APPENDIX A

GEOTECHNICAL REPORT

Winnipeg

FOUNDATION RECOMMENDATIONS AND RIVERBANK STABILITY IMPACT ASSESSMENT
PROPOSED EXPANSION
MAGER SEWAGE PUMPING STATION
CITY PROJECT NUMBER S-572 AND
020-01-04-02-00

GEOTECHNICAL REPORT

JANUARY, 2004

KGS
GROUP

KONTZAMANIS ▪ GRAUMANN ▪ SMITH ▪ MACMILLAN INC.
CONSULTING ENGINEERS & PROJECT MANAGERS

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P:\Projects\2003\03-0107-16\Admin\AdminDocs\Reports\03-107-16 Mager Drive Geotechnical report.rk.doc

1.0 INTRODUCTION

This report presents the results of a geotechnical investigation, provides foundation and shoring recommendations and a slope stability impact assessment for a proposed pump room addition at Mager Drive, Winnipeg.

Authorization to proceed with this work was received in a December 5, 2003 letter from Mr. John Elias, C.E.T., Winnipeg Water and Waste Department.

The site is within 107 m (350 ft) horizontal distance from the normal summer water edge of the Red River and in accordance with the City Waterway By-law, a Waterway Permit is required for new construction. This report is intended to fulfill the geotechnical requirement for a Waterway permit.

The scope of work was described in KGS Group's November 28, 2003 proposal and includes:

- ***Geotechnical Site Investigation*** - perform a subsurface drilling investigation.
- ***Impact Assessment on Riverbank Stability*** - assess the impact of the proposed works on the stability of the existing riverbank.
- ***Foundation Recommendations*** – provide temporary shoring and foundation recommendations.

Previous available information includes:

- December 1991, Mager Drive Pumping Station, Detailed Design of Slope Stabilization Measures, UMA Engineering Ltd., Job Number 41 06 0265 248 02 03.
- November 1991, Mager Drive Pumping Station, Preliminary Slope Stability Investigation, Addendum Report, UMA Engineering Ltd., Job Number 41 06 0265 248 02 03.
- September 1990, Mager Drive Pumping Station, Preliminary Slope Stability Investigation, UMA Engineering Ltd., Job Number 41 06 0265 248 02 03.
- December 1980, Geotechnical Evaluation for Slope stability at Mager Drive, Winnipeg, Manitoba, UMA Engineering Ltd., Job Number 41 06 0265 178 01 02.

2.0 BACKGROUND

2.1 PROJECT DETAILS

The project is understood to comprise the construction of a 7.4 m by 7.8 m by 10 m deep concrete pump room. Ground elevation at the proposed addition is approximately 231.4 m. The bottom of foundation slab would be at approximately 221.65 m. The proposed pump room will be constructed immediately against the north wall of the existing sewage pumping station. No works are proposed at the flood pumping station. All excess excavated material will be removed from the site and the existing grades will be restored.

2.2 SITE DESCRIPTION AND LOCATION

The project is located within the area of Elm Park, in the City of Winnipeg, in the Province of Manitoba. The nearest street address is 11 Mager Drive located immediately southwest of the flood pumping station.

There was thin snow cover on the ground during the fieldwork and the river had ice and snow cover. Willows and low brush are present near river level. The actual right-of-way appears to be grass covered and without trees, however, upstream and downstream, large deciduous and coniferous trees are present.

The site has been regraded. The overall slope is 7 horizontal to 1 vertical from the winter water level to the top of bank; 9 m high and 63 m horizontal distance. At the site, local grades near the top of bank are as steep as 4:1. An approximately 1.5 m high scarp extends downstream (northeast) of the site and also appears to extend upstream (southwest).

There are two buildings on the site, a flood pumping station on the south and a sewage pumping station building just north which is surrounding by a chain link fence. Details of the existing flood pumping station foundation were not available. The lower 1.66 m diameter CSP invert near the building is at 223.11 m. The existing sewage pumping station has four 406 mm (16 inch) diameter timber or cast-in-place concrete piles evenly spaced across the 7.6 m (25 ft)

- October 15, 2002, Mager Drive Sewage Pumping Station, Expansion, Drawings 1 and 2, City of Winnipeg.

long river facing west wall. The bottom of slab is uneven and ranges in elevation from 222.5 to 221.4 m elevation.

Remedial works including a 4 m base width shear key and 8 m long by 3 m wide granular ribs were installed according to the engineering design and construction supervision of UMA Engineering Ltd. in 1993. The shear key and granular ribs were installed to elevation 215.5 m, approximately 1 m into the till. Riprap cobbles and boulders are exposed near the river's edge and were installed under the same contract. Three sand drain trenches had been installed previously in the 1980's to approximate elevation 222 m from the river towards the top of slope.

It is KGS Group's understanding that no distress has been observed at the existing structures and that no significant ground movements have been measured since installation of shear key (personal communication Rob Kenyon, KGS Group with Ken Skaftfeld, UMA Engineering).

3.0 SITE INVESTIGATION

On December 15, 2003, KGS Group supervised the drilling of two testholes located as shown in Figure 1. The holes were drilled with an Acker Soil Sentry rig mounted on a tracked carrier contracted from Paddock Drilling Ltd. The holes were advanced using 125 mm solid stem augers to depths of between 6.4 and 17.2 m below existing ground surface. Both testholes were drilled on the top of bank near the proposed pump room addition. (The first hole was abandoned when the SPT hit refusal and recovered a piece of concrete.)

Solid stem auger samples and split-spoon samples were recovered for laboratory testing. Standard Penetration Tests (SPT's) were performed. At Testhole TH03-02, a 25 mm PVC standpipe was installed with response zone in the till. A lockable steel protective casing was placed over the standpipe. Instrumentation was not installed in Testhole TH03-01. Installation details are presented on the testhole logs. Testhole logs are presented in Appendix A.

Ground surface elevations at the testhole locations were taken from the City of Winnipeg ortho-digital contours.

Classification and index tests were performed at NTL Laboratories Ltd. on soil samples collected from the testholes. Laboratory tests included natural moisture content and Atterberg limits. These results are shown on the testhole logs.

4.0 SUBSURFACE CONDITIONS

4.1 STRATIGRAPHY

The stratigraphy logged in the two testholes drilled at the site is summarized as follows (please refer to the testhole logs for the full description):

- CLAY (Fill)- soft to stiff, silty, trace sand, trace gravel, low to high plastic, moist to wet, brown to black with mottled grey. Clay fill was encountered to greater than 6.4 m depth in TH03-01 located about 3 m north of the fence and to an estimated 5.2 m depth in Testhole TH03-02 located about a total of 6 m from the fence towards the west.
- CLAY (Lacustrine)- CH, soft to firm, silty, trace sand, high plastic, moist to saturated, brown to grey. The clay consistency was soft below elevation 220 m.
- CLAY or SILT (Till)- CL, ML, firm or dense, trace to some sand, trace to some gravel, low plastic, saturated, light grey to pink. Encountered at 15.5 m depth or 216.25 m elevation in Testhole TH03-02. Auger refusal occurred approximately 1.6 m into the till.

4.2 GROUNDWATER CONDITIONS

The depth, below ground surface, to groundwater in the standpipe in TH03-02 was 15.12 m (216.28 m elevation) on Dec 22, 2003.

The river elevation was 221.4 m on December 19, 2003 at Fort Garry (http://www.winnipeg.ca/publicworks/PWDData/RiverLevels/).

The maximum flood protection level for this site is 230.6 m. Groundwater elevations vary seasonally and in response to river levels and precipitation.

5.0 RECOMMENDATIONS

KGS Group has reviewed drawings for the proposed construction and previous available information as noted above. The pump room addition could be constructed with a sloped excavation or temporary shoring subject to additional recommendations below. The existing pump room has a line of piles beneath the wall facing the river. Piles tend to have small displacements, while footings or slabs on soft to firm clay can be subject to relatively large displacements. Pile supported components should be independent from footing or mat slab supported components to allow for this differential movement. Possible pile types include driven steel and bored cast-in-place concrete piles. Piles could be used for a soldier pile and lagging temporary shoring wall, as foundation support and also to provide uplift resistance. Pile recommendations have not been included in this report but will be provided upon request. The top of slope should not be surcharged during or after construction by stockpiled fill or other. Backfill to restore original site grades should be general engineered fill as defined below.

5.1 CONSTRUCTION EXCAVATIONS

The composition and consistencies of the lacustrine clay and fill soils encountered at the site are such that conventional hydraulic excavators should be able to remove these materials.

Construction excavations should be in accordance with good practice and comply with the requirements of the responsible regulatory agencies.

All excavations greater than 1.5 m deep should be sloped or shored for worker protection.

Shallow excavations up to about 3 m depth may use temporary sideslopes of 1:1. A flatter slope of 2:1 should be used if groundwater is encountered. Localized sloughing can be expected from these slopes.

Deep excavations or trenches may require temporary support if space limitations or economic considerations preclude the use of sloped excavations.

For excavations greater than 3 m depth, temporary support should be designed by a qualified professional engineer. The design and proposed installation and construction procedures should be submitted to KGS Group for review.

Attention should be paid to structures or buried service lines close to the excavation. For structures, a general guideline is that if a line projected down, at 45° from the horizontal from the base of foundations of adjacent structures intersects the extent of the proposed excavation, these structures may require underpinning or special shoring techniques to avoid damaging earth movements.

No surface surcharges should be placed closer to the edge of the excavation than a distance equal to the depth of the excavation, unless the excavation support system has been designed to accommodate such surcharge.

5.2 TEMPORARY SHORING

Vertical sided excavations in excess of 1.5 m depth should be supported by some form of shoring. The shoring design and construction procedures should account for:

- The lateral earth pressure of the clay fill and native lacustrine clay soils, groundwater pressures, surcharge load from construction equipment, and any surcharge load from nearby buildings. If the existing pump station wall is proposed to support the internal struts then the structural capacity of the wall should be reviewed.
- Basal heave due to highest possible pore pressures during construction (**may be other pore pressures then those presented in this report**) at the base of the excavation.
- Internal struts should be installed and perform to minimize soil movement and protect nearby structures.
- Removal of temporary shoring and backfilling between the existing ground and the new pump room should be carried out to minimize the potential for lateral and vertical ground movements.
- Excavated materials should not to be placed near the excavation or near the top of slope.

Some form of underpinning may be required in conjunction with the shoring system in order to meet the above objectives. This will depend upon such factors as the nature of adjacent structures and the type of shoring system adopted. As a general rule, however, consideration should be given to the need for underpinning if a line drawn from the base of the excavation behind the shoring at an angle of 45° to the horizontal intercepts any below ground part of a structure behind the shoring. Potential movements of any structures within this zone should be monitored by surveying. Survey points should be established prior to construction.

5.3 MAT SLAB

The bottom of slab for the proposed pump room addition is approximately 221.65 m elevation. Mat slab foundations based on undisturbed native lacustrine clay may be designed using a modulus of subgrade reaction of 5 kPa/mm for calculation of bending moments, shear forces and deflections in the slab. The bearing surfaces for mat slabs should be approved by a qualified professional engineer and protected against disturbance and degradation by applying a lean concrete mix over the exposed surface immediately following excavation. Mat slab areas should be protected from meteorological elements including freezing temperatures and water.

5.4 UPLIFT

The proposed concrete pump room should be of sufficient weight and embedment within soil or otherwise anchored to resist the maximum anticipated hydrostatic uplift forces.

5.5 PERMANENT WALL PRESSURES

Permanent walls should be designed to resist lateral earth pressures, in the at rest condition, and may be designed using the following expression, which assumes a triangular pressure distribution:

$$P_o = K_o (\gamma H + q)$$

Where:

P_o = Lateral earth pressure at rest condition where no movements of walls occur at a given depth (kPa).
K_o = Coefficient of earth pressure at rest condition; use 0.5 for backfill material such as silts and clays, use 0.45 for sands and gravels.
γ = Bulk unit weight of soil for backfill; for silts and clays, use 19 kN/m, for sands and gravel, use 21.0 kN/m.
H = Depth below final grade (m).
q = Any surcharge pressure at ground level.

The above-noted expression assumes native material or backfill material compacted to approximately 95% of Standard Proctor maximum dry density and horizontal ground behind the basement wall. If the ground surface slopes upwards away from the wall, design wall pressures should be re-evaluated.

Backfill around basements should not commence before the concrete walls have reached a minimum two-thirds of its 28-day strength and first floor framing and basement floor slab are in place. Only hand operated compaction should be employed within 600 mm of the concrete basement walls.

5.6 BACKFILL MATERIALS AND COMPACTION

General engineered fill should comprise inorganic cohesive soils. Such material should be placed in compacted lifts not exceeding 200 mm and compacted to not less than 95% of standard Proctor maximum dry density, at a moisture content of between 0 to +3% of optimum.

Structural fill materials should comprise clean well-graded inorganic granular soils. Such fill should be placed in compacted lifts not exceeding 150 mm and compacted to not less than 100% of standard Proctor maximum dry density.

Landscape fill materials may comprise soils without regard to engineering quality. Such soils should be placed in compacted lifts not exceeding 300 mm and compacted to a density of not less than 90% of standard Proctor maximum dry density.

Standard Proctor maximum dry density and optimum moisture content are defined in ASTM Test Method D698.

Backfill comprising cohesive soils or silt should be considered frost susceptible and should not be used in areas where it may become frozen and where frost heaving would be unacceptable.

Pit-run gravel should comprise 200 mm minus, well graded (GW), gravel with less than 5% passing the #200 sieve.

5.7 CONCRETE TYPE

In Winnipeg, the potential degree of sulphate attack on concrete may be considered to be severe. CAN/CSA-A23.1-M90 requires the use of Type 50 cement with a maximum water/cement ratio of 0.45 and a minimum 28-day compressive strength of 32 MPa for concrete with severe exposure to sulphates. Stricter recommendations may be required due to structural or other considerations.

Air entrainment of 4 to 7% by volume is recommended for all concrete exposed to freezing temperatures, native soils, and/or groundwater.

6.0 REVIEW OF DESIGN AND CONSTRUCTION

KGS Group should be given the opportunity to review details of the design and specifications, related to geotechnical aspects of this project, prior to construction. Adequate monitoring during construction is recommended. All construction should be carried out by a qualified contractor, experienced in foundation and earthworks construction. Adequate monitoring includes:

- Shallow foundations: Written approval of all bearing surfaces prior to concrete or mud slab placement.
- Deep foundations: Full-time monitoring and design review during construction.
- Earthworks: Full-time monitoring and compaction testing.

All such monitoring should be carried out by qualified persons, independent of the contractor. Failure to provide an adequate level of foundation monitoring may be in contravention of Building Code requirements.

KGS Group is a multi-discipline consulting engineering firm and can provide assistance for the design of any other aspects of this development, as required, including structural, mechanical, electrical and municipal engineering plus project management and site supervision.

7.0 RIVERBANK IMPACT ASSESSMENT

7.1 IMPACT OF PROPOSED CONSTRUCTION ON RIVERBANK STABILITY

The construction and operation of the pump room will not reduce the stability of the riverbank.

The proposed pump room will offload the top of bank and improve slope stability.

The risk of leakage from water pipes into the slope should be minimized as possible.

7.2 WATERWAYS PERMIT RECOMMENDATION

The proposed construction and operation of the concrete pump room addition to the Mager Drive pumping station will not endanger the stability of the riverbank, will not impede water flow and will not adversely alter the waterway. Therefore, KGS Group recommends that a Waterways permit be granted.

8.0 LIMITATIONS

Geotechnical recommendations presented herein are based on findings in two testholes and previous available information.

If conditions other than those reported are noted, KGS Group should be given the opportunity to review current recommendations. The recommendations presented herein may not be valid if an adequate level of monitoring is not provided during construction, or if relevant building code requirements are not met. This report does not include any recommendations related to contaminants in soil or groundwater. Environmental issues are not included in this scope of work.

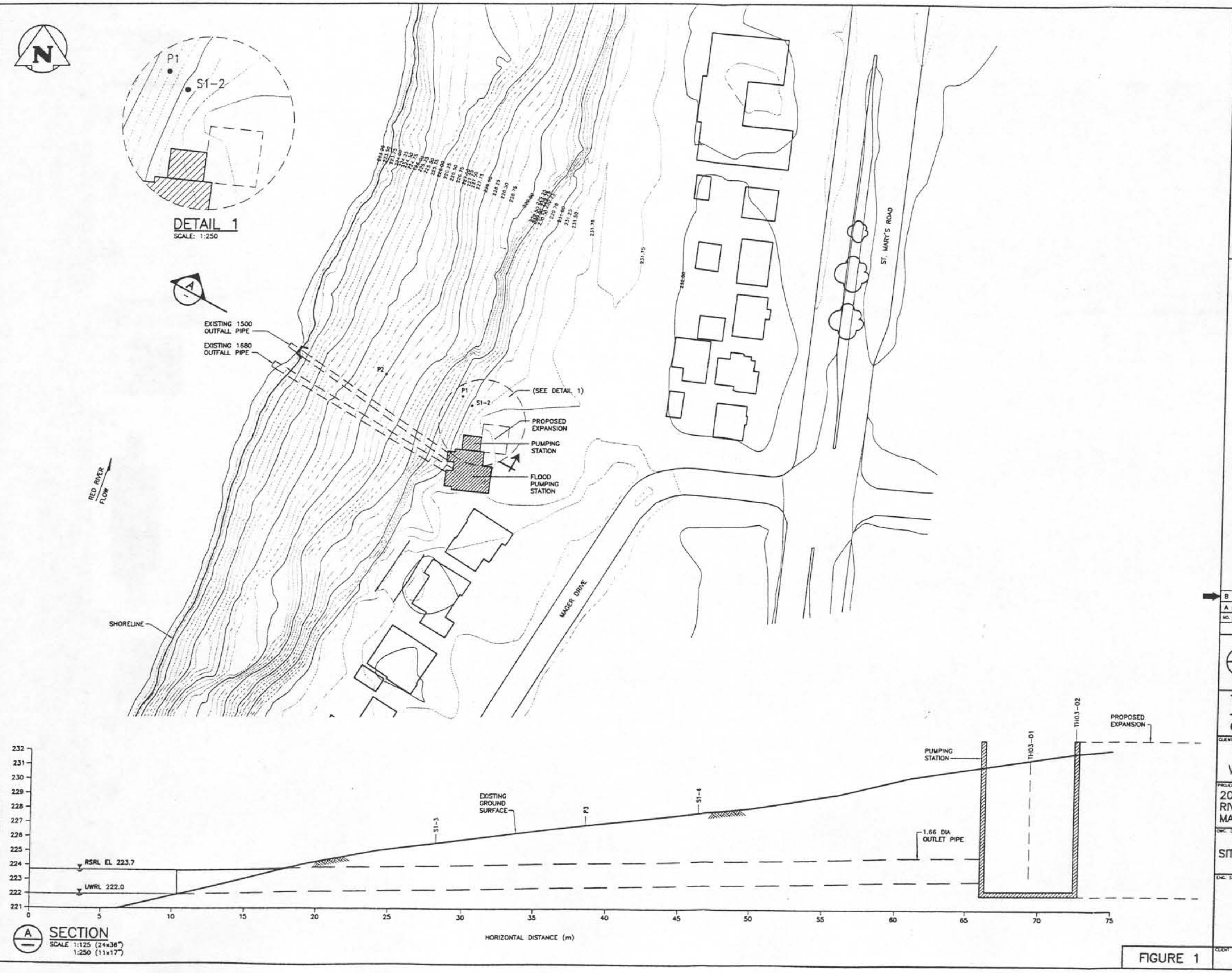
This report has been prepared for the exclusive use of the City of Winnipeg for specific application to the proposed pump room addition on Mager Drive. KGS Group makes no representations to any party with whom KGS Group has not entered into a contract. This report has been prepared in accordance with generally accepted soil and foundation engineering practices. No other warranty is made, either expressed or implied.

FIGURE

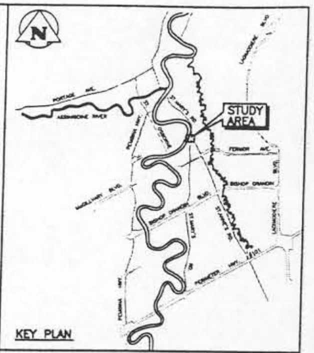
SITE PLAN AND SECTION

KGS FILE NO.: P:\Projects\2003\03-0107-05\Geo\Dwgs\Mager Drive\Revision B\03-0107-05-01revB.dwg
24"x36"/PLOT SCALE: 500

24x36B



A SECTION
SCALE 1:125 (24x36")
1:250 (11x17")



KEY PLAN

LEGEND

S1-3 •	EXISTING DRILLHOLE (BY OTHERS)
TH03-01 ◈	TEST HOLES (BY KGS GROUP, DECEMBER 2003)

0 10 20 30 40 50m

SCALE: 1:500 METRIC 24"x36"
1:1000 METRIC 11"x17"

NO.	D / M / Y	DESCRIPTION	BY
B	15/01/04	ISSUED WITH ADDENDUM	
A	08/12/03	ISSUED WITH REPORT	JMc

REVISIONS / ISSUE

A. SECTION LETTER OR DETAIL NUMBER
B. DRAWING WHERE SECTION OR DETAIL IS DRAWN
OR
DRAWING WHERE SECTION OR DETAIL WAS INDICATED
— SECTION OR DETAIL SHOWN ON SAME DRAWING

KGS GROUP
CONSULTING ENGINEERS & PROJECT MANAGERS
WINNIPEG (204) 896-1209
THUNDER BAY (807) 345-2233

CLIENT:
THE CITY OF WINNIPEG
WATERWORKS, WASTE AND DISPOSAL DEPARTMENT

PROJECT:
2003 GEOTECHNICAL
RIVERBANK ASSESSMENT
MAGER DRIVE, WINNIPEG, MB

DWG. DESCRIPTION:
SITE PLAN AND SECTION

ENG. STAMP:
DESIGNED BY: JMc
CHECKED: RKe
DRAWN BY: EC
CHECKED:
APPROVED:
SCALE: AS NOTED
DATE: DECEMBER 2003
KGS DWG. NO.: 03-0107-05 01
CLIENT DWG. NO.:
REV: B

FIGURE 1

APPENDIX A

TESTHOLE LOGS

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LEGEND FOR SUMMARY LOG

SHEET 1 of 1

CLIENT CITY OF WINNIPEG

JOB NO. 03-107-16

PROJECT MAGER DRIVE PUMPING STATION EXTENSION

DATE DRILLED 17/12/03

LOCATION MAGER DRIVE PUMPING STATION

GRAPHICS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	Cu from Unconfined Comp. Test (kPa) ◇ Cu TORVANE (kPa) ◆ PL MC LL % - kPa 20 40 60 80
	SOIL DESCRIPTION			
⁂	TOPSOIL			
▨	CLAY (FILL)			
▨	CLAY (LACUSTRINE)			
░	SAND			
▥	SILT TILL			
▨	CLAY TILL			

SAMPLE TYPE ▯ AUGER GRAB ⧖ SHELBY ☒ SPLIT SPOON ◧ SPLIT BARREL

CONTRACTOR

INSPECTOR

APPROVED ________ DATE 29/12/03

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SOIL DESCRIPTION CRITERIA

SHEET 1 of 1

PRINCIPAL AND MINOR SOIL COMPONENTS

occasional - trace of very local concentration
trace 0 - 10%
some 10 - 20%
with 20 - 35%
and 35 - 50%

FIELD MOISTURE CONTENT

dry	no moisture visible or to touch when fresh exposure is examined
damp	slightly wet to touch
moist	fresh exposure wet to touch
wet	a film of water is readily visible around particles of granular soils, cohesive soils can readily be smeared or remolded; water can be squeezed out
saturated	water can easily be squeezed out
free water	water completely separated from the soil particles

DEPOSITIONAL STRUCTURE

massive	structureless soil
stratified (layered)	different soils or visible variations in soil constituents arranged in layers, generally but not necessarily parallel to one another, and not necessarily in horizontal position, at least 6 mm thick
varved	glaciolacustrine deposits with annual pairs of fine and coarser laminae (thin laminae of alternately deposited inorganic silt and clay)
laminated	closely spaced, regularly alternating layers of differing soils and/or colours, or shades of similar gradation, relatively consistent in thickness and consisting of sand, silt or clay
lens	inclusions of a different soil within surrounding soils, which thins out horizontally and may not be continuous over any significant distance
pocket	a different soil type of very limited thickness or lateral extent (a small lens)
inclusions	a small pockets
nuggety	a different soil type in form of small lumps
parting	paper thin separation of one type by another

POST DEPOSITIONAL STRUCTURE

fissured	a soil breaks along definite, pre-existing planes or fracture with little resistance to fracturing
slickensided	polished or glossy, sometimes striated surfaces resulting from movement of a material block relative to the adjacent blocks
blocky/friable/platy	cohesive soil that can be broken down into angular larger fragments (blocky), small fragments (friable), or thin plate-like fragments (platy) which resist further breakdown
cemented	soil particles or fragments held together by cemented materials, often chemical precipitants, or deposits within overall soil mass

GRAIN SIZE DISTRIBUTION IN COARSE GRAINED SOIL

boulders	>200 mm ø
cobbles	75 - 200 mm ø
coarse grained gravel	19 - 75 mm ø
fine grained gravel	4.75 - 19 mm ø
coarse grained sand	2.0 - 4.75 mm ø
medium grained sand	0.425 - 2.0 mm ø
fine grained sand	0.075 - 0.425 mm ø

DENSITY OF GRANULAR SOIL

	Standard Penetration Test:	Relative Density:
very loose	0 - 4 blows per 0.3 m	<15%
loose	4 - 10 blows per 0.3 m	15 - 35%
compact	10 - 30 blows per 0.3 m	35 - 65%
dense	30 - 30 blows per 0.3 m	65 - 85%
very dense	>50 blows per 0.3 m	>85%

CONSISTENCY OF COHESIVE SOILS

	Torvane:	Standard Penetration Test:
very soft	<12 kPa	<2
soft	12 - 25 kPa	2 - 4
firm	25 - 50 kPa	4 - 8
stiff	50 - 100 kPa	8 - 15
very stiff	100 - 200 kPa	15 - 30
hard	>200 kPa	>30

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SUMMARY LOG

HOLE NO. **TH-03-01**

SHEET 1 of 1

CLIENT CITY OF WINNIPEG

PROJECT MAGER DRIVE PUMPING STATION EXTENSION

SITE MAGER DRIVE PUMPING STATION

LOCATION

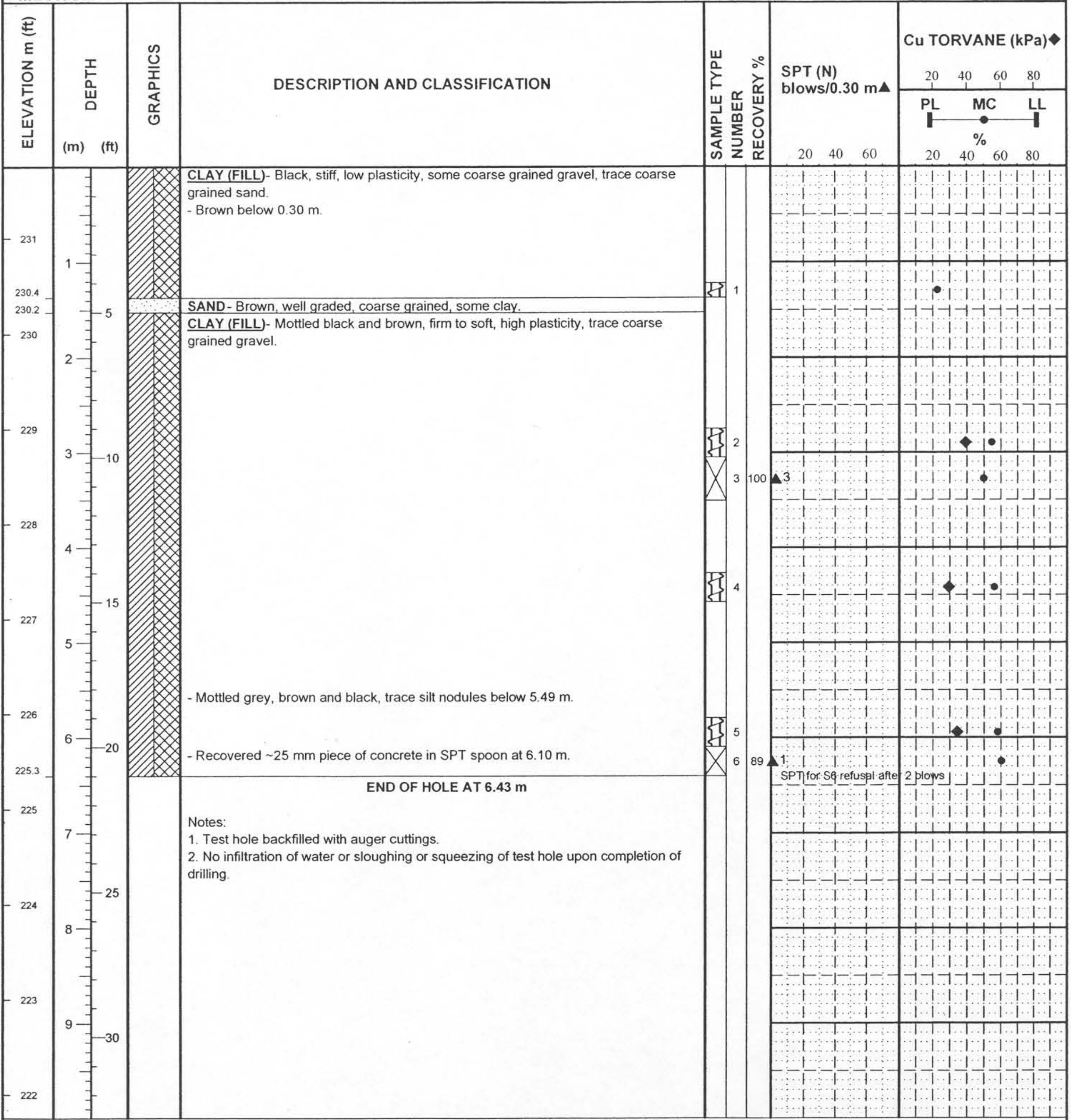
DRILLING METHOD 125 mm ø Solid Stem Auger, ACKER SS Drill Rig

JOB NO. 03-107-16

GROUND ELEV. 231.75 m

WATER ELEV.

DATE DRILLED 17 Dec 03



CLAY (FILL)- Black, stiff, low plasticity, some coarse grained gravel, trace coarse grained sand.
- Brown below 0.30 m.

SAND- Brown, well graded, coarse grained, some clay.

CLAY (FILL)- Mottled black and brown, firm to soft, high plasticity, trace coarse grained gravel.

- Mottled grey, brown and black, trace silt nodules below 5.49 m.
- Recovered ~25 mm piece of concrete in SPT spoon at 6.10 m.

END OF HOLE AT 6.43 m

Notes:
1. Test hole backfilled with auger cuttings.
2. No infiltration of water or sloughing or squeezing of test hole upon completion of drilling.

SAMPLE TYPE ⌇ Auger Grab ☒ Split Spoon

CONTRACTOR
Paddock Drilling Ltd.

INSPECTOR
D. ANDERSON

APPROVED J6M DATE 06/01/04

SPT_FT_M_CALC P:\PROJECTS\2003\03-0107-16\GEO\LOGS\03-107-16 LOGS.GPJ

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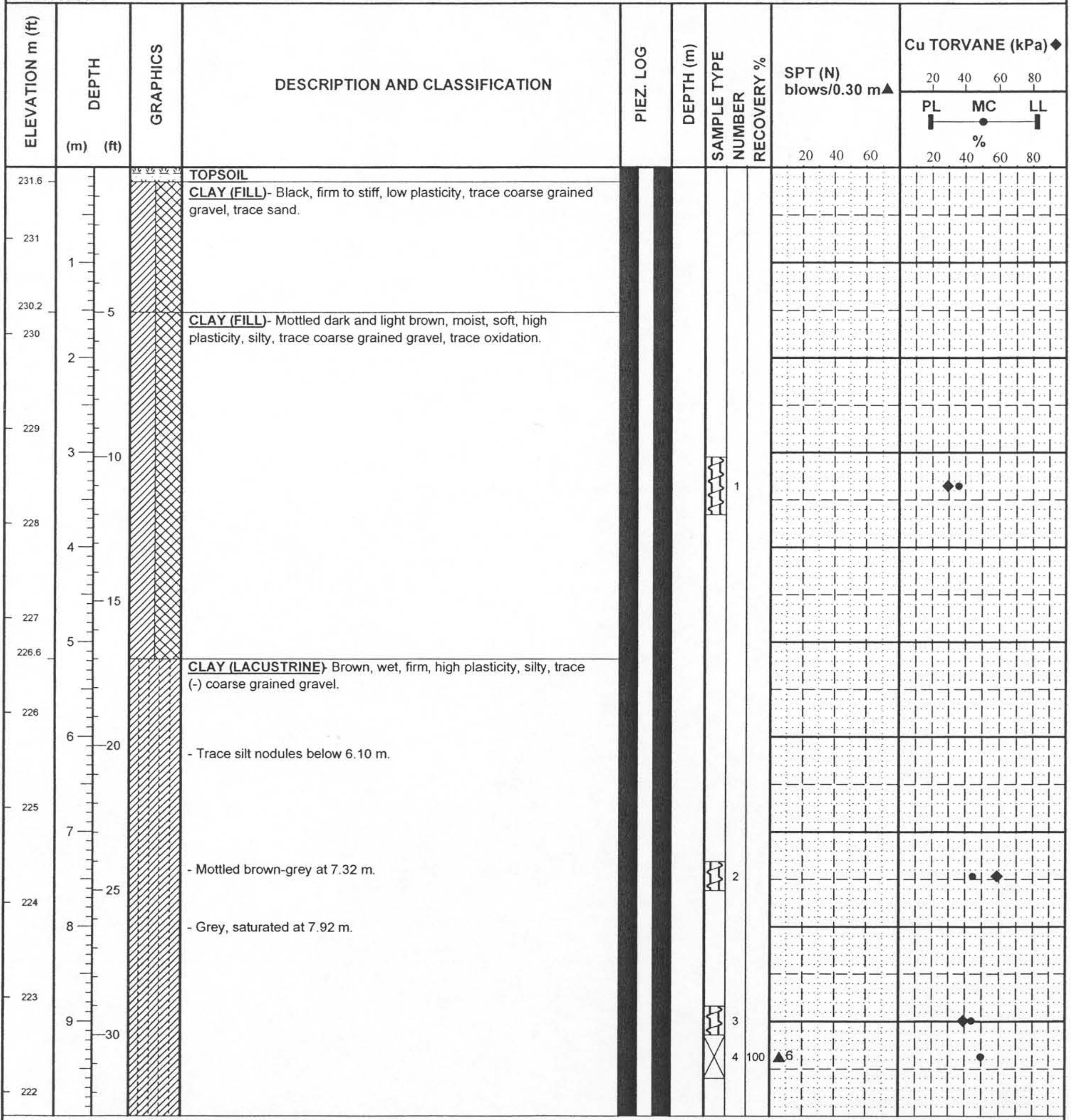
SUMMARY LOG

HOLE NO. **TH-03-02** SHEET 1 of 2

CLIENT	CITY OF WINNIPEG	JOB NO.	03-107-16
PROJECT	MAGER DRIVE PUMPING STATION EXTENSION	GROUND ELEV.	231.75 m
SITE	MAGER DRIVE PUMPING STATION	TOP OF PVC ELEV.	
LOCATION		WATER ELEV.	216.63 m (22 Dec 03)
DRILLING METHOD	125 mm ø Solid Stem Auger, ACKER SS Drill Rig	DATE DRILLED	17 Dec 03



TOPSOIL

CLAY (FILL)- Black, firm to stiff, low plasticity, trace coarse grained gravel, trace sand.

CLAY (FILL)- Mottled dark and light brown, moist, soft, high plasticity, silty, trace coarse grained gravel, trace oxidation.

CLAY (LACUSTRINE)- Brown, wet, firm, high plasticity, silty, trace (-) coarse grained gravel.

- Trace silt nodules below 6.10 m.

- Mottled brown-grey at 7.32 m.

- Grey, saturated at 7.92 m.

SAMPLE TYPE ⌇ Auger Grab ☒ Split Spoon

CONTRACTOR Paddock Drilling Ltd.	INSPECTOR D. ANDERSON	APPROVED	DATE 06/01/04

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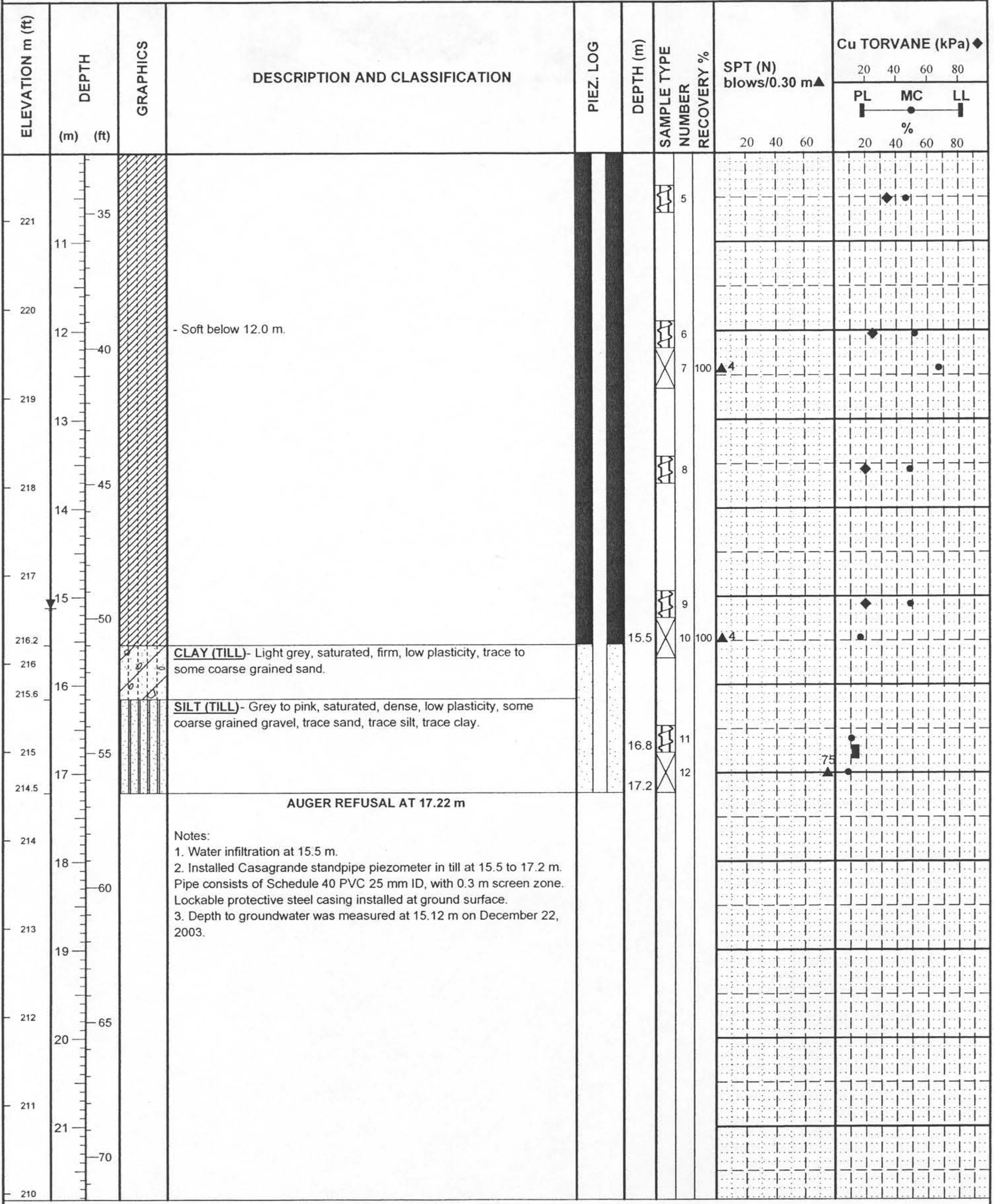
SUMMARY LOG

HOLE NO. **TH-03-02**

SHEET 2 of 2



- Soft below 12.0 m.

CLAY (TILL)- Light grey, saturated, firm, low plasticity, trace to some coarse grained sand.

SILT (TILL)- Grey to pink, saturated, dense, low plasticity, some coarse grained gravel, trace sand, trace silt, trace clay.

AUGER REFUSAL AT 17.22 m

Notes:

1. Water infiltration at 15.5 m.
2. Installed Casagrande standpipe piezometer in till at 15.5 to 17.2 m. Pipe consists of Schedule 40 PVC 25 mm ID, with 0.3 m screen zone. Lockable protective steel casing installed at ground surface.
3. Depth to groundwater was measured at 15.12 m on December 22, 2003.

SAMPLE TYPE ⌇ Auger Grab ☒ Split Spoon

CONTRACTOR
Paddock Drilling Ltd.

INSPECTOR
D. ANDERSON

APPROVED

DATE 06/01/04

SPT_FT_M_CALC P:\PROJECTS\2003\03-0107-16\GEO\LOGS\03-107-16 LOGS.GPJ