 11 located on the south side of the QEW (about 1.3 m below grade) and near elevation 76.2 in the piezometers installed in Boreholes 12 and 13.

Groundwater seepage or surface water that enters the trench excavation should be readily handled by conventional sump pumping techniques. Observed water levels are subject to seasonal fluctuations and rainfall patterns.

The possibility of encountering local seepage from silt or sand zones along the study corridor (such as Boreholes 11 and 13) or from large fractures in the bedrock that may necessitate more elaborate methods to control groundwater (such as high capacity pumps) should not be overlooked.

### **5.3 Bedding Material**

Typically, the founding material at the anticipated invert is expected to comprise weathered shale, or stiff to very stiff silty clay till/clayey silt till. Therefore, no problems with respect to bearing capacity or settlement are anticipated.

The normal minimum 150 mm bedding thickness of granular material as per Ontario Provincial Standards (OPS) and/or local requirements should be satisfactory.

It may be necessary to increase the bedding thickness if excessively loose, soft or wet conditions are experienced locally at the pipe subgrade. The need for this is best determined during construction.

The bedding material should be carried up as backfill for at least 300 mm above the pipe obvert.



#### 5.4 Trench Backfill

It is anticipated that the excavated material along Fifty Road south of North Service Road will primarily comprise weathered shale with lesser amounts of sand and gravel, and native silty clay till/clayey silt till. The excavated material north of this area will primarily comprise clay/clay till.

The industry standard normally calls for service trenches to be backfilled with approved material placed in uniform 200 to 300 mm thick lifts within 3% of the optimum moisture content and compacted to at least 95% of standard Proctor maximum dry density (SPMDD).

The in situ moisture content of the soil to be excavated along the construction corridor within the anticipated depth of excavation typically ranges from 10 to 15%. The optimum moisture content of the clayey material is expected to be in the order of 3 to 5% higher than the in situ moisture content, and some loss of moisture normally occurs during excavation and handling of the material.

Consequently, the moisture content of the excavated clayey soil is likely to be significantly less than the optimum moisture content when placed and compacted in the trench; therefore, the backfill may have a nuggety voided structure due to the presence of lumps/clods and significant post construction settlement could result.

It is difficult to quantify the magnitude of post construction settlements. Based on our experience on similar projects in the area, settlements in the order of 50 to 100 mm may occur with significantly greater settlements occurring in areas that are difficult to compact (around manholes for example).

Provided this magnitude of settlement is acceptable, the excavated clay till is considered to be suitable for reuse.



The implications of, potential for and magnitude of post construction settlements that do occur could be reduced by implementing the following measures:

- increase the moisture content of the clayey soil (periodic spraying the stockpile with water and mixing/spreading of the soil during handling),
- increase the specified degree of compaction of the backfill (98% of SPMDD),
- "flood" the trench after the backfill has been placed and compacted,
- "crown" the top of the trench,
- delay placement of the top layer of asphaltic concrete for at least one year and preferably two,
- schedule the excavation work for the fall of the year when air drying is likely to be minimal and wet weather conditions often prevail.

Reuse of the excavated shale as trench backfill should also be feasible provided it is broken down to a maximum particle size of 100 mm. A tracked machine will help to pulverize the shale when spread in the trench. A heavy club foot compactor will be required to further pulverize and effectively compact the shale. The lift thickness must be strictly controlled.

If spatial requirements restrict the type of equipment that can be utilised, the excavated shale may be unsuitable for reuse as trench backfill.

Organic soil, topsoil, boulders, deleterious or excessively wet material should not be used as backfill.

Should construction extend to the winter season, particular attention must be given to ensure that frozen material is not used as trench backfill beneath roadways.

The trenching and backfilling operations should be carried out in a manner which minimizes the length of trench left open yet accommodates efficient pipe laying and compaction activities.



Full time site review should be provided by PML to examine and approve backfill material, to carefully evaluate placement operations and to verify the compaction by in situ testing using nuclear gages.

## **5.5 Tunnelling**

The preliminary design calls for the watermain to be installed in a steel casing pipe under the CNR and QEW right-of-ways. The preliminary design calls for the casing pipe under the CNR to be between elevation 84.5 to 85.5 and elevation 77.5 to 78.5 under the QEW.

Boreholes 4 and 5 drilled on the south and north sides of the CNR right-of-way indicate the watermain will be installed in shale bedrock. Both jack and bore and tunnelling procedures could be considered to install the watermain below the railway track. Due to the presence of hard limy bands and differential zones of weathering between the obvert and invert of the tunnel within the rock mass, tunnelling is preferred from a geotechnical perspective. The preferred construction procedure however, will be dictated by construction considerations and economic constraints.

Some groundwater seepage into the tunnel should be expected; as noted previously, conventional sump pumping to handle groundwater should be suitable. The potential for substantial flow from large fractures/joints within the rock mass that may require high capacity pumps should not be overlooked however.

'Rock squeeze' or closure of tunnels advanced in some rock formations in southern Ontario, particularly the hard rocks south of the escarpment in Hamilton, often occurs. Closure of the tunnels in the Queenston shale is normally not a concern, particularly when located within a few metres of original grade. Nevertheless, it is recommended that the design consider an allowance for 20 mm of closure on each side of the tunnel below the CNR.

Boreholes 11 to 13 drilled along the alignment under the QEW indicate very stiff to hard/dense clayey silt till/silt exists on the south side of the right-of-way (Borehole 11) and very stiff clay till exists below the travelled portions of the roadway and the north side of the QEW right-of-way.



It is considered that use of either jack and bore or tunnelling techniques to install the watermain below the QEW are feasible. It is recommended that the watermain is installed by tunnelling however, since this technique provides greater ground support and minimizes the potential for settlement

While not identified in the boreholes, the potential for cobbles and boulders to exist in the till units, should not be overlooked.

It is recommended that:

- An experienced tunnelling contractor is retained to carry out the work at both crossings. The magnitude of settlement of the ground surface above the tunnel will be dictated by the construction technique employed and the quality of workmanship provided by the contractor.
- The earth cover between the tunnel crown and the ground surface is at least two (2) times the tunnel diameter.
- The contract documents clearly state that dewatering is the contractor's responsibility.
- A primary liner is installed to support the walls of the tunnel. It should be within the tailpiece of the tunnelling machine and the ring expanded tight to the ground as the machine advances. In addition, it must be capable of preventing the migration of fines into the tunnel opening.

If the tunnelling procedure selected by the contractor requires a secondary liner, a rigid liner should be employed to minimize ground movement.

The performance of the primary support system should be closely monitored for signs of distortion and overstressing.

Gaps between the soil and primary liner as well as the primary and secondary liner if employed should be pressure grouted. The grouting pressure should not exceed the overburden pressure, otherwise heaving at the ground surface may occur.



- Design of the primary and/or secondary tunnel liners should consider the following loading conditions, in addition to any grout pressure and axial thrust load due to the shield jacking operations:
  - a) Ring loads caused by uniformly distributed radial earth pressure on the liners.
  - b) Bending, shear stress and thrust loads caused by the anticipated distortion of the liner.
  - c) External loads such as traffic loads.

## 5.6 Monitoring Program

Some settlement (less than 10mm) of the ground surface above the tunnels at the QEW and CN crossings may occur. The magnitude of settlement however, will be dictated primarily by the work procedures and quality of workmanship employed to advance the tunnels. It is recommended therefore, that a performance specification is prepared for this work. In addition, the ground surface level above the proposed tunnels at the CNR and QEW crossings should be monitored prior to, during and following advancement of the tunnels for installation of the watermain in order that action can be taken should excessive settlement occur that could affect public safety.

The location of nearby utilities and other structures should also be established prior to tunnelling to assess potential impacts of the tunnelling operation on existing facilities.

The monitoring program should be prepared in consultation with MTO and CNR and should involve:

1. CNR crossing - monitoring points established at the top of rail (all tracks) at the centreline of the tunnel and 2 m each side of the tunnel centreline.
2. MTO crossing - monitoring pins installed at four (4) locations at the QEW crossing (ditch north of ramp from QEW WBL to Fifty Road); north EP of the QEW WBL; south EP of the QEW EBL; ditch south of ramp from Fifty Road to QEW EBL.

Three pins should be installed at each location, one at the centreline of the watermain alignment and one on each side of the watermain, 2 m from the centreline.

3. Establishment of decision criteria to evaluate the significance of any movements that do occur such as:

- i) Baseline:

The elevation of the monitoring points should be established on at least three (3) separate occasions prior to commencement of the work to confirm repeatability of the initial data for comparison when the tunnelling starts.

- ii) Alert:

The magnitude of change in elevation of the monitoring points at which the measurements should be repeated to confirm precision and the contractor advised that movement has been detected (5 mm).

- iii) Review:

The magnitude of change in elevation of the monitoring points at which the data should be analyzed in detail and the contractor put on notice to be prepared to implement action to mitigate the impact of the movement (7 mm).

- iv) Action:

The magnitude of change in elevation of the monitoring points at which the contractor will be directed to implement action to mitigate the impact of the movement (10 mm).

4. Commencement of the monitoring one week prior to the start of construction and continue until completion of installation of the tunnel at the respective locations of the CNR crossing and QEW crossing.
5. Measurement of the elevation of the monitoring pins twice each day during the tunnelling operation, one before work starts in the morning and one at the end of the workday.



6. Submission of the results of the measurements to the City of Hamilton, Prime Consultant, Geotechnical Consultant and MTO or CNR as appropriate, by noon each day.

The contract should call for the contractor to have equipment on call to 'repair the pavement' and the railway tracks in the event that settlements exceed the Action criteria.

### 5.7 Entry Pits

Entry pits for pipe jacking or tunnelling adjacent to the CNR crossing and Highway QEW are expected to be about 5 and 8 m deep, respectively. Excavation should be carried out in accordance with the recommendations provided previously in related sections for the 'open cut' trench excavation section of the project.

Recommendations for design of bracing to support the walls of the excavation for multiple and singly based cuts at the QEW crossing are provided in Figures 1 and 2, respectively.

The anticipated subgrade materials underlying the proposed loading pads at the entry pits comprise weathered shale at the CNR crossing and stiff to very stiff silty clay till/ clayey silt till at the QEW crossing. An allowable bearing pressure of 300 and 200 kPa should be used for loading pads bearing on the shale and till material, respectively. The allowable bearing pressure of the founding subgrade should be confirmed by geotechnical personnel from Peto MacCallum Ltd. during construction.

### 5.8 Thrust Blocks

The thrust blocks should be designed using the allowable bearing capacity noted in the following table and an ultimate friction factor of 0.3.

Location	Anticipated Subgrade	Allowable Bearing Capacity (kPa)
0+000 to 0+600	Shale bedrock or hard clay till	300
0+600 to 0+800	Very stiff clay till	200
0+800 to 0+950	Firm clay till	50
1+080 to north limit of property	Firm to stiff clay till	100



An ultimate friction factor of 0.4 is recommended for computation of the frictional resistance along the pipe within the granular bedding material.

### 5.9 Pavement Restoration

The existing pavement structure over the service trench excavation along Fifty Road should be re-established following installation of the watermain. If total reconstruction of the pavement is planned, the standard pavement structure of the City of Hamilton should be suitable.

### 5.10 Corrosivity of Soils and Protective Measures

The corrosivity of the soil on **ductile iron pipe** was evaluated in accordance with the AWWA system that uses soil resistivity, sulphides, pH, redox potential and drainage characteristics as the main indicators of soil aggressiveness. In this procedure, a point system is used to evaluate the corrosivity of the soils along the construction route. Points are also assigned to each indicator in accordance with its anticipated contribution to the total corrosion potential of the soil as determined by laboratory testing and visual examination of the soil. The designated point totals are indicated in Table B1, Appendix B.

The results of the AWWA analyses (Table B1) indicate the watermain will be installed in an environment corrosive to ductile iron pipe.

Table B2 shows the corrosivity analysis of overburden on **mild steel pipe**. The evaluation system is based on the "Corrosion Control Guide", Vol. 1, 1968 by E.G. Sellers. As in the AWWA system, soil resistivity, sulphides, pH, redox potential and drainage characteristics are the main indicators of soil aggressiveness and a point system assigned to each indicator in accordance with its anticipated contribution to the total corrosion potential of the soil as determined by laboratory testing and visual examination of the soil.

The designated point totals for the analysis from the Corrosion Control Guide are shown in Table B2, and indicate the watermain will be installed in an environment corrosive to mild steel pipe.



The measured chloride concentrations also indicate an aggressive to highly aggressive corrosion potential. Measures to limit corrosion should therefore be undertaken.

Use of nonmetallic PVC pipe, polyethylene encasement of ductile iron pipe or cathodic protection of the pipe are considered to be feasible means to minimize the potential for corrosion. Use of steel pipe with a thicker wall is considered feasible.

#### **5.11 Sulphate Attack on Concrete**

The tests conducted to evaluate the potential for sulphate attack on buried concrete structures are provided on Table B3. The results indicate that buried concrete placed in bedrock and the clayey till soil at this site will be subject to a negligible degree of exposure to sulphate attack. Concrete placed in the fill near Borehole 1 will be subject to a positive (mild) degree of exposure. For further comments regarding cement requirements, refer to the current CSA A23.1.

### **6. GEOENVIRONMENTAL CONSIDERATIONS**

The objectives of the geoenvironmental component of the study are to characterize the environmental properties of the material to be excavated in order to develop a management plan for off site disposal of excess material generated during excavation for construction of the watermain.

#### **6.1 Chemical Testing**

Soil samples obtained during in situ sampling/testing for the concurrent geotechnical investigation were bagged and screened using a RKL Eagle Portable Gas Detector, calibrated to hexane. The Eagle detects a combination of combustible gases in parts per million (ppm) and was utilized with the methane response in the off position (to exclude methane). The test results are provided on the Borehole Logs.



Representative samples were then selected in accordance with the City of Hamilton Public Works Document titled *Geoenvironmental Sampling and Testing Protocol, Revised September 28, 2005, Revision No. 3* (City of Hamilton GSTP) for chemical analyses by Maxxam Analytics Inc. (Maxxam), a Canadian Association of Environmental Analytical Laboratories (CAEAL) accredited laboratory in Mississauga, Ontario. The chemical analyses were conducted in accordance with Ontario Regulation 153/04 Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act dated March 9, 2004.

The rationale for sample selection was based on the City of Hamilton GSTP and on general coverage requirements. The samples were analyzed for pH and selected metals in accordance with the GSTP. A summary listing of all samples submitted for analysis is included on Table C1, in Appendix C.

## **6.2 Pertinent Regulatory Standards**

In general, the applicable environmental quality guidelines depend on the site location, land use, and source of potable water. Since Fifty Road, the QEW and both the North and South Service Roads are major transportation corridors in the City of Hamilton, the Background and Generic Criteria of the O. Reg. 153/04, Soil, Groundwater and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act dated March 9, 2004 (Standards) was selected to assess the laboratory test data for soil management purposes.

The Background Full Depth Site Condition Standards (Table 1) for All Other Types of property was used for off site disposal and the Full Depth Generic Site Condition Standards (Table 3) for Industrial/Commercial/Community Property Use in a Nonpotable Groundwater Condition was used for on site reuse of the excavated material.

## **6.3 Analytical Findings**

The results of the laboratory tests are provided on Table C2 in Appendix C. The Certificates of Analysis are also included in Appendix C.



It will be noted from the data provided on the Borehole Logs that the measured concentration of combustible vapour in the headspace of the recovered soil samples typically ranged from 0 to 25 ppm (methane response off), which is not considered to be significant.

#### 6.3.1 Off Site Use

The concentration of the test parameters measured in the test samples complied with the background soil quality (Table 1) criteria except at the following locations:

Location	Borehole	Material Composition	Parameters
Fifty Road near Barton Street	BH1 SS1 and SS3	slag fill	pH, barium, beryllium and selenium
Between Fifty Road and the CN Crossing	BH3 SS3 BH9 SS4	shale bedrock	barium
CN Crossing	BH4 SS2	clayey silt fill	zinc
South Service Road	BH12 SS1 and SS3	clayey silt fill and silty clay	silver

#### 6.3.2 On Site Reuse

The results of chemical analyses indicate the concentrations of the tested parameters were below Table 3 (Industrial/Commercial/Community Property Use) Standards, with the exception of pH (BH1 SS2) and beryllium (BH1 SS2 and BH1 SS3) in the slag fill identified near Barton Street. It is noted the next available sample at this location (Sample BH1 SS4), located below Sample BH1 SS3 met the Standards for both pH and beryllium.

#### 6.4 QA/QC Data

The chemical analysis results for the replicate soil samples (Samples BH2 SS2-1, BH13 SS2A-1, BH9 GS1-1 and BH11 SS2-1) were within acceptable limits. A copy of the Quality Assurance Report provided by Maxxam is attached to the Certificates of Analysis.



## **6.5 Assessment of Analytical Findings and Conclusions**

The purpose of the environmental screening was to characterize the environmental properties of soil at the borehole locations in order to develop a management plan for off site disposal of excess material generated during excavation for construction of the watermain.

With the exception of the four locations noted in Section 6.3.1, the results of the chemical analyses indicate the concentration of the test parameters in the tested samples comply with the background soil quality criteria (Table 1 Standards) and would, in general, not be subject to environmental restriction for off site disposal. The material at the four locations noted in section 6.3.1 does not meet Table 1 Standards for all other types of property use and off site disposal will be subject to certain environmental restrictions.

In this regard, it is noted that the samples from Borehole 12 were obtained within 2 m of original grade. Since excavation for installation of the watermain will be at least 5 m below grade, this material will not be encountered during excavation and off site disposal is not a concern.

When compared to Table 3 Standards, the concentration of the test parameters in the samples noted in section 6.3.1 were below Table 3 (Full Depth) Standards for Industrial/Commercial/Community property use with the exception of pH and beryllium identified in the slag (0.8 to 2.0 m depth) near the intersection of Barton Street and Fifty Road (Borehole 1). It is noted that the underlying weathered red shale met Table 3 Standards for pH and beryllium at this location.

The test results indicate:

- The slag fill identified near Barton Street is subject to restricted off site disposal criteria and if exported off site, should be taken to a landfill facility with a certificate of approval to receive this waste type. Additional testing in accordance with Ontario Regulation 347, Schedule 4, as amended, Toxicity Characteristic Leaching Procedure (TCLP) should be conducted. It is noted the limits of the slag fill have not been defined.



However, it has been our experience that the MOE normally considers the slag in Hamilton to be 'inert' and suitable for reuse for engineering purposes on construction sites.

- Off site disposal of the fill identified near the CNR crossing and along the North Service Road is limited to use for engineering purposes on Industrial/Commercial/Community properties.
- Laboratory tests were conducted on twelve shale samples; the barium concentration exceeded Table 1 criteria in two samples. All other test parameters satisfied the Table 1 criteria. Considering the elevated barium concentration was measured in a sample of shale, shale is indigenous to this area, and the exceedance is limited to thin 'beds' in the overall deposit, the measured concentration of the barium, and the normal mixing that occurs during excavation and handling, it is considered that the shale bedrock is suitable for unrestricted off site disposal.
- The native clayey soil is not subject to off site disposal restrictions.

Reuse of the excavated material from Boreholes 2 through 15, as well as the material below the slag fill identified near Barton Street for engineering purposes on Site, or off Site, at another Table 3 property should not pose an environmental concern provided the following conditions are met:

1. The fill material is used for engineering purposes only and is not placed within 30 m of a body of water;
2. The fill material is not placed within an area of natural significance, as defined in O. Reg. 153/04,
3. The receiving site is within a nonpotable groundwater condition;

It should be noted however that the MOE may closely scrutinize the off site disposal of the material noted in section 6.3.1 with parameter concentrations that exceed the Table 1 criteria.

Depending on the volume of surplus fill generated during construction, additional sampling and chemical testing may be required in order to confirm the continuity of the fill material, prior to off site reuse. As well, any soil removal and disposal will require approval of receiving site authorities



and/or the owner and monitoring by the environmental consultant to check that the above noted handling restrictions are observed.

There is no legal requirement to remove or treat the material that exceeds the Table 1 or Table 3 Standards provided it is demonstrated that there is no off Site impact or adverse effect. However, if left on Site, the landowner assumes liability associated with the site contamination, potential scrutiny from the MOE and the public, potential for decreased value of the land and issues during potential divesting of the property due to concerns regarding environmental liability on the part of future owners or their financiers/insurers. Also, a Risk Assessment (RA) may be required by the MOE to evaluate on site and off site impacts to determine if the fill is suitable to remain on Site, which would include a contaminant management plan.

It should be noted that the soil conditions between and beyond the sampled locations may differ from those encountered during this assignment. PML should be contacted if impacted soil conditions become apparent during future development to further assess and appropriately handle the materials, if any, and evaluate whether modifications to the conclusions documented in this report are necessary.

We trust the information presented in this report is sufficient for your present purposes. If you have any questions, please do not hesitate to contact our office.

Sincerely

Peto MacCallum Ltd.

A handwritten signature in blue ink, appearing to read 'Matt St. Denis'.

Matthew St. Denis, BEng  
Project Supervisor

A handwritten signature in blue ink, appearing to read 'Dennis W. Kerr'.

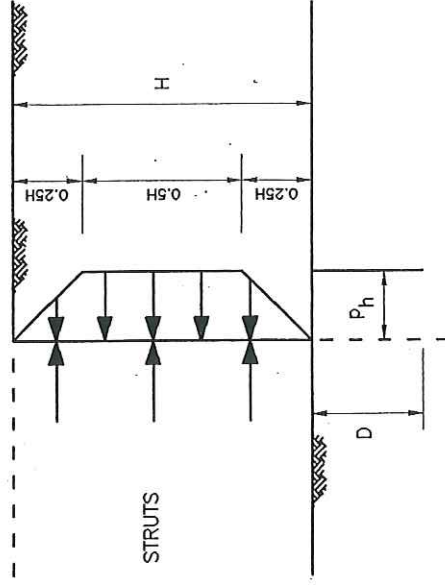
Dennis W. Kerr, MEng., P.Eng.  
Principal Consultant  
Geotechnical and Geoenvironmental Services  
Hamilton

MDS/DWK:lad



**NOTES**

1. The actual magnitude and distribution of the horizontal earth pressures which will act on the bracing system are dependent upon the permissible lateral/vertical movements adjacent to the excavation, the soil type, groundwater conditions, drainage provisions, temporary/permanent surcharge loads, the type of bracing system adopted, weather conditions, quality of workmanship and length of time the excavation will be supported. Hence, the recommended pressure diagram and design parameters should be reviewed when construction details, schedule and type of support system are established.
2. Stability of base of excavation must be confirmed when bracing system design, excavation geometry and surcharge loads are established.
3. Earth pressure diagram is applicable to maximum depth of cut of 12m (40 ft.).
4. Structural components of bracing system should be confirmed adequate for each level of excavation.
5. If sheeting will not permit drainage, bracing system must be designed to resist water pressure.
6. Surcharge loads such as street/construction traffic, supported utilities, adjacent foundations, temporary stockpiles and other loads carried by bracing system are not included in earth pressure diagram.
7. Temporary surcharge loading should not be closer to the face of the excavation than half the depth of excavation unless accounted for in bracing design.
8. If settlement sensitive structures are located near the excavation, special measures should be undertaken to control settlements. A condition survey should be conducted prior to construction and appropriate monitoring (surface and insitu) carried out during construction.
9. Earth pressure diagram is applicable for relatively short construction periods. If excavation is to be open for long periods, monitoring of deformation is essential, the earth pressure diagram must be reviewed, and remedial works may be required.
10. Earth pressure diagram does not account for extended periods of exposure of the excavation to freezing temperatures.
11. Bracing system should be regularly examined for signs of distress.
12. All work should be carried out in accordance with the Occupational Health and Safety Act and local regulations. Good quality workmanship and construction practices are to be employed.
13. This sheet should be read in conjunction with text of report for this project. Additional comments and recommendations concerning these general guidelines will be provided if required.

**EARTH PRESSURE DIAGRAM**

$$P_h = \text{design lateral earth pressure} \\ = 0.4 \gamma H$$

where

$\gamma$  = unit weight of soil

H = depth of excavation

D = depth of embedment of soldier piles (if used).

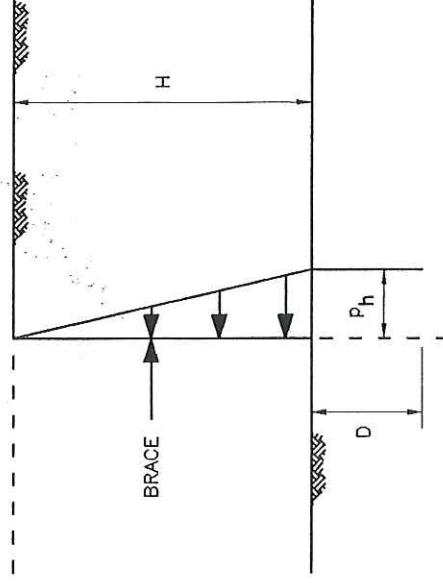
**RECOMMENDED DESIGN PARAMETERS**

$$\gamma = 20 \text{ KN/m}^3$$

$$K = 0.3 \text{ (movement of retained soil acceptable)} \\ 0.5 \text{ (movement of adjacent structures/facilities unacceptable)}$$

**NOTES**

1. The actual magnitude and distribution of the horizontal earth pressures which will act on the bracing system are dependent upon the permissible lateral/vertical movements adjacent to the excavation, the soil type, groundwater conditions, drainage provisions, temporary/permanent surcharge loads, the type of bracing system adopted, weather conditions, quality of workmanship and length of time the excavation will be supported. Hence, the recommended pressure diagram and design parameters should be reviewed when construction details, schedule and type of support system are established.
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**EARTH PRESSURE DIAGRAM**

$P_h$  = design lateral earth pressure  
 $= K\gamma H$

$K$  = lateral earth pressure coefficient

$\gamma$  = unit weight of soil

$H$  = depth of excavation

$D$  = depth of embedment of soldier piles (if used).

**RECOMMENDED DESIGN PARAMETERS**

$\gamma = 20 \text{ kN/m}^3$

$K = 0.3$  (movement of retained soil acceptable)  
 $K = 0.5$  (movement of adjacent structures/facilities unacceptable)

# LIST OF ABBREVIATIONS



## PENETRATION RESISTANCE

Standard Penetration Resistance N: - The number of blows required to advance a standard split spoon sampler 0.3 m into the subsoil. Driven by means of a 63.5 kg hammer falling freely a distance of 0.76 m.

Dynamic Penetration Resistance: - The number of blows required to advance a 51 mm, 60 degree cone, fitted to the end of drill rods, 0.3 m into the subsoil. The driving energy being 475 J per blow.

## DESCRIPTION OF SOIL

The consistency of cohesive soils and the relative density or denseness of cohesionless soils are described in the following terms:

CONSISTENCY	N (blows/0.3 m)	c (kPa)	DENSENESS	N (blows/0.3 m)
Very Soft	0 - 2	0 - 12	Very Loose	0 - 4
Soft	2 - 4	12 - 25	Loose	4 - 10
Firm	4 - 8	25 - 50	Compact	10 - 30
Stiff	8 - 15	50 - 100	Dense	30 - 50
Very Stiff	15 - 30	100 - 200	Very Dense	> 50
Hard	> 30	> 200		
WTPL	Wetter Than Plastic Limit			
APL	About Plastic Limit			
DTPL	Drier Than Plastic Limit			

## TYPE OF SAMPLE

SS	Split Spoon	TW	Thinwall Open
WS	Washed Sample	TP	Thinwall Piston
SB	Scraper Bucket Sample	OS	Oosterberg Sample
AS	Auger Sample	FS	Foil Sample
CS	Chunk Sample	RC	Rock Core
ST	Slotted Tube Sample		
	PH	Sample Advanced Hydraulically	
	PM	Sample Advanced Manually	

## SOIL TESTS

Qu	Unconfined Compression	LV	Laboratory Vane
Q	Undrained Triaxial	FV	Field Vane
Qcu	Consolidated Undrained Triaxial	C	Consolidation
Qd	Drained Triaxial		

## LOG OF BOREHOLE NO. 1

PROJECT Fifty Road Watermain

LOCATION Fifty Road, Hamilton, Ontario

BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE 2006 07 07

OUR PROJECT NO. 06HF033

PROJ. SUP. M. D. St.Denis

TECHNICIAN M. Rapsey

SOIL PROFILE				SAMPLES			SHEAR STRENGTH $C_u$ (kPa)				LIQUID LIMIT $W_L$				GROUND WATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	50 100 150 200				PLASTIC LIMIT $W_p$				
							DYNAMIC CONE PENETRATION				WATER CONTENT $W$				
							STANDARD PENETRATION TEST				$W_p$ $W$ $W_L$				
							BLOWS/0.3M				WATER CONTENT %				
	GROUND ELEVATION 91.75						20	40	60	80	10	20	30		
	PAVEMENT STRUCTURE: 220mm asphaltic concrete over very dense granular A type slag, damp		91	1	SS	53								Headspace Readings <sup>(1)</sup>	
				2*	SS	51								10 ppm	
1.40	loose		90	3*	SS	9								20 ppm	
2.15														10 ppm	
	SHALE: Weathered red shale		89	4*	SS	50/150mm								15 ppm	
3.0				5	SS	50/25mm									
			88												
4.5				6	SS	50/25mm									
4.60	BOREHOLE TERMINATED AT 4.60 m													Upon completion of augering, free water at 2.3 m, no cave.	

NOTES <sup>1</sup> Combustible vapor concentrations were measured on the headspace of available soil bag samples using an Eagle RKI instrument calibrated to hexane (methane response off).  
\*Sample submitted for chemical testing.

- ▲ UNDISTURBED FIELD VANE
- △ REMOLDED FIELD VANE
- POCKET PENETROMETER

CHECKED BY

*MR*

## LOG OF BOREHOLE NO. 2

PROJECT Fifty Road Watermain

LOCATION Fifty Road, Hamilton, Ontario

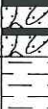
BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE 2006 07 07

OUR PROJECT NO. 06HF033

PROJ. SUP. M. D. St.Denis

TECHNICIAN M. Rapsey

SOIL PROFILE			SAMPLES			SHEAR STRENGTH $C_u$ (kPa)		LIQUID LIMIT $W_L$		GROUND WATER OBSERVATIONS AND REMARKS						
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	50	100	150		200	PLASTIC LIMIT $W_p$				
							DYNAMIC CONE PENETRATION				WATER CONTENT $W$					
							STANDARD PENETRATION TEST				$W_p$ $W$ $W_L$					
							BLOWS/0.3M				WATER CONTENT %					
	GROUND ELEVATION 91.72						20	40	60	80	10	20	30			
	PAVEMENT STRUCTURE: 140 mm asphaltic concrete over 260 mm Granular A type crushed limestone over 90mm asphaltic concrete over 260 mm granular "A" type slag SHALE: Weathered red shale		91	1	SS	46								Headspace Readings <sup>(1)</sup> 10 ppm  15 ppm  15 ppm		
0.75				2*	SS	27										
1.5					90	3	SS	37								
			89													
3.0				4	SS	50/50mm										
			88													
4.5				5	SS	50/25mm										
4.60	BOREHOLE TERMINATED AT 4.60 m													Upon completion of augering, no free water, no cave.		

NOTES <sup>1</sup> Combustible vapor concentrations were measured on the headspace of available soil bag samples using an Eagle RKI instrument calibrated to hexane (methane response off).  
\*Sample submitted for chemical testing.

- ▲ UNDISTURBED FIELD VANE
- △ REMOLDED FIELD VANE
- POCKET PENETROMETER

CHECKED BY

*MS*

## LOG OF BOREHOLE NO. 3

PROJECT Fifty Road Watermain

LOCATION Fifty Road, Hamilton, Ontario

BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE 2006 07 07

OUR PROJECT NO. 06HF033

PROJ. SUP. M. D. St.Denis

TECHNICIAN M. Rapsey

SOIL PROFILE		LEGEND	ELEVATION	SAMPLES			SHEAR STRENGTH $C_u$ (kPa)				LIQUID LIMIT $W_L$			GROUND WATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION			NUMBER	TYPE	BLOWS/0.3m N - VALUES	50	100	150	200	PLASTIC LIMIT $W_p$	WATER CONTENT $W$	WATER CONTENT %	
	GROUND ELEVATION 89.44													
	PAVEMENT STRUCTURE: 120mm asphaltic concrete over 330 mm Granular A type crushed limestone over 80 mm asphaltic concrete over 230 mm granular "A" type slag		89	1	SS	48								Headspace Readings <sup>(1)</sup>
0.76				2*	SS	23								20 ppm
1.5	SHALE: Weathered red and grey shale		88	3*	SS	50/150mm								25 ppm
			87											
3.0			86	4	SS	50/50mm								
4.5			85											
4.80	BOREHOLE TERMINATED AT 4.80 m			5	SS	50/25mm								Upon completion of augering, free water at 3.20 m, no cave.

NOTES <sup>1</sup> Combustible vapor concentrations were measured on the headspace of available soil bag samples using an Eagle RKI instrument calibrated to hexane (methane response off).  
\*Sample submitted for chemical testing.

- ▲ UNDISTURBED FIELD VANE
- △ REMOLDED FIELD VANE
- POCKET PENETROMETER

CHECKED BY

*MR*

## LOG OF BOREHOLE NO. 4

PROJECT Fifty Road Watermain

LOCATION Fifty Road, Hamilton, Ontario

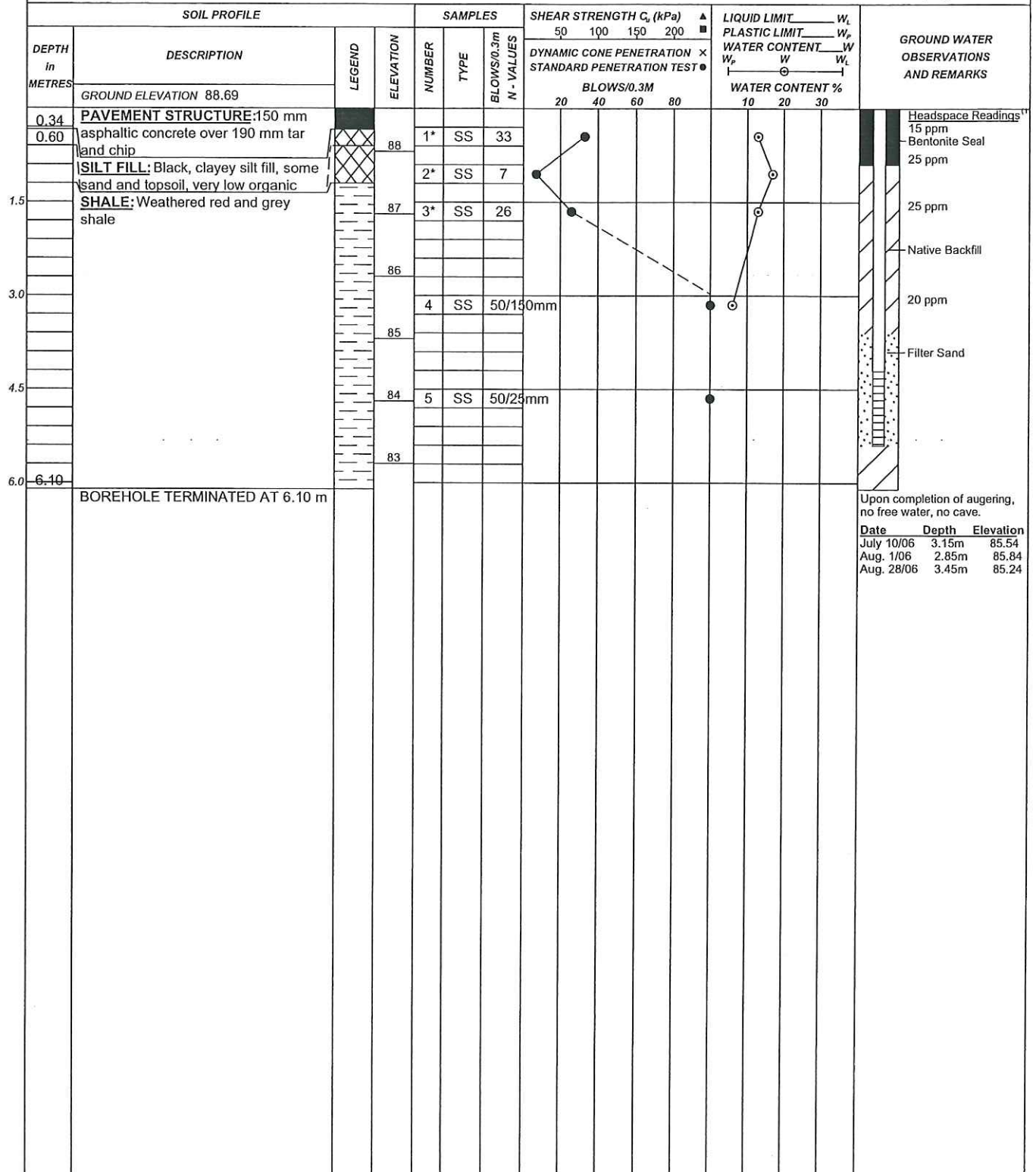
BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE 2006 07 07

OUR PROJECT NO. 06HF033

PROJ. SUP. M. D. St.Denis

TECHNICIAN M. Rapsey



**NOTES** <sup>1</sup> Combustible vapor concentrations were measured on the headspace of available soil bag samples using an Eagle RKI instrument calibrated to hexane (methane response off).  
 \*Sample submitted for chemical testing.  
 ▲ UNDISTURBED FIELD VANE  
 △ REMOLDED FIELD VANE  
 ■ POCKET PENETROMETER

CHECKED BY 

## LOG OF BOREHOLE NO. 5

PROJECT Fifty Road Watermain

LOCATION Fifty Road, Hamilton, Ontario

BORING METHOD Continuous Flight Solid Stem Augers & NXL Rock Coring

BORING DATE 2006 07 10

OUR PROJECT NO. 06HF033

PROJ. SUP. M. D. St.Denis

TÉCHNICIAN M. Rapsey

SOIL PROFILE				SAMPLES			SHEAR STRENGTH $C_u$ (kPa)				LIQUID LIMIT $W_L$			GROUND WATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	50 100 150 200				PLASTIC LIMIT $W_p$			
							DYNAMIC CONE PENETRATION $\times$ STANDARD PENETRATION TEST $\bullet$				WATER CONTENT $W$			
							BLOWS/0.3M				WATER CONTENT %			
	GROUND ELEVATION 88.41						20	40	60	80	10	20	30	
	PAVEMENT STRUCTURE: 230 mm													Headspace Readings <sup>(1)</sup>
0.51	asphaltic concrete over 280 mm		88	1	SS	12								5 ppm
	Granular A type crushed limestone			2*	SS	14								5 ppm
1.40	CLAY FILL: Stiff, brown to dark		87	3	SS	7								
1.5	brown silty clay, some sand,													
	occasional decayed wood organics													
2.10	SAND FILL: Loose, brown silty fine		86	4*	SS	19								20 ppm
	to coarse sand, moist													
	SHALE: Highly weathered very weak													
	red shale with thin grey layers													
3.0			85	5	RC									
4.5			84											RC 5 (from 3.00 to 4.50 m)
														Run = 1.50 m
														Recovery = 100%
														RQD = 57%
			83	6	RC									
6.0														RC 5 (from 4.50 to 6.00 m)
														Run = 1.50 m
														Recovery = 95%
														RQD = 57%
6.10	BOREHOLE TERMINATED AT 6.10 m													Upon completion of augering, no free water, no cave.

NOTES <sup>1</sup> Combustible vapor concentrations were measured on the headspace of available soil bag samples using an Eagle RKI instrument calibrated to hexane (methane response off).  
\*Sample submitted for chemical testing.

- ▲ UNDISTURBED FIELD VANE
- △ REMOLDED FIELD VANE
- POCKET PENETROMETER

CHECKED BY

*MR*

## LOG OF BOREHOLE NO. 6

PROJECT Fifty Road Watermain

LOCATION Fifty Road, Hamilton, Ontario

BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE 2006 07 07

OUR PROJECT NO. 06HF033

PROJ. SUP. M. D. St.Denis

TECHNICIAN M. Rapsey

SOIL PROFILE		LEGEND	ELEVATION	SAMPLES			SHEAR STRENGTH $C_u$ (kPa)				LIQUID LIMIT $W_L$	PLASTIC LIMIT $W_P$	WATER CONTENT $W$	GROUND WATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION			NUMBER	TYPE	BLOWS/0.3m N - VALUES	50	100	150	200				
	GROUND ELEVATION 86.51													
	<b>SAND AND GRAVEL FILL:</b> Compact, grey granular A type crushed limestone, damp		86											Headspace Readings <sup>(1)</sup>
1.35				1	SS	19								20 ppm
1.5			85	2	A*B* SS	20								15 ppm
	<b>CLAY FILL:</b> Stiff, brown silty clay, some of sand and gravel, low plastic, W.T.P.L.		84											
	<b>SHALE:</b> Weathered red shale with occasional grey layers		83	3	SS	50/25mm								
3.0														
4.5			82	4	SS	50/25mm								
4.60	BOREHOLE TERMINATED AT 4.60 m													Upon completion of augering, no free water, no cave.

NOTES <sup>1</sup> Combustible vapor concentrations were measured on the headspace of available soil bag samples using an Eagle RKI instrument calibrated to hexane (methane response off)  
\*Sample submitted for chemical testing.

- ▲ UNDISTURBED FIELD VANE
- △ REMOLDED FIELD VANE
- POCKET PENETROMETER

CHECKED BY

*MR*

## LOG OF BOREHOLE NO. 7

PROJECT Fifty Road Watermain

LOCATION Fifty Road, Hamilton, Ontario

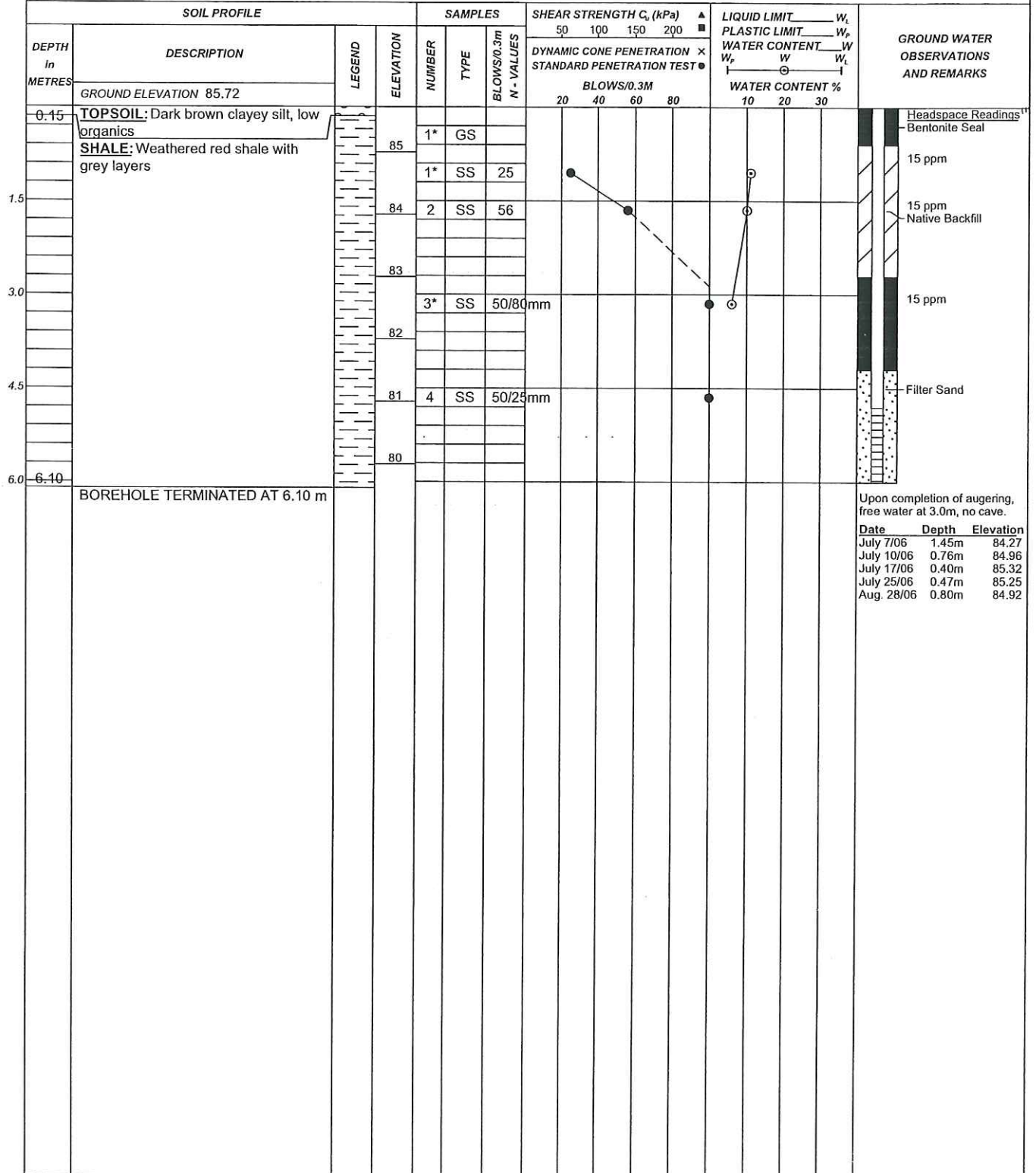
BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE 2006 07 07

OUR PROJECT NO. 06HF033

PROJ. SUP. M. D. St.Denis

TECHNICIAN M. Rapsey



**NOTES** <sup>1</sup> Combustible vapor concentrations were measured on the headspace of available soil bag samples using an Eagle RKI instrument calibrated to hexane (methane response off).  
 ▲ UNDISTURBED FIELD VANE  
 △ REMOLDED FIELD VANE  
 ■ POCKET PENETROMETER

## LOG OF BOREHOLE NO. 8

PROJECT Fifty Road Watermain

LOCATION Fifty Road, Hamilton, Ontario

BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE 2006 07 05

OUR PROJECT NO. 06HF033

PROJ. SUP. M. D. St.Denis

TECHNICIAN M. Rapsey

SOIL PROFILE			SAMPLES				SHEAR STRENGTH $C_u$ (kPa)				LIQUID LIMIT $W_L$				GROUND WATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	50	100	150	200	PLASTIC LIMIT $W_p$	PLASTIC LIMIT $W_p$	PLASTIC LIMIT $W_p$		
							DYNAMIC CONE PENETRATION				WATER CONTENT $W$				
							STANDARD PENETRATION TEST				WATER CONTENT %				
							BLOWS/0.3M				10 20 30				
							20	40	60	80	10	20	30		
0.15	GROUND ELEVATION 85.54													Headspace Readings <sup>(1)</sup>  15 ppm  20 ppm  15 ppm  20 ppm	
	TOPSOIL: Dark brown clayey silt, very low organic		85	1*	AS										
	SHALE: Highly weathered very weak reddish brown shale, with occasional greenish grey layering			2*	SS	35									
1.5			84	3	SS	80/27	5mm								
			83												
3.0	3.00 becoming weathered red and grey shale			4	SS	72									
			82												
4.5			81	5	SS	50/12	5mm								
			80												
6.0	6.10 BOREHOLE TERMINATED AT 6.10 m													Upon completion of augering, free water at 3.0m depth, no cave.	

NOTES <sup>1</sup> Combustible vapor concentrations were measured on the headspace of available soil bag samples using an Eagle RKI instrument calibrated to hexane (methane response off).  
\*Sample submitted for chemical testing.

- ▲ UNDISTURBED FIELD VANE
- △ REMOLDED FIELD VANE
- POCKET PENETROMETER

CHECKED BY

*MR*

## LOG OF BOREHOLE NO. 9

PROJECT Fifty Road Watermain

LOCATION Fifty Road, Hamilton, Ontario


BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE 2006 07 06

OUR PROJECT NO. 06HF033

PROJ. SUP. M. D. St.Denis

TECHNICIAN M. Rapsey

SOIL PROFILE				SAMPLES			SHEAR STRENGTH $C_u$ (kPa)				LIQUID LIMIT $W_L$				GROUND WATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	50 100 150 200				PLASTIC LIMIT $W_p$				
							DYNAMIC CONE PENETRATION				WATER CONTENT $W$				
							STANDARD PENETRATION TEST				$W_p$ $W$ $W_L$				
							BLOWS/0.3M				WATER CONTENT %				
	GROUND ELEVATION 84.42						20	40	60	80	10	20	30		
0.15	TOPSOIL: Dark brown clayey silt, very low organic		84	1*	GS									Headspace Readings <sup>(1)</sup>	
	CLAY TILL: Very stiff to hard, brown silty clay, some sand and gravel, low plastic, D.T.P.L., with bluish grey fissures			1*	SS	23								15 ppm	
1.5			83	2	SS	78/27	5mm							15 ppm	
			82	3	SS	62/27	5mm							20 ppm	
2.60	SHALE: Weathered red shale		81	4*	SS	50/50	mm							10 ppm	
3.0															
			80	5	SS	50/25	mm								
4.5	BOREHOLE TERMINATED AT 4.60 m													Upon completion of augering, no free water, no cave.	

NOTES <sup>1</sup> Combustible vapor concentrations were measured on the headspace of available soil bag samples using an Eagle RKI instrument calibrated to hexane (methane response off).  
\*Sample submitted for chemical testing.

- ▲ UNDISTURBED FIELD VANE
- △ REMOLDED FIELD VANE
- POCKET PENETROMETER

CHECKED BY

*MR*

## LOG OF BOREHOLE NO. 10

PROJECT Fifty Road Watermain

LOCATION Fifty Road, Hamilton, Ontario

BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE 2006 07 06

OUR PROJECT NO. 06HF033

PROJ. SUP. M. D. St.Denis

TECHNICIAN M. Rapsey

SOIL PROFILE				SAMPLES			SHEAR STRENGTH $C_u$ (kPa)				LIQUID LIMIT $W_L$				GROUND WATER OBSERVATIONS AND REMARKS	
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	50	100	150	200	PLASTIC LIMIT $W_p$	WATER CONTENT $W$	$W_p$	$W_L$		
							DYNAMIC CONE PENETRATION				STANDARD PENETRATION TEST					
							BLOWS/0.3M				WATER CONTENT %					
							20	40	60	80	10	20	30			
							GROUND ELEVATION 83.42									
0.15	TOPSOIL: Dark brown clayey silt, very low organic		83	1*	GS										Headspace Readings <sup>(1)</sup>	
	CLAY TILL: Very stiff, brown silty clay, some sand and gravel, low plastic, D.T.P.L., with bluish grey fissures		82	1*	SS	27									25 ppm	
1.5				2	SS	25									20 ppm	
			81													
3.0	becoming brownish grey		80	3*	SS	29									20 ppm	
			79													
4.5				4	SS	29								10 ppm		
5.00	BOREHOLE TERMINATED AT 5.00 m													Upon completion of augering, no free water, no cave.		

NOTES <sup>1</sup> Combustible vapor concentrations were measured on the headspace of available soil bag samples using an Eagle RKI instrument calibrated to hexane (methane response off).  
\*Sample submitted for chemical testing.

- ▲ UNDISTURBED FIELD VANE
- △ REMOLDED FIELD VANE
- POCKET PENETROMETER

CHECKED BY

*MR*

## LOG OF BOREHOLE NO. 11

**PROJECT** Fifty Road Watermain

**LOCATION** Fifty Road, Hamilton, Ontario

**BORING METHOD** Continuous Flight Solid Stem Augers

**BORING DATE** 2006 07 06

**OUR PROJECT NO.** 06HF033

**PROJ. SUP.** M. D. St.Denis

**TECHNICIAN** M. Rapsey

SOIL PROFILE				SAMPLES			SHEAR STRENGTH $C_u$ (kPa) ▲				LIQUID LIMIT $W_L$				GROUND WATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	50 100 150 200 ■				PLASTIC LIMIT $W_p$				
							DYNAMIC CONE PENETRATION ×				WATER CONTENT $W$				
							STANDARD PENETRATION TEST ●				$W_p$ — $W$ — $W_L$				
							BLOWS/0.3M				WATER CONTENT %				
							20 40 60 80				10 20 30				
	GROUND ELEVATION 83.88														
	TOPSOIL: Brown clayey silt, very low organic			1*	GS									Headspace Readings <sup>4+</sup>	
0.80			83											Bentonite Seal	
	SILT TILL: Loose dark brown, fine sandy silt, moist			1*	SS	8								20 ppm	
1.50			82											10 ppm	
	CLAY TILL: Very stiff, brownish grey silty clay, some sand, trace gravel, low plastic, D.T.P.L.			2*	SS	17								Native Backfill	
2.40			81											25 ppm	
	becoming firm grey, W.T.P.L.														
3.0			80												
				3	SS	5									
4.5			79												
4.75															
	SILT: Dense grey silt, trace sand, damp			4	SS	42								15 ppm	
5.55			78												
	CLAY TILL: Very stiff, brownish grey silty clay, some sand, trace gravel, low plastic, D.T.P.L.														
6.0			77												
				5	SS	25								25 ppm	
7.20			76											Filter Sand	
	SILT TILL: Very stiff grey, clayey silt, some sand and gravel, slightly to low plastic, D.T.P.L.														
7.5			75												
				6	SS	28								25 ppm	
8.50															
	TILL SHALE COMPLEX: Hard reddish brown clayey silt till / weathered red shale complex														
9.0															
				7	SS	90								20 ppm	
9.60															
	BOREHOLE TERMINATED AT 9.60 m														

Upon completion of augering, no free water, no cave.

Date	Depth	Elevation
July 7/06	1.65m	82.23
July 10/06	1.46m	82.42
July 17/06	1.38m	82.50
July 25/06	1.33m	82.55
Aug. 28/06	1.10m	82.78

Upon completion of augering, no free water, no cave.

Date	Depth	Elevation
July 7/06	1.65m	82.23
July 10/06	1.46m	82.42
July 17/06	1.38m	82.50
July 25/06	1.33m	82.55
Aug. 28/06	1.10m	82.78

**NOTES** \* Combustible vapor concentrations were measured on the headspace of available soil bag samples using an Eagle RkI instrument calibrated to hexane (methane response off).

- ▲ UNDISTURBED FIELD VANE
- △ REMOLDED FIELD VANE
- POCKET PENETROMETER

CHECKED BY 

## LOG OF BOREHOLE NO. 12

PROJECT Fifty Road Watermain

LOCATION Fifty Road, Hamilton, Ontario

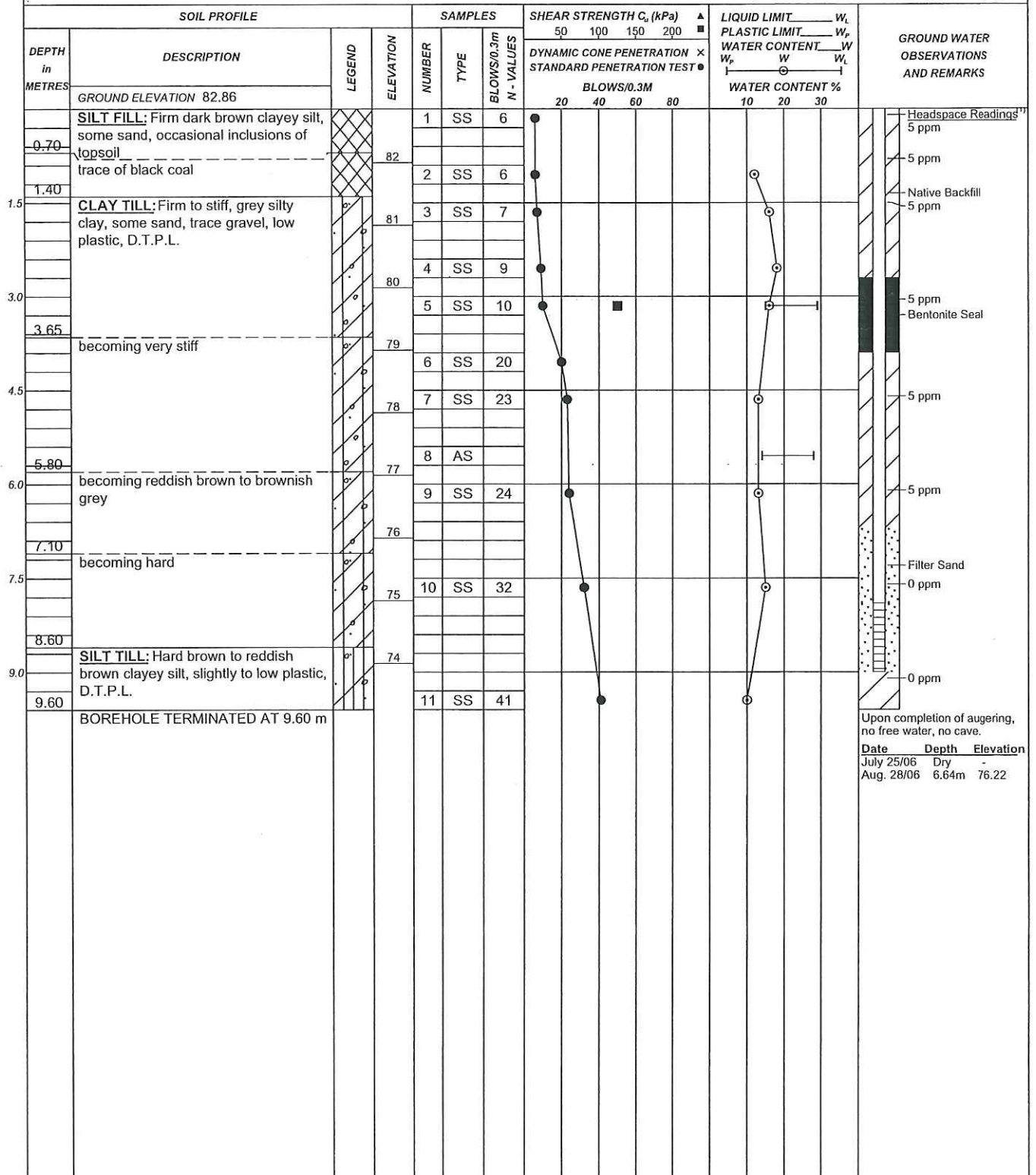
BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE 2006 07 21

OUR PROJECT NO. 06HF033

PROJ. SUP. M. D. St.Denis

TECHNICIAN M. Rapsey



**NOTES** <sup>1</sup> Combustible vapor concentrations were measured on the headspace of available soil bag samples using an Eagle RKI instrument calibrated to hexane (methane response off).  
 ▲ UNDISTURBED FIELD VANE  
 △ REMOLDED FIELD VANE  
 ■ POCKET PENETROMETER

CHECKED BY

*MR*

## LOG OF BOREHOLE NO. 13

**PROJECT** Fifty Road Watermain

**LOCATION** Fifty Road, Hamilton, Ontario

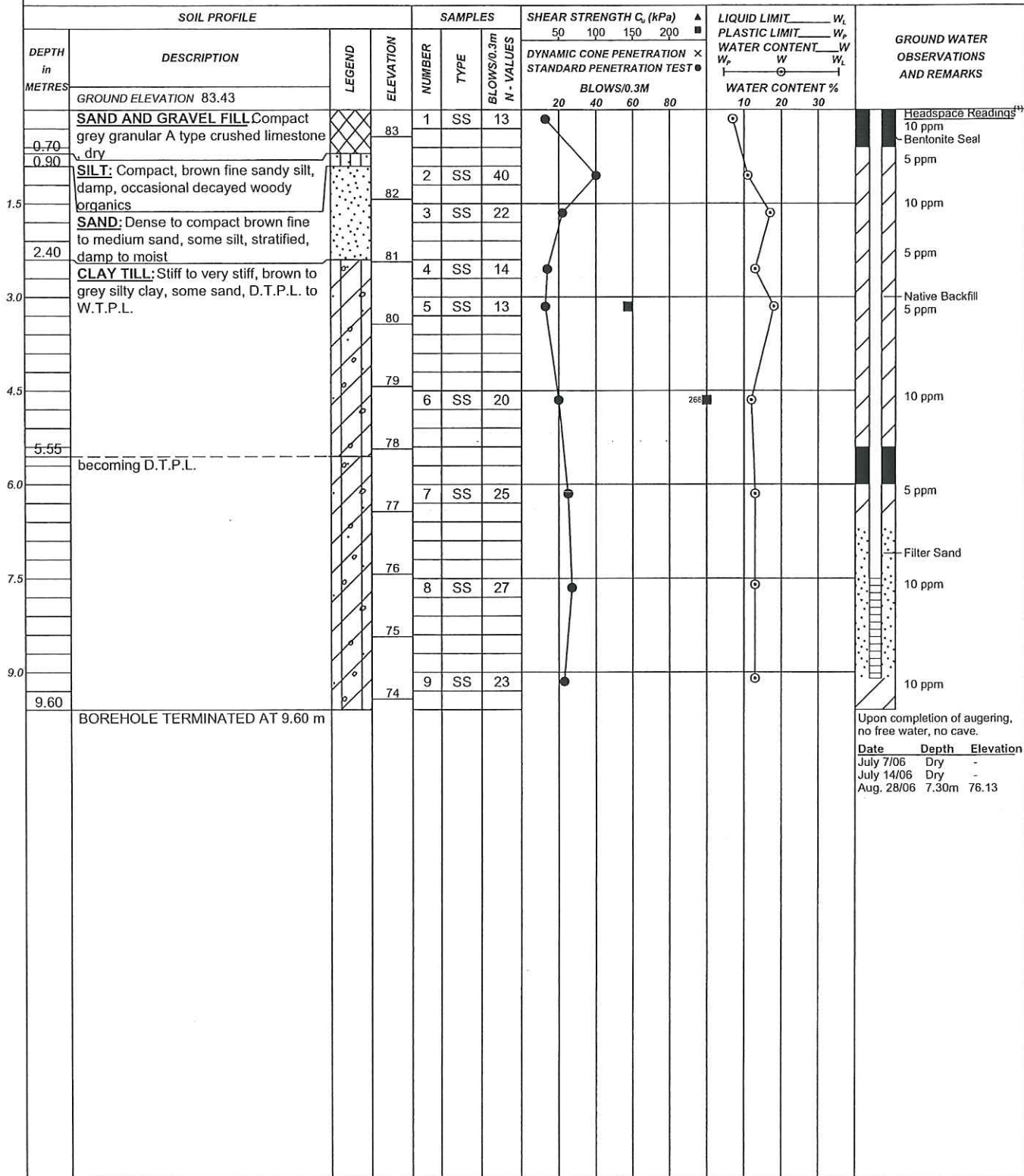
**BORING METHOD** Continuous Flight Solid Stem Augers

**BORING DATE** 2006 07 10

**OUR PROJECT NO.** 06HF033

**PROJ. SUP.** M. D. St.Denis

**TECHNICIAN** M. Rapsey



**NOTES** <sup>1</sup> Combustible vapor concentrations were measured on the headspace of available soil bag samples using an Eagle RKI instrument calibrated to hexane (methane response off).  
 ▲ UNDISTURBED FIELD VANE  
 △ REMOLDED FIELD VANE  
 ■ POCKET PENETROMETER

## LOG OF BOREHOLE NO. 14

PROJECT Fifty Road Watermain

LOCATION Fifty Road, Hamilton, Ontario

BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE 2006 07 10

OUR PROJECT NO. 06HF033

PROJ. SUP. M. D. St.Denis

TECHNICIAN M. Rapsey

SOIL PROFILE				SAMPLES			SHEAR STRENGTH $C_u$ (kPa)				LIQUID LIMIT $W_L$				GROUND WATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	50	100	150	200	PLASTIC LIMIT $W_p$	WATER CONTENT $W$			
							DYNAMIC CONE PENETRATION				WATER CONTENT %				
							STANDARD PENETRATION TEST				$W_p$ $W$ $W_L$				
							BLOWS/0.3M				10 20 30				
	GROUND ELEVATION 83.32						20	40	60	80				Headspace Readings <sup>(1)</sup>	
0.15	<b>SAND AND GRAVEL FILL:</b> Grey granular A type crushed limestone, dry  <b>CLAY:</b> Stiff brown silty clay, some sand, low plastic, W.T.P.L., with a pocket of black clayey silt topsoil <b>SILT TILL:</b> Stiff to very stiff brown clayey silt, some sand, slightly plastic, W.T.P.L. with bluish grey fissures  <b>CLAY TILL:</b> Stiff grey silty clay, some sand and gravel, low plastic, W.T.P.L.		83												
1.10			1	SS	9										10 ppm
1.40															
			2A*/E* SS	25											5 ppm
			81											10 ppm	
				3	SS	20									
			80											10 ppm	
				4*	SS	23									
3.80															
4.50			79	5	SS	10								10 ppm	
	BOREHOLE TERMINATED AT 4.50 m													Upon completion of augering, no free water, no cave.	

NOTES <sup>1</sup> Combustible vapor concentrations were measured on the headspace of available soil bag samples using an Eagle RKI instrument calibrated to hexane (methane response off).  
\*Sample submitted for chemical testing.

- ▲ UNDISTURBED FIELD VANE
- △ REMOLDED FIELD VANE
- POCKET PENETROMETER

CHECKED BY

*MS*

## LOG OF BOREHOLE NO. 15

PROJECT Fifty Road Watermain

LOCATION Fifty Road, Hamilton, Ontario

BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE 2006 07 10

OUR PROJECT NO. 06HF033

PROJ. SUP. M. D. St.Denis

TECHNICIAN M. Rapsey

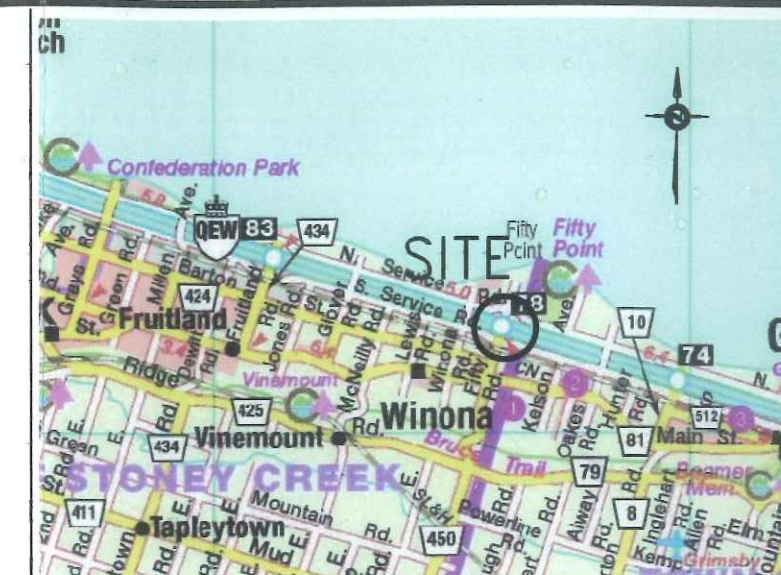
SOIL PROFILE				SAMPLES			SHEAR STRENGTH $C_u$ (kPa)				LIQUID LIMIT $W_L$				GROUND WATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	50 100 150 200				PLASTIC LIMIT $W_p$				
							DYNAMIC CONE PENETRATION				WATER CONTENT $W$				
							STANDARD PENETRATION TEST				$W_p$ $W$ $W_L$				
							BLOWS/0.3M				WATER CONTENT %				
	GROUND ELEVATION 82.56						20	40	60	80	10	20	30		
0.26	SAND AND GRAVEL FILL: grey granular A type crushed limestone, dry		82											Headspace Readings <sup>(1)</sup>	
0.90	SAND FILL: Brown fine to medium sand, some silt, damp			A*/B	SS	24								10 ppm	
1.5	CLAY TILL: Stiff to very stiff, brown silty clay, some sand and gravel, low plastic, D.T.P.L., with bluish grey fissures and oxidized stains becoming W.T.P.L.		81	2*	SS	23								10 ppm	
2.10			80	3*	SS	17								10 ppm	
3.0				4	SS	14								10 ppm	
3.30	becoming grey		79											10 ppm	
4.5	BOREHOLE TERMINATED AT 4.50 m			5	SS	8								Upon completion of augering, no free water, no cave.	

NOTES <sup>1</sup> Combustible vapor concentrations were measured on the headspace of available soil bag samples using an Eagle RKI instrument calibrated to hexane (methane response off).  
\*Sample submitted for chemical testing.

- ▲ UNDISTURBED FIELD VANE
- △ REMOLDED FIELD VANE
- POCKET PENETROMETER

CHECKED BY

*MS*



#### KEY PLAN

CITY OF HAMILTON, ONTARIO

#### LEGEND:



BOREHOLE (BH)

#### REFERENCE:

PLAN PRODUCED FROM THE SITE PLAN PROVIDED BY SUNIL KOTHARI, OF SNC-LAVALIN, IN AN E-MAIL DATED OCTOBER 2, 2006.

#### NOTE:

BOREHOLE ELEVATIONS PROVIDED BY THE CITY OF HAMILTON IN AN EMAIL DATED JULY 27, 2006.

THE INFERRED STRATIGRAPHY REFERRED TO IN THE REPORT IS BASED ON THE DATA FROM THESE BOREHOLES SUPPLEMENTED BY GEOLOGICAL EVIDENCE. THE ACTUAL STRATIGRAPHY BETWEEN THE BOREHOLES MAY VARY.

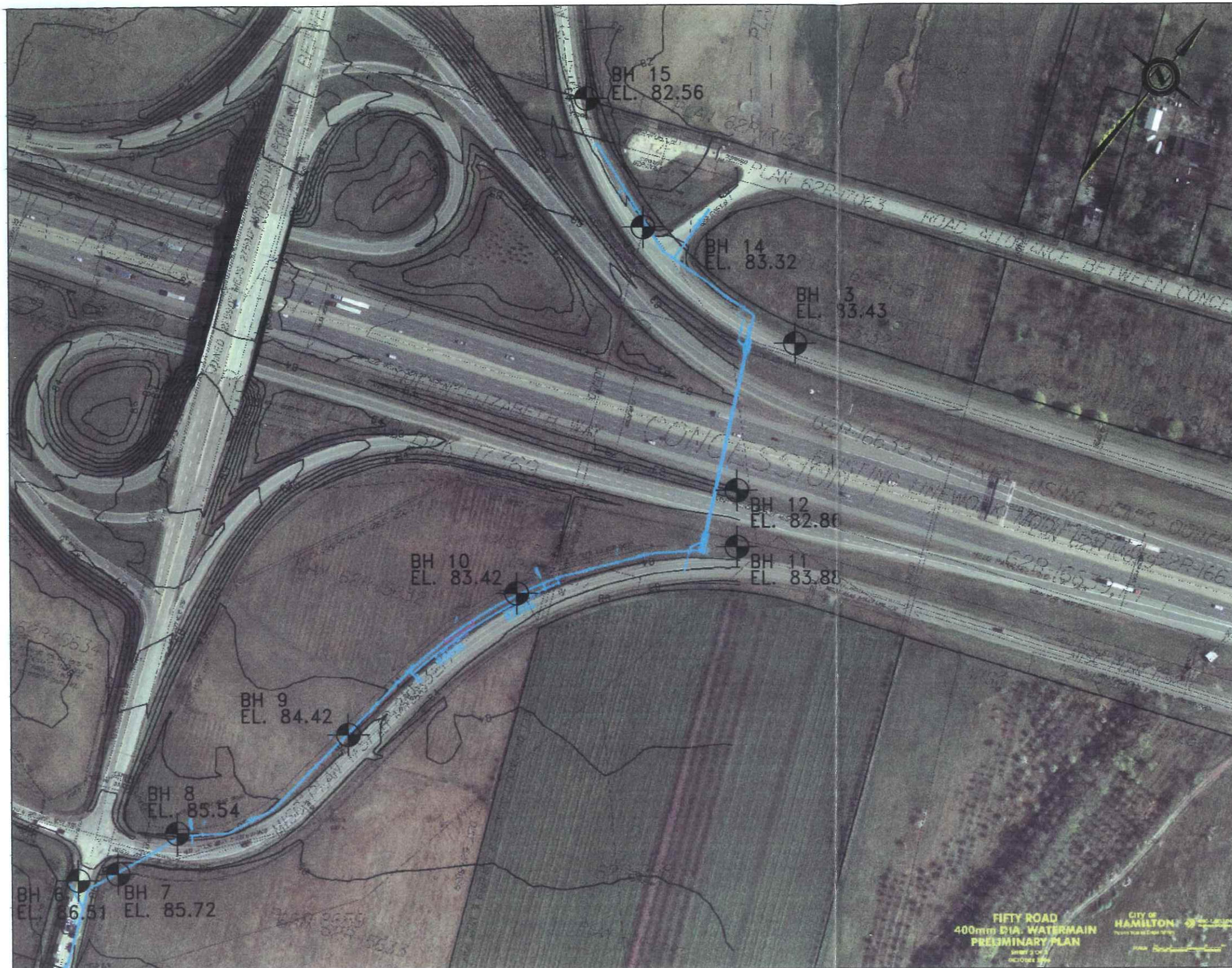
CITY OF HAMILTON

FIFTY ROAD WATERMAIN  
Fifty Road, Hamilton, Ontario

BOREHOLE LOCATION PLAN

**PML Peto MacCallum Ltd.**  
CONSULTING ENGINEERS

DRAWN	MDS/GW	DATE	SCALE	PML REF.	DRAWING NO.
CHECKED	DWK	2006-10	AS SHOWN	06HF033	1
APPROVED	DWK				



KEY PLAN  
CITY OF HAMILTON, ONTARIO

LEGEND:



BOREHOLE (BH)

REFERENCE:

PLAN PRODUCED FROM THE SITE PLAN PROVIDED BY SUNIL KOTHARI, OF SNC-LAVALIN, IN AN E-MAIL DATED OCTOBER 2, 2006.

NOTE:

BOREHOLE ELEVATIONS PROVIDED BY THE CITY OF HAMILTON IN AN EMAIL DATED JULY 27, 2006.

THE INFERRED STRATIGRAPHY REFERRED TO IN THE REPORT IS BASED ON THE DATA FROM THESE BOREHOLES SUPPLEMENTED BY GEOLOGICAL EVIDENCE. THE ACTUAL STRATIGRAPHY BETWEEN THE BOREHOLES MAY VARY.

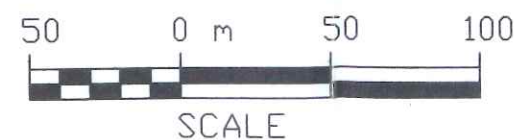
CITY OF HAMILTON

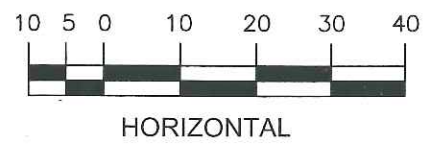
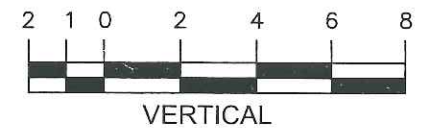
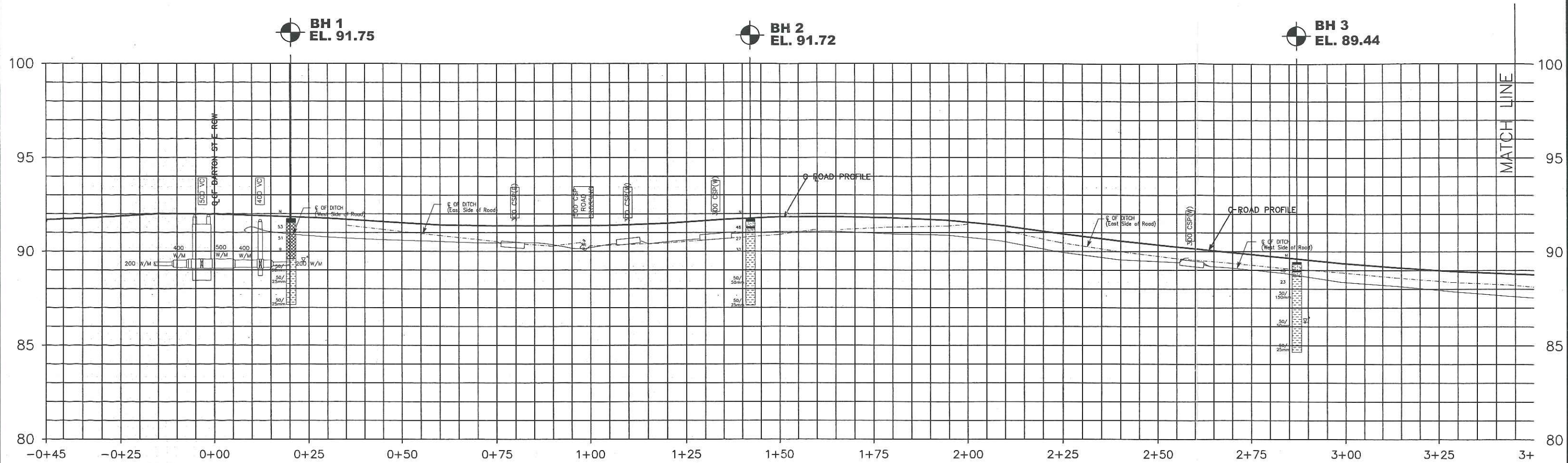
FIFTY ROAD WATERMAIN  
Fifty Road, Hamilton, Ontario

BOREHOLE LOCATION PLAN


**PML Peto MacCallum Ltd.**  
CONSULTING ENGINEERS

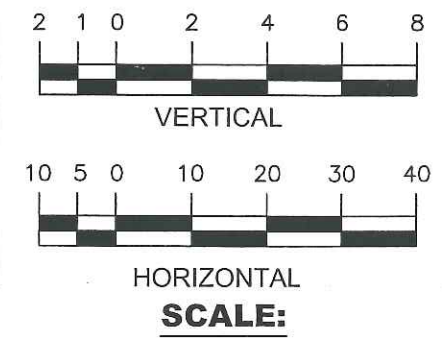
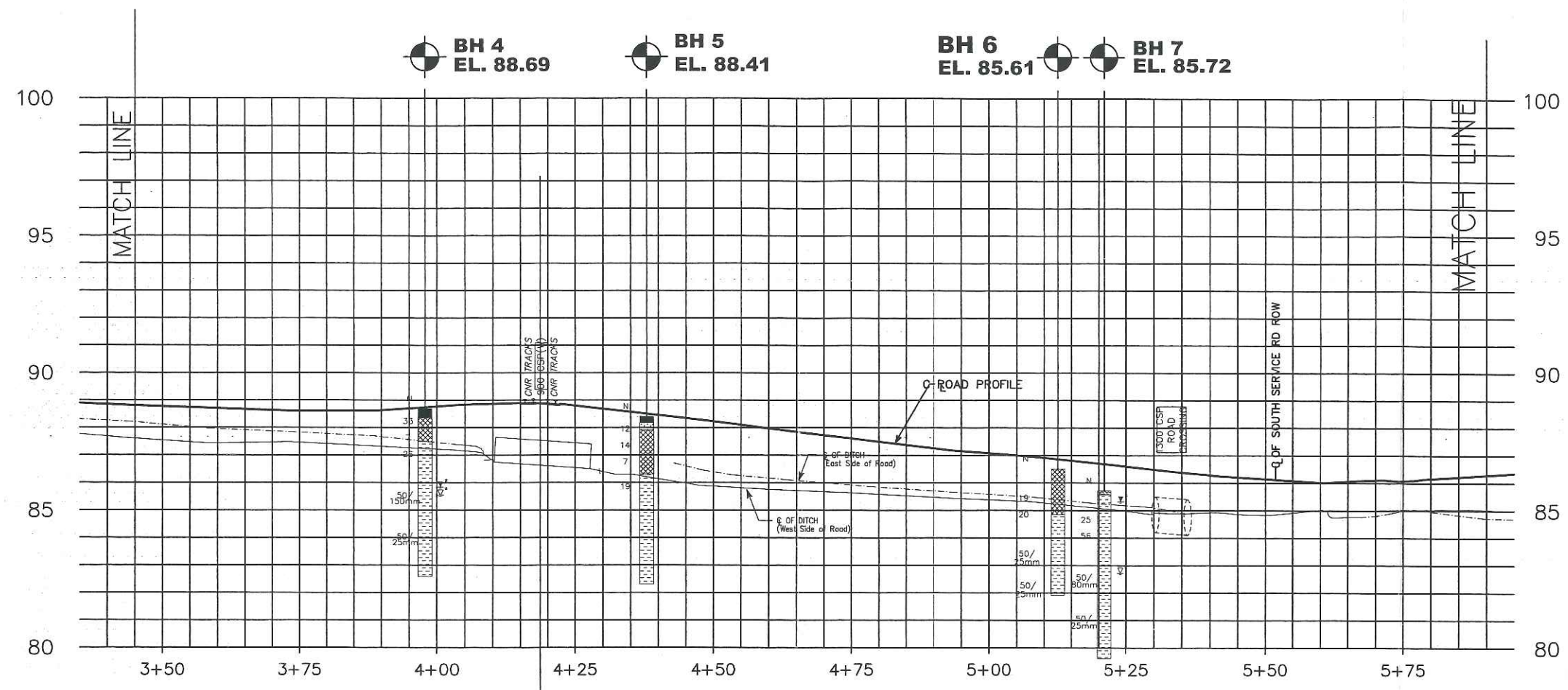
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CHECKED	DWK	2006-10	AS SHOWN	.06HF033	2
APPROVED	DWK				




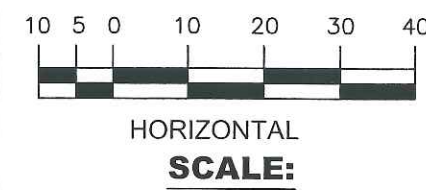
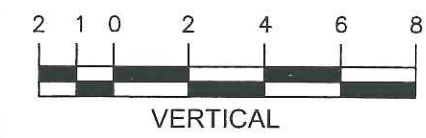
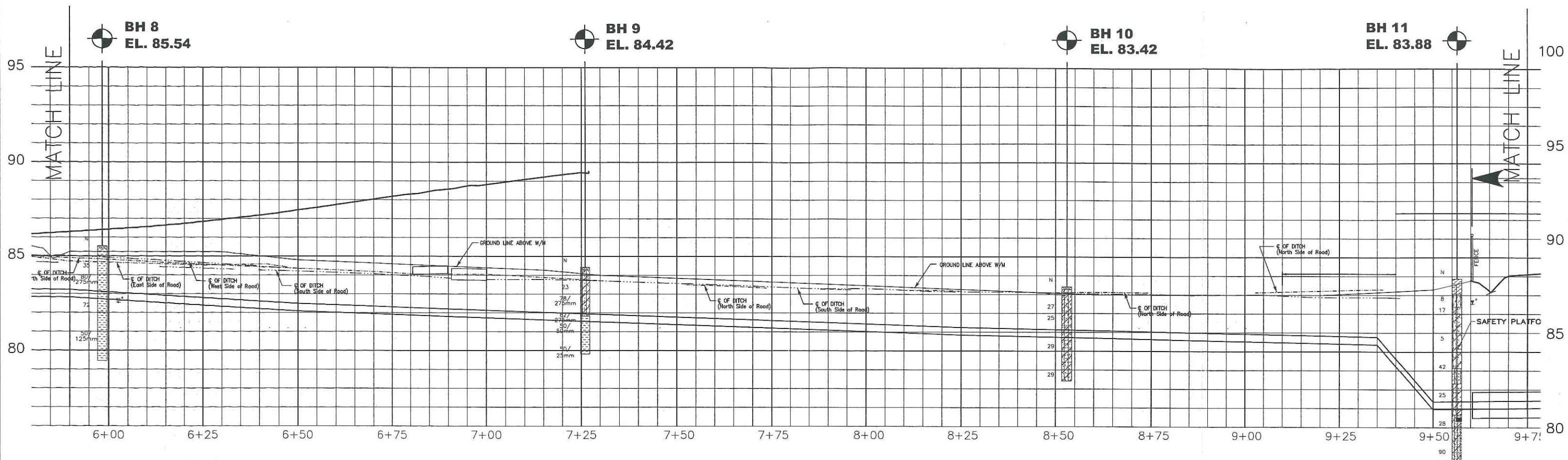



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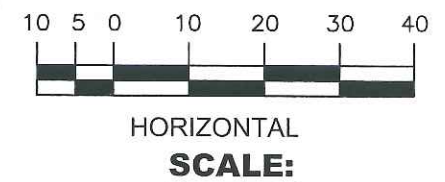
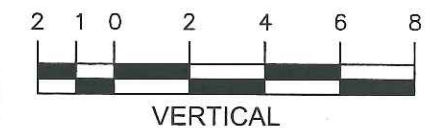
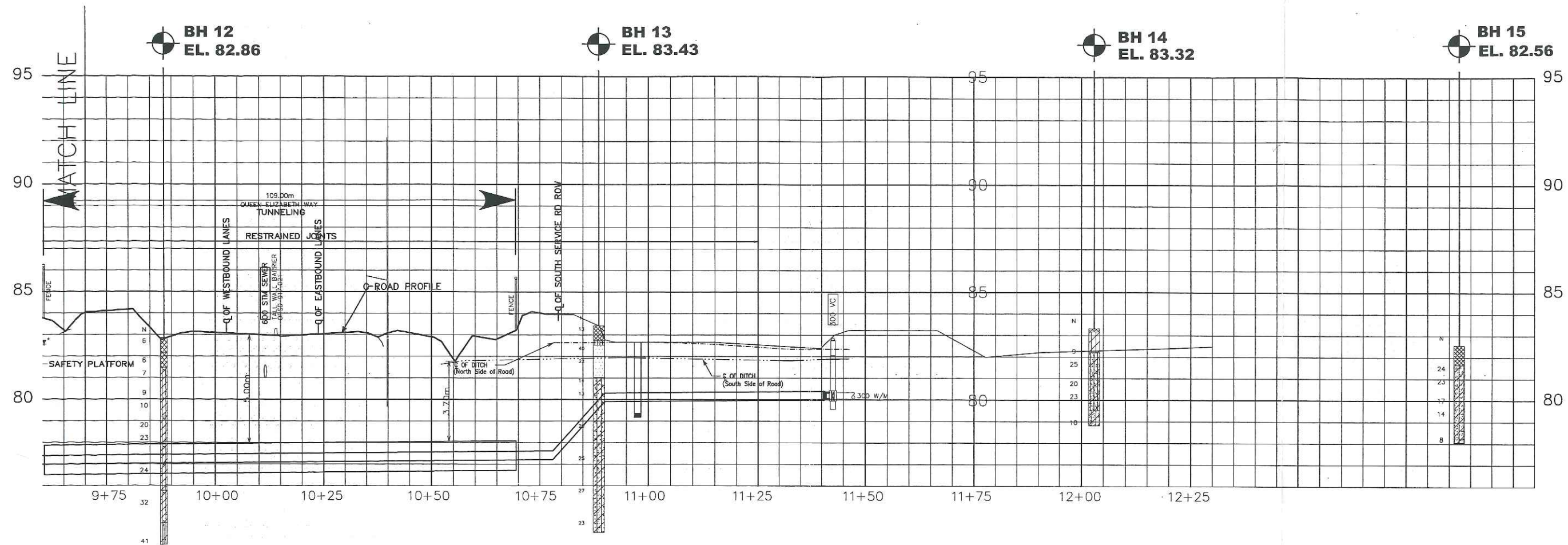
CITY OF HAMILTON		<div><div><b>Peto MacCallum Ltd.</b> CONSULTING ENGINEERS</div></div>				
FIFTY ROAD WATERMAIN						
FIFTY ROAD						
HAMILTON, ONTARIO						
SOIL PROFILE		DRAWN: N.A.	DATE	SCALE	JOB NO.	DRAWING NO.
		CHECKED: M.D.S.	NOV. 2006	AS NOTED	06HF033	3A
		APPROVED: D.W.K.				




CITY OF HAMILTON		<div><div><b>Peto MacCallum Ltd.</b> CONSULTING ENGINEERS</div></div>				
FIFTY ROAD WATERMAIN FIFTY ROAD HAMILTON, ONTARIO						
SOIL PROFILE						
		DRAWN: N.A.	DATE	SCALE	JOB NO.	DRAWING NO.
		CHECKED: M.D.S.	NOV. 2006	AS NOTED	06HF033	3B
		APPROVED: D.W.K.				



CITY OF HAMILTON	<div><div><b>Peto MacCallum Ltd.</b> CONSULTING ENGINEERS</div></div>				
FIFTY ROAD WATERMAIN FIFTY ROAD HAMILTON, ONTARIO					
SOIL PROFILE					
	DRAWN: <b>N.A.</b>	DATE	SCALE	JOB NO.	DRAWING NO.
	CHECKED: <b>M.D.S.</b>	NOV. 2006	AS NOTED	06HF033	3C
	APPROVED: <b>D.W.K.</b>				



CITY OF HAMILTON		<div><div><b>Peto MacCallum Ltd.</b> CONSULTING ENGINEERS</div></div>				
FIFTY ROAD WATERMAIN FIFTY ROAD HAMILTON, ONTARIO						
SOIL PROFILE						
DRAWN: N.A.	DATE	SCALE	JOB NO.	DRAWING NO.		
CHECKED: M.D.S.	NOV. 2006	AS NOTED	06HF033	3D		
APPROVED: D.W.K.						



## **Appendix A**

### **Geotechnical Laboratory Test Results**

Figure A1 – Photograph of Rock Core

Figure A2 – Particle Size Distribution

Figure A3 – Plasticity Chart

## Photograph 1

### Rock Core



Figure A-1

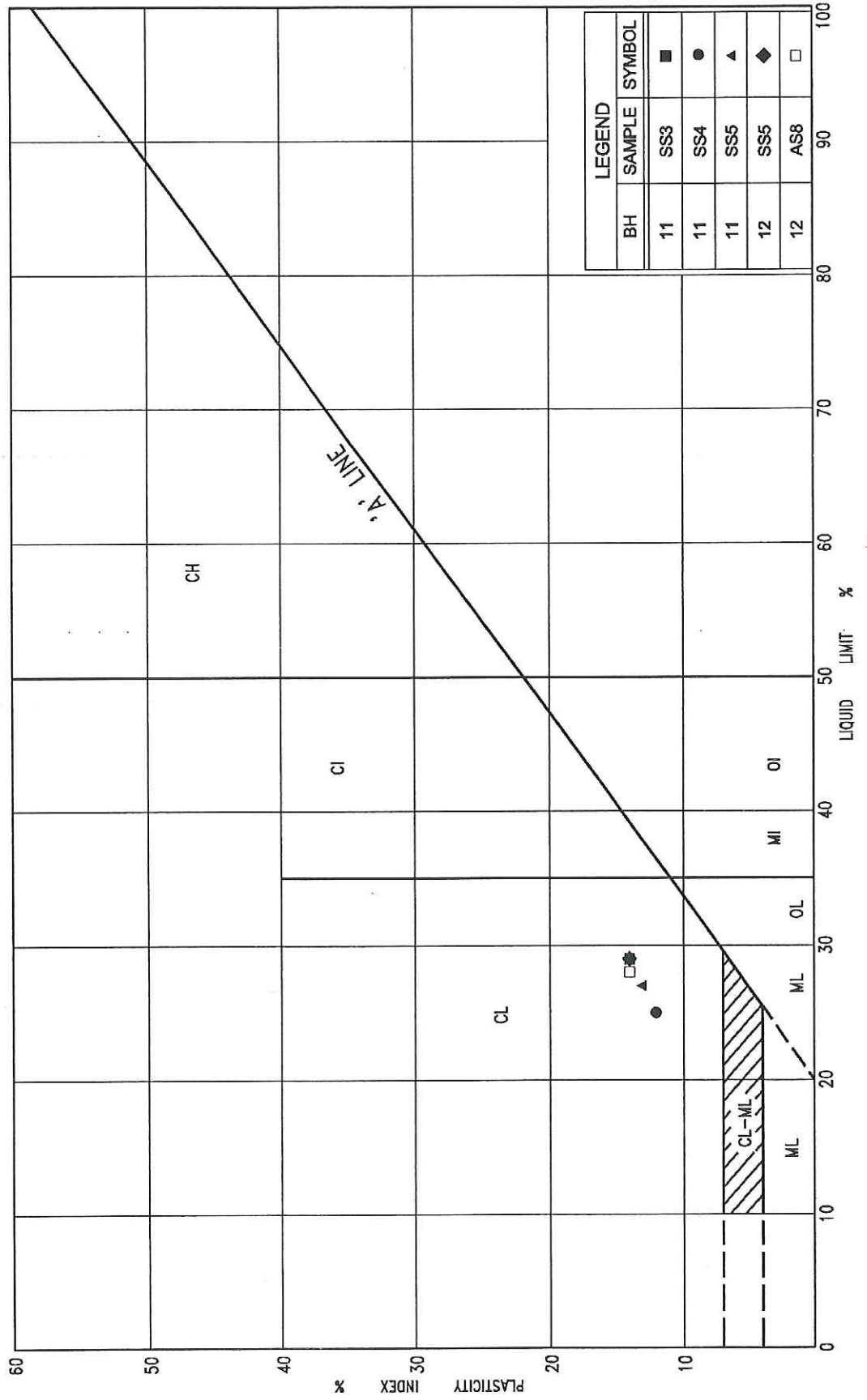


# PARTICLE SIZE DISTRIBUTION CHART





Figure A3 – Plasticity Chart





## **Appendix B**

### **Corrosivity and Sulphate Attack Laboratory Test Results**

Table B1 - Summary of Ductile Iron Pipe Corrosivity Analysis on Soil Samples

Table B2 - Summary of Mild Steel Corrosivity Analysis on Soil Samples

Table B3 - Sulphate Attack on Concrete Test Results

Certificates of Analyses



**TABLE B1**  
Summary of Ductile Iron Pipe Corrosivity Analysis on Soil Samples

Sample No.	Depth (m)	pH Points	Sulphide Pos/Neg Points	Moisture Points	Resistivity Points	Redox Potential Points	Points <sup>2</sup> Total	Chloride <sup>3</sup> (ppm)
BH1 SS3	1.5 to 2.0	$\frac{9.2}{3}$	$\frac{\text{Positive}}{3.5}$	Generally $\frac{\text{Moist}}{1}$	$\frac{\text{N/A}^1}{10}$	$\frac{\text{Negative}}{5}$	22.5	133
BH5 RC5	3.0 to 4.0	$\frac{8.8}{3}$	$\frac{\text{Negative}}{0}$	Generally $\frac{\text{Moist}}{1}$	$\frac{1770}{8}$	$\frac{95 \text{ mV}}{3.5}$	15.5	165
BH12 SS7	5.0 to 6.0	$\frac{8.4}{0}$	$\frac{\text{Negative}}{0}$	Generally $\frac{\text{Moist}}{1}$	$\frac{1340}{10}$	$\frac{70 \text{ mV}}{3.5}$	14.5	17.7
BH15 SS3	2.2 to 2.7	$\frac{7.8}{0}$	$\frac{\text{Negative}}{0}$	Generally $\frac{\text{Moist}}{1}$	$\frac{\text{N/A}^1}{10}$	$\frac{115 \text{ mV}}{0}$	11	677

- Note:
- 1) N/A – Sample not tested in Miller Resistivity box. Maximum point value suggested by A.W.W.A. assumed.
  - 2) Based on A.W.W.A. evaluation system.
  - 3) Greater than 10 points indicates environment corrosive to grey or ductile iron pipe and measures to limit corrosion are required.
    - <100 ppm - Non-Aggressive
    - 100 to 300 ppm - Mild
    - 300 to 500 ppm - Aggressive
    - >500 ppm - Highly Aggressive



**TABLE B2**  
Summary of Mild Steel Corrosivity Analysis on Soil Samples

Sample No.	Depth (m)	pH Points	Sulphide Pos/Neg Points	Moisture Points	Resistivity Points	Redox Potential Points	Points <sup>2</sup> Total	Chloride <sup>3</sup> (ppm)
BH1 SS3	1.5 to 2.0	$\frac{9.2}{0}$	$\frac{\text{Positive}}{4}$	$\frac{\text{Damp}}{1}$	$\frac{\text{N/A}^1}{12}$	$\frac{\text{Negative}}{4}$	21	133
BH5 RC5	3.0 to 4.0	$\frac{8.8}{1}$	$\frac{\text{Negative}}{0}$	$\frac{\text{Damp}}{1}$	$\frac{1770}{8}$	$\frac{95 \text{ mV}}{3}$	13	165
BH12 SS7	5.0 to 6.0	$\frac{8.4}{1}$	$\frac{\text{Negative}}{0}$	$\frac{\text{Damp}}{1}$	$\frac{1340}{8}$	$\frac{70 \text{ mV}}{3}$	13	17.7
BH15 SS3	2.2 to 2.7	$\frac{7.8}{1}$	$\frac{\text{Negative}}{0}$	$\frac{\text{Damp}}{1}$	$\frac{\text{N/A}^1}{12}$	$\frac{115 \text{ mV}}{1}$	15	677

Note: 1) N/A – Sample not tested in Miller Resistivity box. Maximum point value suggested by Corrosion Control Guide assumed.  
2) Based on evaluation system in Table 4 of "Corrosion Control Guide", Vol. 1, 1968, by E.G. Sellers.  

- > 12 - Highly Aggressive
- 10 to 12 - Aggressive
- 7 to 9 - Less Aggressive
- 4 to 6 - Mild
- < 4 - Inocuous

3)

- <100 ppm - Non-Aggressive
- 100 to 300 ppm - Mild
- 300 to 500 ppm - Aggressive
- >500 ppm - Highly Aggressive



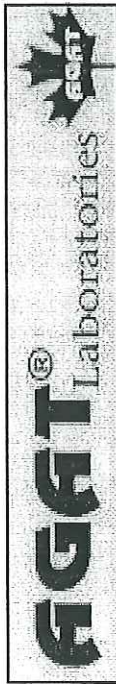
**TABLE B3**

Sulphate Attack on Concrete Test Results

Sample No.	Depth (m)	pH	Soluble Sulphate <sup>1</sup> (µg/g) / (%)
BH1 SS3	1.5 to 2.0	9.2	1620 / 0.16
BH5 RC5	3.0 to 4.0	8.8	61 / 0.01
BH12 SS7	5.0 to 6.0	8.4	165 / 0.02
BH15 SS3	2.2 to 2.7	7.8	228 / 0.02

Note: 1) Based on CSA Standard A23.1 – Percent water soluble sulphate in soil sample

0.00 to 0.10	- Negligible
0.10 to 0.20	- Positive (Mild)
0.20 to 0.50	- Considerable
>0.50	- Severe



# Certificate of Analysis

AGAT WORK ORDER: 06T179901

PROJECT NO: 06HF033

CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Matt St. Denis

## Corrosivity Package

DATE SAMPLED: July 07 2006	DATE RECEIVED: July 28 2006			DATE REPORTED: August 03 2006			SAMPLE TYPE: Soil
	Unit	G / S	M.D.L.	BH1 SS3 555717	BH5 RC5 555718	BH12 SS7 555720	BH15 SS3 555722
Sulphide *	mg/kg		0.2	99.9	<0.2	<0.2	<0.2
Sulphate ( 2:1 water:soil extraction)	µg/g		0.2	1620	60.7	165	228
Chloride ( 2:1 water:soil extraction)	µg/g		0.2	133	165	17.7	677
pH ( 2:1 water:soil extraction)	N/A		NA	9.20	8.78	8.35	7.80
Electrical Conductivity (2:1water:soil extraction)	mS/cm		0.002	1.81	0.499	0.312	1.32
Resistivity	ohmscm			554	2000	3200	759
Redox Potential *	mV		1	<1	95	70	115

Comments: M.D.L. - Method Detection Limit; G / S - Guideline / Standard

555717

\* Analysis subcontracted.

A water extraction at 2:1 ratio (15g soil:30mL DI water) was performed prior to anions analysis, pH and EC measurement. Results are reported as µg/g based on a dry weight.

555718

\* Analysis subcontracted.

A water extraction at 2:1 ratio (15g soil:30mL DI water) was performed prior to anions analysis, pH and EC measurement. Results are reported as µg/g based on a dry weight.

555720

\* Analysis subcontracted.

A water extraction at 2:1 ratio (15g soil:30mL DI water) was performed prior to anions analysis, pH and EC measurement. Results are reported as µg/g based on a dry weight.

555722

\* Analysis subcontracted.

A water extraction at 2:1 ratio (15g soil:30mL DI water) was performed prior to anions analysis, pH and EC measurement. Results are reported as µg/g based on a dry weight.

*Jokey Takewishi*

Certified By:



## **Appendix C**

### **Results of Geoenvironmental Laboratory Testing**

Table C1 - Samples Submitted for Chemical Testing

Table C2 - Summary of Chemical Test Data

Certificates of Analyses



**TABLE C1**

Samples Submitted for Chemical Testing

Location	Sample ID	Approx. Depth (m)	Description	Type of Chemical Analysis
Borehole 1	BH1 SS2	0.8 – 1.2	Dark brown Granular A-type slag	pH and metals
Borehole 1	BH1 SS3	1.5 – 2.0	Loose, dark brown Granular A-type slag	pH and metals
Borehole 1	BH1 SS4	2.3 – 2.7	Weathered red shale	pH and metals
Borehole 2	BH2 SS2	0.8 – 1.2	Weathered red shale	pH and metals
Borehole 2	BH2 SS2-1 (DUPLICATE)	0.8 – 1.2	Weathered red shale	pH and metals
Borehole 3	BH3 SS2	0.8 – 1.2	Weathered red shale	pH and metals
Borehole 3	BH3 SS3	1.5 – 1.7	Weathered red and grey shale	pH and metals
Borehole 4	BH4 SS1	0.3 – 0.8	Black, clayey silt fill, some sand and topsoil, very low organic	pH and metals
Borehole 4	BH4 SS2	0.8 – 1.2	Brown to dark brown clayey silt, some sand fill	pH and metals
Borehole 4	BH4 SS3	1.5 – 2.0	Weathered red and grey shale	pH and metals
Borehole 5	BH5 SS2	0.8 – 1.2	Brown to dark brown silty clay fill, some sand, occurrences of decayed wood organics	pH and metals

**Note:**

pH and metals include barium, beryllium, cadmium, chromium, cobalt, copper, lead, molybdenum, nickel, silver, vanadium, zinc, arsenic, selenium, antimony, and mercury.



**TABLE C1**

Samples Submitted for Chemical Testing

Location	Sample ID	Approx. Depth (m)	Description	Type of Chemical Analysis
Borehole 5	BH5 SS4	2.3 – 2.7	Highly weathered very weak red shale	pH and metals
Borehole 6	BH6 SS2A	1.5 – 1.65	Brown silty clay fill, some sand and gravel	pH and metals
Borehole 6	BH6 SS2B	1.65 – 2.0	Weathered red shale	pH and metals
Borehole 7	BH7 GS1	0.0 – 0.8	Dark brown clayey silt topsoil, low organics	pH and metals
Borehole 7	BH7 SS1	0.8 – 1.2	Weathered red shale	pH and metals
Borehole 7	BH7 SS3	3.05 – 3.5	Weathered red shale with grey layers	pH and metals
Borehole 8	BH8 GS1	0.0 – 0.3	Dark brown clayey silt topsoil, very low organic	pH and metals
Borehole 8	BH8 AS1	0.3 – 0.8	Reddish/brown silt mantling shale	pH and metals
Borehole 8	BH8 SS2	0.8 – 1.2	Highly weathered reddish brown shale	pH and metals
Borehole 9	BH9 GS1	0.0 – 0.9	Dark brown clayey silt topsoil, very low organic	pH and metals
Borehole 9	BH9 GS1-1 (DUPLICATE)	0.0 – 0.9	Dark brown clayey silt topsoil, very low organic	pH and metals
Borehole 9	BH9 SS1	0.8 – 1.2	Brown silty clay till, some sand and gravel with bluish grey fissures	pH and metals

**Note:**

pH and metals include barium, beryllium, cadmium, chromium, cobalt, copper, lead, molybdenum, nickel, silver, vanadium, zinc, arsenic, selenium, antimony, and mercury.



**TABLE C1**

Samples Submitted for Chemical Testing

Location	Sample ID	Approx. Depth (m)	Description	Type of Chemical Analysis
Borehole 9	BH9 SS4	3.05 – 3.5	Weathered red shale	pH and metals
Borehole 10	BH10 GS1	0.0 – 0.8	Dark brown clayey silt topsoil, very low organic	pH and metals
Borehole 10	BH10 SS1	0.8 – 1.2	Brown silty clay till some sand and gravel with bluish grey fissures	pH and metals
Borehole 10	BH10 SS3	3.05 – 3.5	Brownish grey silty clay till some sand and gravel with bluish grey fissures	pH and metals
Borehole 11	BH11 GS1	0.0 – 0.8	Brown clayey silt topsoil, very low organic	pH and metals
Borehole 11	BH11 SS1	0.8 – 1.2	Dark brown, fine sandy silt till, trace of clay	pH and metals
Borehole 11	BH11 SS2	1.5 – 2.0	Brownish grey silty clay till, some sand	pH and metals
Borehole 11	BH11 SS2-1 (DUPLICATE)	1.5 – 2.0	Brownish grey silty clay till, some sand	pH and metals
Borehole 12	BH12 SS1	0.0 – 0.6	Dark brown clayey silt fill, some sand, occasional inclusions of topsoil	pH and metals
Borehole 12	BH12 SS2	0.8 – 1.2	Dark brown clayey silt fill, some sand, occasional inclusions of topsoil with trace black coal	pH and metals
Borehole 12	BH12 SS3	1.5 – 2.0	Grey silty clay till, trace of sand and gravel	pH and metals

**Note:**

pH and metals include barium, beryllium, cadmium, chromium, cobalt, copper, lead, molybdenum, nickel, silver, vanadium, zinc, arsenic, selenium, antimony, and mercury.



**TABLE C1**

Samples Submitted for Chemical Testing

Location	Sample ID	Approx. Depth (m)	Description	Type of Chemical Analysis
Borehole 13	BH13 SS2A	0.8 – 1.0	Brown fine sandy silt, occasional decayed woody organics	pH and metals
Borehole 13	BH13 SS2A-1 (DUPLICATE)	0.8 – 1.0	Brown fine sandy silt, occasional decayed woody organics	pH and metals
Borehole 13	BH13 SS2B	1.0 – 1.25	Brown fine grained silty sand with black stratifications	pH and metals
Borehole 13	BH13 SS4	2.3 – 2.75	Brown silty clay till, some sand	pH and metals
Borehole 14	BH14 SS1A	0.8 – 1.1	Brown silty clay fill, some sand, with pockets of black clayey silt topsoil	pH and metals
Borehole 14	BH14 SS2	1.5 – 2.0	Brown clayey silt till, some sand with bluish grey fissures	pH and metals
Borehole 14	BH14 SS3	2.3 – 2.75	Brown clayey silt till, some sand with bluish grey fissures	pH and metals
Borehole 15	BH15 SS1A	0.3 – 0.9	Brown fine to medium sand fill, some silt	pH and metals
Borehole 15	BH15 SS1B	0.9 – 1.2	Brown silty clay till, some sand and gravel with bluish grey fissures	pH and metals
Borehole 15	BH15 SS2	1.5 – 2.0	Brown silty clay till, some sand and gravel with bluish grey fissures and oxidized stains	pH and metals

**Note:**

pH and metals include barium, beryllium, cadmium, chromium, cobalt, copper, lead, molybdenum, nickel, silver, vanadium, zinc, arsenic, selenium, antimony, and mercury.

TABLE C2

Summary of Chemical Test Results

Soil Type				Granular A type slag	Granular A type slag, loose	Weathered red shale	Weathered red shale	Weathered red shale	Weathered red shale	Weathered red and grey shale	Black, clayey silt fill, some sand and topsoil, very low organic	Brown to dark brown clayey silt, some sand fill	Weathered red and grey shale	Brown to dark brown silty clay, some sand, occurrences of decayed wood organics	Highly weathered very weak red shale	Brown silty clay, some sand and gravel	Weathered red shale	Dark brown clayey silt topsoil, low organics	Weathered red shale
Sample Identification		*O. Reg. 153/04 Table 1 (µg/g)	**O. Reg. 153/04 Table 3 (µg/g)	BH1 SS2	BH1 SS3	BH1 SS4	BH2 SS2	BH2 SS2-1 (Duplicate)	BH3 SS2	BH3 SS3	BH4 SS1	BH4 SS2	BH4 SS3	BH5 SS2	BH5 SS4	BH6 SS2A	BH6 SS2B	BH7 GS1	BH7 SS1
Parameter	Units																		
Antimony	µg/g	1.0	(44) 40	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Arsenic	µg/g	17	(50) 40	1	1	3	3	4	4	3	4	6	4	4	4	5	3	12	3
Barium	µg/g	210	(2000) 1500	760	740	150	67	85	83	370	61	110	81	94	100	140	100	45	78
Beryllium	µg/g	1.2	1.2	11	11	1	0.9	1.1	0.8	0.8	0.5	0.8	0.8	0.8	0.9	1	1	<0.5	0.9
Cadmium	µg/g	1	12.00	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chromium	µg/g	71	(1000) 750	36	35	22	21	23	24	22	14	18	23	20	24	24	23	15	21
Cobalt	µg/g	21	(100) 80	0.9	1.4	14	13	15	15	14	7.8	13	16	10	16	15	15	5.9	14
Copper	µg/g	85	(300) 225	2	2.6	9.9	6.6	7	9.1	7.3	15	26	8.5	19	8.7	14	8.6	18	7.9
Lead	µg/g	120	1000	2	5	9	7	9	9	7	25	57	7	31	10	33	7	48	6
Mercury	µg/g	0.23	10.00	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Molybdenum	µg/g	2.5	40	<0.5	<0.5	1	<0.5	0.5	1	0.9	<0.5	1	0.9	0.8	1.1	0.8	1	0.6	0.7
Nickel	µg/g	43	(200) 150	1	1.8	30	28	32	34	30	13	25	34	19	35	29	32	11	30
Selenium	µg/g	1.9	10.00	6	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Silver	µg/g	0.42	(50) 40	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Vanadium	µg/g	91	(250) 200	17	19	31	30	34	32	30	24	28	28	32	30	31	28	21	24
Zinc	µg/g	160	(800) 600	7	97	63	59	67	94	63	55	350	70	63	74	160	65	78	63
pH (pH Units)	pH	-	-	9.79	9.6	8.39	7.6	7.63	7.85	8.04	7.53	7.61	7.71	7.47	7.57	7.6	7.91	7.37	7.91

Notes:  
pH 5-9 < 1.5 m deep  
pH 5-11 > 1.5 m deep  
Bold Text - Exceeds Table 1 Standards  
Reverse Bold Text - Exceeds Table 3 Standards  
\* - O. Reg. 153/04 Table 1 Standards, All Other Types of Property Use  
\*\* - O. Reg. 153/04 Table 3 Standards, Industrial/Commercial/  
Community Property Use, Nonpotable Ground Water  
( ) - Medium/fine textured soil

TABLE C2

Summary of Chemical Test Results

Soil Type				Weathered red shale with grey layers	Dark brown clayey silt topsoil, very low organic	Reddish/ brown silt (shale)	Highly weathered reddish brown shale	Dark brown clayey silt topsoil, very low organic	Dark brown clayey silt topsoil, very low organic	Brown silty clay, some sand and gravel with bluish grey fissures	Weathered red shale	Dark brown clayey silt topsoil, very low organic	Brown silty clay some sand and gravel with bluish grey fissures	Brownish grey silty clay some sand and gravel with bluish grey fissures	Brown clayey silt topsoil, very low organic	Dark brown, fine sandy silt	Brownish grey silty clay till, some sand	Brownish grey silty clay till, some sand	Dark brown clayey silt, some sand, occasional inclusions of topsoil
Sample Identification		*O. Reg. 153/04 Table 1 (µg/g)	**O. Reg. 153/04 Table 3 (µg/g)	BH7 SS3	BH8 GS1	BH8 AS1	BH8 SS2	BH9 GS1	BH9 GS1-1 (Duplicate)	BH9 SS1	BH9 SS4	BH10 GS1	BH10 SS1	BH10 SS3	BH11 GS1	BH11 SS1	BH11 SS2	BH11 SS2-1 (Duplicate)	BH12 SS1
Parameter	Units																		
Antimony	µg/g	1.0	(44) 40	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Arsenic	µg/g	17	(50) 40	3	4	3	3	8	8	5	3	13	4	5	7	4	5	6	6
Barium	µg/g	210	(2000) 1500	64	35	73	72	77	78	49	<b>280</b>	67	100	100	33	43	110	120	85
Beryllium	µg/g	1.2	1.2	0.8	<0.5	1	1	0.7	0.8	0.8	0.8	0.6	0.6	0.6	<0.5	0.5	0.6	0.6	0.6
Cadmium	µg/g	1	12.00	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chromium	µg/g	71	(1000) 750	21	12	24	26	19	19	22	24	14	16	17	11	13	19	18	21
Cobalt	µg/g	21	(100) 80	14	6.3	16	17	9.2	9.2	14	16	5.2	11	12	4.8	8	13	12	9.9
Copper	µg/g	85	(300) 225	9.2	20	11	11	33	31	36	9.7	29	27	28	42	23	40	37	35
Lead	µg/g	120	1000	7	26	9	9	46	42	14	9	61	14	8	40	8	17	16	42
Mercury	µg/g	0.23	10.00	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Molybdenum	µg/g	2.5	40	1.6	0.8	0.8	1	1	1.1	0.7	1.1	0.8	<0.5	0.6	<0.5	<0.5	0.5	<0.5	<0.5
Nickel	µg/g	43	(200) 150	30	9.9	35	36	17	17	29	34	11	24	23	8.7	15	28	25	26
Selenium	µg/g	1.9	10.00	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Silver	µg/g	0.42	(50) 40	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<b>0.5</b>
Vanadium	µg/g	91	(250) 200	28	18	28	31	26	28	31	27	19	22	24	19	23	26	24	26
Zinc	µg/g	160	(800) 600	63	55	72	75	75	69	63	70	64	54	54	59	37	70	65	88
pH (pH Units)	pH	-	-	7.94	7.27	7.73	7.77	6.96	6.93	7.92	8.14	6.76	7.89	7.95	6.89	7.16	7.77	7.74	7.46

Notes:  
pH 5-9 < 1.5 m deep  
pH 5-11 > 1.5 m deep  
Bold Text - Exceeds Table 1 Standards  
Reverse Bold Text - Exceeds Table 3 Standards  
\* - O. Reg. 153/04 Table 1 Standards, All Other Types of Property Use  
\*\* - O. Reg. 153/04 Table 3 Standards, Industrial/Commercial/  
Community Property Use, Nonpotable Ground Water  
( ) - Medium/fine textured soil

TABLE C2

Summary of Chemical Test Results

Soil Type				Dark brown clayey silt, some sand, occasional inclusions of topsoil with trace black coal	Grey silty clay, trace of sand and gravel	Brown fine sandy silt, occasional decayed woody organics	Brown fine sandy silt, occasional decayed woody organics	Brown fine sandy silt, occasional decayed woody organics		Brown silty clay fill, some sand, with pockets of black clayey silt topsoil	Brown clayey silt till, some sand with bluish grey fissures	Brown clayey silt till, some sand with bluish grey fissures	Brown fine to medium sand fill, some silt	Brown silty clay till, some sand and gravel with bluish grey fissures	Brown silty clay till, some sand and gravel with bluish grey fissures and oxidized stains
Sample Identification		*O. Reg. 153/04 Table 1 (µg/g)	**O. Reg. 153/04 Table 3 (µg/g)	BH12 SS2	BH12 SS3	BH13 SS2A	BH13 SS2A-1	BH13 SS2B	BH13 SS4	BH14 SS1A	BH14 SS2	BH14 SS3	BH15 SS1A	BH15 SS1B	BH15 SS2
Parameter	Units						(Duplicate)								
Antimony	µg/g	1.0	(44) 40	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Arsenic	µg/g	17	(50) 40	5	4	4	5	4	4	7	5	6	5	6	6
Barium	µg/g	210	(2000) 1500	64	91	48	47	50	82	100	110	130	120	120	110
Beryllium	µg/g	1.2	1.2	0.6	0.7	<0.5	<0.5	<0.5	0.7	0.7	0.7	0.8	<0.5	0.8	0.7
Cadmium	µg/g	1	12.00	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chromium	µg/g	71	(1000) 750	16	23	15	15	13	23	21	21	24	25	25	22
Cobalt	µg/g	21	(100) 80	9.3	13	6.9	8	8.7	13	10	12	14	10	14	14
Copper	µg/g	85	(300) 225	28	33	21	23	26	40	29	32	36	47	44	35
Lead	µg/g	120	1000	34	12	7	9	8	12	18	16	13	14	14	12
Mercury	µg/g	0.23	10.00	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Molybdenum	µg/g	2.5	40	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.7	<0.5	0.6	<0.5	<0.5	<0.5
Nickel	µg/g	43	(200) 150	19	28	14	15	18	27	19	26	31	23	29	28
Selenium	µg/g	1.9	10.00	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Silver	µg/g	0.42	(50) 40	<0.3	0.5	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Vanadium	µg/g	91	(250) 200	25	30	27	27	26	32	34	30	33	38	36	32
Zinc	µg/g	160	(800) 600	79	66	34	37	39	62	57	61	69	73	67	63
pH (pH Units)	pH	-	-	7.63	7.74	7.39	7.45	7.3	7.89	7.46	7.83	7.65	7.03	7.72	7.99

Notes:  
pH 5-9 < 1.5 m deep  
pH 5-11 > 1.5 m deep  
Bold Text - Exceeds Table 1 Standards  
Reverse Bold Text - Exceeds Table 3 Standards  
\* - O. Reg. 153/04 Table 1 Standards, All Other Types of Property Use  
\*\* - O. Reg. 153/04 Table 3 Standards, Industrial/Commercial/  
Community Property Use, Nonpotable Ground Water  
( ) - Medium/fine textured soil

Your Project #: 06HF033  
Your C.O.C. #: 00441047

**Attention: Melissa King**  
Peto MacCallum Ltd  
45 Burford Rd  
Hamilton, ON  
L8E 3C6

Report Date: 2006/07/21

**CERTIFICATE OF ANALYSIS**

**MAXXAM JOB #: A669785**  
**Received: 2006/07/12, 17:42**

Sample Matrix: Soil  
# Samples Received: 21

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Acid Extractable Metals in Soil by GF	9	2006/07/17	2006/07/18	Ont SOP 0095	EPA 7010
Acid Extractable Metals in Soil by GF	12	2006/07/19	2006/07/19	Ont SOP 0095	EPA 7010
Mercury in Soil by CVAA	2	2006/07/17	2006/07/18	Ont SOP 0112	EPA 7470
Mercury in Soil by CVAA	12	2006/07/18	2006/07/18	Ont SOP 0112	EPA 7470
Mercury in Soil by CVAA	7	2006/07/18	2006/07/19	Ont SOP 0112	EPA 7470
Total Metals in Soil by Axial ICP-AES	4	2006/07/17	2006/07/18	Ont SOP-0072	EPA SW-846-6010C
Total Metals in Soil by Axial ICP-AES	17	2006/07/19	2006/07/19	Ont SOP-0072	EPA SW-846-6010C
pH CaCl2 EXTRACT	18	N/A	2006/07/18	Ont SOP-0067	4500-H+B
pH CaCl2 EXTRACT	3	N/A	2006/07/19	Ont SOP-0067	4500-H+B

\* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key



Leena Thomas

21 Jul 2006 11:44:00 -04:00

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

LEENA THOMAS, Project Manager  
Email: leena.thomas@maxxamanalytics.com  
Phone# (905) 817-5700 Ext:5798

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. SCC and CAEAL have approved this reporting process and electronic report format.

For Service Group specific validation please refer to the Validation Signature Page

Total cover pages: 1

Page 1 of 21

Maxxam Job #: A669785  
Report Date: 2006/07/21

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### RESULTS OF ANALYSES OF SOIL

Maxxam ID		N07171	N07172	N07173	N07174		
Sampling Date		2006/07/07	2006/07/07	2006/07/07	2006/07/07		
COC Number		00441047	00441047	00441047	00441047		
Units		BH1 SS2	BH1 SS3	BH1 SS4	BH2 SS2	RDL	QC Batch

<b>INORGANICS</b>							
Available (CaCl2) pH	pH	9.79	9.60	8.39	7.60	N/A	1013394
RDL = Reportable Detection Limit QC Batch = Quality Control Batch							

Maxxam ID		N07175		N07176		N07177	
Sampling Date		2006/07/07		2006/07/07		2006/07/10	
COC Number		00441047		00441047		00441047	
Units		BH3 SS2	QC Batch	BH3 SS3	QC Batch	BH5 SS2	RDL QC Batch

<b>INORGANICS</b>							
Available (CaCl2) pH	pH	7.85	1013711	8.04	1014287	7.47	N/A 1013711
RDL = Reportable Detection Limit QC Batch = Quality Control Batch							

Maxxam ID		N07178		N07179		N07180	
Sampling Date		2006/07/10		2006/07/07		2006/07/07	
COC Number		00441047		00441047		00441047	
Units		BH5 SS4	QC Batch	BH6 SS2A	QC Batch	BH6 SS2B	RDL QC Batch

<b>INORGANICS</b>							
Available (CaCl2) pH	pH	7.57	1014287	7.60	1013394	7.91	N/A 1014287
RDL = Reportable Detection Limit QC Batch = Quality Control Batch							

Maxxam ID		N07181		N07182		N07183	
Sampling Date		2006/07/10		2006/07/10		2006/07/10	
COC Number		00441047		00441047		00441047	
Units		BH13 SS2A	QC Batch	BH13 SS2B	QC Batch	BH13 SS4	RDL QC Batch

<b>INORGANICS</b>							
Available (CaCl2) pH	pH	7.39	1013394	7.30	1013711	7.89	N/A 1013394
RDL = Reportable Detection Limit QC Batch = Quality Control Batch							

Maxxam Job #: A669785  
Report Date: 2006/07/21

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### RESULTS OF ANALYSES OF SOIL

Maxxam ID		N07184	N07185		N07186		
Sampling Date		2006/07/10	2006/07/10		2006/07/10		
COC Number		00441047	00441047		00441047		
	Units	BH14 SS1A	BH14 SS3	QC Batch	BH14 SS2	RDL	QC Batch

<b>INORGANICS</b>							
Available (CaCl <sub>2</sub> ) pH	pH	7.46	7.65	1013394	7.83	N/A	1013711
RDL = Reportable Detection Limit QC Batch = Quality Control Batch							

Maxxam ID		N07187		N07188	N07189		
Sampling Date		2006/07/07		2006/07/10	2006/07/10		
COC Number		00441047		00441047	00441047		
	Units	BH2 SS2-1	QC Batch	BH13 SS2A-1	BH15 SS1A	RDL	QC Batch

<b>INORGANICS</b>							
Available (CaCl <sub>2</sub> ) pH	pH	7.63	1013394	7.45	7.03	N/A	1013711
RDL = Reportable Detection Limit QC Batch = Quality Control Batch							

Maxxam ID		N07190	N07191		
Sampling Date		2006/07/10	2006/07/10		
COC Number		00441047	00441047		
	Units	BH15 SS1B	BH15 SS2	RDL	QC Batch

<b>INORGANICS</b>					
Available (CaCl <sub>2</sub> ) pH	pH	7.72	7.99	N/A	1013394
RDL = Reportable Detection Limit QC Batch = Quality Control Batch					

Maxxam Job #: A669785  
Report Date: 2006/07/21

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID			N07173		N07174		
Sampling Date			2006/07/07		2006/07/07		
COC Number			00441047		00441047		
	Units	Criteria	BH1 SS4	QC Batch	BH2 SS2	RDL	QC Batch

METALS							
Acid Extractable Antimony (Sb)	ug/g	1.0	ND	1014360	ND	1	1012803
Acid Extractable Arsenic (As)	ug/g	17	3	1014292	3	1	1014292
Acid Extractable Barium (Ba)	ug/g	210	150	1014292	67	0.5	1014292
Acid Extractable Beryllium (Be)	ug/g	1.2	1.0	1014292	0.9	0.5	1014292
Acid Extractable Cadmium (Cd)	ug/g	1.0	ND	1014292	ND	0.3	1014292
Acid Extractable Chromium (Cr)	ug/g	71	22	1014292	21	0.5	1014292
Acid Extractable Cobalt (Co)	ug/g	21	14	1014292	13	0.5	1014292
Acid Extractable Copper (Cu)	ug/g	85	9.9	1014292	6.6	0.5	1014292
Acid Extractable Lead (Pb)	ug/g	120	9	1014292	7	1	1014292
Acid Extractable Mercury (Hg)	ug/g	0.23	ND	1013696	ND	0.05	1013696
Acid Extractable Molybdenum (Mo)	ug/g	2.5	1.0	1014292	ND	0.5	1014292
Acid Extractable Nickel (Ni)	ug/g	43	30	1014292	28	0.5	1014292
Acid Extractable Selenium (Se)	ug/g	1.9	ND	1014360	ND	1	1012803
Acid Extractable Silver (Ag)	ug/g	0.42	ND	1014292	ND	0.3	1014292
Acid Extractable Vanadium (V)	ug/g	91	31	1014292	30	0.5	1014292
Acid Extractable Zinc (Zn)	ug/g	160	63	1014292	59	3	1014292

ND = Not detected  
RDL = Reportable Detection Limit  
QC Batch = Quality Control Batch  
CRITERIA: Ref. to Ontario Regulation 153/04 made under the Environmental protection Act on May 12, 2004.  
Table 1: Full Depth Background Site Condition Standards.  
Soil - All Other Types of Property Use.

Maxxam Job #: A669785  
Report Date: 2006/07/21

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID			N07171	N07172		
Sampling Date			2006/07/07	2006/07/07		
COC Number			00441047	00441047		
	Units	Criteria	BH1 SS2	BH1 SS3	RDL	QC Batch

Table 3  
1/c/c

<b>METALS</b>						
Acid Extractable Antimony (Sb)	ug/g	1.0	ND	ND	1	1014291
Acid Extractable Arsenic (As)	ug/g	17	1	1	1	1014298
Acid Extractable Barium (Ba)	ug/g	210	760	740	0.5	1014298
Acid Extractable Beryllium (Be)	ug/g	1.2	11	11	0.5	1014298
Acid Extractable Cadmium (Cd)	ug/g	1.0	ND	ND	0.3	1014298
Acid Extractable Chromium (Cr)	ug/g	71	36	35	0.5	1014298
Acid Extractable Cobalt (Co)	ug/g	21	0.9	1.4	0.5	1014298
Acid Extractable Copper (Cu)	ug/g	85	2.0	2.6	0.5	1014298
Acid Extractable Lead (Pb)	ug/g	120	2	5	1	1014298
Acid Extractable Mercury (Hg)	ug/g	0.23	ND	ND	0.05	1013696
Acid Extractable Molybdenum (Mo)	ug/g	2.5	ND	ND	0.5	1014298
Acid Extractable Nickel (Ni)	ug/g	43	1.0	1.8	0.5	1014298
Acid Extractable Selenium (Se)	ug/g	1.9	6	5	1	1014291
Acid Extractable Silver (Ag)	ug/g	0.42	ND	ND	0.3	1014298
Acid Extractable Vanadium (V)	ug/g	91	17	19	0.5	1014298
Acid Extractable Zinc (Zn)	ug/g	160	7	97	3	1014298

(2000) 1500  
1.2

10

ND = Not detected  
RDL = Reportable Detection Limit  
QC Batch = Quality Control Batch  
CRITERIA: Ref. to Ontario Regulation 153/04 made under the Environmental protection Act on May 12, 2004.  
Table 1: Full Depth Background Site Condition Standards.  
Soil - All Other Types of Property Use.

Maxxam Job #: A669785  
Report Date: 2006/07/21

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID			N07175		N07176		
Sampling Date			2006/07/07		2006/07/07		
COC Number			00441047		00441047		
	Units	Criteria	BH3 SS2	QC Batch	BH3 SS3	RDL	QC Batch

Table 3  
11c/c

<b>METALS</b>							
Acid Extractable Antimony (Sb)	ug/g	1.0	ND	1012803	ND	1	1014291
Acid Extractable Arsenic (As)	ug/g	17	4	1012782	3	1	1014292
Acid Extractable Barium (Ba)	ug/g	210	83	1012782	370	0.5	1014292
Acid Extractable Beryllium (Be)	ug/g	1.2	0.8	1012782	0.8	0.5	1014292
Acid Extractable Cadmium (Cd)	ug/g	1.0	ND	1012782	ND	0.3	1014292
Acid Extractable Chromium (Cr)	ug/g	71	24	1012782	22	0.5	1014292
Acid Extractable Cobalt (Co)	ug/g	21	15	1012782	14	0.5	1014292
Acid Extractable Copper (Cu)	ug/g	85	9.1	1012782	7.3	0.5	1014292
Acid Extractable Lead (Pb)	ug/g	120	9	1012782	7	1	1014292
Acid Extractable Mercury (Hg)	ug/g	0.23	ND	1014130	ND	0.05	1013696
Acid Extractable Molybdenum (Mo)	ug/g	2.5	1.0	1012782	0.9	0.5	1014292
Acid Extractable Nickel (Ni)	ug/g	43	34	1012782	30	0.5	1014292
Acid Extractable Selenium (Se)	ug/g	1.9	ND	1012803	ND	1	1014291
Acid Extractable Silver (Ag)	ug/g	0.42	ND	1012782	ND	0.3	1014292
Acid Extractable Vanadium (V)	ug/g	91	32	1012782	30	0.5	1014292
Acid Extractable Zinc (Zn)	ug/g	160	94	1012782	63	3	1014292

(2000)1500

ND = Not detected  
RDL = Reportable Detection Limit  
QC Batch = Quality Control Batch  
CRITERIA: Ref. to Ontario Regulation 153/04 made under the Environmental protection Act on May 12, 2004.  
Table 1: Full Depth Background Site Condition Standards.  
Soil - All Other Types of Property Use.

Maxxam Job #: A669785  
Report Date: 2006/07/21

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID			N07177		N07178		
Sampling Date			2006/07/10		2006/07/10		
COC Number			00441047		00441047		
	Units	Criteria	BH5 SS2	QC Batch	BH5 SS4	RDL	QC Batch

<b>METALS</b>							
Acid Extractable Antimony (Sb)	ug/g	1.0	ND	1014608	ND	1	1012803
Acid Extractable Arsenic (As)	ug/g	17	4	1014298	4	1	1012782
Acid Extractable Barium (Ba)	ug/g	210	94	1014298	100	0.5	1012782
Acid Extractable Beryllium (Be)	ug/g	1.2	0.8	1014298	0.9	0.5	1012782
Acid Extractable Cadmium (Cd)	ug/g	1.0	ND	1014298	ND	0.3	1012782
Acid Extractable Chromium (Cr)	ug/g	71	20	1014298	24	0.5	1012782
Acid Extractable Cobalt (Co)	ug/g	21	10	1014298	16	0.5	1012782
Acid Extractable Copper (Cu)	ug/g	85	19	1014298	8.7	0.5	1012782
Acid Extractable Lead (Pb)	ug/g	120	31	1014298	10	1	1012782
Acid Extractable Mercury (Hg)	ug/g	0.23	ND	1013696	ND	0.05	1014130
Acid Extractable Molybdenum (Mo)	ug/g	2.5	0.8	1014298	1.1	0.5	1012782
Acid Extractable Nickel (Ni)	ug/g	43	19	1014298	35	0.5	1012782
Acid Extractable Selenium (Se)	ug/g	1.9	ND	1014608	ND	1	1012803
Acid Extractable Silver (Ag)	ug/g	0.42	ND	1014298	ND	0.3	1012782
Acid Extractable Vanadium (V)	ug/g	91	32	1014298	30	0.5	1012782
Acid Extractable Zinc (Zn)	ug/g	160	63	1014298	74	3	1012782

ND = Not detected

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

CRITERIA: Ref. to Ontario Regulation 153/04 made under the Environmental protection Act on May 12, 2004.

Table 1: Full Depth Background Site Condition Standards.

Soil - All Other Types of Property Use.

Maxxam Job #: A669785  
Report Date: 2006/07/21

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID			N07179		N07180		
Sampling Date			2006/07/07		2006/07/07		
COC Number			00441047		00441047		
	Units	Criteria	BH6 SS2A	QC Batch	BH6 SS2B	RDL	QC Batch

<b>METALS</b>							
Acid Extractable Antimony (Sb)	ug/g	1.0	ND	1012803	ND	1	1012803
Acid Extractable Arsenic (As)	ug/g	17	5	1014292	3	1	1014298
Acid Extractable Barium (Ba)	ug/g	210	140	1014292	100	0.5	1014298
Acid Extractable Beryllium (Be)	ug/g	1.2	1.0	1014292	1.0	0.5	1014298
Acid Extractable Cadmium (Cd)	ug/g	1.0	ND	1014292	ND	0.3	1014298
Acid Extractable Chromium (Cr)	ug/g	71	24	1014292	23	0.5	1014298
Acid Extractable Cobalt (Co)	ug/g	21	15	1014292	15	0.5	1014298
Acid Extractable Copper (Cu)	ug/g	85	14	1014292	8.6	0.5	1014298
Acid Extractable Lead (Pb)	ug/g	120	33	1014292	7	1	1014298
Acid Extractable Mercury (Hg)	ug/g	0.23	ND	1013696	ND	0.05	1012762
Acid Extractable Molybdenum (Mo)	ug/g	2.5	0.8	1014292	1.0	0.5	1014298
Acid Extractable Nickel (Ni)	ug/g	43	29	1014292	32	0.5	1014298
Acid Extractable Selenium (Se)	ug/g	1.9	ND	1012803	ND	1	1012803
Acid Extractable Silver (Ag)	ug/g	0.42	ND	1014292	ND	0.3	1014298
Acid Extractable Vanadium (V)	ug/g	91	31	1014292	28	0.5	1014298
Acid Extractable Zinc (Zn)	ug/g	160	160	1014292	65	3	1014298

ND = Not detected

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

CRITERIA: Ref. to Ontario Regulation 153/04 made under the Environmental protection Act on May 12, 2004.

Table 1: Full Depth Background Site Condition Standards.

Soil - All Other Types of Property Use.

Maxxam Job #: A669785  
Report Date: 2006/07/21

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID			N07181		N07182		
Sampling Date			2006/07/10		2006/07/10		
COC Number			00441047		00441047		
	Units	Criteria	BH13 SS2A	QC Batch	BH13 SS2B	RDL	QC Batch

<b>METALS</b>							
Acid Extractable Antimony (Sb)	ug/g	1.0	ND	1014291	ND	1	1014291
Acid Extractable Arsenic (As)	ug/g	17	4	1014298	4	1	1014292
Acid Extractable Barium (Ba)	ug/g	210	48	1014298	50	0.5	1014292
Acid Extractable Beryllium (Be)	ug/g	1.2	ND	1014298	ND	0.5	1014292
Acid Extractable Cadmium (Cd)	ug/g	1.0	ND	1014298	ND	0.3	1014292
Acid Extractable Chromium (Cr)	ug/g	71	15	1014298	13	0.5	1014292
Acid Extractable Cobalt (Co)	ug/g	21	6.9	1014298	8.7	0.5	1014292
Acid Extractable Copper (Cu)	ug/g	85	21	1014298	26	0.5	1014292
Acid Extractable Lead (Pb)	ug/g	120	7	1014298	8	1	1014292
Acid Extractable Mercury (Hg)	ug/g	0.23	ND	1013696	ND	0.05	1013696
Acid Extractable Molybdenum (Mo)	ug/g	2.5	ND	1014298	ND	0.5	1014292
Acid Extractable Nickel (Ni)	ug/g	43	14	1014298	18	0.5	1014292
Acid Extractable Selenium (Se)	ug/g	1.9	ND	1014291	ND	1	1014291
Acid Extractable Silver (Ag)	ug/g	0.42	ND	1014298	ND	0.3	1014292
Acid Extractable Vanadium (V)	ug/g	91	27	1014298	26	0.5	1014292
Acid Extractable Zinc (Zn)	ug/g	160	34	1014298	39	3	1014292

ND = Not detected

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

CRITERIA: Ref. to Ontario Regulation 153/04 made under the Environmental protection Act on May 12, 2004.

Table 1: Full Depth Background Site Condition Standards.

Soil - All Other Types of Property Use.

Maxxam Job #: A669785  
Report Date: 2006/07/21

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID			N07183		N07184		
Sampling Date			2006/07/10		2006/07/10		
COC Number			00441047		00441047		
	Units	Criteria	BH13 SS4	QC Batch	BH14 SS1A	RDL	QC Batch

<b>METALS</b>							
Acid Extractable Antimony (Sb)	ug/g	1.0	ND	1014291	ND	1	1014291
Acid Extractable Arsenic (As)	ug/g	17	4	1014298	7	1	1014298
Acid Extractable Barium (Ba)	ug/g	210	82	1014298	100	0.5	1014298
Acid Extractable Beryllium (Be)	ug/g	1.2	0.7	1014298	0.7	0.5	1014298
Acid Extractable Cadmium (Cd)	ug/g	1.0	ND	1014298	ND	0.3	1014298
Acid Extractable Chromium (Cr)	ug/g	71	23	1014298	21	0.5	1014298
Acid Extractable Cobalt (Co)	ug/g	21	13	1014298	10	0.5	1014298
Acid Extractable Copper (Cu)	ug/g	85	40	1014298	29	0.5	1014298
Acid Extractable Lead (Pb)	ug/g	120	12	1014298	18	1	1014298
Acid Extractable Mercury (Hg)	ug/g	0.23	ND	1013696	ND	0.05	1014130
Acid Extractable Molybdenum (Mo)	ug/g	2.5	ND	1014298	0.7	0.5	1014298
Acid Extractable Nickel (Ni)	ug/g	43	27	1014298	19	0.5	1014298
Acid Extractable Selenium (Se)	ug/g	1.9	ND	1014291	ND	1	1014291
Acid Extractable Silver (Ag)	ug/g	0.42	ND	1014298	ND	0.3	1014298
Acid Extractable Vanadium (V)	ug/g	91	32	1014298	34	0.5	1014298
Acid Extractable Zinc (Zn)	ug/g	160	62	1014298	57	3	1014298

ND = Not detected

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

CRITERIA: Ref. to Ontario Regulation 153/04 made under the Environmental protection Act on May 12, 2004.

Table 1: Full Depth Background Site Condition Standards.

Soil - All Other Types of Property Use.

Maxxam Job #: A669785  
Report Date: 2006/07/21

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID			N07185		N07186		
Sampling Date			2006/07/10		2006/07/10		
COC Number			00441047		00441047		
	Units	Criteria	BH14 SS3	QC Batch	BH14 SS2	RDL	QC Batch

<b>METALS</b>							
Acid Extractable Antimony (Sb)	ug/g	1.0	ND	1014291	ND	1	1012803
Acid Extractable Arsenic (As)	ug/g	17	6	1014298	5	1	1014326
Acid Extractable Barium (Ba)	ug/g	210	130	1014298	110	0.5	1014326
Acid Extractable Beryllium (Be)	ug/g	1.2	0.8	1014298	0.7	0.5	1014326
Acid Extractable Cadmium (Cd)	ug/g	1.0	ND	1014298	ND	0.3	1014326
Acid Extractable Chromium (Cr)	ug/g	71	24	1014298	21	0.5	1014326
Acid Extractable Cobalt (Co)	ug/g	21	14	1014298	12	0.5	1014326
Acid Extractable Copper (Cu)	ug/g	85	36	1014298	32	0.5	1014326
Acid Extractable Lead (Pb)	ug/g	120	13	1014298	16	1	1014326
Acid Extractable Mercury (Hg)	ug/g	0.23	ND	1013696	ND	0.05	1012762
Acid Extractable Molybdenum (Mo)	ug/g	2.5	0.6	1014298	ND	0.5	1014326
Acid Extractable Nickel (Ni)	ug/g	43	31	1014298	26	0.5	1014326
Acid Extractable Selenium (Se)	ug/g	1.9	ND	1014291	ND	1	1012803
Acid Extractable Silver (Ag)	ug/g	0.42	ND	1014298	ND	0.3	1014326
Acid Extractable Vanadium (V)	ug/g	91	33	1014298	30	0.5	1014326
Acid Extractable Zinc (Zn)	ug/g	160	69	1014298	61	3	1014326

ND = Not detected

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

CRITERIA: Ref. to Ontario Regulation 153/04 made under the Environmental protection Act on May 12, 2004.

Table 1: Full Depth Background Site Condition Standards.

Soil - All Other Types of Property Use.

Maxxam Job #: A669785  
Report Date: 2006/07/21

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID			N07187		N07188		
Sampling Date			2006/07/07		2006/07/10		
COC Number			00441047		00441047		
	Units	Criteria	BH2 SS2-1	QC Batch	BH13 SS2A-1	RDL	QC Batch

METALS							
Acid Extractable Antimony (Sb)	ug/g	1.0	ND	1014360	ND	1	1012803
Acid Extractable Arsenic (As)	ug/g	17	4	1014298	5	1	1012782
Acid Extractable Barium (Ba)	ug/g	210	85	1014298	47	0.5	1012782
Acid Extractable Beryllium (Be)	ug/g	1.2	1.1	1014298	ND	0.5	1012782
Acid Extractable Cadmium (Cd)	ug/g	1.0	ND	1014298	ND	0.3	1012782
Acid Extractable Chromium (Cr)	ug/g	71	23	1014298	15	0.5	1012782
Acid Extractable Cobalt (Co)	ug/g	21	15	1014298	8.0	0.5	1012782
Acid Extractable Copper (Cu)	ug/g	85	7.0	1014298	23	0.5	1012782
Acid Extractable Lead (Pb)	ug/g	120	9	1014298	9	1	1012782
Acid Extractable Mercury (Hg)	ug/g	0.23	ND	1014130	ND	0.05	1014130
Acid Extractable Molybdenum (Mo)	ug/g	2.5	0.5	1014298	ND	0.5	1012782
Acid Extractable Nickel (Ni)	ug/g	43	32	1014298	15	0.5	1012782
Acid Extractable Selenium (Se)	ug/g	1.9	ND	1014360	ND	1	1012803
Acid Extractable Silver (Ag)	ug/g	0.42	ND	1014298	ND	0.3	1012782
Acid Extractable Vanadium (V)	ug/g	91	34	1014298	27	0.5	1012782
Acid Extractable Zinc (Zn)	ug/g	160	67	1014298	37	3	1012782

ND = Not detected

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

CRITERIA: Ref. to Ontario Regulation 153/04 made under the Environmental protection Act on May 12, 2004.

Table 1: Full Depth Background Site Condition Standards.

Soil - All Other Types of Property Use.

Maxxam Job #: A669785  
Report Date: 2006/07/21

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID			N07189		N07190		
Sampling Date			2006/07/10		2006/07/10		
COC Number			00441047		00441047		
	Units	Criteria	BH15 SS1A	QC Batch	BH15 SS1B	RDL	QC Batch

<b>METALS</b>							
Acid Extractable Antimony (Sb)	ug/g	1.0	ND	1012803	ND	1	1014291
Acid Extractable Arsenic (As)	ug/g	17	5	1012782	6	1	1014298
Acid Extractable Barium (Ba)	ug/g	210	120	1012782	120	0.5	1014298
Acid Extractable Beryllium (Be)	ug/g	1.2	ND	1012782	0.8	0.5	1014298
Acid Extractable Cadmium (Cd)	ug/g	1.0	ND	1012782	ND	0.3	1014298
Acid Extractable Chromium (Cr)	ug/g	71	25	1012782	25	0.5	1014298
Acid Extractable Cobalt (Co)	ug/g	21	10	1012782	14	0.5	1014298
Acid Extractable Copper (Cu)	ug/g	85	47	1012782	44	0.5	1014298
Acid Extractable Lead (Pb)	ug/g	120	14	1012782	14	1	1014298
Acid Extractable Mercury (Hg)	ug/g	0.23	ND	1014130	ND	0.05	1014130
Acid Extractable Molybdenum (Mo)	ug/g	2.5	ND	1012782	ND	0.5	1014298
Acid Extractable Nickel (Ni)	ug/g	43	23	1012782	29	0.5	1014298
Acid Extractable Selenium (Se)	ug/g	1.9	ND	1012803	ND	1	1014291
Acid Extractable Silver (Ag)	ug/g	0.42	ND	1012782	ND	0.3	1014298
Acid Extractable Vanadium (V)	ug/g	91	38	1012782	36	0.5	1014298
Acid Extractable Zinc (Zn)	ug/g	160	73	1012782	67	3	1014298

ND = Not detected

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

CRITERIA: Ref. to Ontario Regulation 153/04 made under the Environmental protection Act on May 12, 2004.

Table 1: Full Depth Background Site Condition Standards.

Soil - All Other Types of Property Use.

Maxxam Job #: A669785  
Report Date: 2006/07/21

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID			N07191		
Sampling Date			2006/07/10		
COC Number			00441047		
	Units	Criteria	BH15 SS2	RDL	QC Batch

METALS					
Acid Extractable Antimony (Sb)	ug/g	1.0	ND	1	1012803
Acid Extractable Arsenic (As)	ug/g	17	6	1	1014298
Acid Extractable Barium (Ba)	ug/g	210	110	0.5	1014298
Acid Extractable Beryllium (Be)	ug/g	1.2	0.7	0.5	1014298
Acid Extractable Cadmium (Cd)	ug/g	1.0	ND	0.3	1014298
Acid Extractable Chromium (Cr)	ug/g	71	22	0.5	1014298
Acid Extractable Cobalt (Co)	ug/g	21	14	0.5	1014298
Acid Extractable Copper (Cu)	ug/g	85	35	0.5	1014298
Acid Extractable Lead (Pb)	ug/g	120	12	1	1014298
Acid Extractable Mercury (Hg)	ug/g	0.23	ND	0.05	1013696
Acid Extractable Molybdenum (Mo)	ug/g	2.5	ND	0.5	1014298
Acid Extractable Nickel (Ni)	ug/g	43	28	0.5	1014298
Acid Extractable Selenium (Se)	ug/g	1.9	ND	1	1012803
Acid Extractable Silver (Ag)	ug/g	0.42	ND	0.3	1014298
Acid Extractable Vanadium (V)	ug/g	91	32	0.5	1014298
Acid Extractable Zinc (Zn)	ug/g	160	63	3	1014298

ND = Not detected

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

CRITERIA: Ref. to Ontario Regulation 153/04 made under the Environmental protection Act on May 12, 2004.

Table 1: Full Depth Background Site Condition Standards.

Soil - All Other Types of Property Use.

Maxxam Job #: A669785  
Report Date: 2006/07/21

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

GENERAL COMMENTS

Results relate only to the items tested.

Peto MacCallum Ltd  
Attention: Melissa King  
Client Project #: 06HF033  
P.O. #:  
Project name:

### Quality Assurance Report

Maxxam Job Number: MA669785

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
1012762 MC	MATRIX SPIKE	Acid Extractable Mercury (Hg)	2006/07/18		101	%	75 - 125
	QC STANDARD	Acid Extractable Mercury (Hg)	2006/07/18		104	%	80 - 120
	Spiked Blank	Acid Extractable Mercury (Hg)	2006/07/18		102	%	75 - 125
	Method Blank	Acid Extractable Mercury (Hg)	2006/07/18	ND, RDL=0.05		ug/g	
	RPD	Acid Extractable Mercury (Hg)	2006/07/18	NC		%	35
1012782 GBU	MATRIX SPIKE	Acid Extractable Arsenic (As)	2006/07/18		98	%	75 - 125
		Acid Extractable Barium (Ba)	2006/07/18		103	%	75 - 125
		Acid Extractable Beryllium (Be)	2006/07/18		102	%	75 - 125
		Acid Extractable Cadmium (Cd)	2006/07/18		98	%	75 - 125
		Acid Extractable Chromium (Cr)	2006/07/18		103	%	75 - 125
		Acid Extractable Cobalt (Co)	2006/07/18		101	%	75 - 125
		Acid Extractable Copper (Cu)	2006/07/18		102	%	75 - 125
		Acid Extractable Lead (Pb)	2006/07/18		99	%	75 - 125
		Acid Extractable Molybdenum (Mo)	2006/07/18		99	%	75 - 125
		Acid Extractable Nickel (Ni)	2006/07/18		99	%	75 - 125
		Acid Extractable Silver (Ag)	2006/07/18		97	%	75 - 125
		Acid Extractable Vanadium (V)	2006/07/18		104	%	75 - 125
		Acid Extractable Zinc (Zn)	2006/07/18		103	%	75 - 125
	QC STANDARD	Acid Extractable Arsenic (As)	2006/07/18		123	%	30 - 170
		Acid Extractable Barium (Ba)	2006/07/18		114	%	70 - 130
		Acid Extractable Chromium (Cr)	2006/07/18		98	%	40 - 160
		Acid Extractable Cobalt (Co)	2006/07/18		109	%	75 - 125
		Acid Extractable Copper (Cu)	2006/07/18		114	%	73 - 127
		Acid Extractable Lead (Pb)	2006/07/18		106	%	54 - 146
		Acid Extractable Nickel (Ni)	2006/07/18		109	%	61 - 139
		Acid Extractable Vanadium (V)	2006/07/18		116	%	50 - 150
		Acid Extractable Zinc (Zn)	2006/07/18		114	%	72 - 128
	Method Blank	Acid Extractable Arsenic (As)	2006/07/18	ND, RDL=1		ug/g	
		Acid Extractable Barium (Ba)	2006/07/18	ND, RDL=0.5		ug/g	
		Acid Extractable Beryllium (Be)	2006/07/18	ND, RDL=0.5		ug/g	
		Acid Extractable Cadmium (Cd)	2006/07/18	ND, RDL=0.3		ug/g	
		Acid Extractable Chromium (Cr)	2006/07/18	ND, RDL=0.5		ug/g	
		Acid Extractable Cobalt (Co)	2006/07/18	ND, RDL=0.5		ug/g	
		Acid Extractable Copper (Cu)	2006/07/18	ND, RDL=0.5		ug/g	
		Acid Extractable Lead (Pb)	2006/07/18	ND, RDL=1		ug/g	
		Acid Extractable Molybdenum (Mo)	2006/07/18	ND, RDL=0.5		ug/g	
		Acid Extractable Nickel (Ni)	2006/07/18	ND, RDL=0.5		ug/g	
		Acid Extractable Silver (Ag)	2006/07/18	ND, RDL=0.3		ug/g	
		Acid Extractable Vanadium (V)	2006/07/18	ND, RDL=0.5		ug/g	
		Acid Extractable Zinc (Zn)	2006/07/18	ND, RDL=3		ug/g	
	RPD	Acid Extractable Arsenic (As)	2006/07/18	NC		%	20
		Acid Extractable Barium (Ba)	2006/07/18	10.5		%	20
		Acid Extractable Beryllium (Be)	2006/07/18	NC		%	20
		Acid Extractable Cadmium (Cd)	2006/07/18	NC		%	20
		Acid Extractable Chromium (Cr)	2006/07/18	1.7		%	20
		Acid Extractable Cobalt (Co)	2006/07/18	NC		%	20
		Acid Extractable Copper (Cu)	2006/07/18	10.4		%	20
		Acid Extractable Lead (Pb)	2006/07/18	NC		%	20
		Acid Extractable Molybdenum (Mo)	2006/07/18	NC		%	20
		Acid Extractable Nickel (Ni)	2006/07/18	4.4		%	20
		Acid Extractable Silver (Ag)	2006/07/18	NC		%	20
		Acid Extractable Vanadium (V)	2006/07/18	19.4		%	20
		Acid Extractable Zinc (Zn)	2006/07/18	5.3		%	20
1012803 HRE	MATRIX SPIKE	Acid Extractable Selenium (Se)	2006/07/18		100	%	75 - 125
	QC STANDARD	Acid Extractable Antimony (Sb)	2006/07/18		101	%	82 - 128
		Acid Extractable Selenium (Se)	2006/07/18		104	%	82 - 118

Peto MacCallum Ltd  
Attention: Melissa King  
Client Project #: 06HF033  
P.O. #:  
Project name:

### Quality Assurance Report (Continued)

Maxxam Job Number: MA669785

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
1012803 HRE	Method Blank	Acid Extractable Antimony (Sb)	2006/07/18	ND, RDL=1		ug/g	
		Acid Extractable Selenium (Se)	2006/07/18	ND, RDL=1		ug/g	
	RPD	Acid Extractable Antimony (Sb)	2006/07/18	NC		%	35
		Acid Extractable Selenium (Se)	2006/07/18	NC		%	35
1013696 MC	MATRIX SPIKE	Acid Extractable Mercury (Hg)	2006/07/18		99	%	75 - 125
		QC STANDARD	2006/07/18		109	%	80 - 120
	Spiked Blank	Acid Extractable Mercury (Hg)	2006/07/18		100	%	75 - 125
		Method Blank	2006/07/18	ND, RDL=0.05		ug/g	
	RPD	Acid Extractable Mercury (Hg)	2006/07/18	NC		%	35
1014130 MC	MATRIX SPIKE	Acid Extractable Mercury (Hg)	2006/07/19		103	%	75 - 125
		QC STANDARD	2006/07/19		113	%	80 - 120
	Spiked Blank	Acid Extractable Mercury (Hg)	2006/07/19		98	%	75 - 125
		Method Blank	2006/07/19	ND, RDL=0.05		ug/g	
	RPD [N07184-01]	Acid Extractable Mercury (Hg)	2006/07/19	NC		%	35
1014291 AHE	MATRIX SPIKE	Acid Extractable Antimony (Sb)	2006/07/19		104	%	75 - 125
		Acid Extractable Selenium (Se)	2006/07/19		110	%	75 - 125
	QC STANDARD	Acid Extractable Antimony (Sb)	2006/07/19		105	%	N/A
		Acid Extractable Selenium (Se)	2006/07/19		101	%	N/A
	Method Blank	Acid Extractable Antimony (Sb)	2006/07/19	ND, RDL=1		ug/g	
		Acid Extractable Selenium (Se)	2006/07/19	ND, RDL=1		ug/g	
	RPD [N07181-01]	Acid Extractable Antimony (Sb)	2006/07/19	NC		%	35
		Acid Extractable Selenium (Se)	2006/07/19	NC		%	35
	MATRIX SPIKE	Acid Extractable Arsenic (As)	2006/07/19		105	%	75 - 125
		Acid Extractable Barium (Ba)	2006/07/19		111	%	75 - 125
1014292 GBU	MATRIX SPIKE	Acid Extractable Beryllium (Be)	2006/07/19		103	%	75 - 125
		Acid Extractable Cadmium (Cd)	2006/07/19		103	%	75 - 125
		Acid Extractable Chromium (Cr)	2006/07/19		114	%	75 - 125
		Acid Extractable Cobalt (Co)	2006/07/19		104	%	75 - 125
		Acid Extractable Copper (Cu)	2006/07/19		104	%	75 - 125
		Acid Extractable Lead (Pb)	2006/07/19		104	%	75 - 125
		Acid Extractable Molybdenum (Mo)	2006/07/19		103	%	75 - 125
		Acid Extractable Nickel (Ni)	2006/07/19		107	%	75 - 125
		Acid Extractable Silver (Ag)	2006/07/19		101	%	75 - 125
		Acid Extractable Vanadium (V)	2006/07/19		131 (1)	%	75 - 125
		Acid Extractable Zinc (Zn)	2006/07/19		112	%	75 - 125
	QC STANDARD	Acid Extractable Arsenic (As)	2006/07/19		121	%	30 - 170
		Acid Extractable Barium (Ba)	2006/07/19		111	%	70 - 130
		Acid Extractable Chromium (Cr)	2006/07/19		99	%	40 - 160
		Acid Extractable Cobalt (Co)	2006/07/19		111	%	75 - 125
		Acid Extractable Copper (Cu)	2006/07/19		112	%	73 - 127
		Acid Extractable Lead (Pb)	2006/07/19		106	%	54 - 146
		Acid Extractable Nickel (Ni)	2006/07/19		113	%	61 - 139
		Acid Extractable Vanadium (V)	2006/07/19		115	%	50 - 150
		Acid Extractable Zinc (Zn)	2006/07/19		112	%	72 - 128
	Method Blank	Acid Extractable Arsenic (As)	2006/07/19	ND, RDL=1		ug/g	
		Acid Extractable Barium (Ba)	2006/07/19	ND, RDL=0.5		ug/g	
		Acid Extractable Beryllium (Be)	2006/07/19	ND, RDL=0.5		ug/g	
		Acid Extractable Cadmium (Cd)	2006/07/19	ND, RDL=0.3		ug/g	
		Acid Extractable Chromium (Cr)	2006/07/19	ND, RDL=0.5		ug/g	
		Acid Extractable Cobalt (Co)	2006/07/19	ND, RDL=0.5		ug/g	
		Acid Extractable Copper (Cu)	2006/07/19	ND, RDL=0.5		ug/g	
		Acid Extractable Lead (Pb)	2006/07/19	ND, RDL=1		ug/g	
		Acid Extractable Molybdenum (Mo)	2006/07/19	ND, RDL=0.5		ug/g	
		Acid Extractable Nickel (Ni)	2006/07/19	ND, RDL=0.5		ug/g	

Peto MacCallum Ltd  
Attention: Melissa King  
Client Project #: 06HF033  
P.O. #:  
Project name:

### Quality Assurance Report (Continued)

Maxxam Job Number: MA669785

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
1014292 GBU	Method Blank	Acid Extractable Silver (Ag)	2006/07/19	ND, RDL=0.3		ug/g	
		Acid Extractable Vanadium (V)	2006/07/19	ND, RDL=0.5		ug/g	
	RPD	Acid Extractable Zinc (Zn)	2006/07/19	ND, RDL=3		ug/g	
		Acid Extractable Barium (Ba)	2006/07/19	2.4		%	20
		Acid Extractable Beryllium (Be)	2006/07/19	NC		%	20
		Acid Extractable Cadmium (Cd)	2006/07/19	NC		%	20
		Acid Extractable Chromium (Cr)	2006/07/19	3.2		%	20
		Acid Extractable Cobalt (Co)	2006/07/19	3.6		%	20
		Acid Extractable Copper (Cu)	2006/07/19	0.7		%	20
		Acid Extractable Lead (Pb)	2006/07/19	0.8		%	20
		Acid Extractable Molybdenum (Mo)	2006/07/19	3.5		%	20
		Acid Extractable Nickel (Ni)	2006/07/19	2.1		%	20
		Acid Extractable Silver (Ag)	2006/07/19	NC		%	20
		Acid Extractable Vanadium (V)	2006/07/19	3.6		%	20
		Acid Extractable Zinc (Zn)	2006/07/19	2.3		%	20
1014298 GBU	MATRIX SPIKE [N07185-01]	Acid Extractable Arsenic (As)	2006/07/19		99	%	75 - 125
		Acid Extractable Barium (Ba)	2006/07/19		117	%	75 - 125
		Acid Extractable Beryllium (Be)	2006/07/19		102	%	75 - 125
		Acid Extractable Cadmium (Cd)	2006/07/19		95	%	75 - 125
		Acid Extractable Chromium (Cr)	2006/07/19		111	%	75 - 125
		Acid Extractable Cobalt (Co)	2006/07/19		100	%	75 - 125
		Acid Extractable Copper (Cu)	2006/07/19		102	%	75 - 125
		Acid Extractable Lead (Pb)	2006/07/19		98	%	75 - 125
		Acid Extractable Molybdenum (Mo)	2006/07/19		102	%	75 - 125
		Acid Extractable Nickel (Ni)	2006/07/19		99	%	75 - 125
		Acid Extractable Silver (Ag)	2006/07/19		101	%	75 - 125
		Acid Extractable Vanadium (V)	2006/07/19		120	%	75 - 125
		Acid Extractable Zinc (Zn)	2006/07/19		98	%	75 - 125
	QC STANDARD	Acid Extractable Arsenic (As)	2006/07/19		124	%	30 - 170
		Acid Extractable Barium (Ba)	2006/07/19		120	%	70 - 130
		Acid Extractable Chromium (Cr)	2006/07/19		110	%	40 - 160
		Acid Extractable Cobalt (Co)	2006/07/19		115	%	75 - 125
		Acid Extractable Copper (Cu)	2006/07/19		117	%	73 - 127
		Acid Extractable Lead (Pb)	2006/07/19		108	%	54 - 146
		Acid Extractable Nickel (Ni)	2006/07/19		115	%	61 - 139
		Acid Extractable Vanadium (V)	2006/07/19		130	%	50 - 150
		Acid Extractable Zinc (Zn)	2006/07/19		116	%	72 - 128
	Method Blank	Acid Extractable Arsenic (As)	2006/07/19	ND, RDL=1		ug/g	
		Acid Extractable Barium (Ba)	2006/07/19	ND, RDL=0.5		ug/g	
		Acid Extractable Beryllium (Be)	2006/07/19	ND, RDL=0.5		ug/g	
		Acid Extractable Cadmium (Cd)	2006/07/19	ND, RDL=0.3		ug/g	
		Acid Extractable Chromium (Cr)	2006/07/19	ND, RDL=0.5		ug/g	
		Acid Extractable Cobalt (Co)	2006/07/19	ND, RDL=0.5		ug/g	
		Acid Extractable Copper (Cu)	2006/07/19	ND, RDL=0.5		ug/g	
		Acid Extractable Lead (Pb)	2006/07/19	ND, RDL=1		ug/g	
		Acid Extractable Molybdenum (Mo)	2006/07/19	ND, RDL=0.5		ug/g	
		Acid Extractable Nickel (Ni)	2006/07/19	ND, RDL=0.5		ug/g	
		Acid Extractable Silver (Ag)	2006/07/19	ND, RDL=0.3		ug/g	
		Acid Extractable Vanadium (V)	2006/07/19	ND, RDL=0.5		ug/g	
		Acid Extractable Zinc (Zn)	2006/07/19	ND, RDL=3		ug/g	
	RPD [N07185-01]	Acid Extractable Arsenic (As)	2006/07/19	7.8		%	20
		Acid Extractable Barium (Ba)	2006/07/19	4.6		%	20
		Acid Extractable Beryllium (Be)	2006/07/19	NC		%	20
		Acid Extractable Cadmium (Cd)	2006/07/19	NC		%	20
		Acid Extractable Chromium (Cr)	2006/07/19	0.9		%	20

Peto MacCallum Ltd  
Attention: Melissa King  
Client Project #: 06HF033  
P.O. #:  
Project name:

## Quality Assurance Report (Continued)

Maxxam Job Number: MA669785

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
1014298 GBU	RPD [N07185-01]	Acid Extractable Cobalt (Co)	2006/07/19	1.8		%	20
		Acid Extractable Copper (Cu)	2006/07/19	0.9		%	20
		Acid Extractable Lead (Pb)	2006/07/19	0.07		%	20
		Acid Extractable Molybdenum (Mo)	2006/07/19	NC		%	20
		Acid Extractable Nickel (Ni)	2006/07/19	0.7		%	20
		Acid Extractable Silver (Ag)	2006/07/19	NC		%	20
		Acid Extractable Vanadium (V)	2006/07/19	0.6		%	20
		Acid Extractable Zinc (Zn)	2006/07/19	1.6		%	20
1014326 GBU	MATRIX SPIKE	Acid Extractable Arsenic (As)	2006/07/19		99	%	75 - 125
		Acid Extractable Barium (Ba)	2006/07/19		97	%	75 - 125
		Acid Extractable Beryllium (Be)	2006/07/19		98	%	75 - 125
		Acid Extractable Cadmium (Cd)	2006/07/19		99	%	75 - 125
		Acid Extractable Chromium (Cr)	2006/07/19		99	%	75 - 125
		Acid Extractable Cobalt (Co)	2006/07/19		98	%	75 - 125
		Acid Extractable Copper (Cu)	2006/07/19		99	%	75 - 125
		Acid Extractable Lead (Pb)	2006/07/19		98	%	75 - 125
		Acid Extractable Molybdenum (Mo)	2006/07/19		100	%	75 - 125
		Acid Extractable Nickel (Ni)	2006/07/19		98	%	75 - 125
		Acid Extractable Silver (Ag)	2006/07/19		98	%	75 - 125
		Acid Extractable Vanadium (V)	2006/07/19		104	%	75 - 125
		Acid Extractable Zinc (Zn)	2006/07/19		98	%	75 - 125
	QC STANDARD	Acid Extractable Arsenic (As)	2006/07/19		124	%	30 - 170
		Acid Extractable Barium (Ba)	2006/07/19		107	%	70 - 130
		Acid Extractable Chromium (Cr)	2006/07/19		90	%	40 - 160
		Acid Extractable Cobalt (Co)	2006/07/19		106	%	75 - 125
		Acid Extractable Copper (Cu)	2006/07/19		110	%	73 - 127
		Acid Extractable Lead (Pb)	2006/07/19		106	%	54 - 146
		Acid Extractable Nickel (Ni)	2006/07/19		110	%	61 - 139
		Acid Extractable Vanadium (V)	2006/07/19		107	%	50 - 150
		Acid Extractable Zinc (Zn)	2006/07/19		110	%	72 - 128
	Method Blank	Acid Extractable Arsenic (As)	2006/07/19	ND, RDL=1		ug/g	
		Acid Extractable Barium (Ba)	2006/07/19	ND, RDL=0.5		ug/g	
		Acid Extractable Beryllium (Be)	2006/07/19	ND, RDL=0.5		ug/g	
		Acid Extractable Cadmium (Cd)	2006/07/19	ND, RDL=0.3		ug/g	
		Acid Extractable Chromium (Cr)	2006/07/19	ND, RDL=0.5		ug/g	
		Acid Extractable Cobalt (Co)	2006/07/19	ND, RDL=0.5		ug/g	
		Acid Extractable Copper (Cu)	2006/07/19	ND, RDL=0.5		ug/g	
		Acid Extractable Lead (Pb)	2006/07/19	ND, RDL=1		ug/g	
		Acid Extractable Molybdenum (Mo)	2006/07/19	ND, RDL=0.5		ug/g	
		Acid Extractable Nickel (Ni)	2006/07/19	ND, RDL=0.5		ug/g	
		Acid Extractable Silver (Ag)	2006/07/19	ND, RDL=0.3		ug/g	
		Acid Extractable Vanadium (V)	2006/07/19	ND, RDL=0.5		ug/g	
		Acid Extractable Zinc (Zn)	2006/07/19	ND, RDL=3		ug/g	
	RPD	Acid Extractable Lead (Pb)	2006/07/19	NC		%	20
1014360 AHE	MATRIX SPIKE	Acid Extractable Antimony (Sb)	2006/07/19		98	%	75 - 125
		Acid Extractable Selenium (Se)	2006/07/19		107	%	75 - 125
	QC STANDARD	Acid Extractable Antimony (Sb)	2006/07/19		107	%	N/A
		Acid Extractable Selenium (Se)	2006/07/19		104	%	N/A
	Method Blank	Acid Extractable Antimony (Sb)	2006/07/19	ND, RDL=1		ug/g	
		Acid Extractable Selenium (Se)	2006/07/19	ND, RDL=1		ug/g	
	RPD	Acid Extractable Antimony (Sb)	2006/07/19	NC		%	35
		Acid Extractable Selenium (Se)	2006/07/19	NC		%	35
1014608 HRE	MATRIX SPIKE	Acid Extractable Selenium (Se)	2006/07/19		110 (2)	%	75 - 125
	QC STANDARD	Acid Extractable Antimony (Sb)	2006/07/19		104	%	N/A
		Acid Extractable Selenium (Se)	2006/07/19		102	%	N/A
	Method Blank	Acid Extractable Antimony (Sb)	2006/07/19	ND, RDL=1		ug/g	

Peto MacCallum Ltd  
Attention: Melissa King  
Client Project #: 06HF033  
P.O. #:  
Project name:

### Quality Assurance Report (Continued)

Maxxam Job Number: MA669785

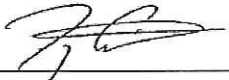
QA/QC Batch				Date Analyzed				
Num Init	QC Type	Parameter		yyyy/mm/dd	Value	Recovery	Units	QC Limits
1014608 HRE	Method Blank	Acid Extractable Selenium (Se)		2006/07/19	ND, RDL=1		ug/g	
<p>ND = Not detected N/A = Not Applicable NC = Non-calculable RPD = Relative Percent Difference QC Standard = Quality Control Standard SPIKE = Fortified sample</p> <p>(1) Matrix Spike recovery is above acceptance criteria. This may represent a high bias in some results for this particular element. (2) Metal analysis: samples were analyzed by ICPMS instead of Graphite Furnace A.A. No impact on detection limits or data quality is expected.</p>								

Validation Signature Page

Maxxam Job #: A669785

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The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



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TROY CARRIERE, B.Sc., Scientific Specialist

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. SCC and CAEAL have approved this reporting process and electronic report format.

# CHAIN OF CUSTODY RECORD

Page 1 of 2

**Maxxam** 6740 Campbell Road, Mississauga, ON L5N 2L3  
 Phone: 905-817-5700 Fax: 905-817-5778 Toll Free: (800) 563-6266

<b>INVOICE INFORMATION</b> Company Name: <u>Peto MacCallum Ltd.</u> Contact Name: <u>Danika Durish</u> Address: <u>45 Burford Road</u> <u>Hamilton, ON L8E 3C6</u> Phone: <u>905-561-2381</u> Fax: <u>905-561-6366</u> Email: <u>hamilton@petomacallum.com</u>		<b>REPORT INFORMATION (if differs from Invoice)</b> Company Name: <u>Peto MacCallum Ltd.</u> Contact Name: <u>Melissa King</u> Address: _____ Phone: _____ Fax: _____ Email: <u>mking@petomacallum.com</u>		<b>PROJECT INFORMATION</b> Quotation #: <u>A65039</u> P.O. #: _____ Project #: <u>00HF033</u> Project Name: _____ Location: _____ Sampled By: <u>Mike Rapsey</u>		<b>MAXXAM JOB NUMBER</b> CHAIN OF CUSTODY # <u>00441048</u>	
----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--	-------------------------------------------------------------------	--

REGULATORY CRITERIA				ANALYSIS REQUESTED (Please be specific)				TURNAROUND TIME (TAT) REQUIRED			
Note: For regulated drinking water samples - please use the Drinking Water Chain of Custody Form. <input type="checkbox"/> MISA <input type="checkbox"/> Reg. 153 <input type="checkbox"/> Sewer Use <input type="checkbox"/> Other <input type="checkbox"/> PW00 <input type="checkbox"/> Table 1 <input type="checkbox"/> Sanitary <input type="checkbox"/> Storm <input type="checkbox"/> specify <input type="checkbox"/> Reg. 558 <input type="checkbox"/> Table 2 <input type="checkbox"/> Region: _____ Report Criteria on C of A? <input checked="" type="checkbox"/> Yes				Regular (Standard) TAT: <input checked="" type="checkbox"/> 5 to 7 Working Days Rush TAT: Rush Confirmation #: _____ (call Lab for #) <input type="checkbox"/> 1 day <input type="checkbox"/> 2 days <input type="checkbox"/> 3 days DATE Required: _____ TIME Required: _____				PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS. Please note that TAT for certain tests such as BOD and Dissolved Phosphorus are > 5 days - contact your Project Manager for details.			
Sample Identification	Date Sampled	Time Sampled	Matrix (see SW 802.04)	Regulated Drinking Water? (Y/N)	Metals Field Filtered? (Y/N)	pH and related (as per spec)	# of Cont.	COMMENTS / TAT COMMENTS			
1 BH1 552	July 7/06		soil	N	N	X	1				
2 BH1 553			soil	N	N	X	1				
3 BH1 554			soil	N	N	X	1				
4 BH2 552			soil	N	N	X	1				
5 BH3 552	July 7/06		soil	N	N	X	1				
6 BH3 553			soil	N	N	X	1				
7 BH5 552	July 10/06		soil	N	N	X	1				
8 BH5 554			soil	N	N	X	1				
9 BH5 554			soil	N	N	X	1				
10 BH6 552A	July 10/06		soil	N	N	X	1				
11 BH6 552B			soil	N	N	X	1				
12 BH6 552C			soil	N	N	X	1				
RELINQUISHED BY (Signature/Print) <u>William D. Durish</u>				RECEIVED BY (Signature/Print) <u>[Signature]</u>				Date 7-12-06			
Time 1:38				Date 06/07/06				Time 17:42			
Laboratory Use Only Condition of Sample on Receipt <input type="checkbox"/> OK <input type="checkbox"/> SIF				Temperature (°C) on Receipt 21/23/25°C				Condition of Sample on Receipt <input type="checkbox"/> OK <input type="checkbox"/> SIF			

\*MANDATORY SECTIONS IN GREY MUST BE FILLED OUT. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White box only Yellow Mark Pink Client

INVOICE INFORMATION		REPORT INFORMATION (if differs from invoice)		PROJECT INFORMATION		MAXXAM JOB NUMBER
Company Name:	Peto MacCallum Ltd	Company Name:	Peto MacCallum Ltd	Question #:	A65039	
Contact Name:	Danika Durish	Contact Name:	Melissa King	P.O. #:		
Address:	45 Burford Rd Hamilton, ON L8E 3C6	Address:		Project #:	06HFE033	CHAIN OF CUSTODY #
Phone:	905-561-2331	Phone:		Project Name:		
Fax:	905-561-6366	Fax:		Locality:		00441047
Email:	hamilton@petomacallum.com	Email:	mkking@petomacallum.com	Sampled By:	Mike Rapsey	

REGULATORY CRITERIA		ANALYSIS REQUESTED (Please be specific)		TURNAROUND TIME (TAT) REQUIRED
<p><i>Note: For regulated drinking water samples - please use the Drinking Water Chain of Custody form.</i></p>				
<input type="checkbox"/> MISA <input type="checkbox"/> PWQC <input type="checkbox"/> Reg. 558	<input checked="" type="checkbox"/> Table 1 <input type="checkbox"/> Table 2 <input type="checkbox"/> Table 3 <i>all other</i>	Sewer Use <input type="checkbox"/> Sanitary <input type="checkbox"/> Storm Region: _____	<input type="checkbox"/> Other specify _____	Regular (Standard) TAT: <input checked="" type="checkbox"/> 5 to 7 Working Days Rush TAT: Rush Confirmation #: _____ (call Lab for #) <input type="checkbox"/> 1 day <input type="checkbox"/> 2 days <input type="checkbox"/> 3 days DATE Required: _____ TIME Required: _____

Sample Identification	Date Sampled	Time Sampled	Matrix (SW, SW, SW, etc.)	Regul. Metal	Date	Time	Laboratory Use Only
1 BH14 552A	JUN1006		SOIL	N N X			
2 BH14 552B			SOIL	N N X			
3 BH14 <del>552B</del> 554	↓		SOIL	N N X			
4 BH15 551A	JUN1006		SOIL	N N X			
5 BH15 <del>552B</del> 553	↓		SOIL	N N X			
6 BH15 552	↓		SOIL	N N X			
7 BH2 552-1	JUN1706		SOIL	N N X			
8 BH14 552A-1	JUN1006		SOIL	N N X			
9 BH16 551A	JUN1006		SOIL	N N X			
10 BH16 551B	↓		SOIL	N N X			
11 BH16 552	↓		SOIL	N N X			
12							

RELINQUISHED BY (Signature/Print)

*William D. Bulsh*

RECEIVED BY (Signature/Print)

*[Signature]* 002A CHV

Date

7-12-01

Time

1:39

RELINQUISHED BY (Signature/Print)

*William D. Bulsh*

RECEIVED BY (Signature/Print)

*[Signature]* 002A CHV

Date

06/07/12

Time

17:42

RELINQUISHED BY (Signature/Print)

*William D. Bulsh*

RECEIVED BY (Signature/Print)

*[Signature]* 002A CHV

Date

06/07/12

Time

17:42

RELINQUISHED BY (Signature/Print)

*William D. Bulsh*

RECEIVED BY (Signature/Print)

*[Signature]* 002A CHV

Date

06/07/12

Time

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*William D. Bulsh*

RECEIVED BY (Signature/Print)

*[Signature]* 002A CHV

Date

06/07/12

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*William D. Bulsh*

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*[Signature]* 002A CHV

Date

06/07/12

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*[Signature]* 002A CHV

Date

06/07/12

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*William D. Bulsh*

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*William D. Bulsh*

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*[Signature]* 002A CHV

Date

06/07/12

Time

17:42

RELINQUISHED BY (Signature/Print)

*William D. Bulsh*

RECEIVED BY (Signature/Print)

*[Signature]* 0

MANDATORY SECTIONS IN GREY MUST BE FILLED OUT. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

Page 14

White: Laxenar,  
Yellow: Mall

**Task:** Client

Your Project #: 06HF033  
Your C.O.C. #: 00441046

**Attention: Melissa King**  
Peto MacCallum Ltd  
45 Burford Rd  
Hamilton, ON  
L8E 3C6

Report Date: 2006/07/24

**CERTIFICATE OF ANALYSIS**

**MAXXAM JOB #: A671300**  
**Received: 2006/07/17, 13:39**

Sample Matrix: Soil  
# Samples Received: 20

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Acid Extractable Metals in Soil by GF	5	2006/07/21	2006/07/21	Ont SOP 0095	EPA 7010
Acid Extractable Metals in Soil by GF	15	2006/07/21	2006/07/24	Ont SOP 0095	EPA 7010
Mercury in Soil by CVAA	20	2006/07/21	2006/07/21	Ont SOP 0112	EPA 7470
Total Metals in Soil by Axial ICP-AES	20	2006/07/21	2006/07/21	Ont SOP-0072	EPA SW-846-6010C
pH CaCl2 EXTRACT	20	N/A	2006/07/21	Ont SOP-0067	4500-H+B

\* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key



Leena Thomas

24 Jul 2006 05:49:57 -04:00

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

LEENA THOMAS, Project Manager  
Email: leena.thomas@maxxamanalytics.com  
Phone# (905) 817-5700 Ext:5798

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. SCC and CAEAL have approved this reporting process and electronic report format.

For Service Group specific validation please refer to the Validation Signature Page

Total cover pages: 1

Page 1 of 17

Maxxam Job #: A671300  
Report Date: 2006/07/24

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### RESULTS OF ANALYSES OF SOIL

Maxxam ID		N14216	N14217	N14218	N14219		
Sampling Date		2006/07/07	2006/07/07	2006/07/07	2006/07/17 09:00		
COC Number		00441046	00441046	00441046	00441046		
	Units	BH 4 SS 1	BH 4 SS 2	BH 4 SS 3	BH 7 GS 1	RDL	QC Batch

<b>INORGANICS</b>							
Available (CaCl <sub>2</sub> ) pH	pH	7.53	7.61	7.71	7.37	N/A	1016028
RDL = Reportable Detection Limit QC Batch = Quality Control Batch							

Maxxam ID		N14220	N14221	N14222	N14223		
Sampling Date		2006/07/17	2006/07/17	2006/07/17 09:00	2006/07/05		
COC Number		00441046	00441046	00441046	00441046		
	Units	BH 7 SS 1	BH 7 SS 3	BH 8 GS 1	BH 8 AS 1	RDL	QC Batch

<b>INORGANICS</b>							
Available (CaCl <sub>2</sub> ) pH	pH	7.91	7.94	7.27	7.73	N/A	1016028
RDL = Reportable Detection Limit QC Batch = Quality Control Batch							

Maxxam ID		N14224	N14225	N14226	N14227		
Sampling Date		2006/07/05	2006/07/06	2006/07/06	2006/07/17 09:00		
COC Number		00441046	00441046	00441046	00441046		
	Units	BH 8 SS 2	BH 9 GS 1	BH 9 SS 1	BH 9 SS 4	RDL	QC Batch

<b>INORGANICS</b>							
Available (CaCl <sub>2</sub> ) pH	pH	7.77	6.96	7.92	8.14	N/A	1016028
RDL = Reportable Detection Limit QC Batch = Quality Control Batch							

Maxxam Job #: A671300  
Report Date: 2006/07/24

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### RESULTS OF ANALYSES OF SOIL

Maxxam ID		N14228	N14229	N14230	N14231		
Sampling Date		2006/07/17 09:00	2006/07/06	2006/07/06	2006/07/17 09:00		
COC Number		00441046	00441046	00441046	00441046		
	Units	BH 10 GS 1	BH 10 SS 1	BH 10 SS3	BH 11 GS 1	RDL	QC Batch

<b>INORGANICS</b>							
Available (CaCl2) pH	pH	6.76	7.89	7.95	6.89	N/A	1016028
RDL = Reportable Detection Limit QC Batch = Quality Control Batch							

Maxxam ID		N14232	N14233	N14234	N14235		
Sampling Date		2006/07/06	2006/07/06	2006/07/17 09:00	2006/07/06		
COC Number		00441046	00441046	00441046	00441046		
	Units	BH 11 SS 1	BH 11 SS 2	BH 9 GS 1-1	BH 11 SS 2-1	RDL	QC Batch

<b>INORGANICS</b>							
Available (CaCl2) pH	pH	7.16	7.77	6.93	7.74	N/A	1016028
RDL = Reportable Detection Limit QC Batch = Quality Control Batch							

Maxxam Job #: A671300  
Report Date: 2006/07/24

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID			N14216		N14217		
Sampling Date			2006/07/07		2006/07/07		
COC Number			00441046		00441046		
	Units	Criteria	BH 4 SS 1	QC Batch	BH 4 SS 2	RDL	QC Batch

Table 3  
11c/c

METALS							
Acid Extractable Antimony (Sb)	ug/g	1.0	ND	1016296	ND	1	1016296
Acid Extractable Arsenic (As)	ug/g	17	4	1016131	6	1	1016096
Acid Extractable Barium (Ba)	ug/g	210	61	1016131	110	0.5	1016096
Acid Extractable Beryllium (Be)	ug/g	1.2	0.5	1016131	0.8	0.5	1016096
Acid Extractable Cadmium (Cd)	ug/g	1.0	ND	1016131	0.3	0.3	1016096
Acid Extractable Chromium (Cr)	ug/g	71	14	1016131	18	0.5	1016096
Acid Extractable Cobalt (Co)	ug/g	21	7.8	1016131	13	0.5	1016096
Acid Extractable Copper (Cu)	ug/g	85	15	1016131	26	0.5	1016096
Acid Extractable Lead (Pb)	ug/g	120	25	1016131	57	1	1016096
Acid Extractable Mercury (Hg)	ug/g	0.23	ND	1016282	0.06	0.05	1016282
Acid Extractable Molybdenum (Mo)	ug/g	2.5	ND	1016131	1.0	0.5	1016096
Acid Extractable Nickel (Ni)	ug/g	43	13	1016131	25	0.5	1016096
Acid Extractable Selenium (Se)	ug/g	1.9	ND	1016296	ND	1	1016296
Acid Extractable Silver (Ag)	ug/g	0.42	ND	1016131	ND	0.3	1016096
Acid Extractable Vanadium (V)	ug/g	91	24	1016131	28	0.5	1016096
Acid Extractable Zinc (Zn)	ug/g	160	55	1016131	350	3	1016096

(800) 606

ND = Not detected  
RDL = Reportable Detection Limit  
QC Batch = Quality Control Batch  
CRITERIA: Ref. to Ontario Regulation 153/04 made under the Environmental protection Act on May 12, 2004.  
Table 1: Full Depth Background Site Condition Standards.  
Soil - All Other Types of Property Use.

Maxxam Job #: A671300  
Report Date: 2006/07/24

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID			N14218		N14219		
Sampling Date			2006/07/07		2006/07/17 09:00		
COC Number			00441046		00441046		
	Units	Criteria	BH 4 SS 3	QC Batch	BH 7 GS 1	RDL	QC Batch

METALS							
Acid Extractable Antimony (Sb)	ug/g	1.0	ND	1016296	ND	1	1016292
Acid Extractable Arsenic (As)	ug/g	17	4	1016096	12	1	1016096
Acid Extractable Barium (Ba)	ug/g	210	81	1016096	45	0.5	1016096
Acid Extractable Beryllium (Be)	ug/g	1.2	0.8	1016096	ND	0.5	1016096
Acid Extractable Cadmium (Cd)	ug/g	1.0	ND	1016096	ND	0.3	1016096
Acid Extractable Chromium (Cr)	ug/g	71	23	1016096	15	0.5	1016096
Acid Extractable Cobalt (Co)	ug/g	21	16	1016096	5.9	0.5	1016096
Acid Extractable Copper (Cu)	ug/g	85	8.5	1016096	18	0.5	1016096
Acid Extractable Lead (Pb)	ug/g	120	7	1016096	48	1	1016096
Acid Extractable Mercury (Hg)	ug/g	0.23	ND	1016282	ND	0.05	1016282
Acid Extractable Molybdenum (Mo)	ug/g	2.5	0.9	1016096	0.6	0.5	1016096
Acid Extractable Nickel (Ni)	ug/g	43	34	1016096	11	0.5	1016096
Acid Extractable Selenium (Se)	ug/g	1.9	ND	1016296	ND	1	1016292
Acid Extractable Silver (Ag)	ug/g	0.42	ND	1016096	ND	0.3	1016096
Acid Extractable Vanadium (V)	ug/g	91	28	1016096	21	0.5	1016096
Acid Extractable Zinc (Zn)	ug/g	160	70	1016096	78	3	1016096

ND = Not detected

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

CRITERIA: Ref. to Ontario Regulation 153/04 made under the Environmental protection Act on May 12, 2004.

Table 1: Full Depth Background Site Condition Standards.

Soil - All Other Types of Property Use.

Maxxam Job #: A671300  
Report Date: 2006/07/24

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID			N14220		N14221		
Sampling Date			2006/07/17		2006/07/17		
COC Number			00441046		00441046		
	Units	Criteria	BH 7 SS 1	QC Batch	BH 7 SS 3	RDL	QC Batch

<b>METALS</b>							
Acid Extractable Antimony (Sb)	ug/g	1.0	ND	1016296	ND	1	1016292
Acid Extractable Arsenic (As)	ug/g	17	3	1016096	3	1	1016096
Acid Extractable Barium (Ba)	ug/g	210	78	1016096	64	0.5	1016096
Acid Extractable Beryllium (Be)	ug/g	1.2	0.9	1016096	0.8	0.5	1016096
Acid Extractable Cadmium (Cd)	ug/g	1.0	ND	1016096	ND	0.3	1016096
Acid Extractable Chromium (Cr)	ug/g	71	21	1016096	21	0.5	1016096
Acid Extractable Cobalt (Co)	ug/g	21	14	1016096	14	0.5	1016096
Acid Extractable Copper (Cu)	ug/g	85	7.9	1016096	9.2	0.5	1016096
Acid Extractable Lead (Pb)	ug/g	120	6	1016096	7	1	1016096
Acid Extractable Mercury (Hg)	ug/g	0.23	ND	1016282	ND	0.05	1016282
Acid Extractable Molybdenum (Mo)	ug/g	2.5	0.7	1016096	1.6	0.5	1016096
Acid Extractable Nickel (Ni)	ug/g	43	30	1016096	30	0.5	1016096
Acid Extractable Selenium (Se)	ug/g	1.9	ND	1016296	ND	1	1016292
Acid Extractable Silver (Ag)	ug/g	0.42	ND	1016096	ND	0.3	1016096
Acid Extractable Vanadium (V)	ug/g	91	24	1016096	28	0.5	1016096
Acid Extractable Zinc (Zn)	ug/g	160	63	1016096	63	3	1016096

ND = Not detected

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

CRITERIA: Ref. to Ontario Regulation 153/04 made under the Environmental protection Act on May 12, 2004.

Table 1: Full Depth Background Site Condition Standards.

Soil - All Other Types of Property Use.

Maxxam Job #: A671300  
Report Date: 2006/07/24

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID			N14222		N14223		
Sampling Date			2006/07/17 09:00		2006/07/05		
COC Number			00441046		00441046		
	Units	Criteria	BH 8 GS 1	QC Batch	BH 8 AS 1	RDL	QC Batch

METALS							
Acid Extractable Antimony (Sb)	ug/g	1.0	ND	1016292	ND	1	1016296
Acid Extractable Arsenic (As)	ug/g	17	4	1016517	3	1	1016131
Acid Extractable Barium (Ba)	ug/g	210	35	1016517	73	0.5	1016131
Acid Extractable Beryllium (Be)	ug/g	1.2	ND	1016517	1.0	0.5	1016131
Acid Extractable Cadmium (Cd)	ug/g	1.0	ND	1016517	ND	0.3	1016131
Acid Extractable Chromium (Cr)	ug/g	71	12	1016517	24	0.5	1016131
Acid Extractable Cobalt (Co)	ug/g	21	6.3	1016517	16	0.5	1016131
Acid Extractable Copper (Cu)	ug/g	85	20	1016517	11	0.5	1016131
Acid Extractable Lead (Pb)	ug/g	120	26	1016517	9	1	1016131
Acid Extractable Mercury (Hg)	ug/g	0.23	ND	1016282	ND	0.05	1016282
Acid Extractable Molybdenum (Mo)	ug/g	2.5	0.8	1016517	0.8	0.5	1016131
Acid Extractable Nickel (Ni)	ug/g	43	9.9	1016517	35	0.5	1016131
Acid Extractable Selenium (Se)	ug/g	1.9	ND	1016292	ND	1	1016296
Acid Extractable Silver (Ag)	ug/g	0.42	ND	1016517	ND	0.3	1016131
Acid Extractable Vanadium (V)	ug/g	91	18	1016517	28	0.5	1016131
Acid Extractable Zinc (Zn)	ug/g	160	55	1016517	72	3	1016131

ND = Not detected

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

CRITERIA: Ref. to Ontario Regulation 153/04 made under the Environmental protection Act on May 12, 2004.

Table 1: Full Depth Background Site Condition Standards.

Soil - All Other Types of Property Use.

Maxxam Job #: A671300  
Report Date: 2006/07/24

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID			N14224	N14225	N14226		
Sampling Date			2006/07/05	2006/07/06	2006/07/06		
COC Number			00441046	00441046	00441046		
	Units	Criteria	BH 8 SS 2	BH 9 GS 1	BH 9 SS 1	RDL	QC Batch

METALS							
Acid Extractable Antimony (Sb)	ug/g	1.0	ND	ND	ND	1	1016296
Acid Extractable Arsenic (As)	ug/g	17	3	8	5	1	1016131
Acid Extractable Barium (Ba)	ug/g	210	72	77	49	0.5	1016131
Acid Extractable Beryllium (Be)	ug/g	1.2	1.0	0.7	0.8	0.5	1016131
Acid Extractable Cadmium (Cd)	ug/g	1.0	ND	ND	ND	0.3	1016131
Acid Extractable Chromium (Cr)	ug/g	71	26	19	22	0.5	1016131
Acid Extractable Cobalt (Co)	ug/g	21	17	9.2	14	0.5	1016131
Acid Extractable Copper (Cu)	ug/g	85	11	33	36	0.5	1016131
Acid Extractable Lead (Pb)	ug/g	120	9	46	14	1	1016131
Acid Extractable Mercury (Hg)	ug/g	0.23	ND	ND	ND	0.05	1016282
Acid Extractable Molybdenum (Mo)	ug/g	2.5	1.0	1.0	0.7	0.5	1016131
Acid Extractable Nickel (Ni)	ug/g	43	36	17	29	0.5	1016131
Acid Extractable Selenium (Se)	ug/g	1.9	ND	ND	ND	1	1016296
Acid Extractable Silver (Ag)	ug/g	0.42	ND	ND	ND	0.3	1016131
Acid Extractable Vanadium (V)	ug/g	91	31	26	31	0.5	1016131
Acid Extractable Zinc (Zn)	ug/g	160	75	75	63	3	1016131

ND = Not detected

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

CRITERIA: Ref. to Ontario Regulation 153/04 made under the Environmental protection Act on May 12, 2004.

Table 1: Full Depth Background Site Condition Standards.

Soil - All Other Types of Property Use.

Maxxam Job #: A671300  
Report Date: 2006/07/24

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID			N14227		N14228		
Sampling Date			2006/07/17 09:00		2006/07/17 09:00		
COC Number			00441046		00441046		
	Units	Criteria	BH 9 SS 4	QC Batch	BH 10 GS 1	RDL	QC Batch

Table 3  
1/c/c

METALS							
Acid Extractable Antimony (Sb)	ug/g	1.0	ND	1016296	ND	1	1016292
Acid Extractable Arsenic (As)	ug/g	17	3	1016131	13	1	1016517
Acid Extractable Barium (Ba)	ug/g	210	280	1016131	67	0.5	1016517
Acid Extractable Beryllium (Be)	ug/g	1.2	0.8	1016131	0.6	0.5	1016517
Acid Extractable Cadmium (Cd)	ug/g	1.0	ND	1016131	ND	0.3	1016517
Acid Extractable Chromium (Cr)	ug/g	71	24	1016131	14	0.5	1016517
Acid Extractable Cobalt (Co)	ug/g	21	16	1016131	5.2	0.5	1016517
Acid Extractable Copper (Cu)	ug/g	85	9.7	1016131	29	0.5	1016517
Acid Extractable Lead (Pb)	ug/g	120	9	1016131	61	1	1016517
Acid Extractable Mercury (Hg)	ug/g	0.23	ND	1016282	ND	0.05	1016282
Acid Extractable Molybdenum (Mo)	ug/g	2.5	1.1	1016131	0.8	0.5	1016517
Acid Extractable Nickel (Ni)	ug/g	43	34	1016131	11	0.5	1016517
Acid Extractable Selenium (Se)	ug/g	1.9	ND	1016296	ND	1	1016292
Acid Extractable Silver (Ag)	ug/g	0.42	ND	1016131	ND	0.3	1016517
Acid Extractable Vanadium (V)	ug/g	91	27	1016131	19	0.5	1016517
Acid Extractable Zinc (Zn)	ug/g	160	70	1016131	64	3	1016517

(2000) 1500

ND = Not detected

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

CRITERIA: Ref. to Ontario Regulation 153/04 made under the Environmental protection Act on May 12, 2004.

Table 1: Full Depth Background Site Condition Standards.

Soil - All Other Types of Property Use.

Maxxam Job #: A671300  
Report Date: 2006/07/24

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID			N14229	N14230	N14231		
Sampling Date			2006/07/06	2006/07/06	2006/07/17 09:00		
COC Number			00441046	00441046	00441046		
	Units	Criteria	BH 10 SS 1	BH 10 SS3	BH 11 GS 1	RDL	QC Batch

METALS							
Acid Extractable Antimony (Sb)	ug/g	1.0	ND	ND	ND	1	1016296
Acid Extractable Arsenic (As)	ug/g	17	4	5	7	1	1016131
Acid Extractable Barium (Ba)	ug/g	210	100	100	33	0.5	1016131
Acid Extractable Beryllium (Be)	ug/g	1.2	0.6	0.6	ND	0.5	1016131
Acid Extractable Cadmium (Cd)	ug/g	1.0	ND	ND	ND	0.3	1016131
Acid Extractable Chromium (Cr)	ug/g	71	16	17	11	0.5	1016131
Acid Extractable Cobalt (Co)	ug/g	21	11	12	4.8	0.5	1016131
Acid Extractable Copper (Cu)	ug/g	85	27	28	42	0.5	1016131
Acid Extractable Lead (Pb)	ug/g	120	14	8	40	1	1016131
Acid Extractable Mercury (Hg)	ug/g	0.23	ND	ND	ND	0.05	1016282
Acid Extractable Molybdenum (Mo)	ug/g	2.5	ND	0.6	ND	0.5	1016131
Acid Extractable Nickel (Ni)	ug/g	43	24	23	8.7	0.5	1016131
Acid Extractable Selenium (Se)	ug/g	1.9	ND	ND	ND	1	1016296
Acid Extractable Silver (Ag)	ug/g	0.42	ND	ND	ND	0.3	1016131
Acid Extractable Vanadium (V)	ug/g	91	22	24	19	0.5	1016131
Acid Extractable Zinc (Zn)	ug/g	160	54	54	59	3	1016131

ND = Not detected

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

CRITERIA: Ref. to Ontario Regulation 153/04 made under the Environmental protection Act on May 12, 2004.

Table 1: Full Depth Background Site Condition Standards.

Soil - All Other Types of Property Use.

Maxxam Job #: A671300  
Report Date: 2006/07/24

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID			N14232	N14233	N14234		
Sampling Date			2006/07/06	2006/07/06	2006/07/17 09:00		
COC Number			00441046	00441046	00441046		
	Units	Criteria	BH 11 SS 1	BH 11 SS 2	BH 9 GS 1-1	RDL	QC Batch

METALS							
Acid Extractable Antimony (Sb)	ug/g	1.0	ND	ND	ND	1	1016296
Acid Extractable Arsenic (As)	ug/g	17	4	5	8	1	1016131
Acid Extractable Barium (Ba)	ug/g	210	43	110	78	0.5	1016131
Acid Extractable Beryllium (Be)	ug/g	1.2	0.5	0.6	0.8	0.5	1016131
Acid Extractable Cadmium (Cd)	ug/g	1.0	ND	ND	ND	0.3	1016131
Acid Extractable Chromium (Cr)	ug/g	71	13	19	19	0.5	1016131
Acid Extractable Cobalt (Co)	ug/g	21	8.0	13	9.2	0.5	1016131
Acid Extractable Copper (Cu)	ug/g	85	23	40	31	0.5	1016131
Acid Extractable Lead (Pb)	ug/g	120	8	17	42	1	1016131
Acid Extractable Mercury (Hg)	ug/g	0.23	ND	ND	ND	0.05	1016282
Acid Extractable Molybdenum (Mo)	ug/g	2.5	ND	0.5	1.1	0.5	1016131
Acid Extractable Nickel (Ni)	ug/g	43	15	28	17	0.5	1016131
Acid Extractable Selenium (Se)	ug/g	1.9	ND	ND	ND	1	1016296
Acid Extractable Silver (Ag)	ug/g	0.42	ND	ND	ND	0.3	1016131
Acid Extractable Vanadium (V)	ug/g	91	23	26	28	0.5	1016131
Acid Extractable Zinc (Zn)	ug/g	160	37	70	69	3	1016131

ND = Not detected

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

CRITERIA: Ref. to Ontario Regulation 153/04 made under the Environmental protection Act on May 12, 2004.

Table 1: Full Depth Background Site Condition Standards.

Soil - All Other Types of Property Use.

Maxxam Job #: A671300  
Report Date: 2006/07/24

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID			N14235		
Sampling Date			2006/07/06		
COC Number			00441046		
	Units	Criteria	BH 11 SS 2-1	RDL	QC Batch

METALS					
Acid Extractable Antimony (Sb)	ug/g	1.0	ND	1	1016292
Acid Extractable Arsenic (As)	ug/g	17	6	1	1016096
Acid Extractable Barium (Ba)	ug/g	210	120	0.5	1016096
Acid Extractable Beryllium (Be)	ug/g	1.2	0.6	0.5	1016096
Acid Extractable Cadmium (Cd)	ug/g	1.0	ND	0.3	1016096
Acid Extractable Chromium (Cr)	ug/g	71	18	0.5	1016096
Acid Extractable Cobalt (Co)	ug/g	21	12	0.5	1016096
Acid Extractable Copper (Cu)	ug/g	85	37	0.5	1016096
Acid Extractable Lead (Pb)	ug/g	120	16	1	1016096
Acid Extractable Mercury (Hg)	ug/g	0.23	ND	0.05	1016282
Acid Extractable Molybdenum (Mo)	ug/g	2.5	ND	0.5	1016096
Acid Extractable Nickel (Ni)	ug/g	43	25	0.5	1016096
Acid Extractable Selenium (Se)	ug/g	1.9	ND	1	1016292
Acid Extractable Silver (Ag)	ug/g	0.42	ND	0.3	1016096
Acid Extractable Vanadium (V)	ug/g	91	24	0.5	1016096
Acid Extractable Zinc (Zn)	ug/g	160	65	3	1016096

ND = Not detected

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

CRITERIA: Ref. to Ontario Regulation 153/04 made under the Environmental protection Act on May 12, 2004.

Table 1: Full Depth Background Site Condition Standards.

Soil - All Other Types of Property Use.

Maxxam Job #: A671300  
Report Date: 2006/07/24

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

**GENERAL COMMENTS**

Results relate only to the items tested.

Peto MacCallum Ltd  
Attention: Melissa King  
Client Project #: 06HF033  
P.O. #:  
Project name:

Quality Assurance Report  
Maxxam Job Number: MA671300

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
1016096 GBU	MATRIX SPIKE	Acid Extractable Arsenic (As)	2006/07/21		102	%	75 - 125
		Acid Extractable Barium (Ba)	2006/07/21		112	%	75 - 125
		Acid Extractable Beryllium (Be)	2006/07/21		104	%	75 - 125
		Acid Extractable Cadmium (Cd)	2006/07/21		104	%	75 - 125
		Acid Extractable Chromium (Cr)	2006/07/21		113	%	75 - 125
		Acid Extractable Cobalt (Co)	2006/07/21		106	%	75 - 125
		Acid Extractable Copper (Cu)	2006/07/21		105	%	75 - 125
		Acid Extractable Lead (Pb)	2006/07/21		106	%	75 - 125
		Acid Extractable Molybdenum (Mo)	2006/07/21		105	%	75 - 125
		Acid Extractable Nickel (Ni)	2006/07/21		106	%	75 - 125
		Acid Extractable Silver (Ag)	2006/07/21		100	%	75 - 125
		Acid Extractable Vanadium (V)	2006/07/21		116	%	75 - 125
		Acid Extractable Zinc (Zn)	2006/07/21		115	%	75 - 125
	QC STANDARD	Acid Extractable Arsenic (As)	2006/07/21		124	%	30 - 170
		Acid Extractable Barium (Ba)	2006/07/21		112	%	70 - 130
		Acid Extractable Chromium (Cr)	2006/07/21		98	%	40 - 160
		Acid Extractable Cobalt (Co)	2006/07/21		111	%	75 - 125
		Acid Extractable Copper (Cu)	2006/07/21		113	%	73 - 127
		Acid Extractable Lead (Pb)	2006/07/21		109	%	54 - 146
		Acid Extractable Nickel (Ni)	2006/07/21		116	%	61 - 139
		Acid Extractable Vanadium (V)	2006/07/21		114	%	50 - 150
		Acid Extractable Zinc (Zn)	2006/07/21		117	%	72 - 128
	Method Blank	Acid Extractable Arsenic (As)	2006/07/21	ND, RDL=1		ug/g	
		Acid Extractable Barium (Ba)	2006/07/21	ND, RDL=0.5		ug/g	
		Acid Extractable Beryllium (Be)	2006/07/21	ND, RDL=0.5		ug/g	
		Acid Extractable Cadmium (Cd)	2006/07/21	ND, RDL=0.3		ug/g	
		Acid Extractable Chromium (Cr)	2006/07/21	ND, RDL=0.5		ug/g	
		Acid Extractable Cobalt (Co)	2006/07/21	ND, RDL=0.5		ug/g	
		Acid Extractable Copper (Cu)	2006/07/21	ND, RDL=0.5		ug/g	
		Acid Extractable Lead (Pb)	2006/07/21	ND, RDL=1		ug/g	
		Acid Extractable Molybdenum (Mo)	2006/07/21	ND, RDL=0.5		ug/g	
		Acid Extractable Nickel (Ni)	2006/07/21	ND, RDL=0.5		ug/g	
		Acid Extractable Silver (Ag)	2006/07/21	ND, RDL=0.3		ug/g	
		Acid Extractable Vanadium (V)	2006/07/21	ND, RDL=0.5		ug/g	
		Acid Extractable Zinc (Zn)	2006/07/21	ND, RDL=3		ug/g	
	RPD	Acid Extractable Arsenic (As)	2006/07/21	NC		%	20
		Acid Extractable Barium (Ba)	2006/07/21	5.7		%	20
		Acid Extractable Beryllium (Be)	2006/07/21	NC		%	20
		Acid Extractable Cadmium (Cd)	2006/07/21	NC		%	20
		Acid Extractable Chromium (Cr)	2006/07/21	5.0		%	20
		Acid Extractable Cobalt (Co)	2006/07/21	8.4		%	20
		Acid Extractable Copper (Cu)	2006/07/21	1.7		%	20
		Acid Extractable Lead (Pb)	2006/07/21	7.6		%	20
		Acid Extractable Molybdenum (Mo)	2006/07/21	NC		%	20
		Acid Extractable Nickel (Ni)	2006/07/21	4.1		%	20
		Acid Extractable Silver (Ag)	2006/07/21	NC		%	20
		Acid Extractable Vanadium (V)	2006/07/21	4.5		%	20
		Acid Extractable Zinc (Zn)	2006/07/21	4.2		%	20
1016131 GBU	MATRIX SPIKE	Acid Extractable Arsenic (As)	2006/07/21		106	%	75 - 125
		Acid Extractable Barium (Ba)	2006/07/21		122	%	75 - 125
		Acid Extractable Beryllium (Be)	2006/07/21		102	%	75 - 125
		Acid Extractable Cadmium (Cd)	2006/07/21		102	%	75 - 125
		Acid Extractable Chromium (Cr)	2006/07/21		112	%	75 - 125
		Acid Extractable Cobalt (Co)	2006/07/21		104	%	75 - 125
		Acid Extractable Copper (Cu)	2006/07/21		114	%	75 - 125
		Acid Extractable Lead (Pb)	2006/07/21		124	%	75 - 125

Peto MacCallum Ltd  
Attention: Melissa King  
Client Project #: 06HF033  
P.O. #:  
Project name:

### Quality Assurance Report (Continued)

Maxxam Job Number: MA671300

QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
1016131 GBU	MATRIX SPIKE	Acid Extractable Molybdenum (Mo)	2006/07/21		103	%	75 - 125
		Acid Extractable Nickel (Ni)	2006/07/21		105	%	75 - 125
		Acid Extractable Silver (Ag)	2006/07/21		99	%	75 - 125
		Acid Extractable Vanadium (V)	2006/07/21		120	%	75 - 125
		Acid Extractable Zinc (Zn)	2006/07/21		NC (1)	%	75 - 125
	QC STANDARD	Acid Extractable Arsenic (As)	2006/07/21		130	%	30 - 170
		Acid Extractable Barium (Ba)	2006/07/21		112	%	70 - 130
		Acid Extractable Chromium (Cr)	2006/07/21		96	%	40 - 160
		Acid Extractable Cobalt (Co)	2006/07/21		108	%	75 - 125
		Acid Extractable Copper (Cu)	2006/07/21		111	%	73 - 127
		Acid Extractable Lead (Pb)	2006/07/21		106	%	54 - 146
		Acid Extractable Nickel (Ni)	2006/07/21		114	%	61 - 139
		Acid Extractable Vanadium (V)	2006/07/21		112	%	50 - 150
		Acid Extractable Zinc (Zn)	2006/07/21		118	%	72 - 128
	Method Blank	Acid Extractable Arsenic (As)	2006/07/21	ND, RDL=1		ug/g	
		Acid Extractable Barium (Ba)	2006/07/21	ND, RDL=0.5		ug/g	
		Acid Extractable Beryllium (Be)	2006/07/21	ND, RDL=0.5		ug/g	
		Acid Extractable Cadmium (Cd)	2006/07/21	ND, RDL=0.3		ug/g	
		Acid Extractable Chromium (Cr)	2006/07/21	ND, RDL=0.5		ug/g	
		Acid Extractable Cobalt (Co)	2006/07/21	ND, RDL=0.5		ug/g	
		Acid Extractable Copper (Cu)	2006/07/21	ND, RDL=0.5		ug/g	
		Acid Extractable Lead (Pb)	2006/07/21	ND, RDL=1		ug/g	
		Acid Extractable Molybdenum (Mo)	2006/07/21	ND, RDL=0.5		ug/g	
		Acid Extractable Nickel (Ni)	2006/07/21	ND, RDL=0.5		ug/g	
		Acid Extractable Silver (Ag)	2006/07/21	ND, RDL=0.3		ug/g	
		Acid Extractable Vanadium (V)	2006/07/21	ND, RDL=0.5		ug/g	
		Acid Extractable Zinc (Zn)	2006/07/21	ND, RDL=3		ug/g	
	RPD	Acid Extractable Arsenic (As)	2006/07/21	13.4		%	20
		Acid Extractable Barium (Ba)	2006/07/21	6.9		%	20
		Acid Extractable Beryllium (Be)	2006/07/21	NC		%	20
		Acid Extractable Cadmium (Cd)	2006/07/21	NC		%	20
		Acid Extractable Chromium (Cr)	2006/07/21	9.5		%	20
		Acid Extractable Cobalt (Co)	2006/07/21	7.4		%	20
		Acid Extractable Copper (Cu)	2006/07/21	7.5		%	20
		Acid Extractable Lead (Pb)	2006/07/21	15.3		%	20
		Acid Extractable Molybdenum (Mo)	2006/07/21	9.7		%	20
		Acid Extractable Nickel (Ni)	2006/07/21	6.7		%	20
		Acid Extractable Silver (Ag)	2006/07/21	NC		%	20
		Acid Extractable Vanadium (V)	2006/07/21	6.9		%	20
		Acid Extractable Zinc (Zn)	2006/07/21	9.1		%	20
1016282 MC	MATRIX SPIKE [N14216-01]	Acid Extractable Mercury (Hg)	2006/07/21		91	%	75 - 125
	QC STANDARD	Acid Extractable Mercury (Hg)	2006/07/21		104	%	80 - 120
	Spiked Blank	Acid Extractable Mercury (Hg)	2006/07/21		109	%	75 - 125
	Method Blank	Acid Extractable Mercury (Hg)	2006/07/21	ND, RDL=0.05		ug/g	
	RPD [N14216-01]	Acid Extractable Mercury (Hg)	2006/07/21	NC		%	35
1016292 HRE	MATRIX SPIKE	Acid Extractable Selenium (Se)	2006/07/21		104 (2)	%	75 - 125
	QC STANDARD	Acid Extractable Antimony (Sb)	2006/07/21		99	%	N/A
		Acid Extractable Selenium (Se)	2006/07/21		104	%	N/A
	Method Blank	Acid Extractable Antimony (Sb)	2006/07/21	ND, RDL=1		ug/g	
		Acid Extractable Selenium (Se)	2006/07/21	ND, RDL=1		ug/g	
	RPD	Acid Extractable Antimony (Sb)	2006/07/21	NC		%	35
		Acid Extractable Selenium (Se)	2006/07/21	NC		%	35
1016296 HRE	MATRIX SPIKE [N14232-01]	Acid Extractable Selenium (Se)	2006/07/24		94	%	75 - 125
	QC STANDARD	Acid Extractable Antimony (Sb)	2006/07/24		102	%	N/A

Peto MacCallum Ltd  
Attention: Melissa King  
Client Project #: 06HF033  
P.O. #:  
Project name:

### Quality Assurance Report (Continued)

Maxxam Job Number: MA671300

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
1016296 HRE	QC STANDARD	Acid Extractable Selenium (Se)	2006/07/24		105	%	N/A
		Acid Extractable Antimony (Sb)	2006/07/24	ND, RDL=1		ug/g	
	Method Blank	Acid Extractable Selenium (Se)	2006/07/24	ND, RDL=1		ug/g	
		Acid Extractable Antimony (Sb)	2006/07/24	NC		%	35
		Acid Extractable Selenium (Se)	2006/07/24	NC		%	35
1016517 GBU	MATRIX SPIKE	Acid Extractable Arsenic (As)	2006/07/21		100	%	75 - 125
		Acid Extractable Barium (Ba)	2006/07/21		100	%	75 - 125
		Acid Extractable Beryllium (Be)	2006/07/21		97	%	75 - 125
		Acid Extractable Cadmium (Cd)	2006/07/21		97	%	75 - 125
		Acid Extractable Chromium (Cr)	2006/07/21		97	%	75 - 125
		Acid Extractable Cobalt (Co)	2006/07/21		97	%	75 - 125
		Acid Extractable Copper (Cu)	2006/07/21		97	%	75 - 125
		Acid Extractable Lead (Pb)	2006/07/21		96	%	75 - 125
		Acid Extractable Molybdenum (Mo)	2006/07/21		98	%	75 - 125
		Acid Extractable Nickel (Ni)	2006/07/21		95	%	75 - 125
		Acid Extractable Silver (Ag)	2006/07/21		96	%	75 - 125
		Acid Extractable Vanadium (V)	2006/07/21		98	%	75 - 125
		Acid Extractable Zinc (Zn)	2006/07/21		98	%	75 - 125
	QC STANDARD	Acid Extractable Arsenic (As)	2006/07/21		132	%	30 - 170
		Acid Extractable Barium (Ba)	2006/07/21		113	%	70 - 130
		Acid Extractable Chromium (Cr)	2006/07/21		94	%	40 - 160
		Acid Extractable Cobalt (Co)	2006/07/21		114	%	75 - 125
		Acid Extractable Copper (Cu)	2006/07/21		116	%	73 - 127
		Acid Extractable Lead (Pb)	2006/07/21		109	%	54 - 146
		Acid Extractable Nickel (Ni)	2006/07/21		117	%	61 - 139
		Acid Extractable Vanadium (V)	2006/07/21		112	%	50 - 150
		Acid Extractable Zinc (Zn)	2006/07/21		119	%	72 - 128
	Method Blank	Acid Extractable Arsenic (As)	2006/07/21	ND, RDL=1		ug/g	
		Acid Extractable Barium (Ba)	2006/07/21	ND, RDL=0.5		ug/g	
		Acid Extractable Beryllium (Be)	2006/07/21	ND, RDL=0.5		ug/g	
		Acid Extractable Cadmium (Cd)	2006/07/21	ND, RDL=0.3		ug/g	
		Acid Extractable Chromium (Cr)	2006/07/21	ND, RDL=0.5		ug/g	
		Acid Extractable Cobalt (Co)	2006/07/21	ND, RDL=0.5		ug/g	
		Acid Extractable Copper (Cu)	2006/07/21	ND, RDL=0.5		ug/g	
		Acid Extractable Lead (Pb)	2006/07/21	ND, RDL=1		ug/g	
		Acid Extractable Molybdenum (Mo)	2006/07/21	ND, RDL=0.5		ug/g	
		Acid Extractable Nickel (Ni)	2006/07/21	ND, RDL=0.5		ug/g	
		Acid Extractable Silver (Ag)	2006/07/21	ND, RDL=0.3		ug/g	
		Acid Extractable Vanadium (V)	2006/07/21	ND, RDL=0.5		ug/g	
		Acid Extractable Zinc (Zn)	2006/07/21	ND, RDL=3		ug/g	
	RPD	Acid Extractable Lead (Pb)	2006/07/21	NC		%	20

ND = Not detected

N/A = Not Applicable

NC = Non-calculable

RPD = Relative Percent Difference

QC Standard = Quality Control Standard

SPIKE = Fortified sample

(1) The recovery in the matrix spiked sample was not calculated. Because of the high concentration in the parent sample, the relative difference between the spiked and un-spiked concentrations is not sufficiently significant to permit a reliable recovery calculation.

(2) Metal analysis: samples were analyzed by ICPMS instead of Graphite Furnace A.A. No impact on detection limits or data quality is expected.

Validation Signature Page

Maxxam Job #: A671300

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The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

EWA PRANJIC, M.Sc., C.Chem, Scientific Specialist

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. SCC and CAEAL have approved this reporting process and electronic report format.

INVOICE INFORMATION				REPORT INFORMATION (if differs from invoice)				PROJECT INFORMATION		MAXXAM JOB NUMBER	
Company Name: <u>Peto MacCallum Ltd.</u>				Company Name: <u>Peto MacCallum Ltd.</u>				Quotation #: <u>A65039</u>		CHAIN OF CUSTODY #	
Contact Name: <u>Danika Durish</u>				Contact Name: <u>Melissa King</u>				P.O. #: <u>04HFO33</u>			
Address: <u>45 Burford Road</u>				Address: <u></u>				Project Name: <u></u>			
City: <u>Hamilton ON L8E 3C6</u>				City: <u></u>				Location: <u></u>			
Phone: <u>905-561-2281</u> Fax: <u>905-561-6304</u>				Phone: <u></u> Fax: <u></u>				Sampled By: <u>Mike Bapsy</u>		00441046	
Email: <u>hamilton@petomacallum.com</u>				Email: <u>melissa@petomacallum.com</u>							

REGULATORY CRITERIA				ANALYSIS REQUESTED (Please be specific)				TURNAROUND TIME (TAT) REQUIRED			
<p>Note: For regulated drinking water samples - please use the Drinking Water Chain of Custody Form.</p> <p><input type="checkbox"/> MISA <input type="checkbox"/> Reg. 153 <input type="checkbox"/> Sewer Use <input type="checkbox"/> Other</p> <p><input type="checkbox"/> PWQO <input type="checkbox"/> Table 1 <input type="checkbox"/> Sanitary <input type="checkbox"/> Storm <input type="checkbox"/> specify</p> <p><input type="checkbox"/> Reg. 558 <input type="checkbox"/> Table 2 <input type="checkbox"/> Table 3 <input type="checkbox"/> Region: <u></u></p> <p><input type="checkbox"/> all other</p>				<p>Report Criteria on C of A? <u>Yes</u></p>				<p>PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS.</p> <p>Regular (Standard) TAT: <u>15 to 7 Wk</u></p> <p>Rush TAT: <u>Rush</u></p> <p><input type="checkbox"/> 1 day</p> <p>DATE Required: <u>17-Jul-06 13:39</u></p> <p>TIME Required: <u></u></p>			
<p>SAMPLES MUST BE KEPT COOL (&lt;10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM.</p>				<p>Regulated Drinking Water? (Y/N) <u>(N)</u></p> <p>Metals Field Filtered? (Y/N) <u>(N)</u></p> <p>pH and metals last per quick</p>				<p>Project Name: <u>LEENA THOMAS</u></p> <p>Project ID: <u>A671300</u></p> <p>CU: <u>ENV-1014</u></p>			

Sample Identification	Date Sampled	Time Sampled	Matrix	Comments / TAT COMMENTS
1 BH4 S51	July 7/06		Soil	
2 BH4 S52			Soil	
3 BH4 S53			Soil	
4 BH7 G51	July 7/06	9:00 AM	Soil	
5 BH7 S51	July 7/06		Soil	
6 BH7 S53	July 7/06	9:00 AM	Soil	
7 BH8 G51	July 7/06	9:00 AM	Soil	
8 BH8 S51	July 7/06		Soil	
9 BH8 S52	July 7/06		Soil	
10 BH9 G51	July 7/06	9:00 AM	Soil	
11 BH9 S51	July 7/06		Soil	
12 BH9 S51	July 7/06		Soil	

RELINQUISHED BY (Signature/Print)	RECEIVED BY (Signature/Print)	Date	Time	Temperature (°C) on Receipt	Condition of Sample on Receipt
<u>Danika Durish</u>	<u>[Signature]</u>	7-17-06	11:58	20/23/21/0c	<input type="checkbox"/> OK <input type="checkbox"/> SIF

# CHAIN OF CUSTODY REPORT

**Maxxam**  
A subsidiary of  
6740 Campobello Road, Mississauga, ON L5N 2L8  
Phone: 905-817-5700 Fax: 905-817-5778 Toll Free: (800) 563-6266

Page 1 of 2

<b>INVOICE INFORMATION</b> Company Name: <u>Peto MacCallum Ltd.</u> Contact Name: <u>Denise Durish</u> Address: <u>45 Burford Road</u> <u>Hamilton, ON L8E 3C6</u> Phone: <u>905-561-2331</u> Fax: <u>905-561-1636</u> Email: <u>hamilton@petomacallum.com</u>		<b>REPORT INFORMATION (if differs from invoice)</b> Company Name: <u>Peto MacCallum Ltd.</u> Contact Name: <u>Melissa King</u> Address: _____ Phone: _____ Email: <u>mking@petomacallum.com</u>		<b>PROJECT INFORMATION</b> Quotation #: <u>A65039</u> P.O. #: _____ Project #: <u>06HFD33</u> Project Name: _____ Location: _____ Sampled By: <u>Mike Rapsey</u>		<b>MAXXAM JOB NUMBER</b> <u>A671300</u> <b>CHAIN OF CUSTODY #</b> <u>00 441045</u>	
----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--	---------------------------------------------------------------------------------------------	--

<b>REGULATORY CRITERIA</b> Note: For regulated drinking water samples - please use the Drinking Water Chain of Custody form. <input type="checkbox"/> MISA <input type="checkbox"/> Reg. 153 <input type="checkbox"/> Sewer Use <input type="checkbox"/> Other <input checked="" type="checkbox"/> PWOC <input checked="" type="checkbox"/> Table 1 <input type="checkbox"/> Sanitary <input type="checkbox"/> Storm <input type="checkbox"/> specify <input type="checkbox"/> Table 2 <input type="checkbox"/> Table 3 <input type="checkbox"/> Region: _____ <input type="checkbox"/> Reg. 558 <input type="checkbox"/> Report Criteria on C of A2 <u>YES</u> <u>all other</u>				<b>ANALYSIS REQUESTED (Please be specific)</b> <u>pH and metals/perchlorate</u>				<b>TURNAROUND TIME (TAT) REQUIRED</b> PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS. Regular (Standard) TAT: <input checked="" type="checkbox"/> 5 to 7 Working Days Rush TAT: Rush Confirmation #: _____ (call Lab for #) <input type="checkbox"/> 1 day <input type="checkbox"/> 2 days <input type="checkbox"/> 3 days DATE Required: _____ TIME Required: _____ Please note that TAT for certain tests such as BOD and Diatoms/Puzzles are > 5 days - contact your Project Manager for details.			
<b>SAMPLES MUST BE KEPT COOL (&lt;10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM.</b>				Regulated Drinking Water? (Y / N) _____ Metals Field Filtered? (Y / N) _____				COMMENTS / TAT COMMENTS # of Cont. _____			
1	BH10 651	July 7 <sup>th</sup> 9:00 <sup>am</sup>	Soil	N	N	N	N	1			
2	BH10 551	July 6 <sup>th</sup>	Soil	N	N	N	N	1			
3	BH10 553	↓	Soil	N	N	N	N	1			
4	BH11 651	July 7 <sup>th</sup> 9:00 <sup>am</sup>	Soil	N	N	N	N	1			
5	BH11 551	July 6 <sup>th</sup>	Soil	N	N	N	N	1			
6	BH11 552	↓	Soil	N	N	N	N	1			
7	BH9 651-1	July 7 <sup>th</sup> 9:00 <sup>am</sup>	Soil	N	N	N	N	1			
8	BH11 552-1	July 6 <sup>th</sup>	Soil	N	N	N	N	1			
9											
10											
11											
12											
RELINQUISHED BY (Signature/Print) <u>William D. Durish</u>				RECEIVED BY (Signature/Print) <u>[Signature]</u>				Date <u>7-17-06</u>			
Time <u>11:57</u>				Laboratory Use Only Condition of Sample on Receipt <input type="checkbox"/> OK <input type="checkbox"/> SIF				Temperature (°C) on Receipt <input type="checkbox"/> OK <input type="checkbox"/> SIF			

\*MANDATORY SECTIONS IN GREY MUST BE FILLED OUT. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

1394230-0811-0516

Print - Client

Yellow - Max

White - Maxxam

Your Project #: 06HF033  
Your C.O.C. #: 395440

**Attention: Melissa King**  
Peto MacCallum Ltd  
45 Burford Rd  
Hamilton, ON  
L8E 3C6

Report Date: 2006/07/31

**CERTIFICATE OF ANALYSIS**

**MAXXAM JOB #: A674429**  
**Received: 2006/07/24, 16:02**

Sample Matrix: Soil  
# Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Acid Extractable Metals in Soil by GF	3	2006/07/28	2006/07/30	Ont SOP 0095	EPA 7010
Mercury in Soil by CVAA	3	2006/07/28	2006/07/28	Ont SOP 0112	EPA 7470
Total Metals in Soil by Axial ICP-AES	3	2006/07/28	2006/07/28	Ont SOP-0072	EPA SW-846-6010C
pH CaCl2 EXTRACT	3	N/A	2006/07/28	Ont SOP-0067	4500-H+B

\* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key



Leena Thomas

31 Jul 2006 03:14:10 -04:00

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

LEENA THOMAS, Project Manager  
Email: leena.thomas@maxxamanalytics.com  
Phone# (905) 817-5700 Ext:5798

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. SCC and CAEAL have approved this reporting process and electronic report format.

For Service Group specific validation please refer to the Validation Signature Page

Total cover pages: 1

Page 1 of 8

Maxxam Job #: A674429  
Report Date: 2006/07/31

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### RESULTS OF ANALYSES OF SOIL

Maxxam ID		N28479	N28480	N28481		
Sampling Date		2006/07/21	2006/07/21	2006/07/21		
COC Number		395440	395440	395440		
	Units	BH12 SS1	BH12 SS2	BH12 SS3	RDL	QC Batch

INORGANICS						
Available (CaCl2) pH	pH	7.46	7.63	7.74	N/A	1020835

RDL = Reportable Detection Limit  
QC Batch = Quality Control Batch

Maxxam Job #: A674429  
Report Date: 2006/07/31

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID			N28479	N28480		
Sampling Date			2006/07/21	2006/07/21		
COC Number			395440	395440		
	Units	Criteria	BH12 SS1	BH12 SS2	RDL	QC Batch

Table 3  
ilc/c

METALS						
Acid Extractable Antimony (Sb)	ug/g	1.0	ND	ND	1	1021528
Acid Extractable Arsenic (As)	ug/g	17	6	5	1	1021376
Acid Extractable Barium (Ba)	ug/g	210	85	64	0.5	1021376
Acid Extractable Beryllium (Be)	ug/g	1.2	0.6	0.6	0.5	1021376
Acid Extractable Cadmium (Cd)	ug/g	1.0	ND	ND	0.3	1021376
Acid Extractable Chromium (Cr)	ug/g	71	21	16	0.5	1021376
Acid Extractable Cobalt (Co)	ug/g	21	9.9	9.3	0.5	1021376
Acid Extractable Copper (Cu)	ug/g	85	35	28	0.5	1021376
Acid Extractable Lead (Pb)	ug/g	120	42	34	1	1021376
Acid Extractable Mercury (Hg)	ug/g	0.23	ND	ND	0.05	1021314
Acid Extractable Molybdenum (Mo)	ug/g	2.5	ND	ND	0.5	1021376
Acid Extractable Nickel (Ni)	ug/g	43	26	19	0.5	1021376
Acid Extractable Selenium (Se)	ug/g	1.9	ND	ND	1	1021528
Acid Extractable Silver (Ag)	ug/g	0.42	0.5	ND	0.3	1021376
Acid Extractable Vanadium (V)	ug/g	91	26	25	0.5	1021376
Acid Extractable Zinc (Zn)	ug/g	160	88	79	3	1021376

50/40

ND = Not detected  
RDL = Reportable Detection Limit  
QC Batch = Quality Control Batch  
CRITERIA: Ref. to Ontario Regulation 153/04 made under the Environmental protection Act on May 12, 2004.  
Table 1: Full Depth Background Site Condition Standards.  
Soil - All Other Types of Property Use.

Maxxam Job #: A674429  
Report Date: 2006/07/31

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

### ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID			N28481		
Sampling Date			2006/07/21		
COC Number			395440		
	Units	Criteria	BH12 SS3	RDL	QC Batch

Table 3  
11c/c

<b>METALS</b>					
Acid Extractable Antimony (Sb)	ug/g	1.0	ND	1	1021528
Acid Extractable Arsenic (As)	ug/g	17	4	1	1021424
Acid Extractable Barium (Ba)	ug/g	210	91	0.5	1021424
Acid Extractable Beryllium (Be)	ug/g	1.2	0.7	0.5	1021424
Acid Extractable Cadmium (Cd)	ug/g	1.0	ND	0.3	1021424
Acid Extractable Chromium (Cr)	ug/g	71	23	0.5	1021424
Acid Extractable Cobalt (Co)	ug/g	21	13	0.5	1021424
Acid Extractable Copper (Cu)	ug/g	85	33	0.5	1021424
Acid Extractable Lead (Pb)	ug/g	120	12	1	1021424
Acid Extractable Mercury (Hg)	ug/g	0.23	ND	0.05	1021314
Acid Extractable Molybdenum (Mo)	ug/g	2.5	ND	0.5	1021424
Acid Extractable Nickel (Ni)	ug/g	43	28	0.5	1021424
Acid Extractable Selenium (Se)	ug/g	1.9	ND	1	1021528
Acid Extractable Silver (Ag)	ug/g	0.42	0.5	0.3	1021424
Acid Extractable Vanadium (V)	ug/g	91	30	0.5	1021424
Acid Extractable Zinc (Zn)	ug/g	160	66	3	1021424

50L40

ND = Not detected  
RDL = Reportable Detection Limit  
QC Batch = Quality Control Batch  
CRITERIA: Ref. to Ontario Regulation 153/04 made under the Environmental protection Act on May 12, 2004.  
Table 1: Full Depth Background Site Condition Standards.  
Soil - All Other Types of Property Use.

Maxxam Job #: A674429  
Report Date: 2006/07/31

Peto MacCallum Ltd  
Client Project #: 06HF033  
Project name:  
Sampler Initials:

**GENERAL COMMENTS**

Results relate only to the items tested.

Peto MacCallum Ltd  
Attention: Melissa King  
Client Project #: 06HF033  
P.O. #:  
Project name:

### Quality Assurance Report

Maxxam Job Number: MA674429

QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
1021314 MC	MATRIX SPIKE	Acid Extractable Mercury (Hg)	2006/07/28		103	%	75 - 125
	QC STANDARD	Acid Extractable Mercury (Hg)	2006/07/28		98	%	80 - 120
	Spiked Blank	Acid Extractable Mercury (Hg)	2006/07/28		100	%	75 - 125
	Method Blank	Acid Extractable Mercury (Hg)	2006/07/28	ND, RDL=0.05		ug/g	
	RPD	Acid Extractable Mercury (Hg)	2006/07/28	NC		%	35
1021376 GBU	MATRIX SPIKE	Acid Extractable Arsenic (As)	2006/07/28		98	%	75 - 125
		Acid Extractable Barium (Ba)	2006/07/28		NC (1)	%	75 - 125
		Acid Extractable Beryllium (Be)	2006/07/28		97	%	75 - 125
		Acid Extractable Cadmium (Cd)	2006/07/28		97	%	75 - 125
		Acid Extractable Chromium (Cr)	2006/07/28		95	%	75 - 125
		Acid Extractable Cobalt (Co)	2006/07/28		99	%	75 - 125
		Acid Extractable Copper (Cu)	2006/07/28		99	%	75 - 125
		Acid Extractable Lead (Pb)	2006/07/28		104	%	75 - 125
		Acid Extractable Molybdenum (Mo)	2006/07/28		101	%	75 - 125
		Acid Extractable Nickel (Ni)	2006/07/28		96	%	75 - 125
		Acid Extractable Silver (Ag)	2006/07/28		95	%	75 - 125
		Acid Extractable Vanadium (V)	2006/07/28		91	%	75 - 125
		Acid Extractable Zinc (Zn)	2006/07/28		98	%	75 - 125
	QC STANDARD	Acid Extractable Arsenic (As)	2006/07/28		125	%	30 - 170
		Acid Extractable Barium (Ba)	2006/07/28		102	%	70 - 130
		Acid Extractable Chromium (Cr)	2006/07/28		90	%	40 - 160
		Acid Extractable Cobalt (Co)	2006/07/28		109	%	75 - 125
		Acid Extractable Copper (Cu)	2006/07/28		109	%	73 - 127
		Acid Extractable Lead (Pb)	2006/07/28		105	%	54 - 146
		Acid Extractable Nickel (Ni)	2006/07/28		107	%	61 - 139
		Acid Extractable Vanadium (V)	2006/07/28		104	%	50 - 150
		Acid Extractable Zinc (Zn)	2006/07/28		113	%	72 - 128
	Method Blank	Acid Extractable Arsenic (As)	2006/07/28	ND, RDL=1		ug/g	
		Acid Extractable Barium (Ba)	2006/07/28	ND, RDL=0.5		ug/g	
		Acid Extractable Beryllium (Be)	2006/07/28	ND, RDL=0.5		ug/g	
		Acid Extractable Cadmium (Cd)	2006/07/28	ND, RDL=0.3		ug/g	
		Acid Extractable Chromium (Cr)	2006/07/28	ND, RDL=0.5		ug/g	
		Acid Extractable Cobalt (Co)	2006/07/28	ND, RDL=0.5		ug/g	
		Acid Extractable Copper (Cu)	2006/07/28	ND, RDL=0.5		ug/g	
		Acid Extractable Lead (Pb)	2006/07/28	ND, RDL=1		ug/g	
		Acid Extractable Molybdenum (Mo)	2006/07/28	ND, RDL=0.5		ug/g	
		Acid Extractable Nickel (Ni)	2006/07/28	ND, RDL=0.5		ug/g	
		Acid Extractable Silver (Ag)	2006/07/28	ND, RDL=0.3		ug/g	
		Acid Extractable Vanadium (V)	2006/07/28	ND, RDL=0.5		ug/g	
		Acid Extractable Zinc (Zn)	2006/07/28	ND, RDL=3		ug/g	
	RPD	Acid Extractable Arsenic (As)	2006/07/28	NC		%	20
		Acid Extractable Lead (Pb)	2006/07/28	3.4		%	20
1021424 GBU	MATRIX SPIKE	Acid Extractable Arsenic (As)	2006/07/28		92	%	75 - 125
		Acid Extractable Barium (Ba)	2006/07/28		88	%	75 - 125
		Acid Extractable Beryllium (Be)	2006/07/28		91	%	75 - 125
		Acid Extractable Cadmium (Cd)	2006/07/28		87	%	75 - 125
		Acid Extractable Chromium (Cr)	2006/07/28		92	%	75 - 125
		Acid Extractable Cobalt (Co)	2006/07/28		92	%	75 - 125
		Acid Extractable Copper (Cu)	2006/07/28		89	%	75 - 125
		Acid Extractable Lead (Pb)	2006/07/28		89	%	75 - 125
		Acid Extractable Molybdenum (Mo)	2006/07/28		93	%	75 - 125
		Acid Extractable Nickel (Ni)	2006/07/28		89	%	75 - 125
		Acid Extractable Silver (Ag)	2006/07/28		92	%	75 - 125
		Acid Extractable Vanadium (V)	2006/07/28		90	%	75 - 125
		Acid Extractable Zinc (Zn)	2006/07/28		92	%	75 - 125
	QC STANDARD	Acid Extractable Arsenic (As)	2006/07/28		107	%	30 - 170

Peto MacCallum Ltd  
Attention: Melissa King  
Client Project #: 06HF033  
P.O. #:  
Project name:

### Quality Assurance Report (Continued)

Maxxam Job Number: MA674429

QA/QC Batch		Date		Value	Recovery	Units	QC Limits
Num Init	QC Type	Parameter	Analyzed yyyy/mm/dd				
1021424 GBU	QC STANDARD	Acid Extractable Barium (Ba)	2006/07/28		101	%	70 - 130
		Acid Extractable Chromium (Cr)	2006/07/28		92	%	40 - 160
		Acid Extractable Cobalt (Co)	2006/07/28		101	%	75 - 125
		Acid Extractable Copper (Cu)	2006/07/28		101	%	73 - 127
		Acid Extractable Lead (Pb)	2006/07/28		97	%	54 - 146
		Acid Extractable Nickel (Ni)	2006/07/28		101	%	61 - 139
		Acid Extractable Vanadium (V)	2006/07/28		105	%	50 - 150
		Acid Extractable Zinc (Zn)	2006/07/28		102	%	72 - 128
	Method Blank	Acid Extractable Arsenic (As)	2006/07/28	ND, RDL=1		ug/g	
		Acid Extractable Barium (Ba)	2006/07/28	ND, RDL=0.5		ug/g	
		Acid Extractable Beryllium (Be)	2006/07/28	ND, RDL=0.5		ug/g	
		Acid Extractable Cadmium (Cd)	2006/07/28	ND, RDL=0.3		ug/g	
		Acid Extractable Chromium (Cr)	2006/07/28	ND, RDL=0.5		ug/g	
		Acid Extractable Cobalt (Co)	2006/07/28	ND, RDL=0.5		ug/g	
		Acid Extractable Copper (Cu)	2006/07/28	ND, RDL=0.5		ug/g	
		Acid Extractable Lead (Pb)	2006/07/28	ND, RDL=1		ug/g	
		Acid Extractable Molybdenum (Mo)	2006/07/28	ND, RDL=0.5		ug/g	
		Acid Extractable Nickel (Ni)	2006/07/28	ND, RDL=0.5		ug/g	
		Acid Extractable Silver (Ag)	2006/07/28	ND, RDL=0.3		ug/g	
		Acid Extractable Vanadium (V)	2006/07/28	ND, RDL=0.5		ug/g	
		Acid Extractable Zinc (Zn)	2006/07/28	ND, RDL=3		ug/g	
	RPD	Acid Extractable Arsenic (As)	2006/07/28	NC		%	20
		Acid Extractable Barium (Ba)	2006/07/28	1.8		%	20
		Acid Extractable Beryllium (Be)	2006/07/28	NC		%	20
		Acid Extractable Cadmium (Cd)	2006/07/28	NC		%	20
		Acid Extractable Chromium (Cr)	2006/07/28	3.9		%	20
		Acid Extractable Cobalt (Co)	2006/07/28	NC		%	20
		Acid Extractable Copper (Cu)	2006/07/28	5.0		%	20
		Acid Extractable Lead (Pb)	2006/07/28	17.3		%	20
		Acid Extractable Molybdenum (Mo)	2006/07/28	NC		%	20
		Acid Extractable Nickel (Ni)	2006/07/28	3.4		%	20
		Acid Extractable Silver (Ag)	2006/07/28	NC		%	20
		Acid Extractable Vanadium (V)	2006/07/28	1		%	20
		Acid Extractable Zinc (Zn)	2006/07/28	3.6		%	20
1021528 CDH	QC STANDARD	Acid Extractable Antimony (Sb)	2006/07/30		104	%	N/A
		Acid Extractable Selenium (Se)	2006/07/30		94	%	N/A
	Method Blank	Acid Extractable Antimony (Sb)	2006/07/30	ND, RDL=1		ug/g	
		Acid Extractable Selenium (Se)	2006/07/30	ND, RDL=1		ug/g	

ND = Not detected

N/A = Not Applicable

NC = Non-calculable

RPD = Relative Percent Difference

QC Standard = Quality Control Standard

SPIKE = Fortified sample

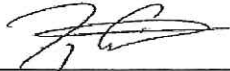
(1) The recovery in the matrix spiked sample was not calculated. Because of the high concentration in the parent sample, the relative difference between the spiked and un-spiked concentrations is not sufficiently significant to permit a reliable recovery calculation.

Validation Signature Page

Maxxam Job #: A674429

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The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



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TROY CARRIERE, B.Sc., Scientific Specialist

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. SCC and CAEAL have approved this reporting process and electronic report format.