JOHN D. PATERSON AND ASSOCIATES LIMITED

Ottawa Consulting Engineers North Bay

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TERRAIN ANALYSIS REPORT
PROPOSED RESIDENTIAL DEVELOPMENT
STANLEY PARK SUBDIVISION
TOWNSHIP OF OSGOODE, ONTARIO

FOR

MR. CECIL STANLEY

c/o

CONNELLY McMANUS ENGINEERING LIMITED

REPORT NO. G7591-99

DECEMBER 16TH, 1999

APPENDICES

1.0 INTRODUCTION

John D. Paterson and Associates Limited were retained by Connelly McManus Engineering Limited, on behalf of Mr. Cecil Stanley to carry out a terrain analysis study at the site of a proposed residential development. The subject site represents the completion of the existing Stanley Park Subdivision, and is located north and east of the intersection of Stanmore Street and Scottanne Street as shown on Drawing No. G7591-1, which is appended to this report. A previous Terrain Analysis and Hydrogeological Study was completed in 1990 for the existing subdivision lands, by Water and Earth Science Associates Limited (File No. 2046). A review of that report was conducted by this firm prior to initiating our investigation.

The purpose of this investigation is to provide preliminary recommendations with respect to the suitability for sewage system development on the property based on the subsurface soil and groundwater conditions, and to determine whether or not the proposed lot sizes can be accommodated. Figure 1 in Appendix 3 shows the location of the study site.

2.0 SITE DESCRIPTION

The subject site is located east and north of the intersection of Stanmore Street and Scottanne Street, in the existing Stanley Park Subdivision. The site is well drained, and slopes very gently in a northeasterly direction. This area is primarily an open field and grass covered, with the exception of a small hardwood bush area along the easterly limit.

3.0 METHOD OF INVESTIGATION

The field work for this investigation was carried out on November 15th, 1999, and consisted of thirteen (13) test pits being put down, using a backhoe supplied by the client. These works were conducted under the supervision of a technologist from our Geotechnical Division. The test pits were put down at the locations shown on Drawing No. G7591-1 in Appendix 2 of this report.

Test pit locations were selected by John D. Paterson and Associates personnel, and the horizontal and vertical control was provided by Connelly McManus Engineering Limited. The soil profiles observed in the test pits, including the depth to the groundwater table, were recorded in detail in the field. The subsurface conditions observed at the test pit locations are shown on Drawing No. G7591-1 and on the Soil Profile and Test Data sheets in the appendices of this report.

Representative samples of soil were recovered from the test pits. All samples were classified texturally in the field and sealed in proper containers for further perusal in our laboratory. The depths at which the auger samples were recovered from the test holes are shown as "G" on the Soil Profile and Test Data sheets.

Laboratory Testing

Two samples of the in situ sands were selected for grain size analyses in our laboratory. The results of this testing are provided on the Grain Size Distribution sheets in Appendix 2.

Based on the results of this testing, the sands are estimated to have a percolation rate (T) of 6 to 10 min/cm.

Sample Storage

All samples will be stored in our laboratory for a period of three months after issuance of this report. They will then be discarded unless we are directed otherwise.

4.0 TERRAIN CLASSIFICATION

The surficial geology of the site was mapped using test pit methods. In general, the soil profile (below the surficial topsoil) was observed to consist of a layer of uniform sand over glacial till and/or silty clay. The groundwater level was taken to be the uppermost point at which seepage was observed in the test pits, and is generally at a depth of the order of 1.5 metres.

The details of the soil profile at each test pit location are provided on the Soil Profile and Test Data sheets in Appendix 1, and are presented graphically on Drawing No. G7591-1.

5.0 DEVELOPMENT RECOMMENDATIONS

5.1 Site Development

This portion of the site represents the remaining portion of the lands available to complete the existing Stanley Park Subdivision. The proposed development of these lands are consistent with the previous phases with respect to lot sizes. Sewage disposal can be accommodated by in-ground leaching beds, as is the case in the previous phases.

5.2 Sewage System Design

Sewage systems must be designed according to Ontario Regulation 374/81. The regulations and local amendments state that 0.9 m of suitable soil above an impervious layer and the high water table are required below absorption trenches.

It is expected that this criteria can be met for in-ground leaching beds. The percolation rate of the native sand is estimated to be of the order of 6 to 10 min/cm.

A 4- bedroom residence (240 square metres) produces of the order of 2,400 L/day of sewage effluent. Assuming the more conservative T-time of 10 min/cm, a tile length of 120 metres is required for such a home. The resulting sewage system envelope required would be of the order of 168 m^2.

A typical lot development plan is shown on Drawing No. 7591-2, which demonstrates that a house, well, and septic system system can be accommodated, while maintaining all of the applicable set-backs and separation distances. An area for a spare leaching bed is also available on each lot.

5.3 Nitrate Impact Assessment

The tile beds which will serve the proposed subdivision have the potential of increasing the nitrate levels in the underlying aquifers. The potential for contamination of the aquifer can be reduced by ensuring that the tile beds are correctly sized and positioned on the proposed lots.

Traditional accepted civil engineering design methods have dictated that, for the design of ditch and culvert capacity, a built-out subdivision composed of approximately 0.21 ha lots, would exhibit average stormwater runoff characteristics reflecting about 20% to 30% of total rainfall. This runoff coefficient can be calculated by averaging out the individual runoff coefficient for each component surface in the subdivision. This exercise yields c_{avg}=0.24 for the Stanley Subdivision.

It should be noted that this runoff coefficient is conservative for design purposes, but generally reflects reality for storms of sufficient intensity, such that they occur only once every five years. For storms of greater frequency and reduced intensity, the runoff coefficient can be expected to decrease substantially, since the rainfall has a much greater opportunity to infiltrate. What this means is that even with traditional subdivision design treatment, infiltration and evaporation would account for more than 76% of precipitation in this proposed subdivision, particularly because the terrain is flat and the soils are quite permeable.

The South Nation River Conservation Authority has already indicated, and it is currently common practice, that the design of this subdivision will generally have to comply with the Ontario Ministry of the Environment's *"Stormwater Management Practices Planning and Design Manual."* Among other criteria, those of sections "4.4.4 Baseflow Maintenance" and "4.5 SWMP Selection" will be respected in the final design of this subdivision. This has been confirmed with David McManus, P.Eng., of Connelly McManus Engineering Limited, the municipal engineers of record. Therefore, it can be expected that more than 80% of total, annual

precipitation will be accounted for as evaporation and infiltration. For purposes of our analysis, we have assumed (quite conservatively), that 50% of this component will infiltrate the soil (i.e. coefficient of infiltration = 0.4)

To determine the impact the subdivision will have on the underlying aquifer, the Thornwaite Water Balance equation was used to determine the long term effect of septic systems on the groundwater aquifer, and determine the appropriate lot size for development. A description of the parameters used and the calculation are enclosed in Appendix 2. The analysis indicates that the site can accommodate 32 septic systems (with 31 lots currently being proposed).

6.0 CONCLUSIONS

A terrain analysis was completed on the final phase of the Stanley Park Subdivision located in the Township of Osgoode, Ontario. The results of this investigation indicate that the site is underlain by very pervious soils, which permits from a hydrogeological perspective, the development of 31 residential lots having an area of the order of 0.21 hectares. In-ground sewage beds systems will be required for this development. The findings of this study are consistent with the previous phases of the Stanley Park Subdivision, and the recommendations contained within the 1990 Water and Earth Sciences report.

7.0 CLOSURE

The recommendations made in this report are in accordance with our present understanding of the project. We request that we be permitted to review our recommendations when your drawings and specifications are complete.

A soils investigation of this nature is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test locations, we request that we be notified immediately in order to permit reassessment of our recommendations.

JOHN D. PATERSON AND ASSOCIATES LIMITED

Stephen J. Walker, P.Eng.

APPENDIX 1

Soil Profile And Test Data Sheets

Symbols and Terms

JOHN D. PATERSON & ASSOCIATES LTD.
Consulting Geotechnical and Environmental Engineers
28 Concourse Gate, Nepean, Ont. K2E 7T7

SOIL PROFILE & TEST DATA

Terrain Analysis and Hydrogeological Study
Proposed Stanley Subdivision, Stanmore St.
Township of Osgoode, Ontario

DATUM Ground surface elevations provided by Connelly McManus Engineering Limited.

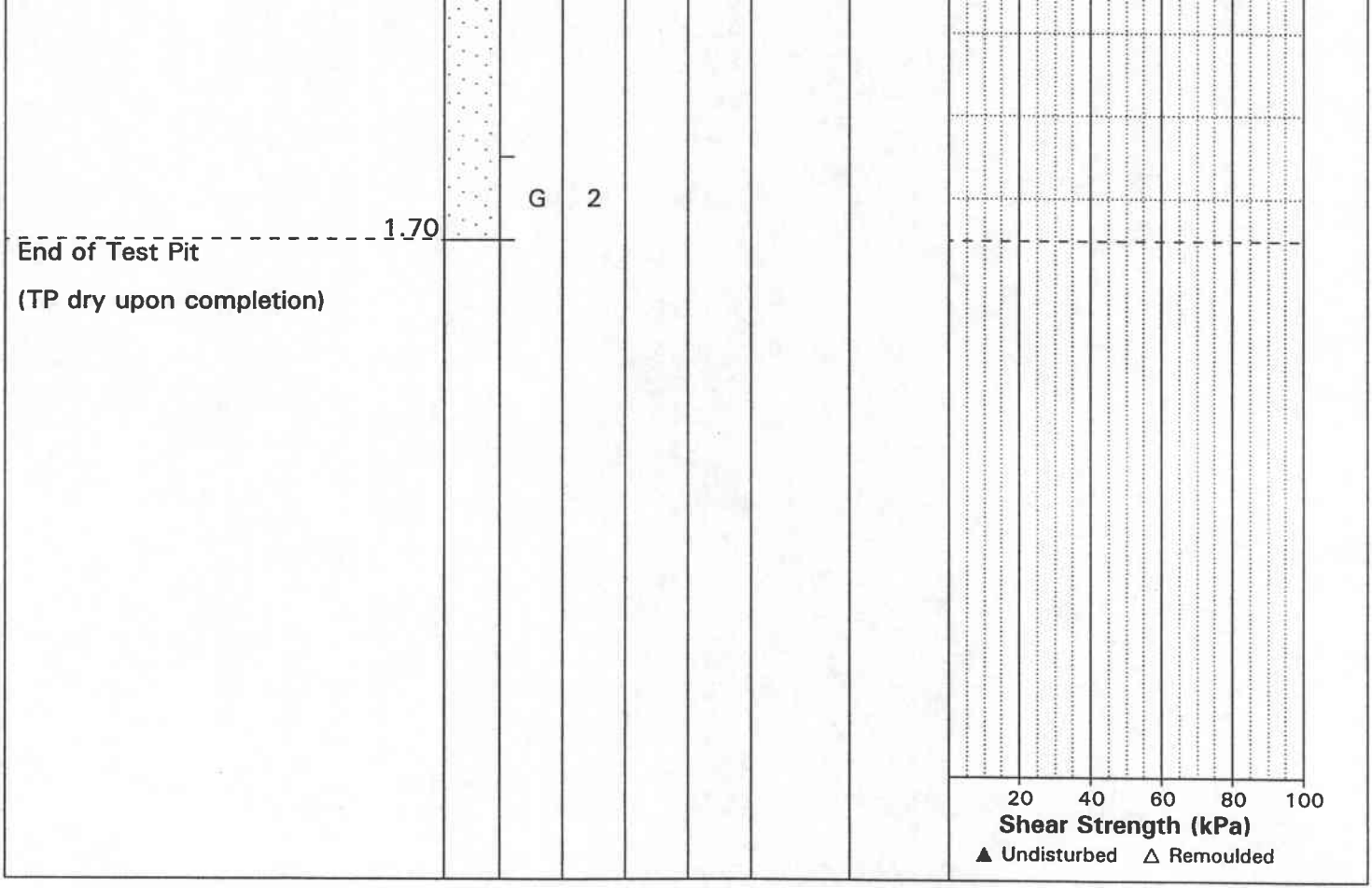
FILE NO. G7591

REMARKS

HOLE NO. TP 1

BORINGS BY Backhoe **DATE** 15 November 1999

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % (20 40 60 80)	PIEZOMETER CONSTRUCTION
GROUND SURFACE						0	101.35		
Dark brown sandy **TOPSOIL**									
0.30									
Compact, reddish to light brown SAND, some silt, gravel and cobbles		G	1			1	100.35		


G
2
1.70
End of Test Pit
(TP dry upon completion)
20
40
60
80
100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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FILE NO. G7591

REMARKS

HOLE NO. TP 2

BORINGS BY Backhoe **DATE** 15 November 1999

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % (20 40 60 80)	PIEZOMETER CONSTRUCTION
GROUND SURFACE						0	100.94		
Dark brown sandy **TOPSOIL**									
0.30									
Reddish brown to brown **SAND**, some silt, gravel						1	99.94		

and cobbles

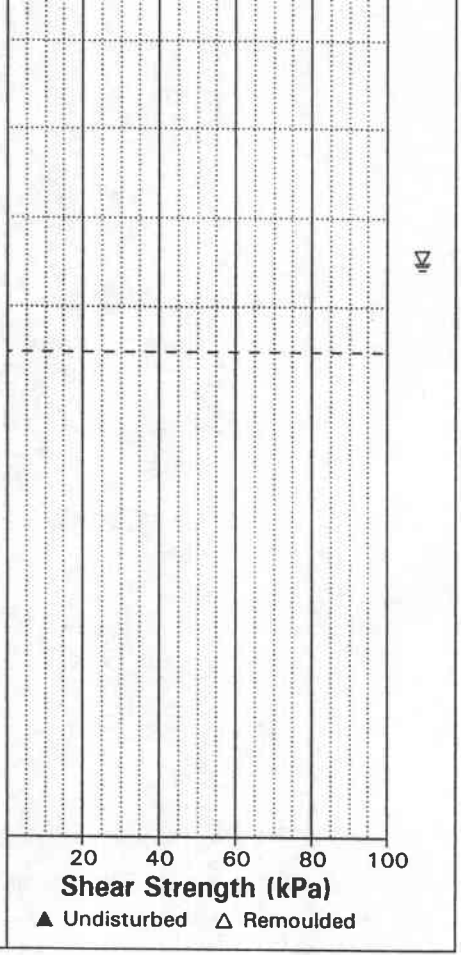
G 3

G 4

1.90

End of Test Pit

(Water infiltration @ 1.7m depth)



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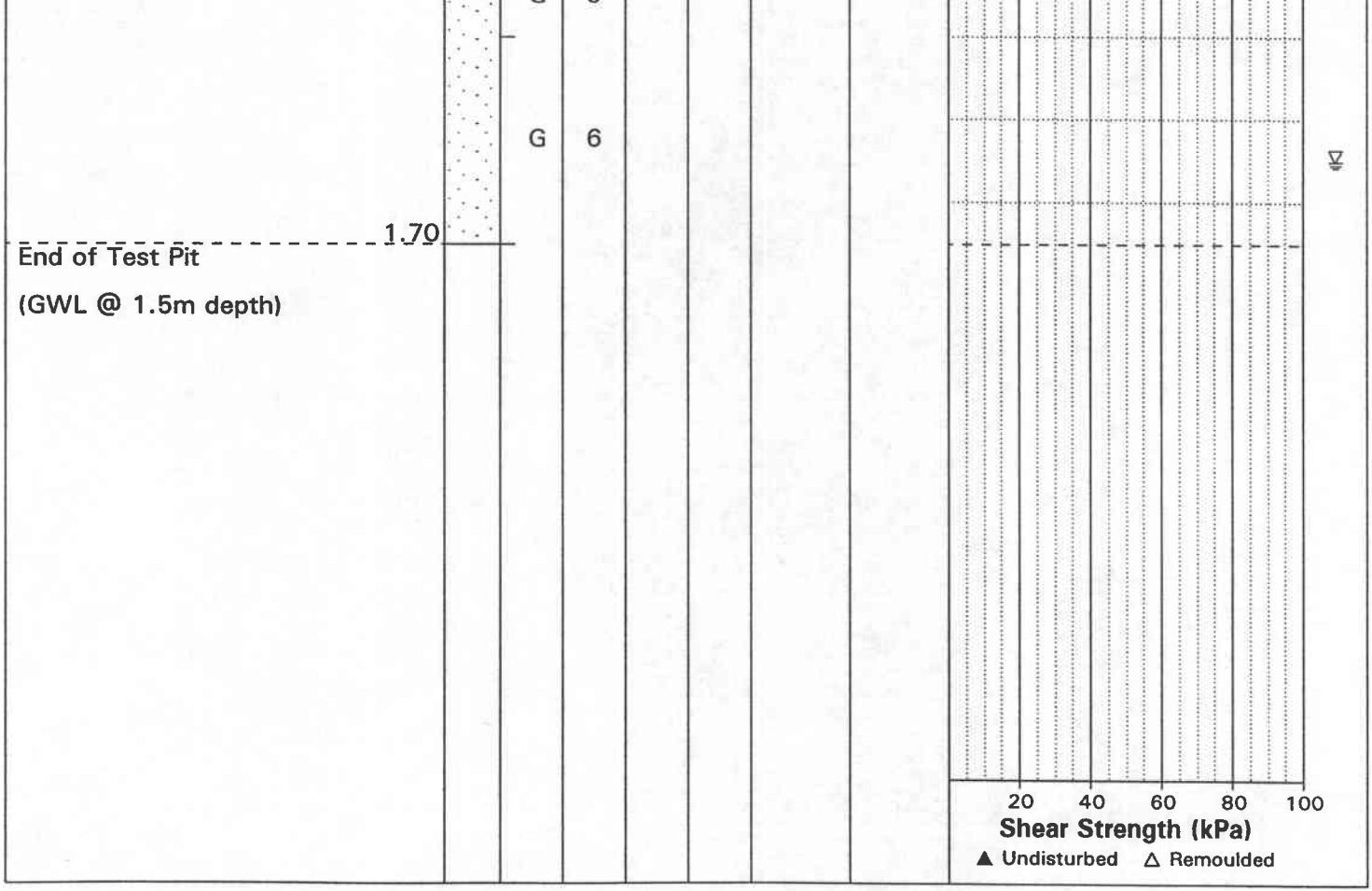
REMARKS

HOLE NO. TP 3

BORINGS BY Backhoe **DATE** 15 November 1999

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content % (20 40 60 80)	PIEZOMETER CONSTRUCTION
GROUND SURFACE						0	100.49		
Dark brown sandy **TOPSOIL**									
0.25									
Loose to compact, reddish to light brown SAND, some to trace silt and gravel		G	5			1	99.49		


G
6
1.70
End of Test Pit
(GWL @ 1.5m depth)
20
40
60
80
100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE & TEST DATA

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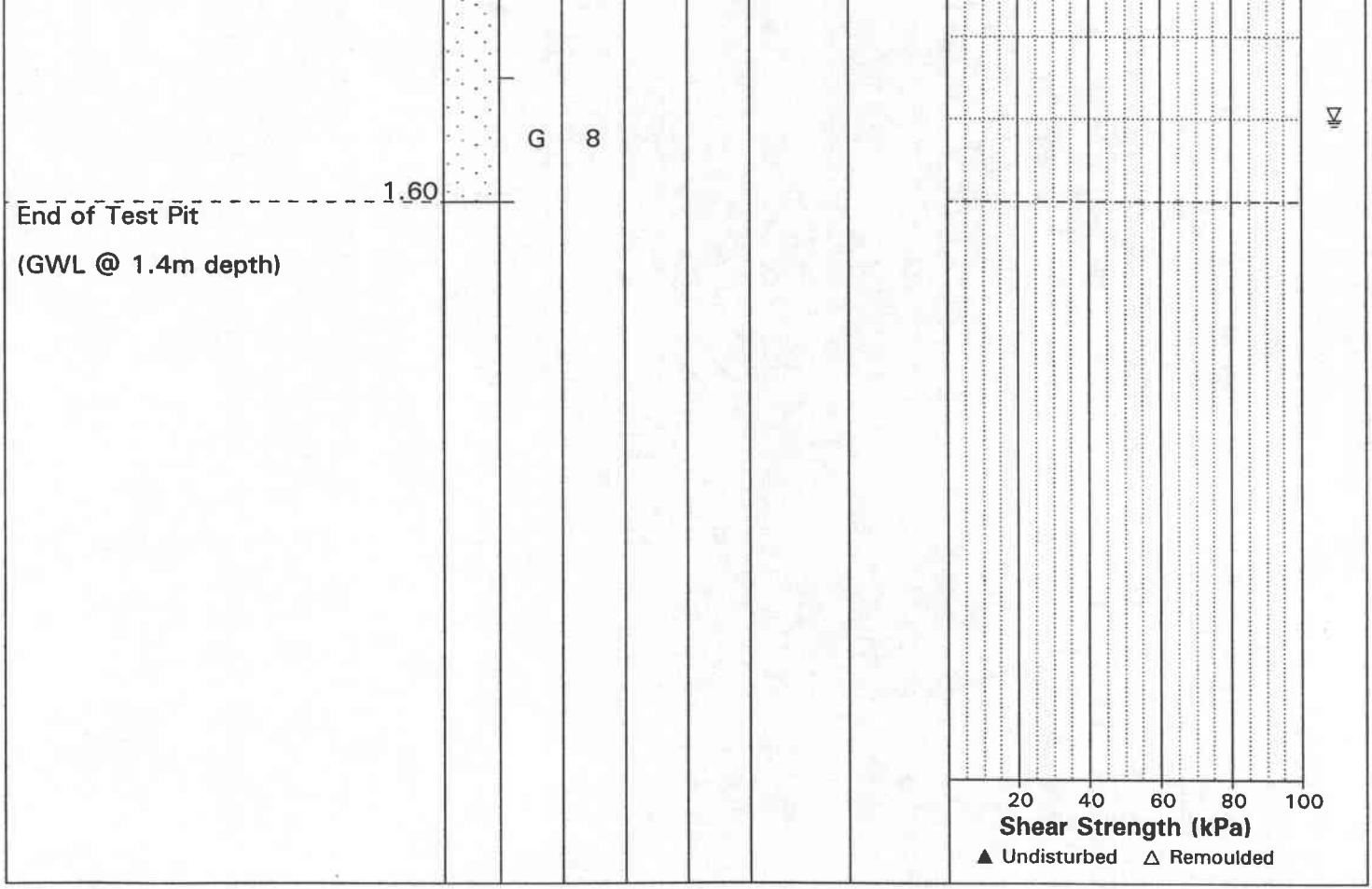
FILE NO. G7591

REMARKS

HOLE NO. TP 4

BORINGS BY Backhoe **DATE** 15 November 1999

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % (20 40 60 80)	PIEZOMETER CONSTRUCTION
GROUND SURFACE						0	100.38		
Dark brown sandy **TOPSOIL**									
0.30									
Reddish to light brown **SAND**, some to trace of silt, gravel and cobbles		G	7						
						1	99.38		


G
8
1.60
End of Test Pit
(GWL @ 1.4m depth)
20
40
60
80
100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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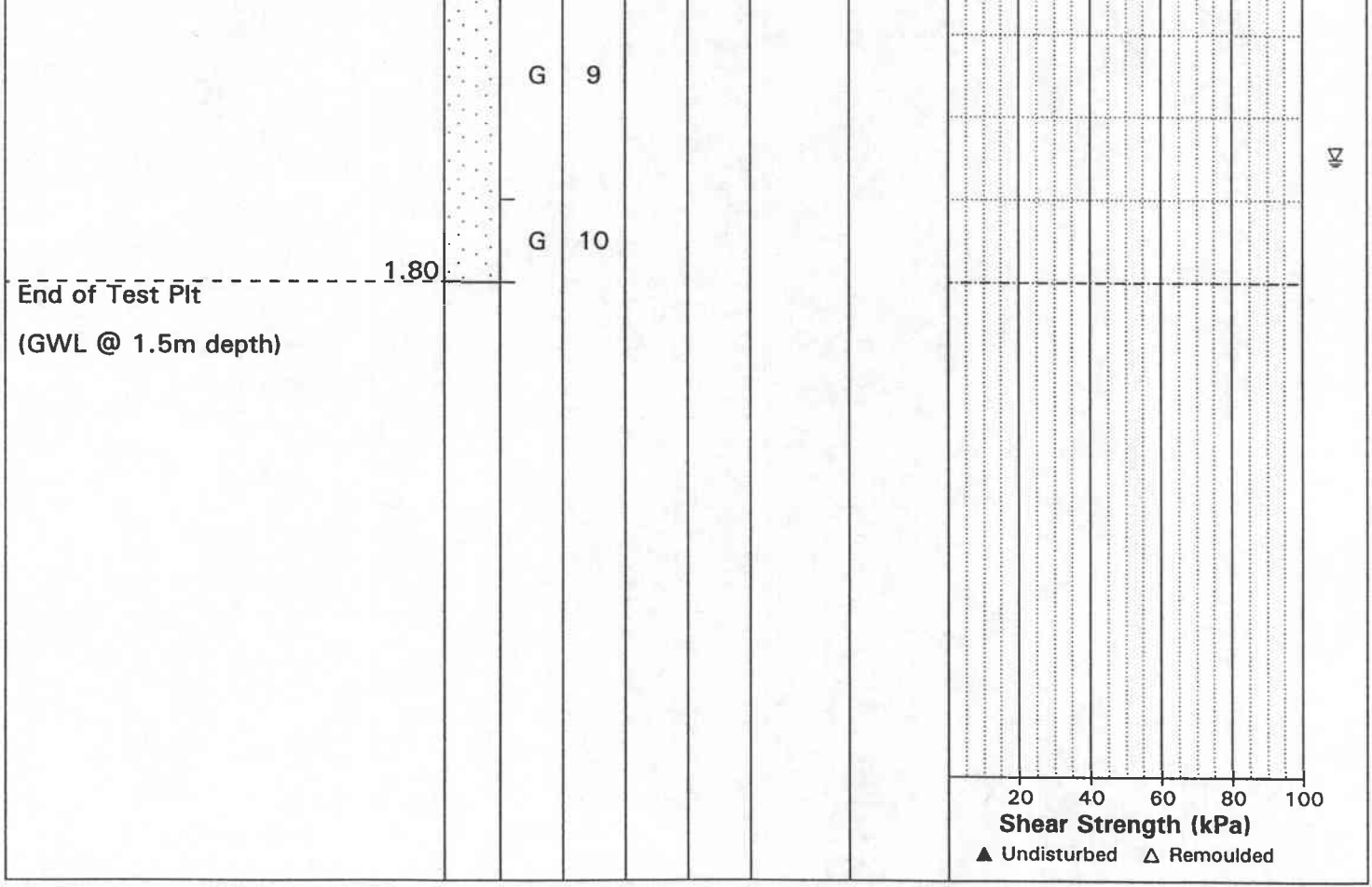
FILE NO. G7591

REMARKS

HOLE NO. TP 5

BORINGS BY Backhoe **DATE** 15 November 1999

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % (20 40 60 80)	PIEZOMETER CONSTRUCTION
GROUND SURFACE						0	100.51		
Dark brown sandy **TOPSOIL**									
0.30									
Loose to compact, reddish brown to grey SAND, some silt, trace clay						1	99.51		


G 9
G 10
1.80
End of Test Pit
(GWL @ 1.5m depth)
20
40
60
80
100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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FILE NO. G7591

REMARKS

HOLE NO. TP 6

BORINGS BY Backhoe **DATE** 15 November 1999

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content % (20 40 60 80)	PIEZOMETER CONSTRUCTION
GROUND SURFACE						0	100.65		
Dark brown sandy **TOPSOIL**									
0.30									
Reddish to light brown **SAND**, some silt, trace gravel						1	99.65		

G 11

G 12

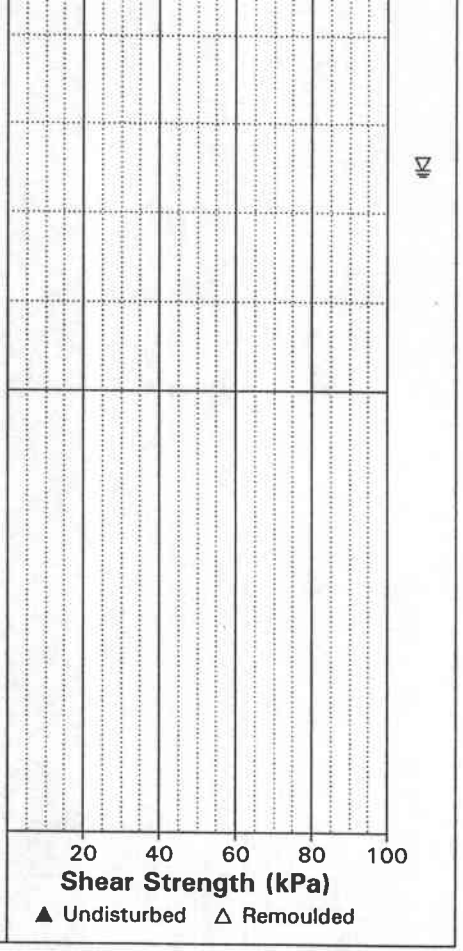
2.00

End of Test Pit

TP terminated on silty clay
@ 2.0m depth.

(GWL @ 1.5m depth)

2 98.65



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SOIL PROFILE & TEST DATA

Terrain Analysis and Hydrogeological Study
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FILE NO. **G7591**

BORINGS BY Backhoe **DATE** 15 November 1999

HOLE NO. **TP 7**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	PIEZOMETER CONSTRUCTION
GROUND SURFACE						0	100.84	20 40 60 80	
Dark brown sandy **TOPSOIL**									
0.25									
Reddish to light brown **SAND**, some silt, occasional gravel		G	13			1	99.84		

1.80

Light grey **SILTY CLAY**

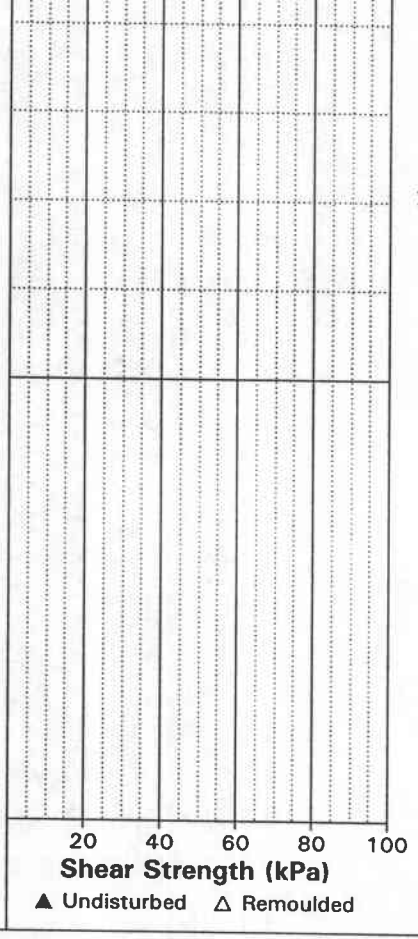
2.00

End of Test Pit

(GWL @ 1.6m depth)

G 14

2-98.84



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SOIL PROFILE & TEST DATA

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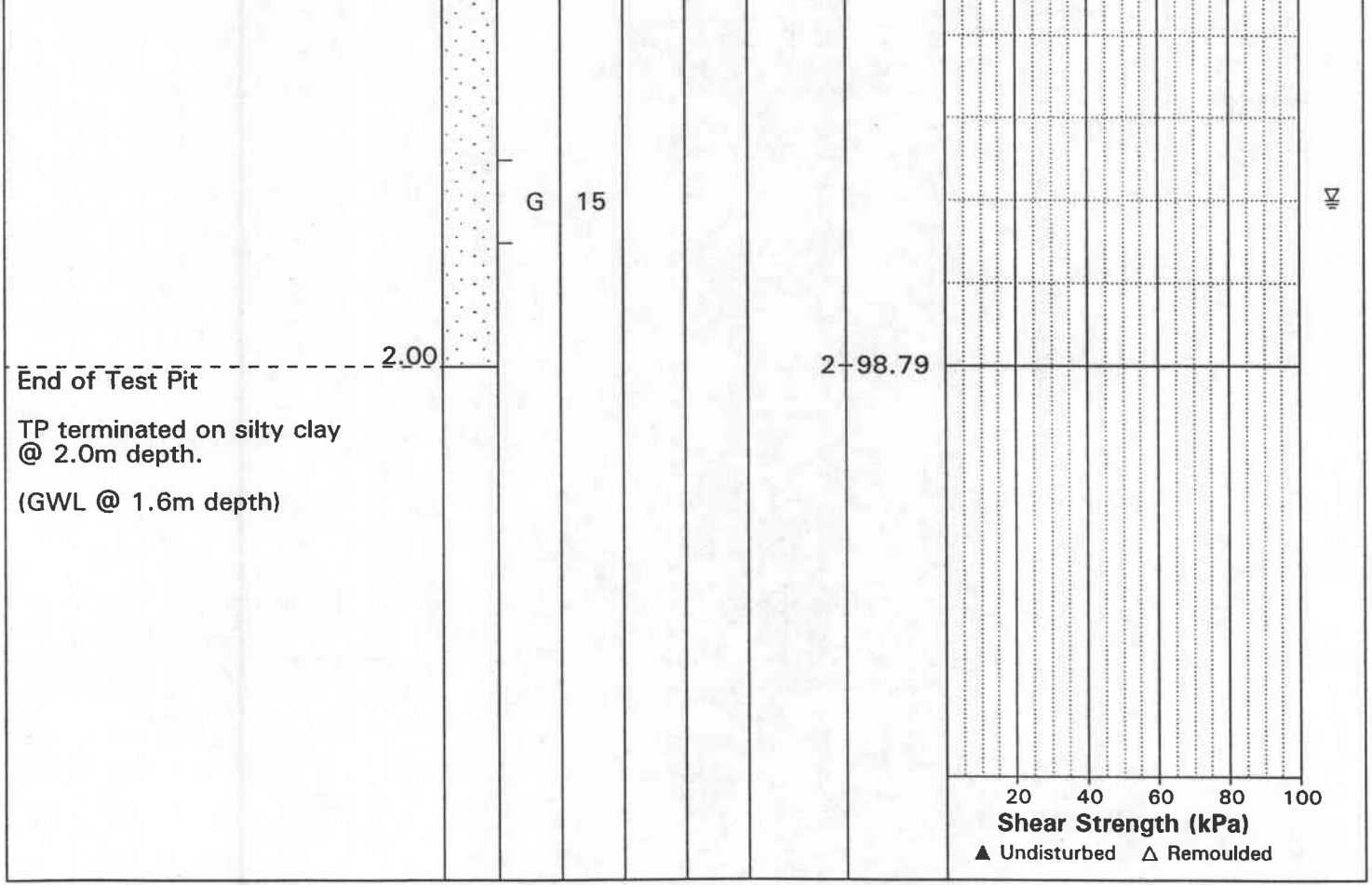
REMARKS

HOLE NO. TP 8

BORINGS BY Backhoe **DATE** 15 November 1999

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % (20 40 60 80)	PIEZOMETER CONSTRUCTION
GROUND SURFACE						0	100.79		
Dark brown sandy **TOPSOIL**									
0.30									
Reddish to light brown **SAND**, trace of silt						1	99.79		


G
15
2.00
End of Test Pit
TP terminated on silty clay
@ 2.0m depth.
(GWL @ 1.6m depth)
2-98.79
20
40
60
80
100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE & TEST DATA

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FILE NO. G7591

REMARKS

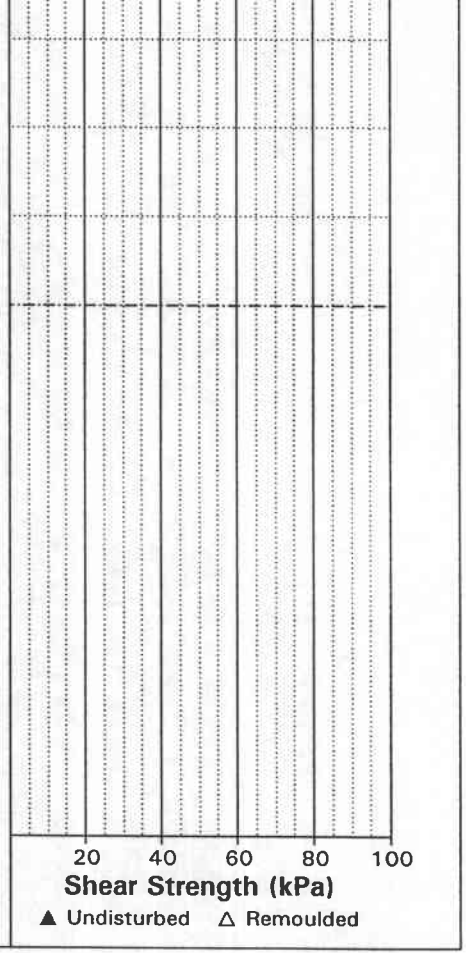
HOLE NO. TP 9

BORINGS BY Backhoe **DATE** 15 November 1999

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % (20 40 60 80)	PIEZOMETER CONSTRUCTION
GROUND SURFACE						0	100.92		
Dark brown sandy **TOPSOIL**									
0.20									
Reddish to greyish brown **SAND**, some silt and gravel		G	16			1	99.92		

1.80

End of Test Pit



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SOIL PROFILE & TEST DATA

Terrain Analysis and Hydrogeological Study
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DATUM Ground surface elevations provided by Connelly McManus Engineering Limited.

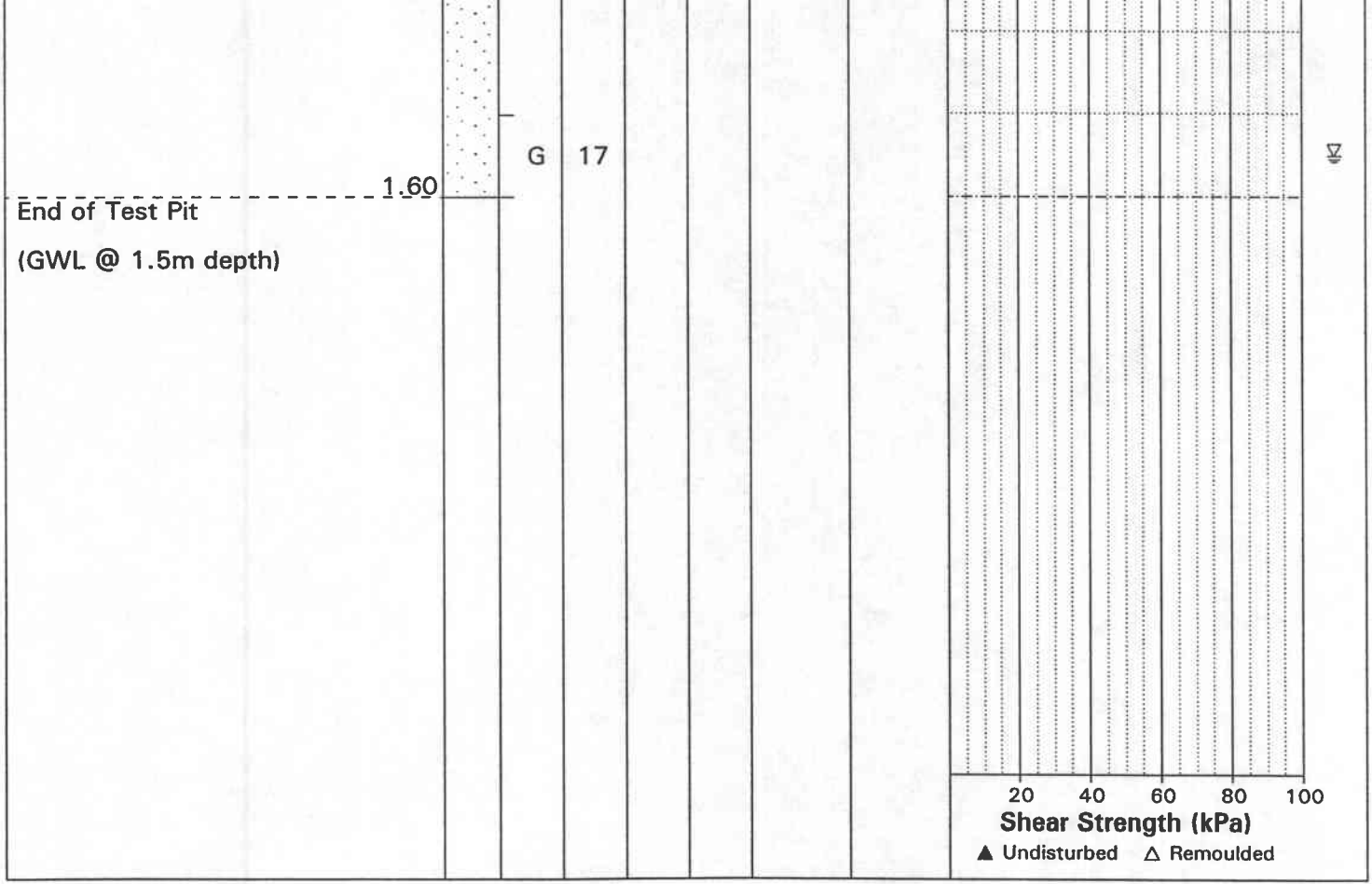
FILE NO. G7591

REMARKS

HOLE NO. TP10

BORINGS BY Backhoe **DATE** 15 November 1999

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	PIEZOMETER CONSTRUCTION
GROUND SURFACE						0	100.39	20 40 60 80	
Dark brown sandy **TOPSOIL** 0.20									
Reddish brown to light grey **SAND**, some silt						1	99.39		


G
17
1.60
End of Test Pit
(GWL @ 1.5m depth)
20
40
60
80
100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE & TEST DATA

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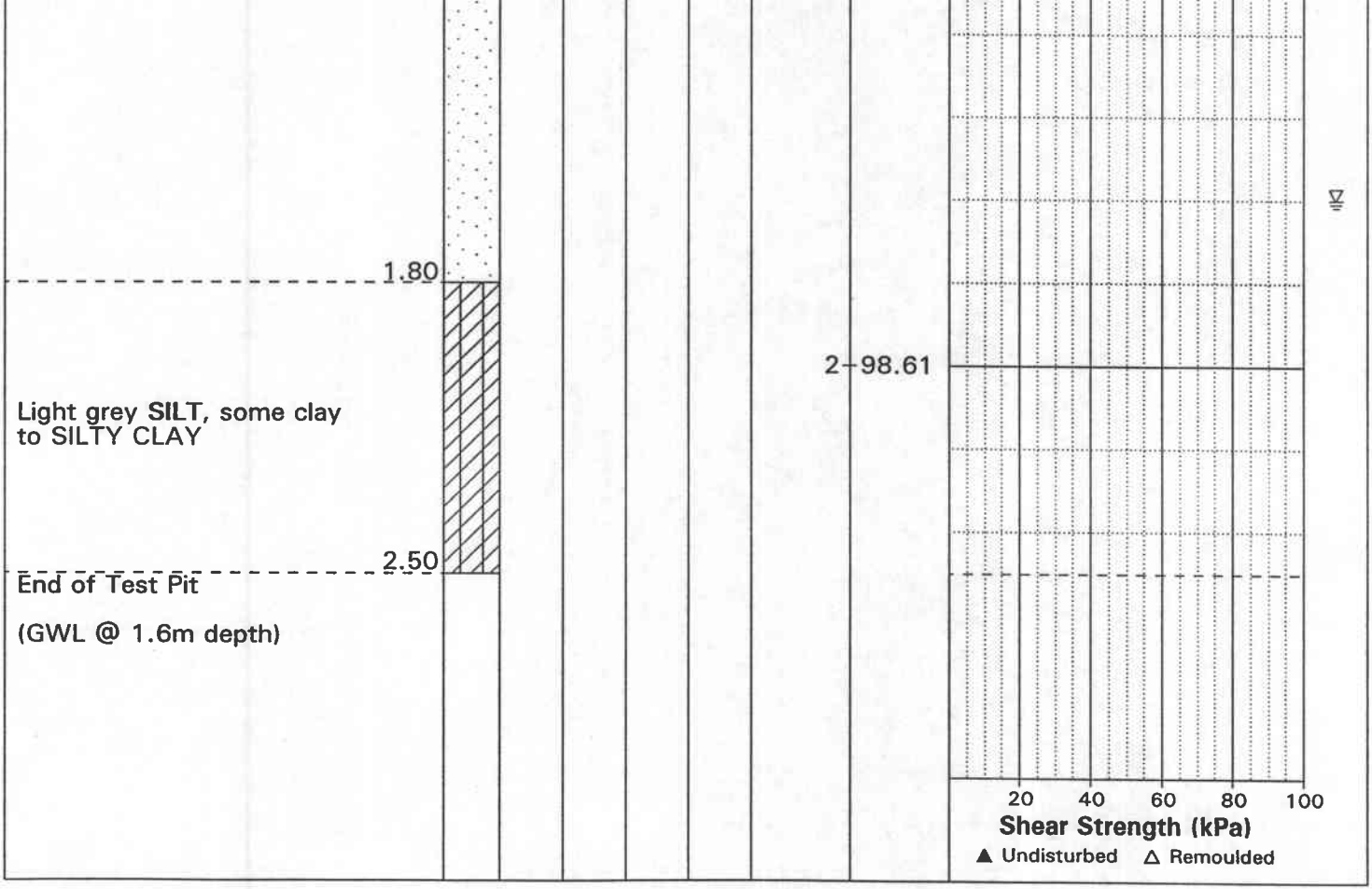
FILE NO. G7591

REMARKS

HOLE NO. TP11

BORINGS BY Backhoe **DATE** 15 November 1999

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content % (20 40 60 80)	PIEZOMETER CONSTRUCTION
GROUND SURFACE						0	100.61		
Dark brown sandy **TOPSOIL**									
						0.30			
Light brown to light grey **SAND**, some silt and gravel						1	99.61		


1.80
Light grey SILT, some clay to SILTY CLAY
2.50
End of Test Pit
(GWL @ 1.6m depth)
2
98.61
20
40
60
80
100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE & TEST DATA

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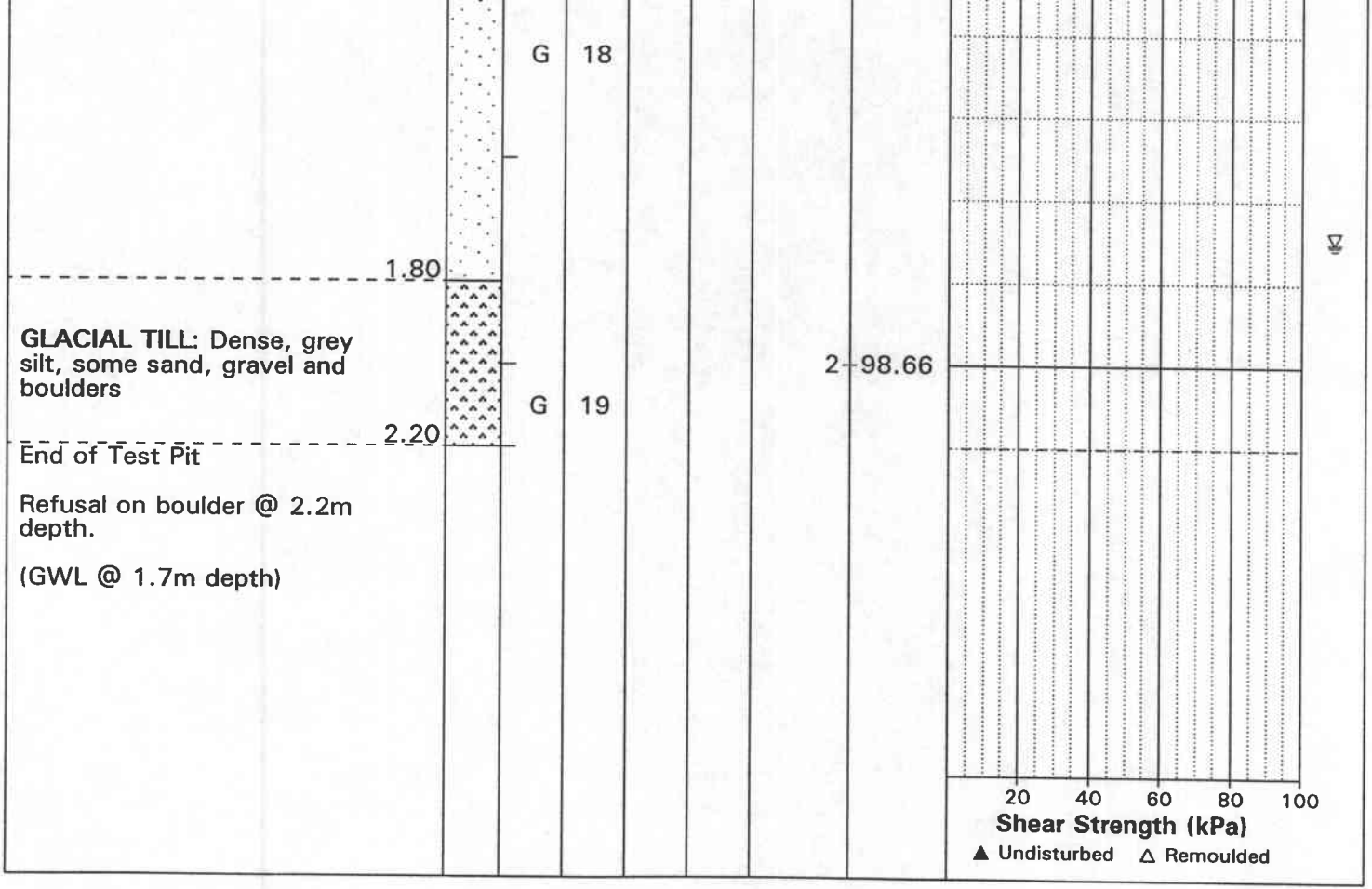
REMARKS

BORINGS BY Backhoe **DATE** 15 November 1999

FILE NO. G7591

HOLE NO. TP12

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content % (20 40 60 80)	PIEZOMETER CONSTRUCTION
GROUND SURFACE						0	100.66		
Dark brown sandy **TOPSOIL**									
0.30									
Loose to compact, light brown SAND, trace silt						1	99.66		


G 18
1.80
GLACIAL TILL: Dense, grey silt, some sand, gravel and boulders
G 19
2.20
End of Test Pit
Refusal on boulder @ 2.2m depth.
(GWL @ 1.7m depth)
2
98.66
20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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DATUM Ground surface elevations provided by Connelly McManus Engineering Limited.

REMARKS

BORINGS BY Backhoe **DATE** 15 November 1999

FILE NO. **G7591**

HOLE NO. **TP13**

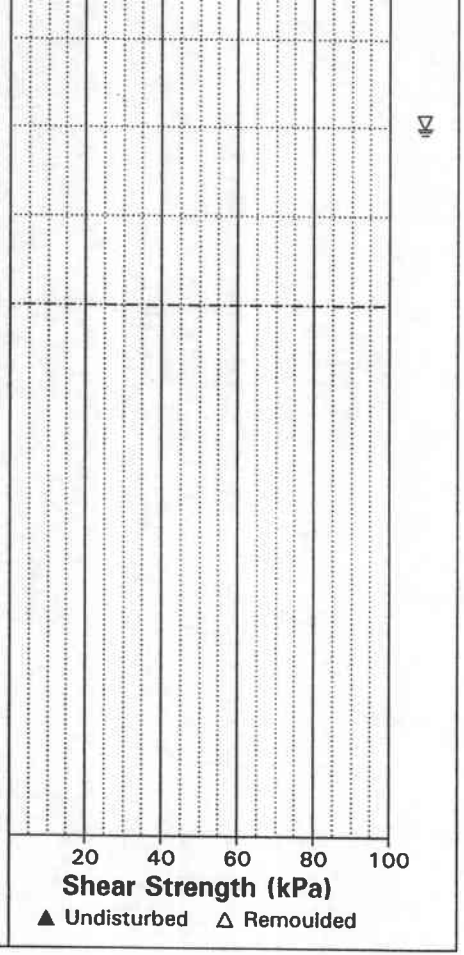
SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % (20 40 60 80)	PIEZOMETER CONSTRUCTION
GROUND SURFACE						0	100.53		
Dark brown sandy **TOPSOIL**									
0.30									
Compact, reddish brown to light grey SAND, trace silt						1	99.53		

1.80

End of Test Pit

TP terminated on silty clay
@ 1.8m depth.

(GWL @ 1.4m depth)



SYMBOLS AND TERMS

SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the strength of cohesionless soils is the relative density, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm.

Relative Density	'N' Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by in situ or laboratory vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

Consistency	Undrained Shear Strength (kPa)	'N' Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also classified according to their "sensitivity". The sensitivity is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

Terminology used for describing soil strata based upon texture, or the proportion of individual particle sizes present is provided on the Textural Soil Classification Chart at the end of this information package.

ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NXL size core. However, it can be used on smaller core sizes, such as BX, if the bulk of the fractures caused by drilling stresses (called

"mechanical breaks") are easily distinguishable from the normal in-situ fractures.

RQD %	ROCK QUALITY
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.) Rock core samples are obtained with the use of standard diamond drilling bits

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

MC%	-	Natural moisture content or water content of sample, %
LL	-	Liquid limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic limit, % (water content above which soil behaves plastically)
PI	-	Plasticity index, % (difference between LL and PL)
Dxx	-	Grain size at which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D10	-	Grain size at which 10% of the soil is finer (effective grain size)
D60	-	Grain size at which 60% of the soil is finer
Cc	-	Concavity coefficient = $(D30)^2$ / (D10 x D60)
Cu	-	Uniformity coefficient = D60 / D10

Cc and Cu are used to assess the grading of sands and gravels:
Well-graded gravels have: $1 < Cc < 3$ and $Cu > 4$
Well-graded sands have: $1 < Cc < 3$ and $Cu > 6$
Sand and gravels not meeting the above requirements are poorly-graded or uniformly-graded.
Cc and Cu are not applicable for the description of soils with more than 10% silt and clay (more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidation ratio = p'_c / p'_o
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
Wo	-	Initial water content (at start of consolidation test)

PERMEABILITY TEST

k	-	Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.

TEXTURAL SOIL CLASSIFICATION CHART

DESCRIPTION OF SOIL TEXTURE	SIZE OF PARTICLES	WEIGHT PERCENTAGE TO THE TOTAL DRY WEIGHT OF SOIL
CLAY	Clay	50 to 100
LEAN CLAY	Clay Silt Sand and Gravel	30 to 50 0 to 50 0 to 50
SILTY CLAY	Clay Silt Sand and Gravel	30 to 50 50 to 70 0 to 20
SANDY CLAY	Clay Silt Sand and Gravel	30 to 50 0 to 20 50 to 70
SILT	Clay Silt Sand and Gravel	0 to 20 65 to 100 0 to 20
CLAYEY SILT	Clay Silt Sand and Gravel	15 to 30 50 to 80 0 to 35

DESCRIPTION OF SOIL TEXTURE	SIZE OF PARTICLES	WEIGHT PERCENTAGE TO THE TOTAL DRY WEIGHT OF SOIL
SAND with a trace of Silt and Clay	Clay and Silt Sand and Gravel Gravel	5 to 12 88 to 95 0 to 10
GRAVEL with some Silt and Clay	Clay Silt Sand and Gravel Gravel	0 to 15 0 to 30 70 to 88 45 to 88
SAND - GRAVEL with some Silt and Clay	Clay Silt Sand and Gravel Gravel	0 to 15 0 to 30 70 to 88 10 to 45
SAND with some Silt and Clay	Clay Silt Sand and Gravel Gravel	0 to 15 0 to 30 70 to 88 0 to 10
SILTY GRAVEL	Clay Silt Sand and Gravel Gravel	0 to 15 15 to 50 42.5 to 70 40 to 70
SILTY SAND - GRAVEL	Clay Silt Sand and Gravel Gravel	0 to 15 15 to 50 42.5 to 70 10 to 60

					10 to 40
SANDY SILT	Clay Silt Sand and Gravel	0 to 15 42.5 to 80 20 to 50	SILTY SAND	Clay Silt Sand and Gravel Gravel	0 to 15 15 to 50 42.5 to 70 0 to 10
CLAYEY SANDY SILT	Clay Silt Sand and Gravel	15 to 30 35 to 50 20 to 42.5	CLAYEY GRAVEL	Clay Silt Sand and Gravel Gravel	15 to 30 0 to 35 50 to 85 40 to 85
GRAVEL	Clay and Silt Sand and Gravel Gravel	0 to 5 95 to 100 50 to 100	CLAYEY SAND - GRAVEL	Clay Silt Sand and Gravel Gravel	15 to 30 0 to 35 50 to 85 10 to 40
SAND - GRAVEL	Clay and Silt Sand and Gravel Gravel	0 to 5 95 to 100 10 to 50	CLAYEY SAND	Clay Silt Sand and Gravel Gravel	15 to 30 0 to 35 50 to 85 0 to 10
SAND	Clay and Silt Sand and Gravel Gravel	0 to 5 95 to 100 0 to 10	CLAYEY SILTY GRAVEL	Clay Silt Sand and Gravel Gravel	15 to 30 20 to 42.5 35 to 50 30 to 50
GRAVEL with a trace of Silt and Clay	Clay and Silt Sand and Gravel Gravel	5 to 12 88 to 95 50 to 100	CLAYEY SILTY SAND - GRAVEL	Clay Silt Sand and Gravel Gravel	15 to 30 20 to 42.5 35 to 50 10 to 30
SAND - GRAVEL with a trace of Silt and Clay	Clay and Silt Sand and Gravel Gravel	5 to 12 88 to 95 10 to 50	CLAYEY SILTY SAND	Clay Silt Sand and Gravel Gravel	15 to 30 20 to 42.5 35 to 50 0 to 10

NOTE

FINE, MEDIUM and COARSE SAND are all described by "SAND".
However they respectively have at least 60% of the particles
in the 0.074 to 0.42 mm, 0.42 to 2.00 mm and 2.00 to 4.74 mm ranges.

APPENDIX 2

Nitrate Impact Assessment

Grain Size Distribution Sheets

Drawing No. G7591-1 Test Hole Location Plan

Drawing No. G7591-2 Typical Lot Layout Plan

Concentration of Effluent (Cs) =	40	mg/L
Allowable Nitrate Concentration (Ca) =	10	mg/L
Average Annual Nitrate Load / System (Ln) =	1.46E+07	mg/year
Septic Load (Ls) =	3.65E+05	L / year

Calculation of Permissible Number of Septic Systems

Permissible number of beds = Ca * Qi / (Ln - Ca*Ls)

= 32 septic systems

Maximum septic density = 1 system per 0.28 hectares of site area

NITRATE DILUTION ANALYSIS
Thornwaite Water Balance Equation

PROJECT : Stanley Park Subdivision
PROJECT NO.: G7591-99
CLIENT : Connelly McManus Engineering Limited

Site Characteristics

Site Area (A) =	8.8813	hectares
Annual Precipitation (P) =	975	mm
Coefficient of Infiltration (Ci) =	0.4	
Total Annual Infiltration Across Site (Qi) =	3.46E+07	L / year

Septic Loading

Concentration of Effluent (Cs) =	40	mg/l

SILT OR CLAY	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

	Specimen Identification	Classification	MC%	LL	PL	PI	Cc	Cu
●	1103M TP2-G3	SAND						

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	1103M TP2-G3	13.25	0.62	0.366	0.2045	3.4	94.0	2.6	

CLIENT Connelly McManus Engineering

PROJECT Terrain Analysis and Hydrogeological Study - Proposed Stanley Subdivision, Stanmore St.

FILE NO. G7591

DATE 15/11/99

GRAIN SIZE DISTRIBUTION

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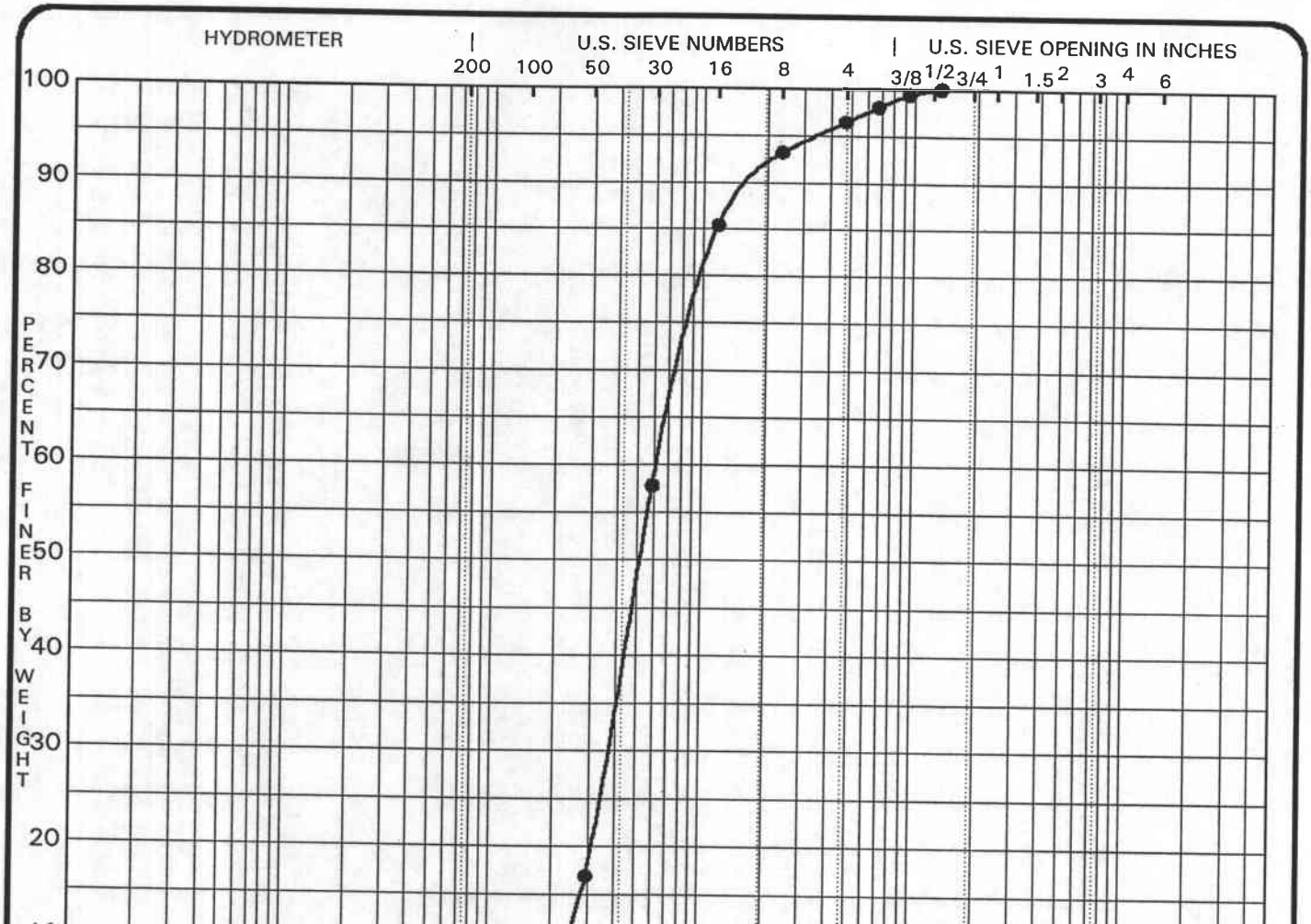
HYDROMETER
U.S. SIEVE NUMBERS
200 100 50 30 16 8 4
U.S. SIEVE OPENING IN INCHES
3/8 1/2 3/4 1 1.5 2 3 4 6
PERCENT FINER BY WEIGHT
100
90
80
70
60
50
40
30
20

SILT OR CLAY	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

Specimen Identification	Classification	MC%	LL	PL	PI	Cc	Cu
● 1104MTP12-G18	SAND						

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● 1104MTP12-G18	6.70	0.23	0.171	0.1153	0.1	98.0	1.9	

CLIENT **Connelly McManus Engineering**

PROJECT **Terrain Analysis and Hydrogeological Study - Proposed Stanley Subdivision, Stanmore St.**

FILE NO. **G7591**

DATE **15/11/99**

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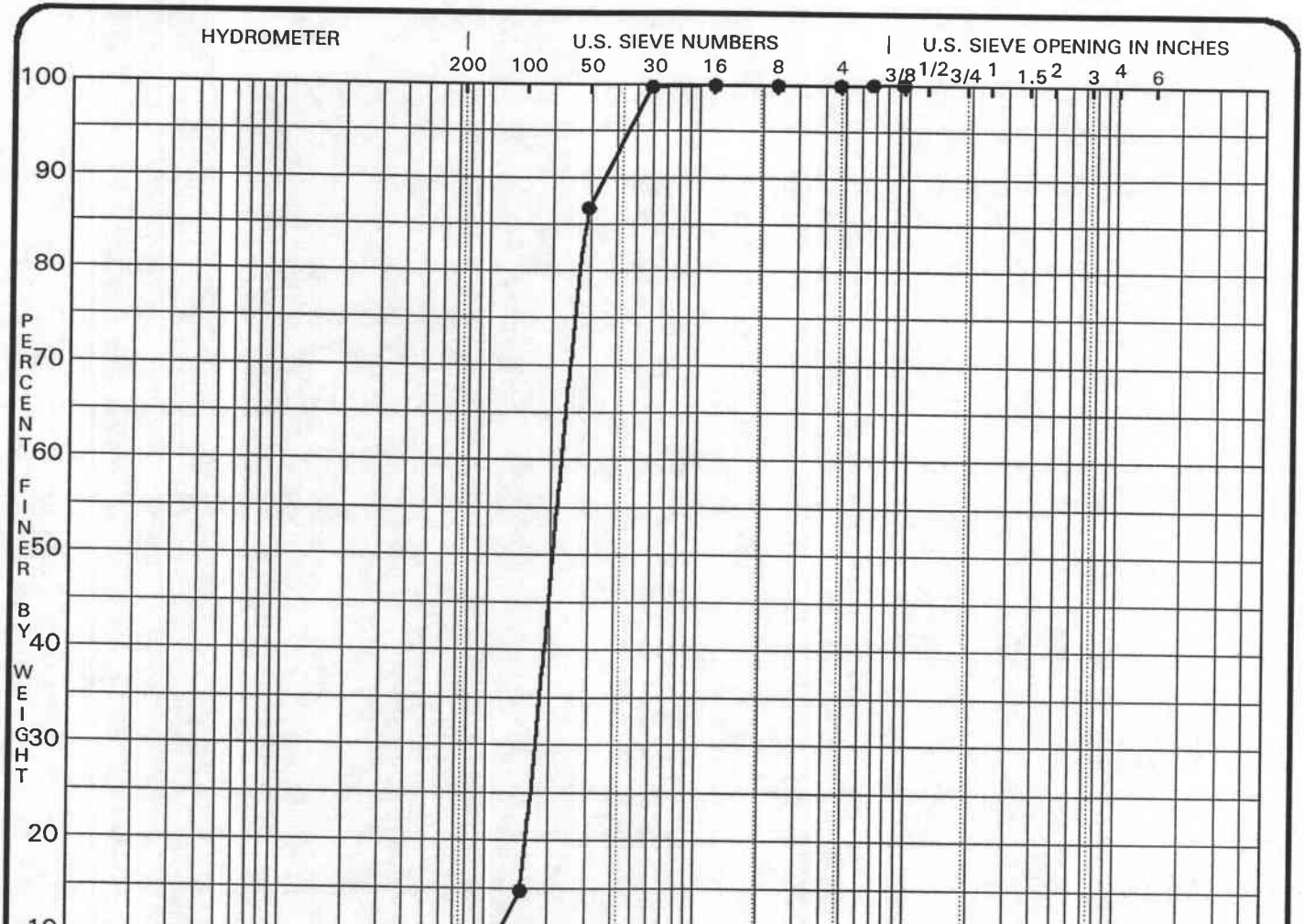
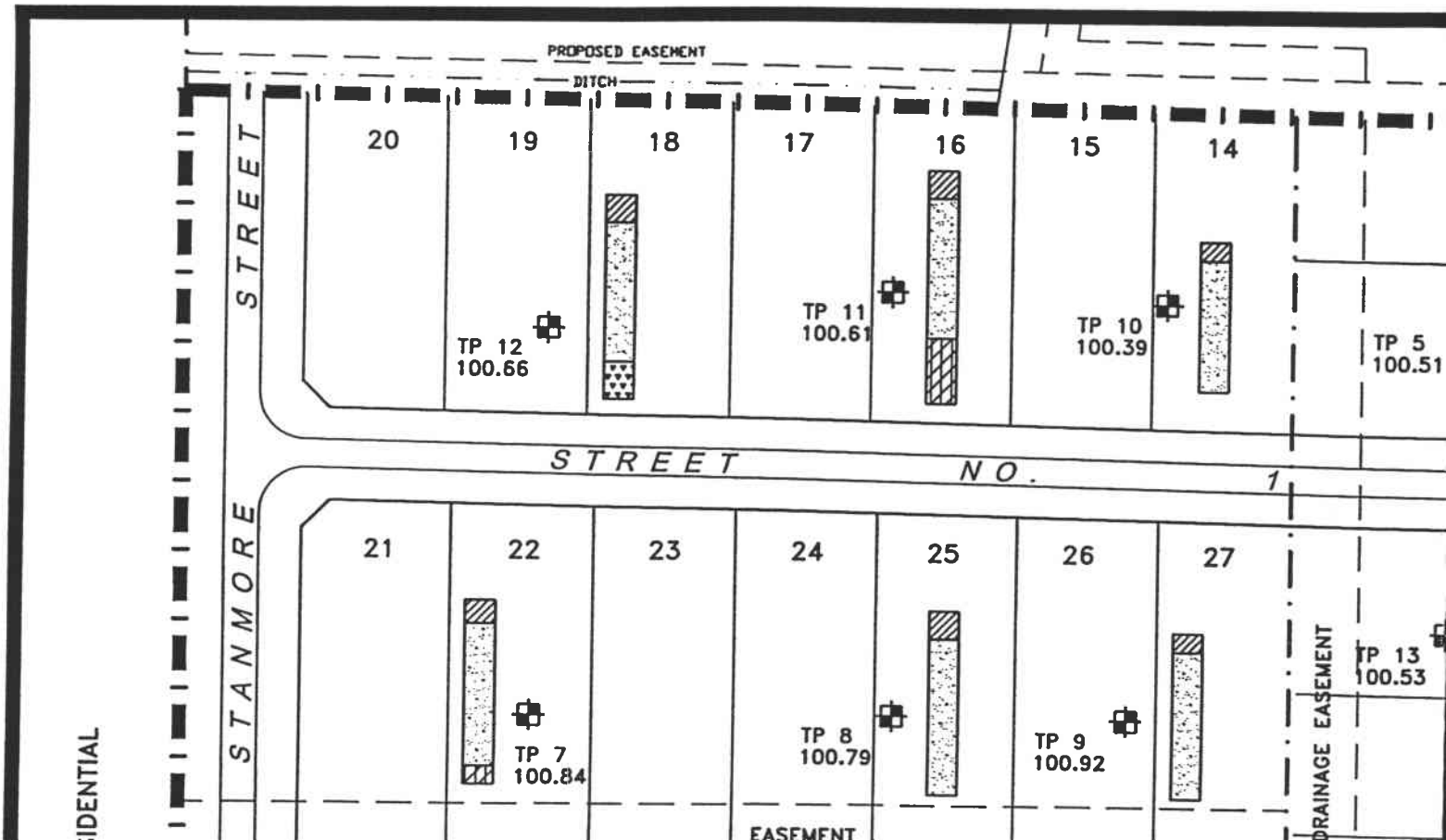
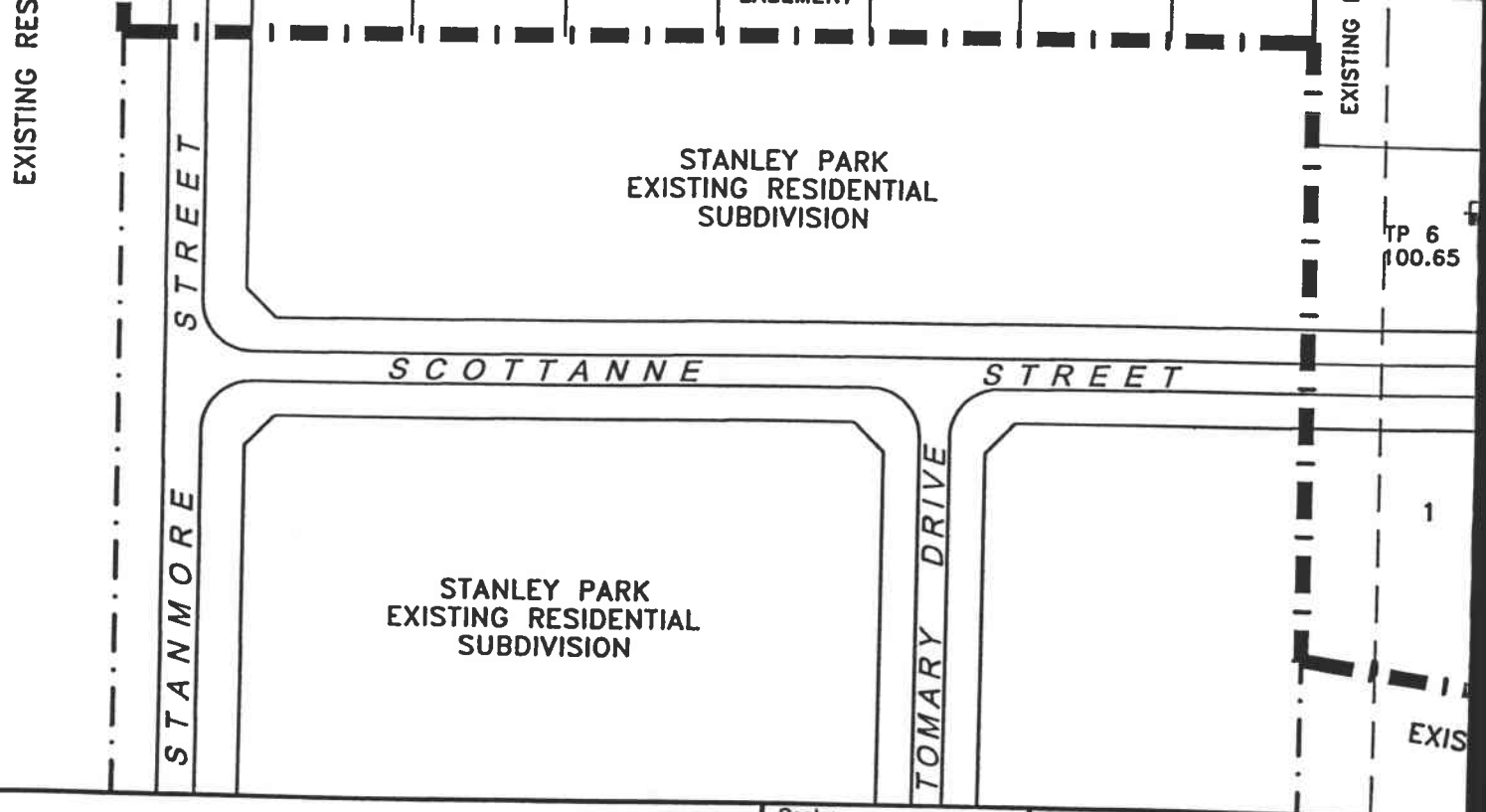

HYDROMETER
U.S. SIEVE NUMBERS
200 100 50 30 16 8 4
U.S. SIEVE OPENING IN INCHES
3/8 1/2 3/4 1 1.5 2 3 4 6
100
90
80
70
60
50
40
30
20
PERCENT FINER BY WEIGHT


PROPOSED EASEMENT
DITCH
STREET
STANMORE
STREET NO. 1
20
19
18
17
16
15
14
21
22
23
24
25
26
27
TP 12
100.66
TP 11
100.61
TP 10
100.39
TP 5
100.51
TP 7
100.84
TP 8
100.79
TP 9
100.92
TP 13
100.53
DRAINAGE EASEMENT
EASEMENT
IDENTIAL



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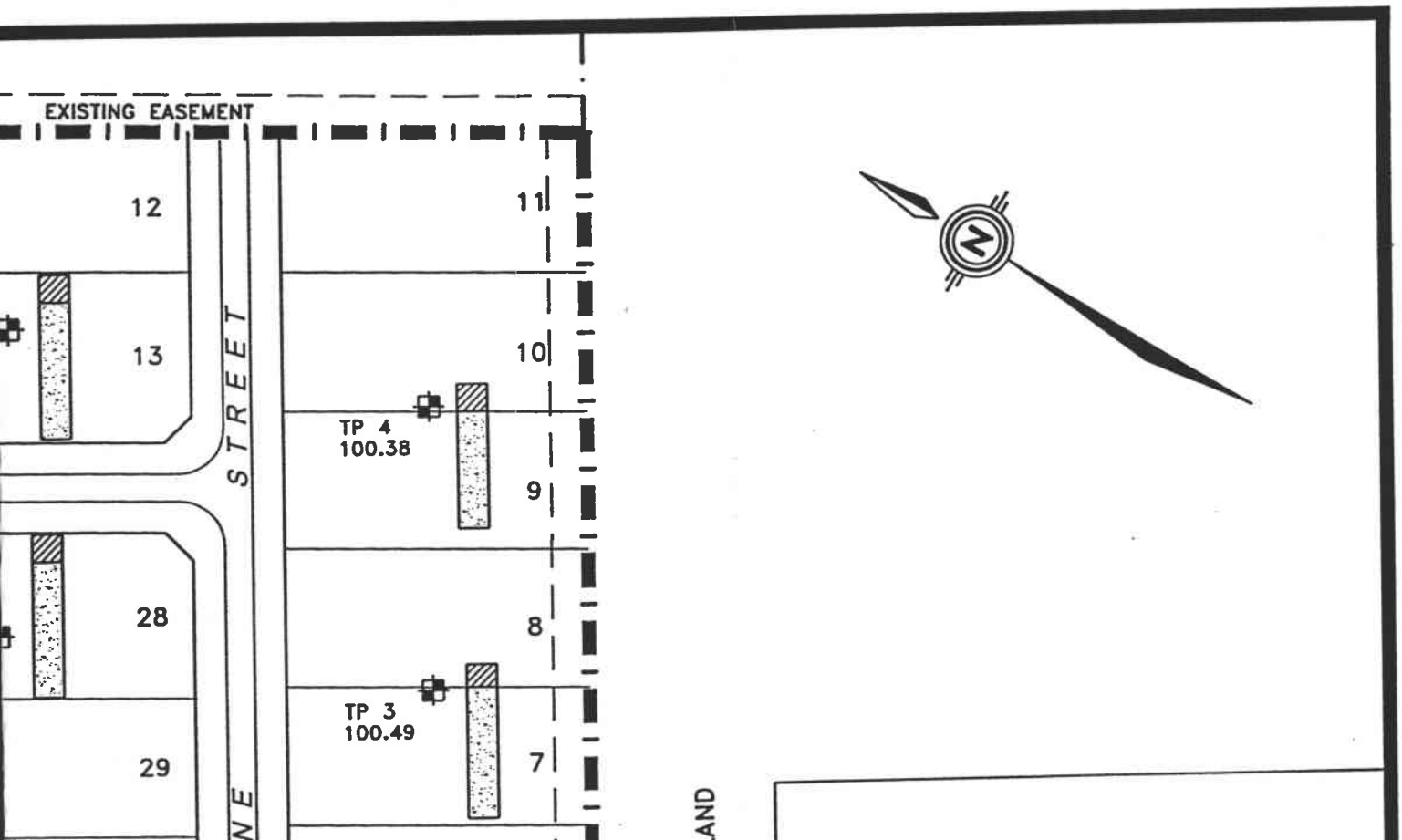
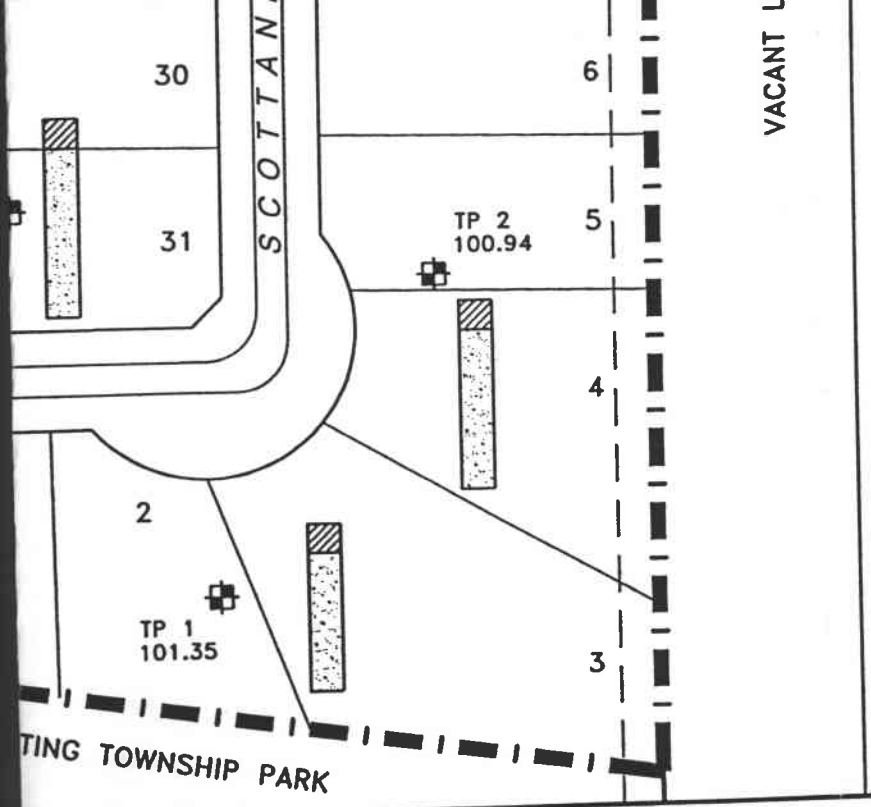
Scale: 1:1500
Des.:
Dwn:
Chkd: SJW

CONNELLY McMANUS EN
TERRAIN ANALYSIS & HYDR
PROPOSED STANLEY P
TOWNSHIP OF OSGOODE,

11x17


EXISTING EASEMENT
12
11
13
10
STREET
TP 4
100.38
9
28
8
TP 3
100.49
29
7
N



LEGEND:

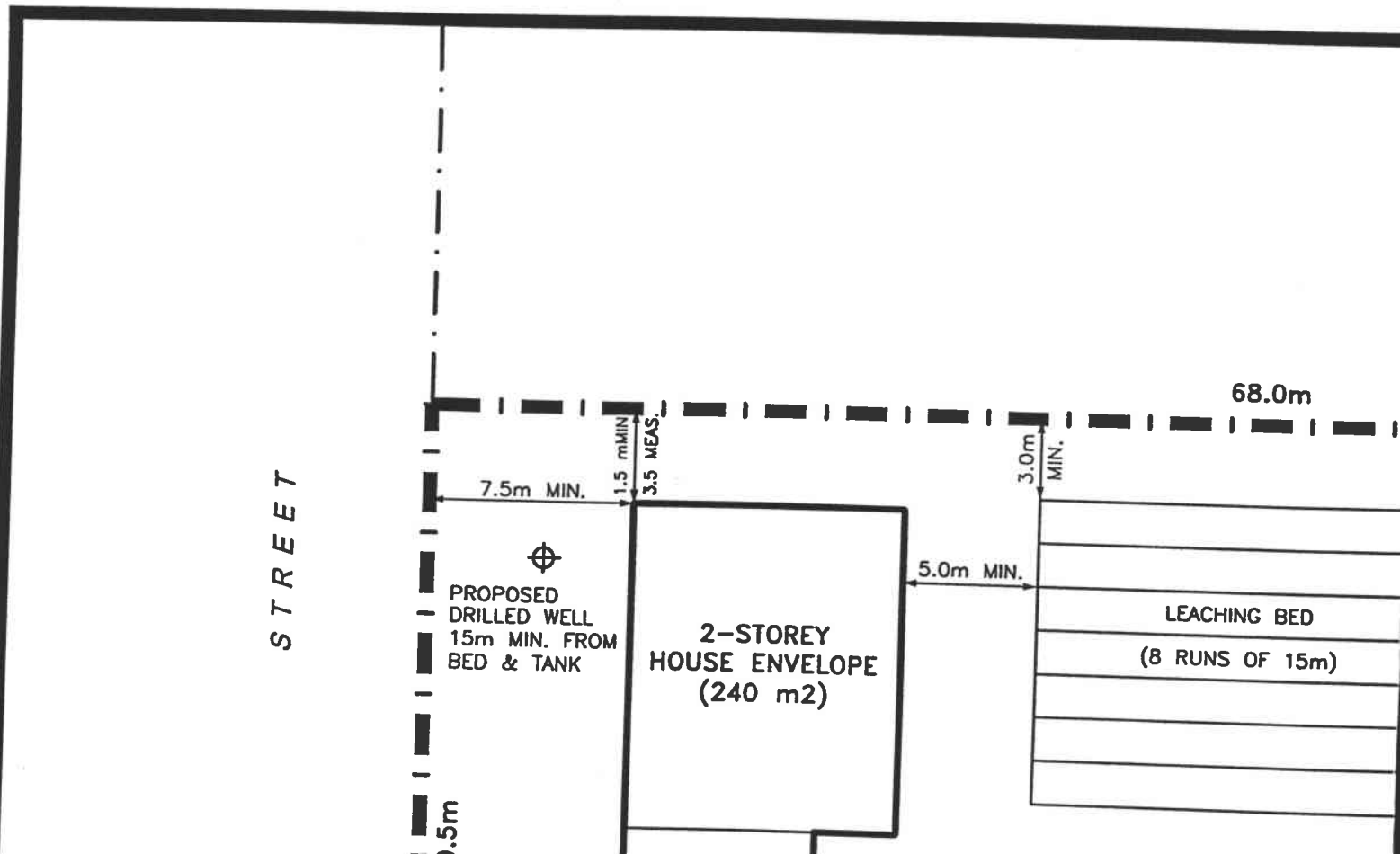
- TEST PIT LOCATION
- 101.35 GROUND SURFACE ELEV. (m)
- TOPSOIL
- SAND
- SILTY CLAY
- GLACIAL TILL

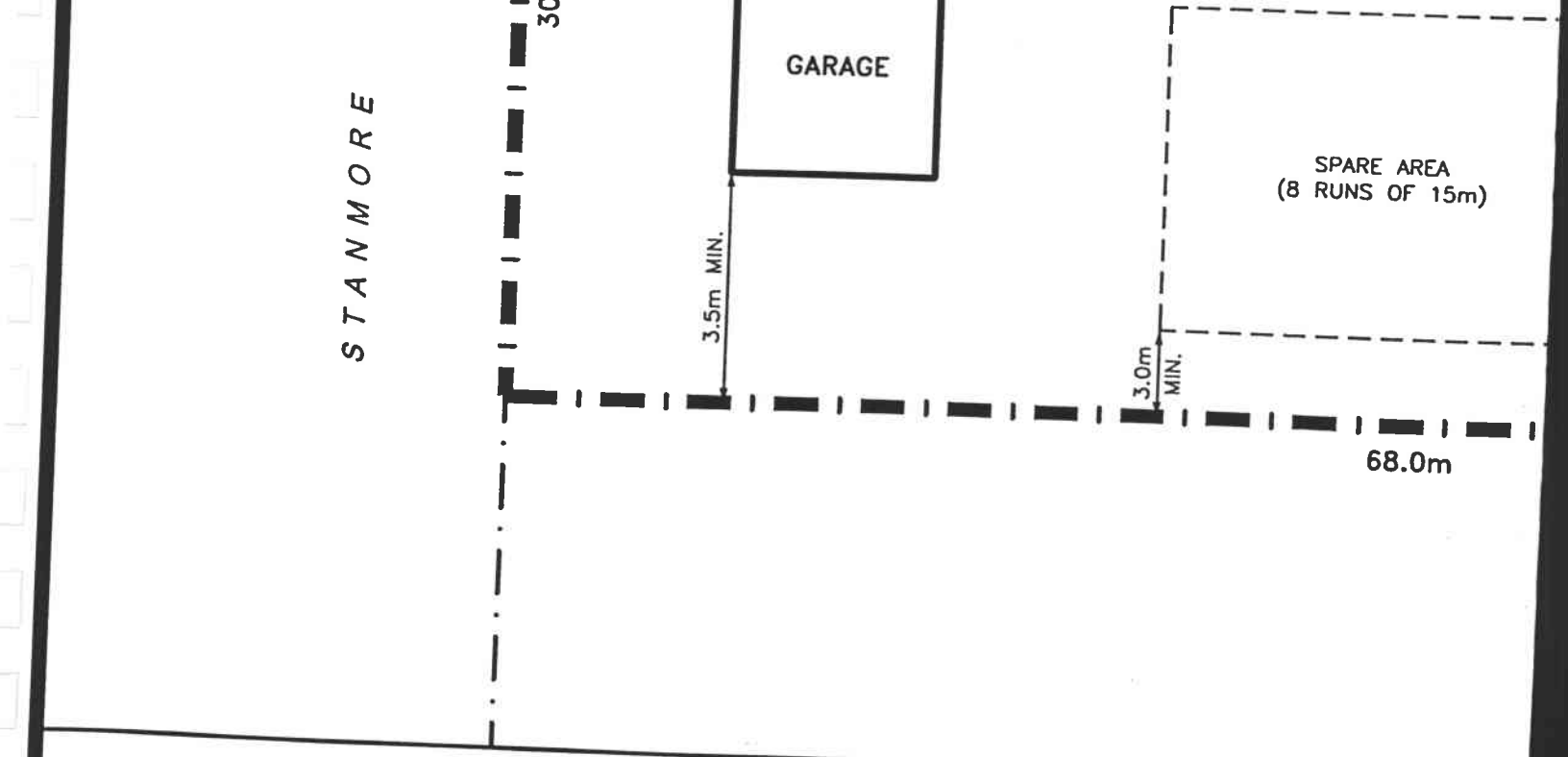
NOTE: VERTICAL SCALE FOR SOIL STRATIGRAPHY IS 1:75

GINEERING LIMITED
OGEOLOGICAL STUDY
ARK SUBDIVISION
ONTARIO

TEST HOLE LOCATION PLAN

Dwg. No. G7591-1
Report No. G7591-99
Date: 99/12


68.0m
STREET
7.5m MIN.
1.5 mMIN
3.5 MEAS.
3.0m MIN.
5.0m MIN.
PROPOSED DRILLED WELL 15m MIN. FROM BED & TANK
2-STOREY HOUSE ENVELOPE (240 m2)
LEACHING BED
(8 RUNS OF 15m)
0.5m



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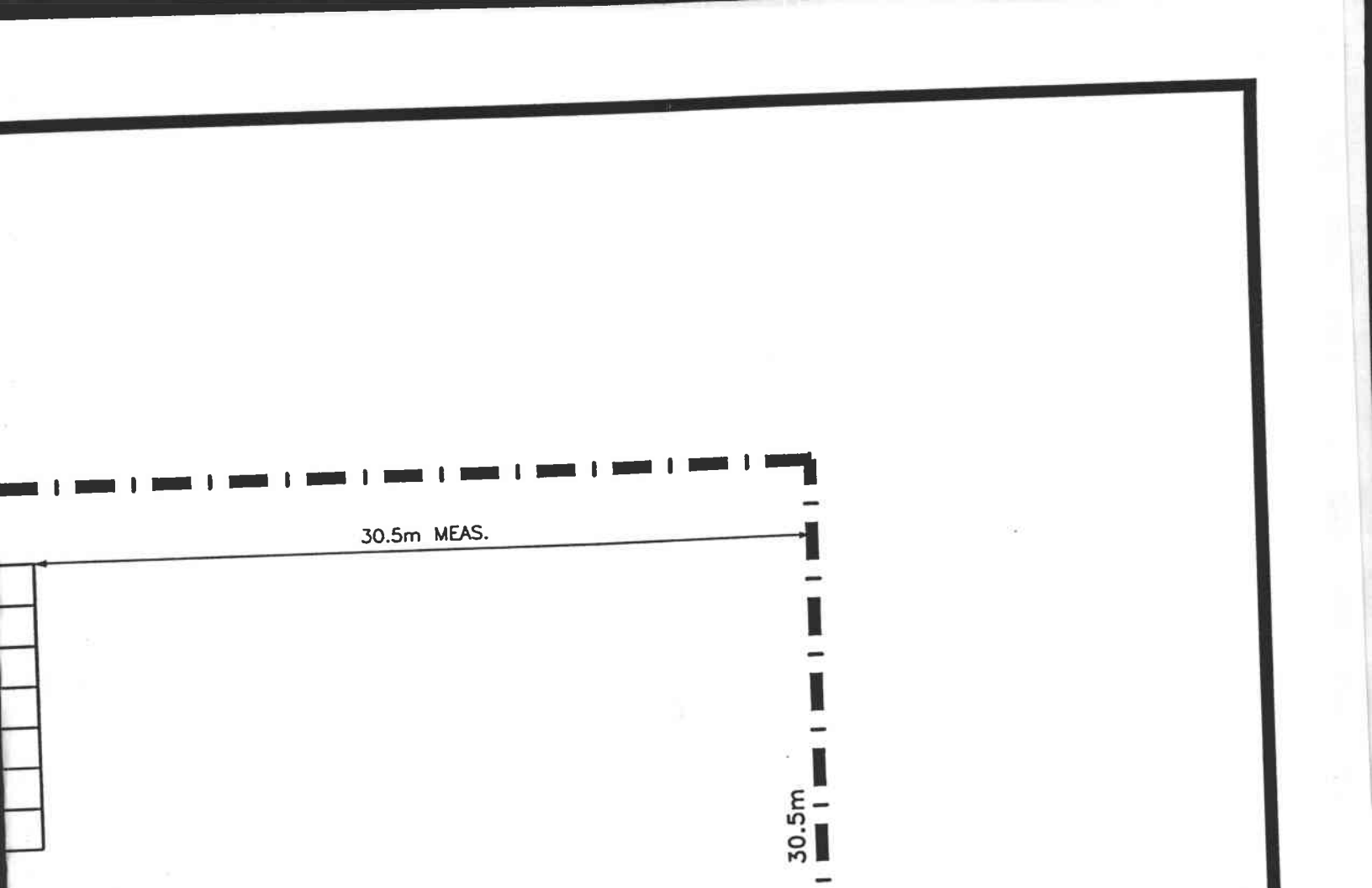
Scale:	1:250
Des.:	AVS
Dwn:	MPG
Chkd:	SJW

CONNELLY McMANUS ENG
PROPOSED STANLEY PA
STANMORE S
TOWNSHIP OF OSGOODE,

11x17


30.5m MEAS.
30.5m

NEERING LIMITED
RK SUBDIVISION
TREET
ONTARIO

TYPICAL LOT LAYOUT PLAN

Dwg. No.
G7591-2
Report No. G7591-99
Date: 99/12