

MAYFIELD

RESIDENTIAL SUBDIVISION STAGE 3

**REPORT ON SUBDIVISION EARTHWORKS
& RECOMMENDATIONS FOR BUILDING**

**WESTMORLAND RISE, HAWKRIDGE HEIGHTS
ATHFIELD DRIVE, MILLER ROAD
BETHLEHEM**

Our Ref: 16530
April 2004

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1.0 Introduction

The earthworks, roading construction and services installation were completed on 30 April 2004 for Stage 3 of the Mayfield Subdivision in Bethlehem North. 50 residential lots were created in an extension of Westmorland Rise from the Stage 2 area to the south, the completion of Athfield Drive from the west and the construction of parts of Miller Road and Hawkridge Heights, which extends into the Stage 5 area, also completed at the same time.

The locations and sizes of the 50 lots created are shown on DP 330215 (3 sheets). A copy of DP 330215 is contained in Appendix I.

This report describes the earthworks undertaken in the formation of this stage of subdivision including the relevant standards adopted for the placement of filling to support residential buildings and recommendations for building.

During the report reference is made to drawings 16530-81 which is included in Appendix I to this report. This drawing shows the relevant road and lot locations, areas of cut and filling and subsoil and fill compaction test locations.

2.0 Pre Subdivision Investigations

Prior to obtaining approval a geotechnical assessment of the development area was undertaken by Connell Wagner Ltd on behalf of Mayfield Ltd. The Connell Wagner report is referenced 7073-SH-04 and is dated June 1999. A copy of this report is present on the City Council subdivision file.

Their investigation determined, as quoted from the Connell Wagner report, that:

- (a) *The soils over the higher ground generally comprised typical ash deposits for this region with approximately 3 to 4 metres of younger ash overlying older Hamilton ashes, which in turn overlie the Tauranga formation.*

The younger ashes consisted of firm to stiff light brown sandy silts and silty sands. These soils are underlain by the older Hamilton ashes which often comprise a dark brown silty clay layer overlying a series of interbedded brown and orange silty clays, clay silts and sands. The underlying Tauranga formation mostly comprised a series of light grey or white pumiceous sand and silts.

- (b) *The low lying generally flat area within the lower end of the south-north gully system comprises topsoil overlaying marine and alluvially deposited normally to slightly over consolidated silts that extend from several level. These soils contain random layers of sands and sandy silts.*

Connell Wagner reported on the scope of their investigation which comprised four handaugered boreholes shown in location on 16530-81 on lots 128, 140 and 178 and on the Miller Road alignment opposite lot 193. Dutch cone penetrometer tests (CPT) were also reported in the Stage 3 area.

Additional site investigations in the Stage 2 and Stage 3 areas were undertaken by S & L Consultants Ltd to check the interface between horticultural filling placed in the Stage 2 area and the marine and alluvial silts present at the northern end of the subdivision as identified by Connell Wagner. Tests pits numbered TP1, TP2, TP9 and TP11 were located along the Westmorland Rise alignment and test pits TP12, TP13, TP14 and TP15 on lots 126, 179 and 123 respectively. These positions are shown on 16530-81 and the summary logs are contained in Appendix IV.

Based on the pre subdivision investigation evidence it was decided to remove past horticultural filling in the south-north gully along the alignment of Westmorland Rise until the filling and underlying organic soils were removed. Further north the marine and alluvial silts were to be left in place with only the removal of surface vegetation to be undertaken. Additional structural filling was required in this area to achieve minimum building platform levels. The filling in this area was to be surcharged (preloaded) to simulate the effects and loadings from future housing.

3.0 Scope of Earthworks

The earthworks undertaken in the Stage 3 area comprised:

- The removal of past filling and underlying organic soils in the old gully area that extended along the Westmorland Rise alignment as far as lots 127 and 180. The maximum depth of cut was up to 4 metres opposite lots 126 and 127, 179 and 180.
- The removal of surface growth including hedgerows and rank grass in the lower section of the south-north gully within lots 129, 130, 131, 181 and 182 and the placement of structural filling to depths of up to 2 metres.
- The installation of a subsurface drain at locations shown on 16530-81 around the perimeter of the filled area taking in lots 129, 130, 131, 181 and 182 and Westmorland Rise and the intersection with Athfield Drive and Hawkridge Heights.
- The obtaining of filling material by the reduction of higher ground at lots 184 to 187 (a cut of up to 6 metres) and along and to the east of Hawkridge Heights where depths of excavation of up to 12 metres took place.
- The construction of and the later infilling of a temporary sediment runoff control pond within lots 139 and 140.
- The placement of a preload 1.0 metres deep (equivalent to a surcharge of 15 kPa) over the area of filling along Westmorland Rise and lots on either side as shown on 16530-81.

- The monitoring of rates of induced ground settlement from the presence of filling and the preload along Westmorland Rise and on lots. Rates of settlement were monitored since the markers were first installed in November 2002. The preload was removed after the rates of settlements reduced to levels where future degrees of differential ground settlement under the imposed loadings from buildings will not exceed the performance requirements stated in Section B of the New Zealand Building Code.

The depths of filling shown on drawings 16530-81 were derived from surveyed contours of the finished surface taken on the completion of the earthworks for this stage compared with the topographical survey undertaken by Connell Wagner Ltd for Mayfield Ltd prior to the subdivision construction and from surveyed depths of cutting to remove unsuitable soils by S & L Consultants Ltd.

The earthworks for Stage 3 development were undertaken by A & R Partnership subcontracted to Higgins Contractors Bay of Plenty Ltd during the 2002-2003 earthworks season in compliance with consent 61698 issued by Environment Bay of Plenty. Construction of the roading and services were undertaken after the preloading period.

4.0 Earthworks Standards

The performance specification required of the Contractor was based on the guidelines contained in NZS 4431:1989 "Code of Practice for Earthfill for Residential Development". Enforcement of the compaction requirements listed below satisfies the standards listed in Section 7 of NZS 4431.

Air voids percentage (as defined in NZS 4402:Part 1:1980)

Structural Fill - average value less than 10% (any 10 tests)
 - Maximum single value 12%

Undrained shear strength (measured by insitu vane)

Structural Fill - average value not less than 150kPa (any 10 tests)
 - Minimum single value 100kPa

13 compaction tests were undertaken in the filling in the stage 3 areas at locations shown on 16530-81. A summary of the compaction test results is contained in Appendix III. The filling to which these tests relate was undertaken concurrently with filling in the stage 2 area to the south and the future stage 4 area for properties fronting Miller Road to the east. In the context of the extent of the earthworks being undertaken the minor increases in air voids percentages over average values were considered acceptable, at the time of the insitu testing. Where target compaction parameters were not achieved retesting was undertaken (tests T10, T40A and T72A).

Post construction testing as described in section 4.0 below found that high insitu undrained shear strengths had developed in the filling.

The earthworks were observed by an engineering technician from this office and compaction and strength control testing was undertaken by local IANZ accredited soil testing laboratories in Tauranga both on site and in the laboratory.

5.0 Post Construction Testing

Post construction handaugered boreholes were put down on each lot at locations shown on 16530-81. These boreholes were generally 1 metre deep and were intended to confirm ground bearing conditions for shallow building foundations that were identified in the pre-subdivision boreholes and pits and during observations of services trench cuts and exposed soils prior to the placement of topsoil and grassing.

As the boreholes were being drilled undrained shear strengths were recorded with a hand held shear vane pushed in advance of the auger.

Summary logs of these boreholes and the shear strengths recorded are contained in Appendix IV.

6.0 Monitoring Of Settlements

Rates of ground consolidation under the surcharge of constructing filling and the preload were monitored at 9 locations noted as SMA to SMH and SMJ on drawing 16580-81.

Rates of settlement at the markers at each of these locations were recorded from surveys undertaken using stable benchmarks away from the filled areas. Degrees and rates of settlements of the markers are shown on the diagrams in Appendix III:

7.0 Summary and Recommendations

7.1 Subdivision Construction Filling

Structural filling as shown on drawing 16530-81 was placed in accordance with the methods and standards quoted in NZS 4431 under the supervision of S & L Consultants Ltd. Compaction testing on site confirmed that a high and uniform degree of compaction has been achieved suitable for the support of buildings. Post construction boreholes also confirmed this suitability. In the filled areas post construction settlements were induced by the placement of a preload surcharge to simulate the mass of a future house. Rates of settlement reduced and the preload was removed when the likelihood of future ground settlements will be within tolerable limits for a house erected on the lots located in filled areas. Accordingly buildings may be erected with surface foundations in accordance with NZS 3604 without the need for further ground improvement or to reduce ground contact pressures.

Within areas of structural filling on which buildings may be erected, however, the possibility of variation of soil type and strength may exist away from our

observation or compaction test locations. The normal inspection of foundation conditions during construction of buildings by competent tradesmen as described in NZS 3604 and by building certifiers should therefore be undertaken. If for any reason areas of low soil strength are found professional geotechnical advice should be sought.

7.2 Areas of Cut

In areas of cut the subsoils present on these lots will be those typical of those found in the Tauranga area.

The varying depths of cut have however exposed a variety of different soil types immediately below the topsoil overlay. This is because the more recent volcanic ashes which extend below the original ground level and which comprise a stiff upper mantle of light brown friable silt overlying bands of yellow or light grey pumiceous sand have been partially or totally removed. Within lots 142 to 148 east of Hawkrise Heights cuts up to 12 metres deep have exposed medium dense to dense grey pumiceous sands typical of the fluvial and estuarine soils within the Matua subgroup of the Tauranga series of subsoils usually present at depths in elevated areas of Western Bay of Plenty.

Post construction handaugered boreholes were put down on all lots at locations shown on 16530-81 and logs of the soils found in these boreholes are contained in Appendix IV.

Each soil type identified from observations during construction and the post construction boreholes had varying undrained shear strengths or degrees of compaction. The tests undertaken showed that undrained shear strengths in insitu soils are sufficient for the construction of shallow building foundations.

For all lots located in areas of cut the post construction boreholes indicate that ultimate ground bearing pressures for foundation design may be taken as 300 kPa in the limit state. This capacity meets the definition of "good ground" as defined in NZS 3604. In situ tests showed that the soils present in the cut areas are of adequate strength for an ultimate bearing capacity of 300 kPa. However if they are disturbed or are found to be variable during construction, foundations detailed in accordance with NZS 3604 may have to be deepened or widened accordingly.

7.3 Areas of Undisturbed Ground

Small areas of ground that were not altered by subdivision earthworks exist on lots.

Pre and post subdivision investigations indicated that insitu soils or minor depths of horticultural filling would exist in the areas not modified during the subdivision construction. Tests taken during these investigations indicated that shallow building foundations can be constructed and that ultimate ground bearing pressures for foundation design may be taken as 300 kPa in the limit state. This capacity meets the definition of "good ground" as defined on NZS 3604.

7.4 Land Stability

Most of the area on the lots contained in Stage 3 at Mayfield comprise near flat or gently sloping ground. In these areas no global stability issues exist that may restrict or prevent buildings being erected and therefore no building restriction lines or areas subject to restructure covenants are necessary nor are shown on DP 330215.

On lots 139 and 140 where the slopes exist up to 20 degrees levelled areas may be required for building sites or the development of the rear yards by earthworks which could require the placement of filling on the sloping ground towards the rear boundaries. Such filling should be placed by compaction in layers on horizontal cut lateral benches after the surface topsoil has been removed. Retaining wall should be erected to resist lateral earth pressures from the filling present. Professional engineering advice should be sought on appropriate embedment depths for retaining walls where they are located on sloping ground. Due regard should also be given to the possibility of adversely surcharging structures or unfaced cut batters that may be present on the properties below (lots 122 and 123).

Levelled areas may be required for building sites by cutting into the sloping ground rising to the rear boundaries. For cut faces higher than 1.5 metres retaining wall should be erected. Such walls are to be specifically designed and a building consent issued. In locating cut batters or undertaking site earthworks care should be given to maintaining support to the properties above.

A minor unretained cut batter exists along the southern boundary of lot 142. It is unlikely that buildings would be erected close to this batter, but the batter may still be vulnerable to long term erosion and a retaining wall or some form of erosion prevention facing may be required in the future to maintain long term stability.

7.5 Topsoil Thickness

During the subdivision earthworks areas of cut or fill were initially stripped of topsoil and this was then replaced to target depths of up to 300mm. Outside of the earthworks areas where the ground was not disturbed and also close to road berms it is possible that topsoil depths may be deeper than 300mm where the topsoil depth was developed naturally or where it was deepened due to past farming activities or where the slopes were eased down to the road berm levels. No guarantee is implied or given that the topsoil on any part of any lot is 300mm deep or less and it is recommended that future owners or builders check topsoil depths when preparing site development plans and cost schedules.

8.0 Professional Opinion

Our statement in the format of Council's Code of Practice for Development (Form G2) that all lots are suitable for building is contained in Appendix II. This statement is accompanied by form G2A which summarizes the information and recommendations within this report.

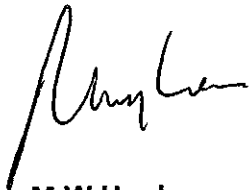
9.0 Applicability

Recommendations contained in this document are based on data from boreholes, observations of soil exposures, and test results. Inferences about the nature and continuity of subsoils away from these locations are made but cannot be guaranteed.

In all circumstances, if variations in the subsoils occur which differ from that described or assumed to exist the site should be inspected by an engineer suitably qualified to make an informed judgement and provide advice on appropriate improvement measures.

This report has been prepared specifically for the development at Stage 3 of the Mayfield Subdivision and no responsibility is accepted by S & L Consultants Ltd for the use of any part of this report for other development sites without their written approval.

S & L Consultants Ltd
Consulting Engineers, Surveyors, Planners



M W Hughes
Geotechnical Engineer

30 April 2004

APPENDIX I

**Drawings – Earthworks Completion Plan 16530-81
Deposited Plan DP 330215**

- KEY
- 7% Construction Compaction Test Position
 - Post Construction Barholes by S & L Consultants Ltd
 - 7% Pre subdivision Test Pit by S & L Consultants Ltd
 - Pre subdivision Barholes by Connell Wagner Ltd
 - 10 — Depth of Structural Fill
 - 10 — Depth of Cut
 - SHA Settlement Markers
 - • — Extent of Cut / Fill
 - ***** Subsoil Drain

Drawn by	1	226	Application	04/04
Checked by				
Approved by				
DATE				
NAME				
DATE				
SPKED				
Surveyed				
Designed				
Drawn				
Checked				
Approved				
REFERENCES				

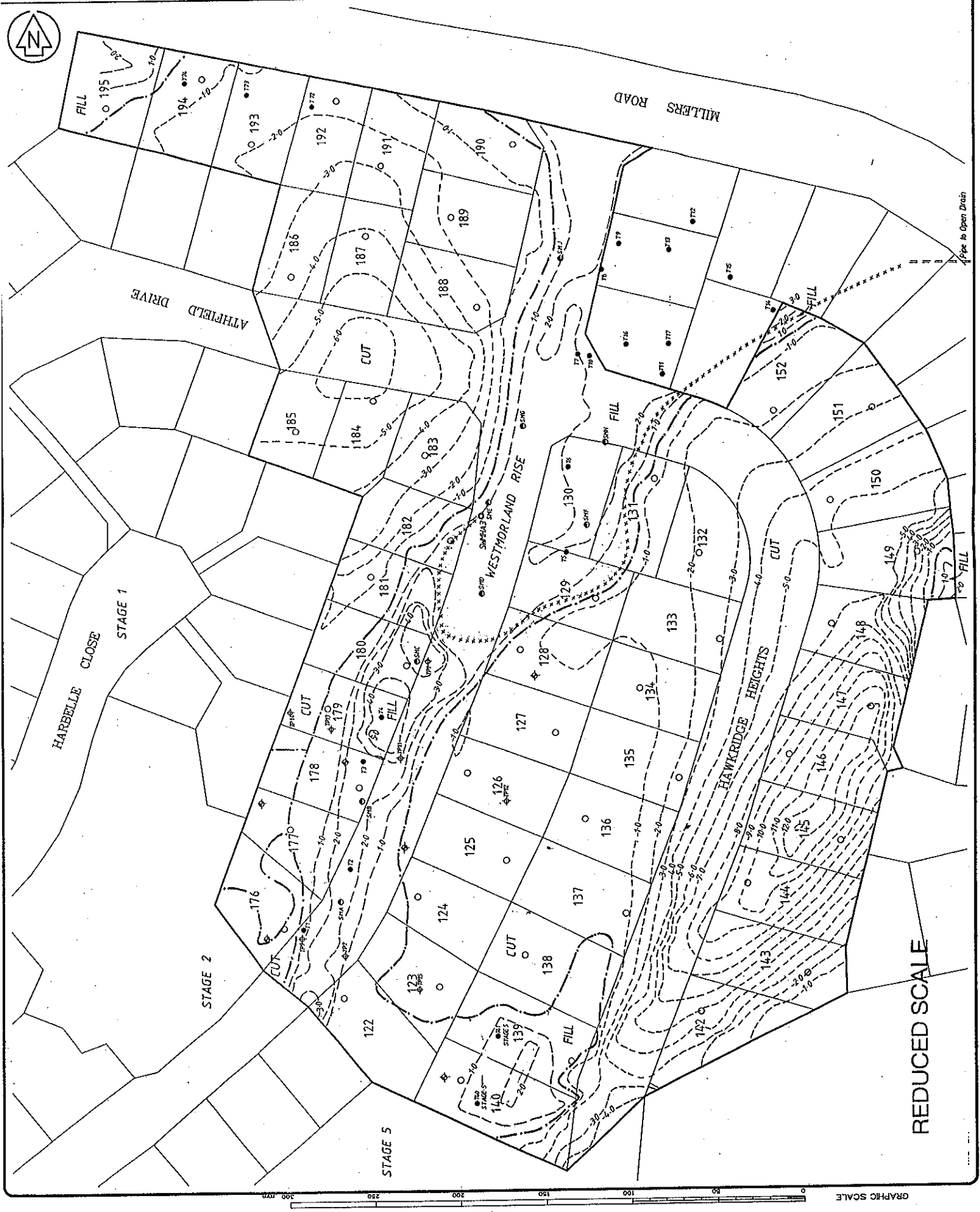


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TITLE
MAYFIELD
SUBDIVISION
STAGE 3

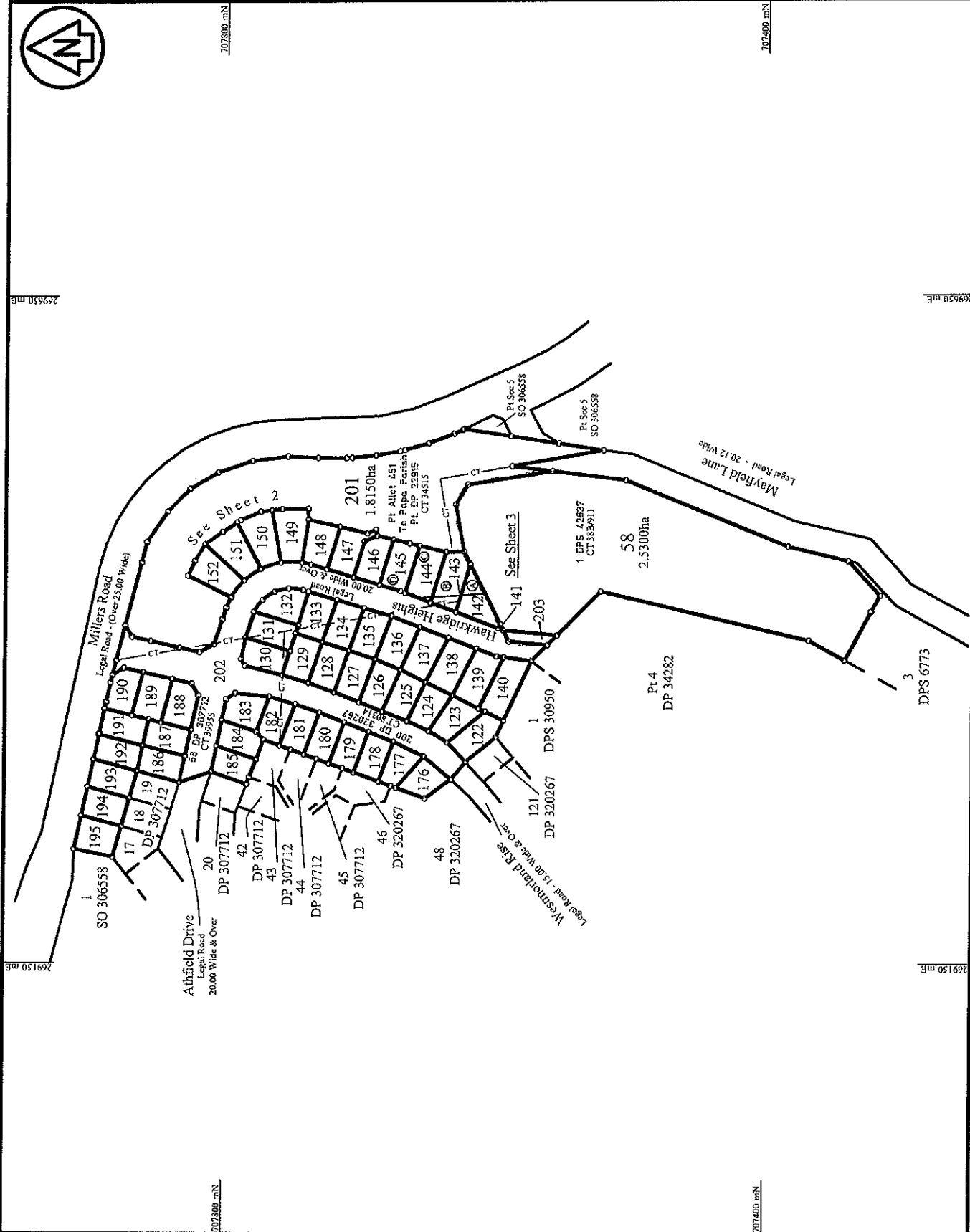
COMPLETED EARTHWORKS
REFERENCE PLAN

Copyright in this drawing is reserved	DATE	04/04
GRAPHIC SCALE	1:500 (A1)	
DRAWING No	16530-81	
Revisions	1	

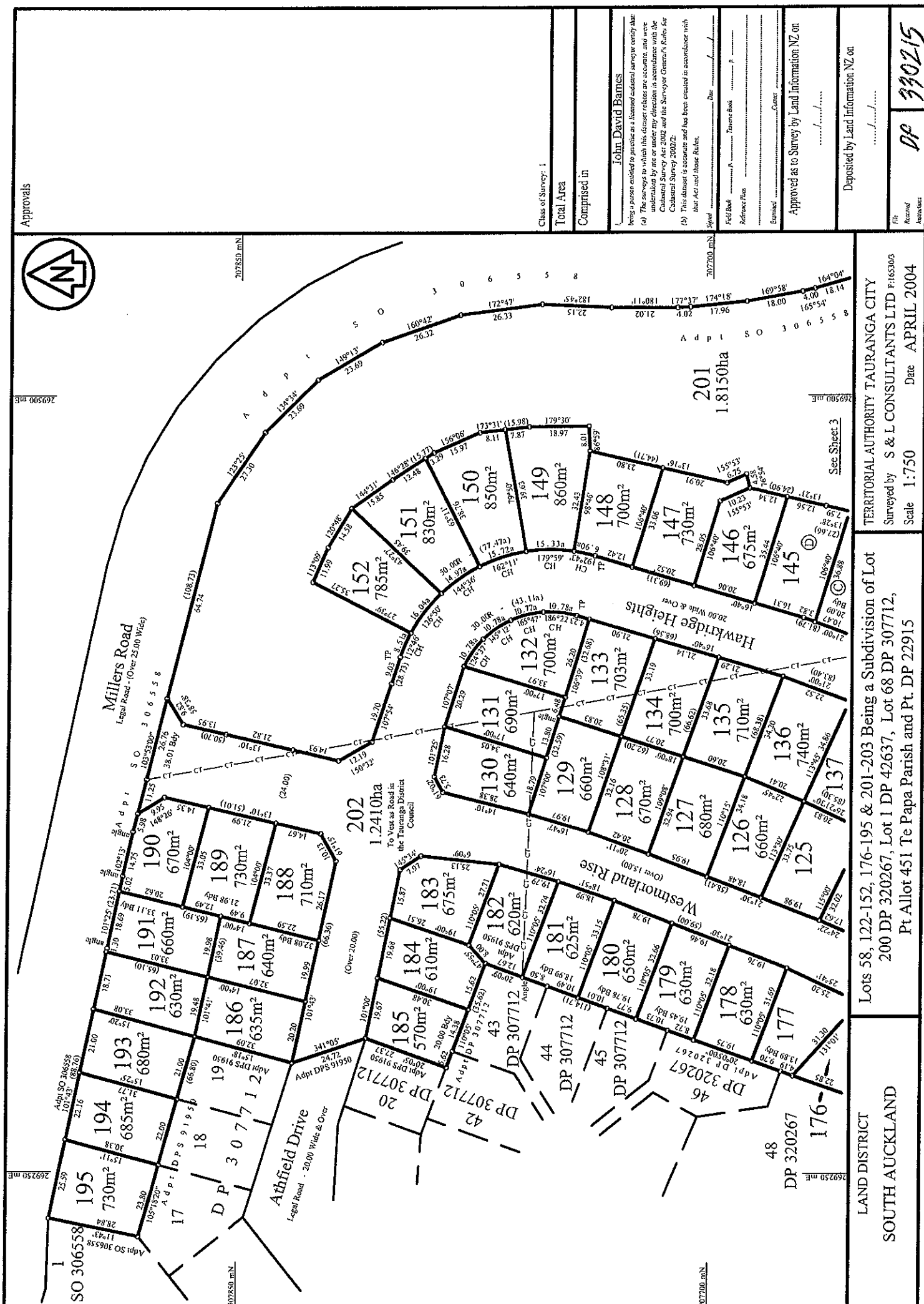


REDUCED SCALE

GRAPHIC SCALE

[illegible]

Approvals



Class of Survey: 1

Total Area

Comprised in

John David Barnes

being a person entitled to practice as a licensed cadastral surveyor under the

(a) The surveys to which this dataset relates are accurate, and were

undertaken by me or under my direction in accordance with the

Cadastral Survey Act 2002 and the Surveyor General's Rules for

Cadastral Survey 2002.

(b) This dataset is accurate and has been created in accordance with

that Act and those Rules.

Signed

Date

Field Book

Reference Plan

Examined

Approved as to Survey by Land Information NZ on

Deposited by Land Information NZ on

File

Received

Instructions

Sheet 2 of 3 Sheets

TERRITORIAL AUTHORITY TAURANGA CITY
Surveyed by S & L CONSULTANTS LTD F:165303
Scale 1:750 Date APRIL 2004

Lots 58, 122-152, 176-195 & 201-203 Being a Subdivision of Lot
200 DP 320267, Lot 1 DP 42637, Lot 68 DP 307712,
Pt Allot 451 Te Papa Parish and Pt DP 22915

LAND DISTRICT
SOUTH AUCKLAND

DP 320215

Approvals

Class of Survey: 1

Total Area

Comprised in

John David Barnes

being a person entitled to practise as a licensed cadastral surveyor certify that:
(a) The surveys to which this dataset relates are accurate, and were undertaken by me or under my direction in accordance with the Cadastral Survey Act 2002 and the Surveyor General's Rules for Cadastral Survey 2002;
(b) This dataset is accurate and has been created in accordance with that Act and those Rules.

Signed _____ Date _____

Field Book _____

Reference Plan _____

Examined _____

Approved as to Survey by Land Information NZ on _____

Deposited by Land Information NZ on _____

File No. **DP 390215**

Sheet 3 of 3 Sheets



Millers Road
Legal Road - (Over 25.00 Wide)

201
1.8150ha

58
2.5300ha

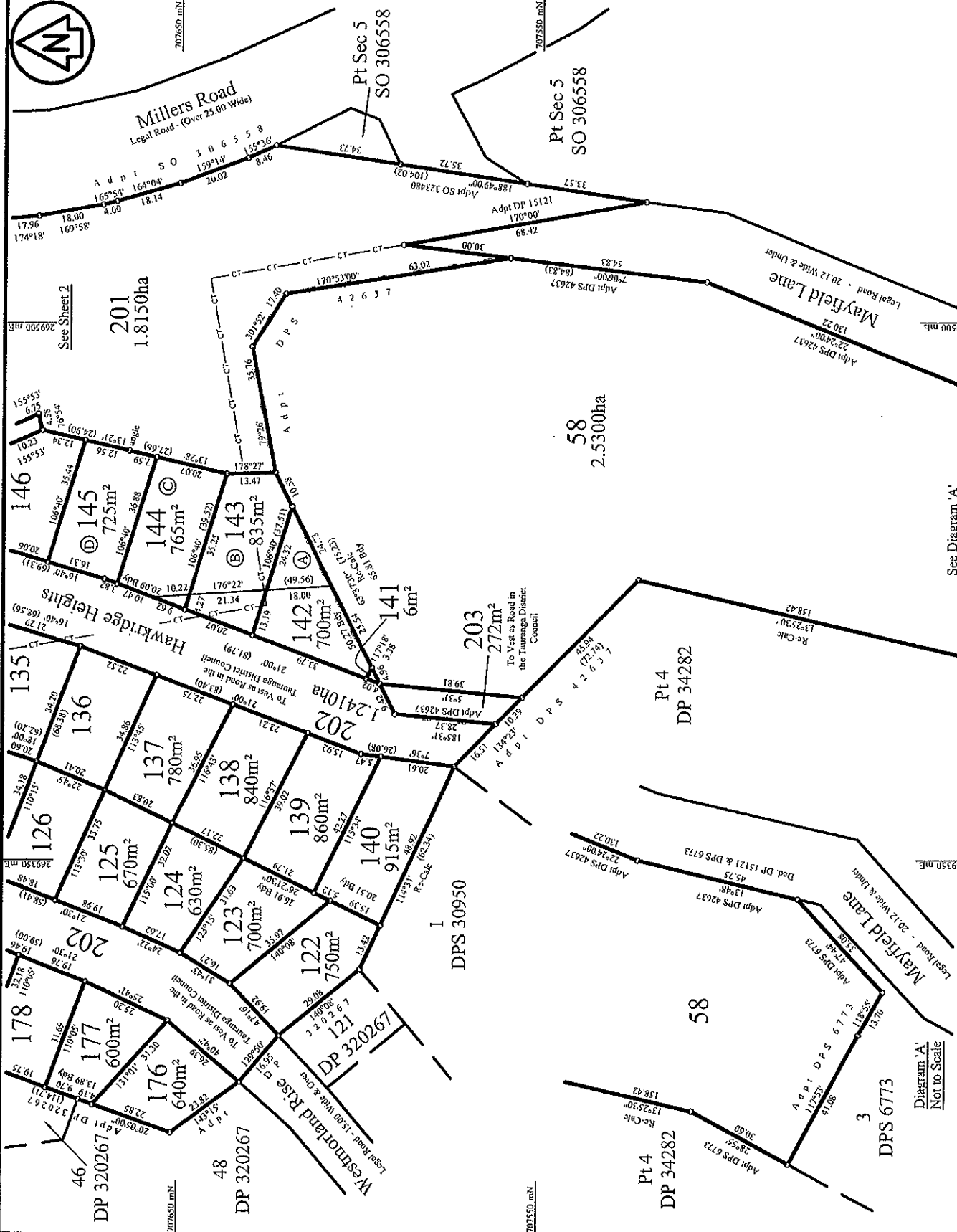
Mayfield Lane
Legal Road - 20.12 Wide & Under

See Diagram 'A'

LAND DISTRICT
SOUTH AUCKLAND

Lots 58, 122-152, 176-195 & 201-203 Being a Subdivision of Lot
200 DP 320267, Lot 1 DP 42637, Lot 68 DP 307712,
Pt Allot 451 Te Papa Parish and Pt. DP 22915

Diagram 'A'
Not to Scale



APPENDIX II

**Statement of Professional Opinion as to the Suitability of
Land for Building Development**

Lot Summary Report

SECTION 2

To: The Director of Environmental Services

STATEMENT OF PROFESSIONAL OPINION AS TO THE GEOTECHNICAL SUITABILITY OF LAND FOR BUILDING

DEVELOPMENT: Mayfield Subdivision Stage 3

OWNER: Mayfield Ltd

LOCATION: Westmorland Rise, Bethlehem

I Michael William Hughes of S & L Consultants Ltd

(Full Name)

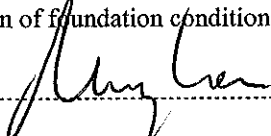
PO Box 231, Tauranga

(Name and Address of Firm)

Hereby confirm that;

- 1) I am a professional person appropriately qualified with experience in geotechnical engineering to ascertain the suitability of the land for building development and was retained as the Soils Engineer to the above development.
- 2) An appropriate level of site investigation and construction supervision has been carried out under my direction and is described in my development evaluation dated 30 April 2004
- 3) In my professional opinion, not to be construed as a guarantee, I consider that;
 - (a) The area shown in my report dated 30 April 2004 of each new allotment is suitable for the erection thereon of the building types appropriate to the zoning of the land, provided that;
Recommendations contained in my report are complied with.
 - (b) The structural earth fills shown on the attached Plan Nos. 16530-81 have been placed in accordance with the Code of Practice for Development of the Tauranga City Council.
 - (c) The completed works give due regard to all land slope and foundation stability considerations.
 - (d) The filled ground is suitable for the erection thereon of residential buildings not requiring specific design in terms of NZS 3604:1999 and related documents providing that:
Recommendations contained in my report, section 7 are complied with.
 - (e) The original ground not affected by filling is suitable for the erection thereon of residential buildings not requiring specific design in terms of NZS 3604:1999 and related documents, subject to the recommendations contained in my report including those relating to topsoil depths and soil variations away from test or observation positions.
4. This professional opinion is furnished to the Council and the owner for their purpose alone, on the express condition that it will not be relied upon by any other person and does not remove the necessity for the normal inspection of foundation conditions at the time of erection for any dwelling.

Signed



Date

30 April 2004



TAURANGA
DISTRICT COUNCIL

**SUITABILITY OF LAND
FOR BUILDING DEVELOPMENT**

TAURANGA CITY COUNCIL

MAY 98

G 2 Δ

The comments and notations included on this summary sheet are outlined in the support documents. These shall be read in conjunction with this summary.

File Ref: 16530

Comments

Refer to S & L Consultants Ltd report reference 16530 dated 30 April 2004

Lots shown on DP 330110



TAURANGA CITY COUNCIL

G 2a Δ

WATFIELD SUBDIVISION STAGE 3

The comments and notations included on this summary sheet are outlined in the support documents. These shall be read in conjunction with this summary.

File Ref: 16530

[illegible]

Refer to S & L Consultants Ltd report reference 16530 dated 30 April 2004

Lots shown on DP 330110



TAURANGA CITY COUNCIL

G 2a Δ

File Ref: 16530

T.D.C Sub 5311

Comments

Refer to S & L Consultants Ltd report reference 16530 dated 30 April 2004

Lots shown on DP 330110



TAURANGA CITY COUNCIL

G 2a Δ

APPENDIX III

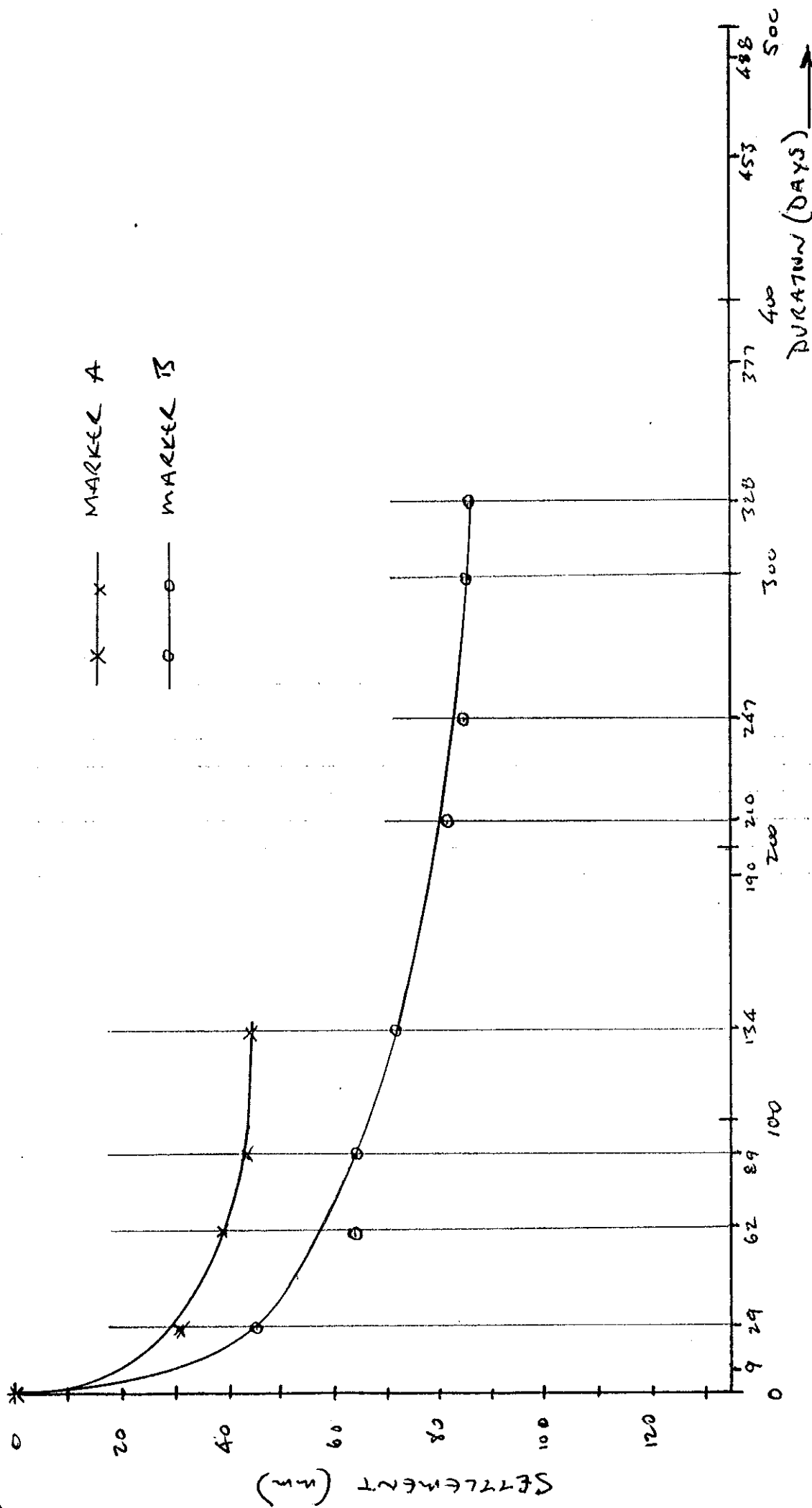
Compaction Test Results

Settlement Rates on Preloaded Areas

SUMMARY OF COMPACTION TEST RESULTS

Test No	Location	Air Voids Percentage	Undrained Shear Strength kPa
T1	Road	7.5	>154
T2	Road	0.1	>146
T3	Lot 178	2.2	>159
T4	Lot 179	9.5	>164
T5	Lot 129	5.2	>164
T6	Lot 130	11.6	>144
T7	Road	11.4	67
T10	Road (Retest of T7)	2.8	>164
T40	Lot 140	6.5	119
T41	Lot 139	3.6	>151
T72	Lot 192	7.9	107
T73	Lot 193	7.4	>200
T74	Lot 194	6.8	>200
T40A	Lot 140	4.6	>200
T72A	(Retest of T40) Lot 192 (Retest of T72)	3.6	>161

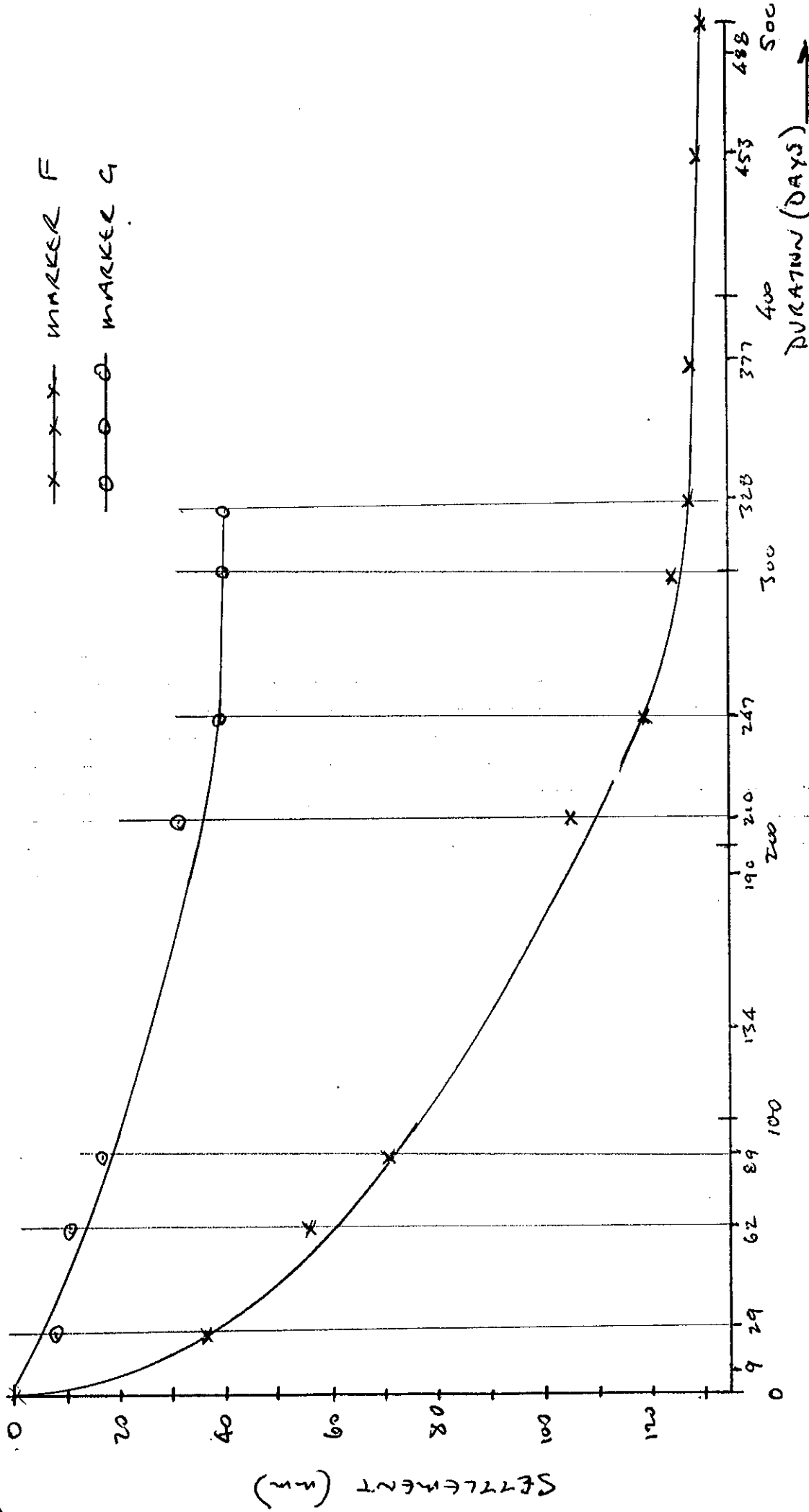
Refer to 16530-81 for test locations



MAYFIELD SUBDIVISION STAGE 3
 SETTLEMENT MARKERS A, B
 PLOT OF SETTLEMENT V TIME

S&L CONSULTANTS LTD
 REGISTERED SURVEYORS
 CONSULTING ENGINEERS
 TOWN PLANNERS

Drawing No	Rev.
16530	0
Date:	4/04
Drawn	Checked



Drawing No 16530	Rev. 0
	Date: 4/04
Drawn	Checked

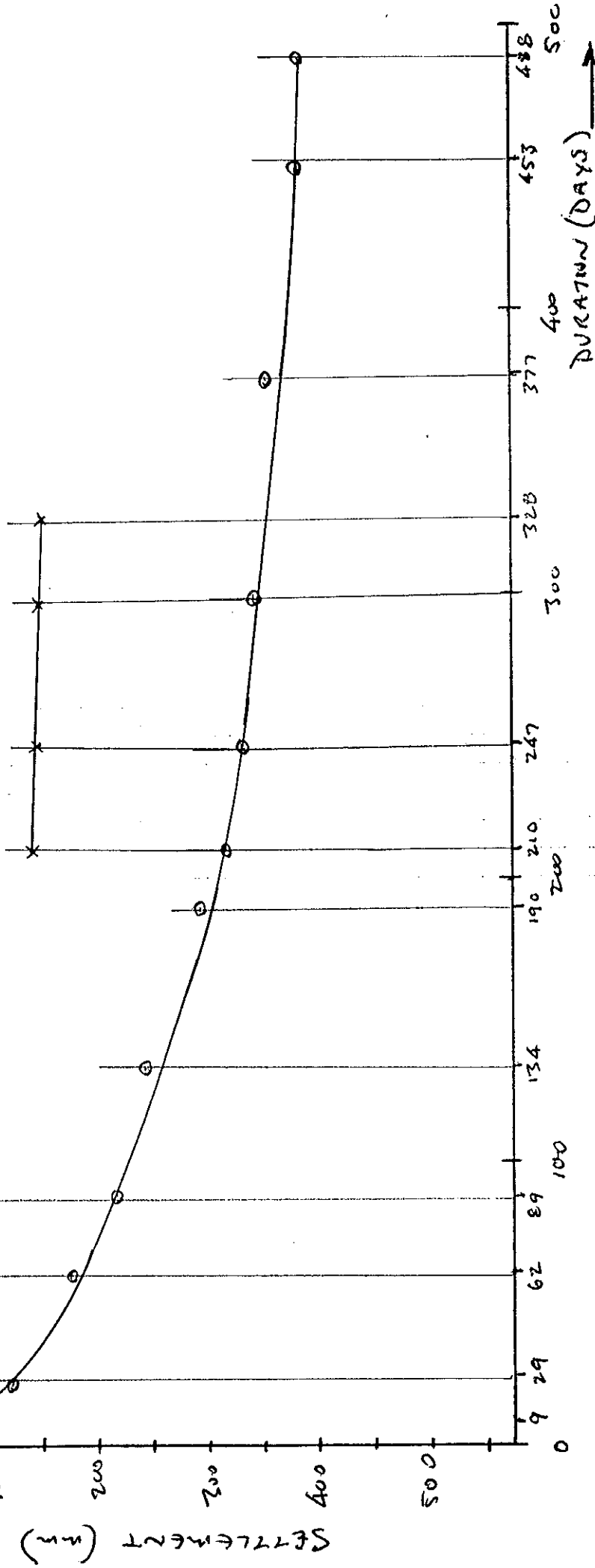
S&L
CONSULTANTS
LTD

REGISTERED SURVEYORS
CONSULTING ENGINEERS
TOWN PLANNERS

MAYFIELD SUBDIVISION STAGE 3
 SETTLEMENT MARKERS F, G
 PLOT OF SETTLEMENT V TIME

~~x x x~~ MARKER D
~~o o o~~ MARKER H

REINSTATED AT
 LOWER LEVEL



S&L CONSULTANTS LTD REGISTERED SURVEYORS CONSULTING ENGINEERS TOWN PLANNERS		Drawing No 16530	Rev. 0
MAYFIELD SUBDIVISION STAGE 3 SETTLEMENT MARKERS D, H PLOT OF SETTLEMENT V TIME		Date: 4/04	Drawn Checked

APPENDIX IV

Post Construction Borehole Logs

Pre Construction Borehole Logs

BOREHOLE ON
LOTS 122, 123

Site: MAYFIELD STAGE 3

Sheet: 1 Of: 1

Job No. 16530

Date Excavated: APRIL 04

RL Ground: —

Logged By: S SLACK

Description of Soil	Soil Symbol	Depth (m)	Undrained Shear Strength (kPa)						
			50	100	150				
LOT 122									
TOPSOIL firm moist black	mm	0.5							
	mm								
	mm								
	mm								
	mm								
SILT stiff moist friable brown	xx	1.0							
	xv								
SILT sandy stiff moist light brown	xx								
	xy								
SILT v. stiff moist friable brown	xy								
end of bore									
LOT 123									
TOPSOIL firm sl. moist black	mm	0.5							
	mm								
	mm								
	mm								
	mm								
SILT v. stiff sl. moist friable brown	xx	1.0							
	xx								
	xx								
	xx								
	xx								
becomes light brown	xx	1.0							
	xy								
remains stiff	xx								
end of bore									
EXCAVATION METHOD: handauger and shear vane									

BOREHOLE ON
LOTS 124, 125

Sheet: 1 Of: 1

Site: MAYFIELD STAGE 3

Job No. 16530

Date Excavated: APRIL 04

RL Ground: —

Logged By: S SLACK

Description of Soil	Soil Symbol	Depth (m)	Undrained Shear Strength (kPa)		
			50	100	150
LOT 124					
TOPSOIL firm moist black	m m m m				
SILT stiff moist friable brown remains stiff becomes light brown	x x x x x x x x	0.5 1.0			
end of bore					
LOT 125					
TOPSOIL firm moist black	m m m m				
SILT stiff moist friable brown	x x x x x x x x	0.5 1.0			
end of bore					

EXCAVATION METHOD: handauger and shear vane



BOREHOLE ON
LOTS 126 127

Sheet: 1 Of: 1

Site: MAYFIELD STAGE 3

Job No. 16530

Date Excavated: APRIL 04

RL Ground: —

Logged By: S SLACK

Description of Soil	Soil Symbol	Depth (m)	Undrained Shear Strength (kPa)		
			50	100	150
LOT 126					
TOPSOIL black	~				
SILT stiff friable sl. moist brown	X X				
	X X				
	X X				
	X X	0.5			
	X X				
remains stiff becomes moist light brown	X X				
	X X				
bec. v. moist	X X	1.0			
	X X				
end of bore					
LOT 127					
TOPSOIL firm black	~				
	~				
mixed with brown silt	X X				
	X X				
	X X	0.5			
	X X				
SILT v. stiff sl. moist friable brown	X X				
	X X				
	X X	1.0			
	X X				
end of bore					

EXCAVATION METHOD: handauger and shear vane



Sheet: 1 Of: 1

RL Ground: —

50 100 150

1.0

LOT 129

0.5

1.0

end of bore

BOREHOLE ON
LOTS 131 132

Site: MAYFIELD STAGE 3

Sheet: 1 Of: 1

Job No. 16530

Date Excavated: APRIL 04

RL Ground: —

Logged By: S SLACK

Description of Soil	Soil Symbol	Depth (m)	Undrained Shear Strength (kPa)					
			50	100	150			
LOT 131								
Topsoil stiff moist black	333							
SILT stiff moist friable brown	xx	0.5						
SILT sandy (t) stiff v. moist friable pumiceous light brown	x'x'	1.0						
end of bore								
LOT 132								
Topsoil stiff moist black	m							
SILT stiff moist friable brown	xx	0.5						
becomes sandy remains stiff	x'x'	1.0						
v. moist light brown	x'x'							
end of bore								

EXCAVATION METHOD: handauger and shear vane

BOREHOLE ON
LOTS 133 134

Site: MAYFIELD STAGE 3

Sheet: 1 Of: 1

Job No. 16530

Date Excavated: APRIL 04

RL Ground: —

Logged By: S SLACK

Description of Soil	Soil Symbol	Depth (m)	Undrained Shear Strength (kPa)					
			50	100	150			
LOT 133								
TOPSOIL firm moist black	mm mm x							
SILT stiff moist friable brown becomes sandy (f) remains stiff v. moist light brown	xy xx x x x x x	0.5 1.0						
end of bore								
LOT 134								
TOPSOIL firm moist black	mm mm m							
SILT stiff friable pl. moist brown remains stiff brown	xx xx xx xx xx xx xx	0.5 1.0						
end of bore								

EXCAVATION METHOD: handauger and shear vane



BOREHOLE ON
LOTS 135 136

Sheet: 1 Of: 1

Site: MAYFIELD STAGE 3

Job No. 16530

Date Excavated: APRIL 04

RL Ground: —

Logged By: S SLACK

Description of Soil	Soil Symbol	Depth (m)	Undrained Shear Strength (kPa)		
			50	100	150
LOT 135					
TOPSOIL firm moist black	m m m m				
SILT stiff moist friable brown	x x x x x x	0.5			
SILT sandy (cf) stiff v. moist pumiceous light brown	x x x x	1.0			
end of bore					
LOT 136					
TOPSOIL firm moist black	m m				
SILT stiff st. moist friable brown becomes moist remains v. stiff light brown	x x x x x x x x x x x x x x	0.5 1.0			
end of bore					

EXCAVATION METHOD: handauger and shear vane



Sheet: 1 Of: 1

Logged By: **S SLACK**

50 100 150

end of bore

EXCAVATION METHOD: **handauger and shear vane**

BOREHOLE ON
LOTS 139 140

Sheet: 1 Of: 1

Site: MAYFIELD STAGE 3

Job No. 16530

Date Excavated: APRIL 04

RL Ground: —

Logged By: S SLACK

Description of Soil	Soil Symbol	Depth (m)	Undrained Shear Strength (kPa)					
			50	100	150			
LOT 139								
TOPSOIL loose dry black becomes stiff moist	SS SS SS SS							
SILT v. stiff moist brown	XX XX	0.5						
SILT v. stiff sl. plastic moist dark brown Fill	XX XX XX XX	1.0						
bec. sandy v. moist brown								
end of bore								
LOT 140								
TOPSOIL firm dry bec. moist black	mm mm mm							
SILT stiff moist sl. plastic mixed brown - light brown	XX XX XX XX XX XX	0.5						
bec v. stiff sl. moist fill	XX XX	1.0						
end of bore								

EXCAVATION METHOD: handauger and shear vane

BOREHOLE ON
LOTS 142 143

Site: MAYFIELD STAGE 3

Sheet: 1 Of: 1

Job No. 16530

Date Excavated: APRIL 04

RL Ground: —

Logged By: S SLACK

Description of Soil	Soil Symbol	Depth (m)	Undrained Shear Strength (kPa)							
			50	100	150					
LOT 142										
Top Soil black	33									
SILT stiff friable moist brown bec. sandy	XX XX X.	0.5								
SILT sandy (r) stiff v. moist friable light brown	X. X. X. X.	1.0								
end of bore										
LOT 143										
Top Soil firm almost black	33									
SILT clayey stiff sl. plastic moist dark brown	X. X. X. X.	0.5								
less clayey friable brown	X. X.	1.0								
end of bore										

EXCAVATION METHOD: handauger and shear vane

EXCAVATION METHOD: handauger and shear vane



BOREHOLE ON
LOTS 144 145

Site: MAYFIELD STAGE 3

Sheet: 1 Of: 1

Job No. 16530

Date Excavated: APRIL 04

RL Ground: —

Logged By: S SLACK

Description of Soil	Soil Symbol	Depth (m)	Undrained Shear Strength (kPa)		
			50	100	150
LOT 144					
Topsoil from black	mm				
SAND (F) silty dense light brown	xx	0.5			
SAND (F) dense moist pumiceous light green	1.0			
end of bore					
LOT 145					
Topsoil from black	mm				
SAND (F) dense moist pumiceous light brown-green	0.5			
SAND (F) dense v. moist light brown bec. silty	1.0			
end of bore					

EXCAVATION METHOD: handauger and shear vane



BOREHOLE ON
LOTS 146 147

Site: MAYFIELD STAGE 3

Sheet: 1 Of: 1

Job No. 16530

Date Excavated: APRIL 04

RL Ground: —

Logged By: S SLACK

Description of Soil	Soil Symbol	Depth (m)	Undrained Shear Strength (kPa)		
			50	100	150
LOT 146					
TOPSOIL from moist black	~				
SAND (F) dense moist puriceous green	•••••	0.5			
		1.0			
end of bore					
LOT 147					
TOPSOIL clayey silt in black	~				
SILT stiff moist friable brown	XA	0.5			
SAND (F) dense moist puriceous green	•••••	1.0			
end of bore					

EXCAVATION METHOD: handauger and shear vane

BOREHOLE ON
LOTS 148 149

Sheet: 1 Of: 1

Site: MAYFIELD STAGE 3

Job No. 16530

Date Excavated: APRIL 04

RL Ground: —

Logged By: S SLACK

Description of Soil	Soil Symbol	Depth (m)	Undrained Shear Strength (kPa)		
			50	100	150
LOT 148					
TOPSOIL from moist black	SSS				
SILT sandy (t) stiff friable moist light brown	XX	0.5			
SAND (t) med dense moist green	...				
SILT sandy (t) stiff v. moist green	XX	1.0			
end of bore					
LOT 149					
TOPSOIL from moist black	SSS				
SILT v. stiff moist friable brown	XX	0.5			
SAND (t) med dense moist light green	...				
SILT v. stiff moist friable brown	XX	1.0			
end of bore					

EXCAVATION METHOD: handauger and shear vane

handauger and shear vane



Sheet: 1 Of: 1

Logged By: **S SLACK**

end of bore

EXCAVATION METHOD: **handauger and shear vane**



BOREHOLE ON
LOTS 177 178

Sheet: 1 Of: 1

Site: MAYFIELD STAGE 3

Job No. 16530

Date Excavated: APRIL 04

RL Ground: —

Logged By: S SLACK

Description of Soil	Soil Symbol	Depth (m)	Undrained Shear Strength (kPa)		
			50	100	150
LOT 177					
TOPSOIL black	SSS				
SILT stiff clay fine brown	XX	0.5			
bee. sand (f) remain stiff	XX				
light brown	XX	1.0			
end of bore					
LOT 178					
TOPSOIL firm black	XX				
SAND (f) silty dense s-moist	XX	0.5			
light brown	XX				
less silty dense (well compacted)	XX	1.0			
end of bore					

EXCAVATION METHOD: handauger and shear vane



BOREHOLE ON
LOTS 179 180

Sheet: 1 Of: 1

Site: MAYFIELD STAGE 3

Job No. 16530

Date Excavated: APRIL 04

RL Ground: —

Logged By: S SLACK

Description of Soil	Soil Symbol	Depth (m)	Undrained Shear Strength (kPa)		
			50	100	150
LOT 179					
TOPSOIL dry black	33				
SILT stiff SL moist friable brown	XX	0.5			
	XX				
	XX				
	XX				
	XX				
	XX				
bec. moist remains stiff	XX	1.0			
	XX				
end of bore					
LOT 180					
TOPSOIL stiff black mixed with brown SILT	33				
	XX				
	XX				
SILT stiff moist brown bec. sandy FILL	XX	0.5			
	XX				
	XX				
	XX				
SAND (st) silty moist mixed light brown - grey FILL	XX	1.0			
	XX				
	XX				
end of bore					

EXCAVATION METHOD: handauger and shear vane

EXCAVATION METHOD: **handauger and shear vane**



Sheet: 1 Of: 1

Logged By: **S SLACK**

end of bore

EXCAVATION METHOD: **handauger and shear vane**

BOREHOLE ON
LOTS 185 186

Sheet: 1 Of: 1

Site: MAYFIELD STAGE 3

Job No. 16530

Date Excavated: APRIL 04

RL Ground: —

Logged By: S SLACK

Description of Soil	Soil Symbol	Depth (m)	Undrained Shear Strength (kPa)					
			50	100	150			
LOT 185								
TOPSOIL firm dry black	~							
SILT stiff sl-moist friable brown	xx	0.5						
	xx							
	xx							
	xx							
	xx							
becomes moist remains stiff brown	xx	1.0						
	xx							
end of bore								
LOT 186								
TOPSOIL firm moist black	~							
	~							
	~							
SAND (f) med dense moist lt. green	...	0.5						
	xx							
SILT stiff sil-clayey v-moist brown	xx							
	xx							
	xx							
SILT stiff friable v-moist light brown bec. v-stiff	xx	1.0						
end of bore								

EXCAVATION METHOD: handauger and shear vane

BOREHOLE ON
LOTS 187 188

Site: MAYFIELD STAGE 3

Sheet: 1 Of: 1

Job No. 16530

Date Excavated: APRIL 04

RL Ground: —

Logged By: S SLACK

Description of Soil	Soil Symbol	Depth (m)	Undrained Shear Strength (kPa)					
			50	100	150			
LOT 187								
TOPSOIL firm black	SS							
SILT v. stiff moist friable pumiceous light grey	XX XY XX XX	0.5						
SILT sandy (t) stiff moist pumiceous light grey bec. v. moist	X' X' X' X' X'	1.0						
end of bore								
LOT 188								
TOPSOIL firm sl. moist black	SS SS SS SS SS	0.5						
SILT sandy (t) med dense moist pumiceous light grey	X' X' X' X'	1.0						
SAND (t) silty med dense light grey	X' X'							
end of bore								

EXCAVATION METHOD: handauger and shear vane



BOREHOLE ON
LOTS 189 190

Sheet: 1 Of: 1

Site: MAYFIELD STAGE 3

Job No. 16530

Date Excavated: APRIL 04

RL Ground: —

Logged By: S SLACK

Description of Soil	Soil Symbol	Depth (m)	Undrained Shear Strength (kPa)		
			50	100	150
LOT 189					
TOPSOIL firm black	m m m				
SILT stiff moist friable brown	x x x x x x x	0.5			
bec. v. moist	x x	1.0			
end of bore					
LOT 190					
TOPSOIL firm black	m m m				
SILT stiff sl. moist friable brown	x x x x x x x	0.5			
	x x	1.0			
end of bore					

EXCAVATION METHOD: handauger and shear vane

BOREHOLE ON
LOTS 191 192

Site: MAYFIELD STAGE 3

Sheet: 1 Of: 1

Job No. 16530

Date Excavated: APRIL 04

RL Ground: —

Logged By: S SLACK

Description of Soil	Soil Symbol	Depth (m)	Undrained Shear Strength (kPa)		
			50	100	150
LOT 191					
TOPSOIL black	mm				
	mm				
	mm				
	mm				
SILT stiff sl. moist friable brown	xx	0.5			
	xx				
SILT sandy (f) stiff moist light brown	x.				
	.x				
	x/				
SILT clayey stiff v. moist sl. plastic light brown	x-	1.0			
	-x				
end of bore					
LOT 192					
TOPSOIL R. brown black	ff				
	ff				
	ff				
	ff				
	ff	0.5			
	ff				
SILT stiff moist friable brown	x				
	x				
	x				
becomes sandy (f) v. moist	.x	1.0			
	-x				
end of bore					

EXCAVATION METHOD: handauger and shear vane

EXCAVATION METHOD: **handauger and shear vane**



BOREHOLE ON
LOT 195

Site: MAYFIELD STAGE 3

Sheet: 1 Of: 1

Job No. 16530

Date Excavated: APRIL 04

RL Ground: —

Logged By: S SLACK

Description of Soil	Soil Symbol	Depth (m)	Undrained Shear Strength (kPa)		
			50	100	150
LOT 195					
TOPSOIL black	SS				
SILT stiff moist friable brown	XX	0.5			
	XX				
	XX				
	XX				
	XX				
remains stiff v. moist fine	XX	1.0			
	XX				
SILT stiff moist dark brown	XX				
	XX				
SILT stiff organic black (refined tipical at original ground level)	XX	1.5			
	XX				
SILT stiff moist friable brown	XX				
	XX				
	XX				
	XX	2.0			
END OF BORE					

EXCAVATION METHOD: handauger and shear vane



Test Pit No. 1

Sheet: Of:

Site: MAYFIELD

Job No. 16530

Date Excavated: 19/7/02

RL Ground:

Logged By: MAB

Description of Soil

Soil Symbol

Depth (m)

Undrained Shear Strength (kPa)

50 100 150

SILT : Brown yellow

175/52 183/62
175/34 >200
159/62 >200
149/34 159/52

72/31

80% Grey silt

55/31

20% topsoil

52/24

69/17

POST + WIRE

FLATTENED VEGETATION

30/13

52/10

57/7

34/10

SILT organic, black, soft

40 kpa ~ 60 kpa.

SAND : pumice, silty, pale grey
medium dense

EOP @ 4.0m : TARGET DEPTH

EXCAVATION METHOD:



Test Pit No. 2

Sheet: 1 Of: 1

Site: MAYFIELD

Job No. 16530

Date Excavated: 19/7/02

RL Ground:

Logged By: MA

Description of Soil

Soil Symbol

Depth (m)

Undrained Shear Strength (kPa)

50 100 150

TOPSOIL

very stiff horticultural
filling $\frac{128}{61}$ $\frac{190}{86}$ $\frac{110}{45}$ $\frac{138}{57}$ $\frac{159}{52}$ $\frac{156}{52}$

stiff horticultural filling

 $\frac{26}{13}$ $\frac{38}{13}$ $\frac{76}{27}$ $\frac{86}{31}$ $\frac{52}{26}$ $\frac{52}{10}$ $\frac{131}{24}$

flattened vegetation

BURIED TOPSOIL

SILT, organic, black, soft

sand, silty, pale grey, firm.

EOB @ 4.0m.

FILLING

NATURAL SOILS

 $\frac{24}{7}$ $\frac{31}{8}$ $\frac{38}{10}$ $\frac{43}{8}$ $\frac{45}{17}$ $\frac{46}{24}$ $\frac{45}{17}$

EXCAVATION METHOD:

Testpit No. **TP 9**Sheet: **1** Of: **1**Site: **MAYFIELD**Job No. **16530**Date Excavated: **24/7/02**

RL Ground:

Logged By: **mtt**

Undrained Shear Strength (kPa)

50 100 150

SILT: clayey, slightly plastic
brown orange, stiff, slightly
moist

92/20 152/56
153/58 153/58
187/20 174/65

10% topsoil, roots up to
15mm of aligned east-west

43/14 36/20
40/20 43/13
40/14 56/16
31/0 42/13

puricite, silt, cream
Buried TOPSOIL

SILT: slightly (5%) organic, brown
with orange inclusions

non organic, sandy slightly
plastic, pale orange brown
sensitive, moist

87/28 145/49
90/26 101/29
121/29 107/40

EOP @ 5.0m: MAXIMUM REACH OF DIGGER

Soil Symbol

Depth (m)

FILLING

NATURAL SUBSOILS

SEE PAGE

MC 74.8
OC 6.8MC MASSIVE
CONTENTOC ORGANIC
CONTENT

EXCAVATION METHOD:



SHRIMPTON & LIPINSKI

Testpit No. *TP 11*Site: *MAYFIELD*Sheet: *1* Of: *1*Job No. *16530*Date Excavated: *24/7/02*

RL Ground:

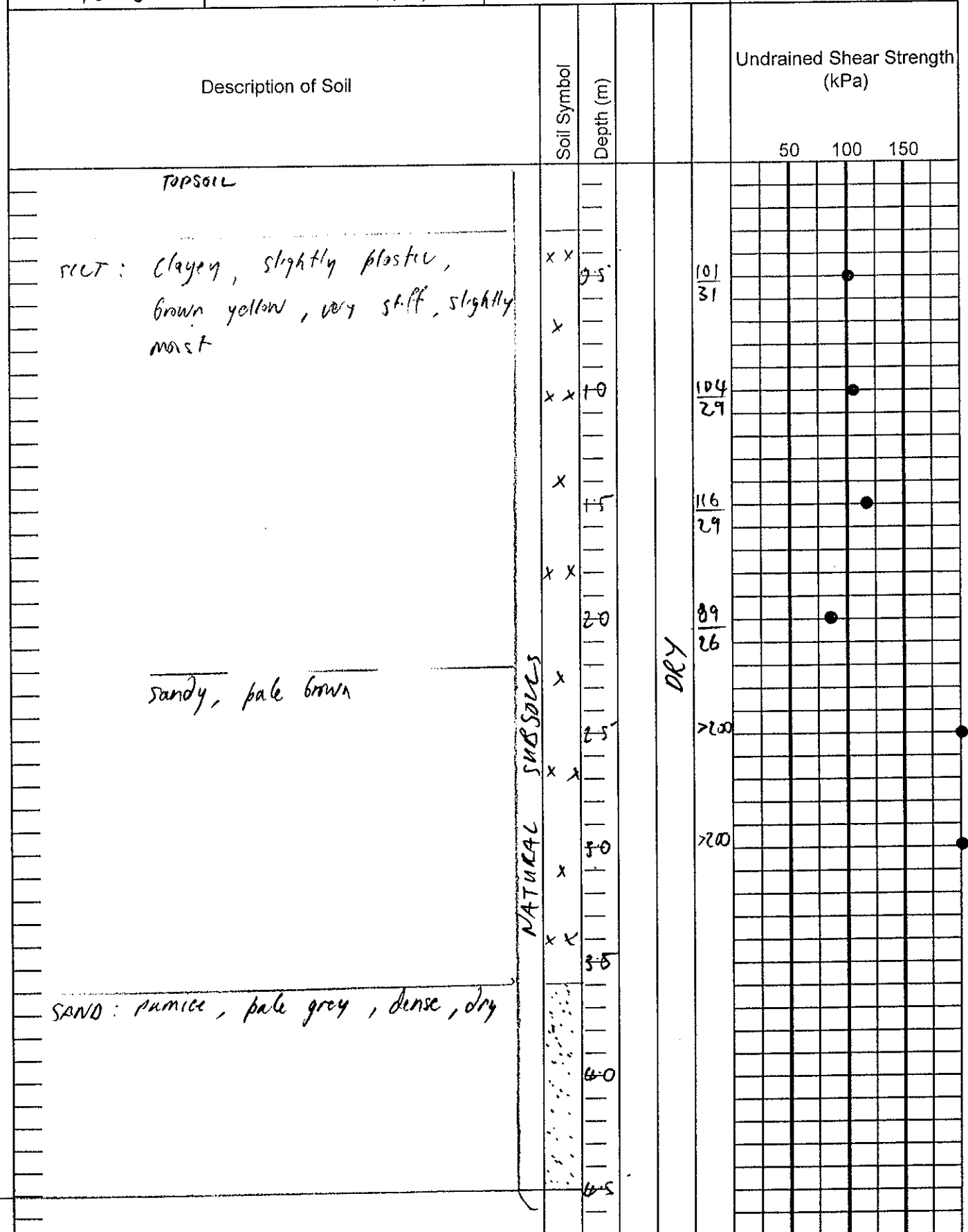
Logged By: *MAH*

Description of Soil					Soil Symbol	Depth (m)				Undrained Shear Strength (kPa)			
										50	100	150	
10% topsoil					① FILLING								
10% brown orange silt													
89	123	72	65	104									
43	36	27	17	17									
118	75	84	92	98									
44	26	20	18	15									
60% brown orange silt													
40% topsoil													
84	58	84	58	81									
30	18	14	17	21									
66	92	60	19	87	② NATURAL SUBSOILS								
23	17	18	18	18									
SILT: slightly (8%) organic, non cohesive, open fabric, high moisture content, stiff													
SILT: sandy, slightly cohesive, pale grey, firm.													
49	43	42	36	30									
13	15	15	9	11									
63	49	40	38	34									
14	20	8	10	8									
SHEAR VANE MEASUREMENTS LAYER 2.													
69	63	46	40	54									
46	21	14	14	18									
75	55	52	42	55									
43	25	15	20	17									

EXCAVATION METHOD:

Testpit No. *TP12*Sheet: *1* Of: *1*Site: *MAYFIELD*Job No. *16530*Date Excavated: *24/7/02*

RL Ground:

Logged By: *MTT*

EXCAVATION METHOD:

Testpit No. **TP 13**Site: **MAYFIELD**Sheet: **1** Of: **1**Job No. **16530**Date Excavated: **24/7/02**

RL Ground:

Logged By: **MA**

Description of Soil	Soil Symbol	Depth (m)	Undrained Shear Strength (kPa)		
			50	100	150
Brown yellow clayey silt, very stiff	FILL	0.5			
60% topsoil					
40% black grey silt					
$\frac{101}{36}$ $\frac{116}{29}$ $\frac{43}{17}$ $\frac{60}{23}$ $\frac{75}{17}$ $\frac{84}{14}$		1.0			
NATURAL BURIED TOPSOIL	NATURAL SOILS	1.5			
SILT: sandy, pale grey, medium dense					
SILT: highly (40-45%), distinct organic smell, black, high moisture content		2.0			
$\frac{62}{7}$ $\frac{52}{8}$ $\frac{44}{10}$ $\frac{52}{13}$ $\frac{40}{6}$ $\frac{42}{4}$		2.5			
SILT: Sandy, some clay, pale brown firm	NATURAL SOILS	3.0			
		3.5			
EOP @ 3.5: TARGET DEPTH					

SEE PAGE

54
8
60
14
53
12
45
10
42
8

EXCAVATION METHOD:

Testpit No. **TP14**Site: **MAYFIELD**Sheet: **1** Of: **1**Job No. **16530**Date Excavated: **24/7/02**

RL Ground:

Logged By: **MLA**

Description of Soil	Soil Symbol	Depth (m)	Undrained Shear Strength (kPa)		
			50	100	150
90% clayey brown yellow SILT Ash. 10% Topsoil	FILLING	0.5	← →		
$\frac{81}{29}$ $\frac{98}{17}$ $\frac{79}{17}$ $\frac{118}{52}$ $\frac{104}{40}$		1.0	← →		
$\frac{92}{26}$ $\frac{71}{21}$ $\frac{94}{17}$ $\frac{79}{29}$ $\frac{97}{27}$	NATURAL SUBSOILS	1.5			
NATURAL BURIED TOPSOIL		2.0			
SILT: sandy, pale grey brown		2.5			
End @ 2.5m.					

DRY

 $\frac{116}{31}$ $\frac{123}{43}$ $\frac{113}{34}$

EXCAVATION METHOD:

Test Pit No. *TP15*Sheet: *1* Of: *1*Site: *MAYFIELD*Job No. *16580*Date Excavated: *24/2/02*

RL Ground:

Logged By: *MA*Undrained Shear Strength
(kPa)

50 100 150

Description of Soil

Soil Symbol

Depth (m)

*TOPSOIL**SILT: Clayey, brown yellow, very
sh. (ASH)**very sandy, pale orange**NATURAL IN SITU SUBSOILS**TEST PIT DRY**EOP @ 3.0m : TARGET DEPTH*

EXCAVATION METHOD:

BOREHOLE LOG

Connell Wagner

[illegible]

BOREHOLE LOG

Connell Wagner

[illegible]

BOREHOLE LOG

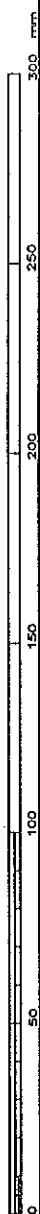
Connell Wagner

[illegible]

BOREHOLE LOG

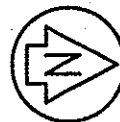
Connell Wagner

[illegible]



GRAPHIC SCALE

REDUCED SCALE



KEY

- T74 Construction Compaction Test Position
- Post Construction Boreholes by S & L Consultants Ltd
- ⊕ TP9 Pre subdivision Test Pit by S & L Consultants Ltd
- ◆ Pre subdivision Boreholes by Connell Wagner Ltd
- 1.0 — Depth of Structural Fill
- - 1.0 - - Depth of Cut
- SHA Settlement Markers
- • — Extent of Cut / Fill
- ***** Subsoil Drain

1		224 Application		04'04
Checked By	Rev. No.	DESCRIPTION	DATE	SIGNED
Surveyed		S & L		
Designed				
Drawn		SD	04'04	
Checked				
Approved				

REFERENCES



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Fax (07) 577-6065
Email: sltga@xtra.co.nz

TITLE

MAYFIELD
SUBDIVISION
STAGE 3

COMPLETED EARTHWORKS
REFERENCE PLAN

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ORIGINAL SCALES	DATE
1:500 (A1)	04'04

DRAWING No	
16530-81	

Revision					
1					

