



## **GREENHILL PARK RESIDENTIAL SUBDIVISION**

### **STAGES 1 & 2**

**Alker Road, Hatric Road, Libeau Road, Jobe Road, Meacham Road  
and Lulu Avenue**

### **HAMILTON**

#### ***REPORT ON SUBDIVISION EARTHWORKS AND RECOMMENDATIONS FOR BUILDING DEVELOPMENT***

Our Ref: 20413-S1

Prepared for Chedworth Properties Ltd

11 July 2016 Revision 1

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## **1.0 Subdivision Development Earthworks**

### **1.1 Introduction**

In accordance with Hamilton City Council's (HCC) Subdivision Resource Consent 11/2015/6025, dated 30 June 2015, bulk earthworks have been completed to re-contour the previously agricultural landscape for Stages 1 and 2 of the Greenhill Park Residential Subdivision in Hamilton. Prior to commencement of earthworks, geotechnical investigations were carried out by Opus International Consultants, Ltd. in 2013 [1] and 2014 [2] and by S&L Consultants, Ltd in 2015 [3].

Stages 1 and 2 of the Greenhill Park residential subdivision in Hamilton are accessed via Pardoia Boulevard to the south. Temporary access to Pardoia Boulevard will be from an extension of Hatric Road to the south through Lot 30. Therefore, as lot 30 is not intended for residential construction at this time, it has been excluded from this report. Upon completion of subsequent stages of the subdivision, access to Stages 1 and 2 will be from Meacham Road and Lulu Avenue to the east. Stages 1 and 2 comprise 45 lots (numbered 1 to 29 and 31 to 46) and 46 lots (numbered 47 to 92), respectively. See the attached *Geotechnical Reference Plan*, drawing 20413-G05 included in Appendix I.

HCC's Infrastructure Technical Specifications (ITS) set out the minimum standards for design and construction of public infrastructure within Hamilton City. Section 2.1.5 of *Earthworks and Geotechnical Requirements* of the ITS states that the developer shall appoint a geo-professional to carry out functions as described in NZS 4404 Section 2.2.4. ITS Section 2.3.3.1 states that a geotechnical completion report shall be submitted as per NZS4404 Section 2.6 including a statement of professional opinion on the suitability of land for building construction. [4]

To satisfy the requirements of HCC's Resource Consent, the ITS and NZS 4404 [5], this report summarises the observations and testing undertaken during the development of the stages, discusses the suitability of the ground for the support of the proposed residential buildings and contains recommendations for the disposal of stormwater runoff generated on individual sites.

Included in Appendix I of this report are parts of deposited plan DP 496238 showing the size of the development of Stages 1 and 2, and drawing 20413-G05, which shows the extent of the earthworks undertaken, test positions, and road and lot locations.

### **1.2 Earthworks in the Subdivision**

The earthworks for this stage of subdivision were undertaken between October 2015 and March 2016. The earthworks generally comprised cut depths of approximately 0.6 m or less and fill depths of up to 1.0 m. Upon completion of the earthworks, approximately 200 to 300 mm of topsoil was placed across the sites for future building with isolated areas up to 400 mm in depth and in accordance with Condition 20 of the Resource Consent, areas of bare earth were re-grassed.

The depths of cut and filling performed during earthworks are shown on drawing 20413-G05. With the removal of topsoil and any disturbed soils that may have been encountered, the actual depth of cut in some areas may vary slightly from that shown.

The soils encountered during the formation of the site and road subgrades were a mixture of silts, sands and pumiceous gravels, typical of soils in the Hamilton area.

The earthworks undertaken on Stages 1 and 2 were part of more extensive earthworks that were being undertaken concurrently over Stages 1 through 4 of the subdivision and construction of Pardo Boulevard. These general works involved the following:

- The stripping and stockpiling of the surface topsoil to expose the natural subgrade.
- The undertaking of the earthworks in cut and filling to achieve required finished grades with testing in the filling to verify compaction to acceptable standards.
- Reinstatement of the surface topsoil layer.

Topsoil depths were generally re-established to be around 300 mm. However post construction tests showed that the topsoil depths in some areas may be deeper. No guarantee is implied or given that the topsoil on any part of any lot is actually 300 mm or less and it is recommended that future owners or builders check topsoil depths when preparing site development plans and cost schedules.

### **1.3 Earthworks Standards**

The earthworks in filling were undertaken using insitu silts sands gained from areas of cut. The standards for the placement of filling, as stated in the earthworks contract documents, were to comply with NZS 4431:1989 “Code of Practice for Earthfill for Residential Development” and the ITS. Filling placed to these standards may be considered as good ground in terms of NZS 3604:2011 “Timber Framed Structures” and NZS 3604 may therefore be adopted for the detailing of residential buildings within the subdivision where appropriate. Refer to Section 1.6.4.3 of this report.

Adequate compaction of the filling placed was achieved when blow counts recorded with a Scala penetrometer were 4 or more per 100 mm of penetration in sand fill or when a shear strength of 100 kPa or more was recorded with a hand held shear vane in silt and clay fill.

### **1.4 Filled Ground**

During the placement of filling on the road subgrades and on areas intended for residential development, the contractor, Online Contractors, Ltd., was observed by S & L Consultants Ltd to strip and remove all topsoil and other organics to stockpiles for reuse. Filling was observed to be placed in discrete layers with compactive effort applied through sheeps-foot drum rollers.

Online Contractors undertook their own Scala penetrometer testing throughout the contract works to verify that the filling had been placed with adequate compactive effort. These test results were reviewed by S & L Consultants Ltd. Where conducted in granular fill, these tests indicate that adequate compaction has been achieved. On 3 December 2015 and 3, 4, 9 and 10 February 2016, S&L put down 61 boreholes at the locations shown on drawing 20413-G05 to evaluate the quality of the earthworks undertaken. Vane shear testing by S&L in filling indicates that adequate compaction has been achieved. The tests undertaken by the contractor and S&L indicate that the construction filling standards have been met.



## 1.5 Areas of Cut

Areas developed on individual lots in cut are shown on 20413-G05. In areas of cut, the ground at formation levels was observed to be the same silts and sands that had been used for filling elsewhere and as identified by pre subdivision tests.

## 1.6 Land Hazards

### 1.6.1 Land Stability

There are no land form stability issues within Stages 1 and 2 of the Greenhill Park Subdivision.

### 1.6.2 Flooding

Flood hazards in Stages 1 and 2 are governed by the following four criteria:

- 1) Lot Levels – New Zealand Standard 4404 Section 4.3.5.2.
- 2) Localised Ponding – New Zealand Building Code (NZBC), *Clause E1 (Stormwater)* and HCC Infrastructure Technical Specifications, *Section 4 Stormwater*.
- 3) Site Drainage - New Zealand Building Code (NZBC), *Clause E1 (Stormwater)*
- 4) Ground Clearance – New Zealand Standard 3604 Section 7.5.2.1.

Criteria 1 and 2 are governed by flooding and ponding levels across the subdivision. Criteria 3 is based on site grades at the property boundary. Criteria 4 is based on site paving, slab construction and wall cladding details as determined by the building's design professional. Final grades on individual lots and finished floor levels of buildings must meet all of these requirements.

**It is the responsibility of the building design professional to ensure that the requirements of all four of the flooding criteria are met by the design prior to submitting to Council for consent.** The following sections describe the flooding criteria in more detail.

#### 1.6.2.1 Flooding Criteria 1 – Lot Levels

NZS 4404 states that the minimum freeboard height additional to the computed top water flood level of the 1% AEP design storm should be 0.5 m as measured from the top water level to the building platform level. In Stages 1 and 2 for the 1% AEP design storm, the top water level has been set at RL 36.15 m by the design of the subdivision.

For the prevention of a flooding hazard, lot levels have been constructed to be above the potential flooding level of 36.65 m (including freeboard). **Site grading during house construction must not lower lot levels below the finished ground levels listed below in Table 2, direct stormwater to adjacent properties, direct stormwater towards buildings, or create areas of localised ponding.**

#### 1.6.2.2 Flooding Criteria 2 – Localised Ponding

Localized ponding and associated secondary flow are governed by NZBC, *Clause E1* and HCC Infrastructure Technical Specifications, *Section 4 Stormwater*.

### NZBC Clause E1 Requirements

NZBC Clause E1 requires that buildings and sitework be constructed so that surface water resulting from an event having a 10% probability of occurring annually does not cause damage or nuisance to other property and that surface water from a 2% event does not enter buildings. *Acceptable Solutions and Verification Methods* by the Ministry of Business, Innovation & Employment (MBIE) provides methodology to comply with Clause E1 [2]. Verification Method E1/VM1 Section 4.3.1 states that “the level of the floor shall be set at the height of the secondary flow plus an allowance for freeboard” and that freeboard is to be a) 500 mm where surface water has a depth of 100mm and extends from the building directly to a road, or b) 150m for all other cases.

As-built surveys of lot levels show that ponding will not extend directly from the building areas to adjacent roads. Therefore, a freeboard of 150mm above localized ponding will satisfy the requirements of NZBC Clause E1.

### ITS, Section 4 Stormwater, Requirements

According to Section 4 of the ITS, all building designs must either adopt the generic minimum freeboard requirements of NZS4404:2010 or, where suitable data exists, are allowed to specifically consider the design environment based on the three parts of Table 4-13. Table 4-13 provides recommended freeboard based on catchment area, ponding depth and flow velocity.

### Localised Ponding in Stages 1 and 2

Stormwater runoff from individual lots in Stages 1 and 2 is directed towards the primary flow paths on Meacham Road and is then conveyed towards the south by the drainage swales along the western sides of Alker, Hatric, Libeau, and Jobe Roads. At the intersections with Lulu Avenue, stormwater from the drainage swales and roadways is directed to the stormwater detention pond and extended swale to the south by a piped reticulation system. Stormwater from lots 29 and 61 to 68 will be directed by private piped reticulation and surface flow to the swale at the southern boundaries of these lots.

In the case of the 1% AEP rainfall event or a failure of the primary system, localised ponding may develop at 4 locations in Stages 1 and 2 being the intersections of Lulu Avenue with Alker, Hatric, Libeau and Jobe Roads. These areas of ponding may develop up to the levels indicated in Table 1 below before tipping over and continuing into the stormwater management areas to the south via overland flow. Table 1 below lists the lots affected, contributing catchment area, estimated ponding level and recommended freeboard from the level of ponding to the finished floor levels based on Table 4-13 of the ITS.

Table 1: Localised Ponding

Location	Lot Numbers	Catchment Area (ha)	Ponding RL (m)	Recommended Freeboard to FFL (mm)
Alker Road	1-8, 33-40	1.48	36.7	225
Hatric Road	31, 32, 41-46, 21-29	1.48	36.5	225
Libean Road	65-77, 86-92	1.35	36.5	225
Jobe Road	78-85, 55-64	1.36	36.6	225

#### 1.6.2.3 Flooding Criteria 3 – Site Drainage

Acceptable Solution E1/AS1 of Compliance Document for New Zealand Building Code E1 “Surface Water”, establishes the minimum acceptable floor level above any stormwater associated with site drainage.

During a storm event in excess of 10% AEP, flows will be down the roadways, eventually to the stormwater management areas to the south. Paragraph 2.0.1 of E1/AS1 recommends that “suspended floors and slabs on ground shall be at least 150 mm above the finished level of the surrounding ground immediately adjacent to the building, and for sites level with or above the road, no less than 150 mm above the road crown on at least one cross-section through the building and roadway.”

In Stages 1 and 2, as-built surveys have shown that the ground levels on the building areas are more than 150 mm above the road crown levels.

#### 1.6.2.4 Flooding Criteria 4 – Ground Clearance

Section 7.5.2.1 of NZS 3604 sets the minimum height of the top surface of the floor slab of the building above adjacent ground based on wall cladding and site paving. **It is the building design professional’s responsibility to set the minimum finished floor level in accordance with the ground clearance requirements of the building code.**

### 1.6.3 Finished Levels

Table 2 below lists the average as-built ground level of each lot and the minimum floor level based on the governing flooding criteria of Section 1.6.2. To prevent areas of localised ponding from extending to buildings and to maintain compliance with NZBC Clause E1, individual lots should not be lowered below the as-built levels. Therefore, finished floor levels will be governed by the ground clearance requirements of Section 7.5.2.1 of NZS 3604.

The minimum floor levels shown in Table 2 are based on a ground clearance of 150mm; however, **prior to submittal of design documents to Council**, minimum floor levels should be determined **by the building design professional** based on the building code requirements for the type of construction selected.

Table 2: Finished Levels\*

<b>Lot Number</b>	<b>As-built Ground Level (m) See Note 2</b>	<b>Minimum Floor Level (m) See Note 1</b>
1	36.9	37.05
2	36.9	37.05
3	36.9	37.05
4	37.0	37.15
5	36.9	37.05
6	37.0	37.15
7	37.1	37.25
8	37.0	37.15
9	37.5	37.65
10	37.4	37.55
11	37.4	37.55
12	37.4	37.55
13	37.4	37.55
14	37.4	37.55
15	37.3	37.45
16	37.4	37.55
17	37.4	37.55
18	37.4	37.55
19	37.4	37.55
20	37.4	37.55
21	37.1	37.25
22	37.1	37.25
23	37.1	37.25
24	37.2	37.35
25	37.1	37.25
26	37.1	37.25
27	37.1	37.25
28	37.1	37.25
29	37.3	37.45
31	37.0	37.15
32	37.0	37.15
33	37.0	37.15
34	37.1	37.25
35	37.1	37.25
36	37.2	37.35
37	37.1	37.25
38	37.2	37.35
39	37.2	37.35
40	37.3	37.45
41	36.9	37.05
42	37.0	37.15
43	37.0	37.15

Table 2: Finished Levels\* (continued)

<b>Lot Number</b>	<b>As-built Ground Level (m) See Note 2</b>	<b>Minimum Floor Level (m) See Note 1</b>
44	37.0	37.15
45	37.0	37.15
46	37.0	37.15
47	37.4	37.55
48	37.4	37.55
49	37.4	37.55
50	37.4	37.55
51	37.4	37.55
52	37.4	37.55
53	37.4	37.55
54	37.5	37.65
55	37.2	37.35
56	37.3	37.45
57	37.3	37.45
58	37.2	37.35
59	37.2	37.35
60	37.2	37.35
61	37.3	37.45
62	37.3	37.45
63	37.3	37.45
64	37.2	37.35
65	37.1	37.25
66	37.2	37.35
67	37.2	37.35
68	37.2	37.35
69	37.0	37.15
70	37.0	37.15
71	37.0	37.15
72	37.0	37.15
73	37.1	37.25
74	37.0	37.15
75	37.1	37.25
76	37.0	37.15
77	37.1	37.25
78	37.1	37.25
79	37.1	37.25
80	37.1	37.25
81	37.1	37.25
82	37.1	37.25
83	37.1	37.25
84	37.0	37.15
85	37.2	37.35
86	37.1	37.25

Table 2: Finished Levels\* (continued)

Lot Number	As-built Ground Level (m) See Note 2	Minimum Floor Level (m) See Note 1
87	37.0	37.15
88	37.2	37.35
89	37.2	37.35
90	37.2	37.35
91	37.2	37.35
92	37.2	37.35

\*Levels shown to Moturiki datum.

- 1) Under all circumstances, building design professionals must ensure that ground clearance requirements of the building code are satisfied (NZS 3604, Section 7.5.2.1).
- 2) Finished ground levels are for information purposes only and are not to be relied upon for construction or daylighting purposes.

#### 1.6.4 Liquefaction

The hazard of liquefaction potential for Stages 1 and 2 of the Greenhill Park Subdivision has been assessed and previously reported in our *Report on Preliminary Geotechnical Investigation*, dated 27 March 2015. Data from CPT tests were used in the analyses. Within Stages 1 and 2, CPT 1 was undertaken in November 2014. This test position is shown on 20413-G05.

##### 1.6.4.1 Analysis

This assessment was based on:

- Analyses undertaken in accordance with the publication *Guidelines for the Identification, Assessment and Mitigation of Liquefaction Hazards* [8]
- Seismic events for the ultimate limit state (1 in 500 year event) and the serviceability limit state (1 in 25 year event) being considered in accordance with NZS 1170.5 [9]. A seismic event with a Richter Scale magnitude of 7.5 was considered in accordance with the NZGS guidelines. Peak ground accelerations were derived for both seismic events. The subsoils were classified as Class D and described as “deep or soft” in accordance with Section 3.0 of NZS 1170.5. Proposed houses were deemed to have an importance level of 2.
- The use of reviewed software CLiq [10].

##### 1.6.4.2 Results

The liquefaction assessment results are summarised in table 3 below

Table 3: Liquefaction Summary

CPT Position	Depth Analysed (m)	Potential Liquefaction Level (m)	Vertical Settlement (mm)
1	20	3.5-5.0, 18.5-20	79

The results of the assessments were that:

- CPT equipment was advanced to a depth of 20 m at location CPT 1.
- Vertical settlement in the ultimate limit state was estimated to be 79 mm at CPT 1. Plots showing this settlement are in Appendix V. No vertical settlements are likely to occur in the serviceability limit state.
- Lateral spread is unlikely to occur in Stages 1 and 2.
- These computed settlements, along with the ground improvement work undertaken during the subdivision earthworks and the thick non-liquefiable surficial layer, indicate that any seismically induced differential settlements in the ultimate limit state will be within tolerable limits for standard house construction in accordance with MBIE Compliance Document B1,VM4 [11].

#### *1.6.4.3 Liquefaction Recommendations*

Buildings on the residential lots that are to be supported with a concrete slab on ground construction should incorporate a concrete raft type system (ribraft). The use of such a tied slab system will be more resistant to any effects of seismically induced differential settlements or lateral movements.

Alternatively the use of a timber framed subfloor on shallow piles in accordance with NZS 3604:2011 can be adopted.

## **2.0 Disposal of Stormwater**

Sections 37(8)(p) & 39(5)(h) of the Resource Consent relating to Stages 1 and 2 state that “Each residential lot shall be provided with a means for disposal of stormwater, with no private stormwater pipes or soakage systems crossing from one lot to another except through a right of way.” Stormwater management on individual lots has been assessed by S&L and reported in the *Internal Site Stormwater Management Guide Stages 1 & 2*, dated 23 March 2016, which is included in Appendix VI. The assessment was based on soakage testing conducted in accordance with Section 37(8)(t) of the Resource consent which states that testing shall be conducted on every third lot of Stage one. Results of testing at 16 locations within Stage 1 are presented in the *Greenhill Park Ruakura North, Stage 1, Soakage Test Report* included in Appendix VI.

The results of our assessment indicate that the lots within Stages 1 and 2 have the capability to provide varying amounts of on-site stormwater disposal through ground soakage. Most lots will require a mixture of on-site disposal with overflow directed to the subdivision stormwater system. Greater detail regarding the requirements of individual lots is provided in the *Management Guide* and *Soakage Test Report* included in Appendix VI.

## **3.0 Professional Opinion**

It has been shown in this Geotechnical Completion Report that earthworks have been completed and building platforms have been constructed to comply with Council's Infrastructure Technical Specifications and the New Zealand Building Code. Recommendations have been provided within for the disposal of stormwater from

individual lots, for the ongoing development of the lots and for the mitigation of liquefaction risk where applicable.

In accordance with ITS Section 2.3.3.1, a statement of professional opinion is enclosed in Appendix II of this document. This statement is presented in the form of Checklist 2.1 of Council's Development Manual, Volume 4: Quality Systems for Land Development, and is accompanied by a *Summary of Geotechnical Data for Individual Lots* which summarizes the information and recommendations contained in this report.

#### **4.0 Applicability**

Recommendations contained in this document are based on data from observations of site earthworks, boreholes 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 those described or are 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 Stages 1 and 2 as shown on DP 496238 within the Greenhill Park Residential 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



Report prepared by L Shuler, MIPENZ  
Geotechnical Engineer



Report reviewed by M W Hughes, CPEng  
Senior Geotechnical Engineer

11 July 2016 Revision 1



## 5.0 References

- [1] W. McWha, K. Read and C. Hughes, "Geotechnical Summary Report, Ruakura Development," Opus International Consultants, Ltd., Hamilton, New Zealand, 2013.
- [2] C. Hughes and K. Read, "Ruakura Development - Stage 1 Geotechnical Investigation – Liquefaction Potential Detailed Assessment," Opus International Consultants, Ltd., Hamilton, New Zealand, 2014.
- [3] M. Hughes and L. Shuler, "Report on Preliminary Geotechnical Investigation, Ruakura Development, Hamilton," S&L Consultants, Ltd., Tauranga, New Zealand, 2015.
- [4] "Section 2 Earthworks and Geotechnical Requirements," in *Infrastructure Technical Specifications*, Hamilton, New Zealand, Hamilton City Council, 2013.
- [5] "NZS 4404 Land Development and Subdivision Infrastructure," in *New Zealand Standards*, Wellington, New Zealand, Standards New Zealand, 2010.
- [6] "Geotechnical Engineering Practice - Module 1," in *Guidelines for the Identification, Assessment and Mitigation of Liquefaction Hazards*, New Zealand Geotechnical Society, 2010.
- [7] "Part 5: Earthquake Actions - New Zealand," in *NZS 1170.5:2004 Structural Design Actions*, Standards New Zealand, 2004.
- [8] GeoLogismiki, "CLiq (Version 1.7.6.34) [Software]," Retrieved from <http://www.geologismiki.gr>, 2012.
- [9] "Clause B1: Structure," in *Acceptable Solutions and Verification Methods For New Zealand Building Code*, Wellington, Ministry of Business, Innovation and Employment, 2014.
- [10] "Part A: Technical Guidance," in *Repairing and rebuilding houses affected by the Canterbury earthquakes*, Wellington, Ministry of Business, Innovation and Employment, 2012.
- [11] "Clause E1: Surface Water," in *Acceptable Solutions and Verification Methods For New Zealand Building Code*, Wellington, Ministry of Business, Innovation and Employment, 2014.
- [12] "Section 4 Stormwater," in *Infrastructure Technical Specifications*, Hamilton, New Zealand, Hamilton City Council, 2015.

## **APPENDIX I**

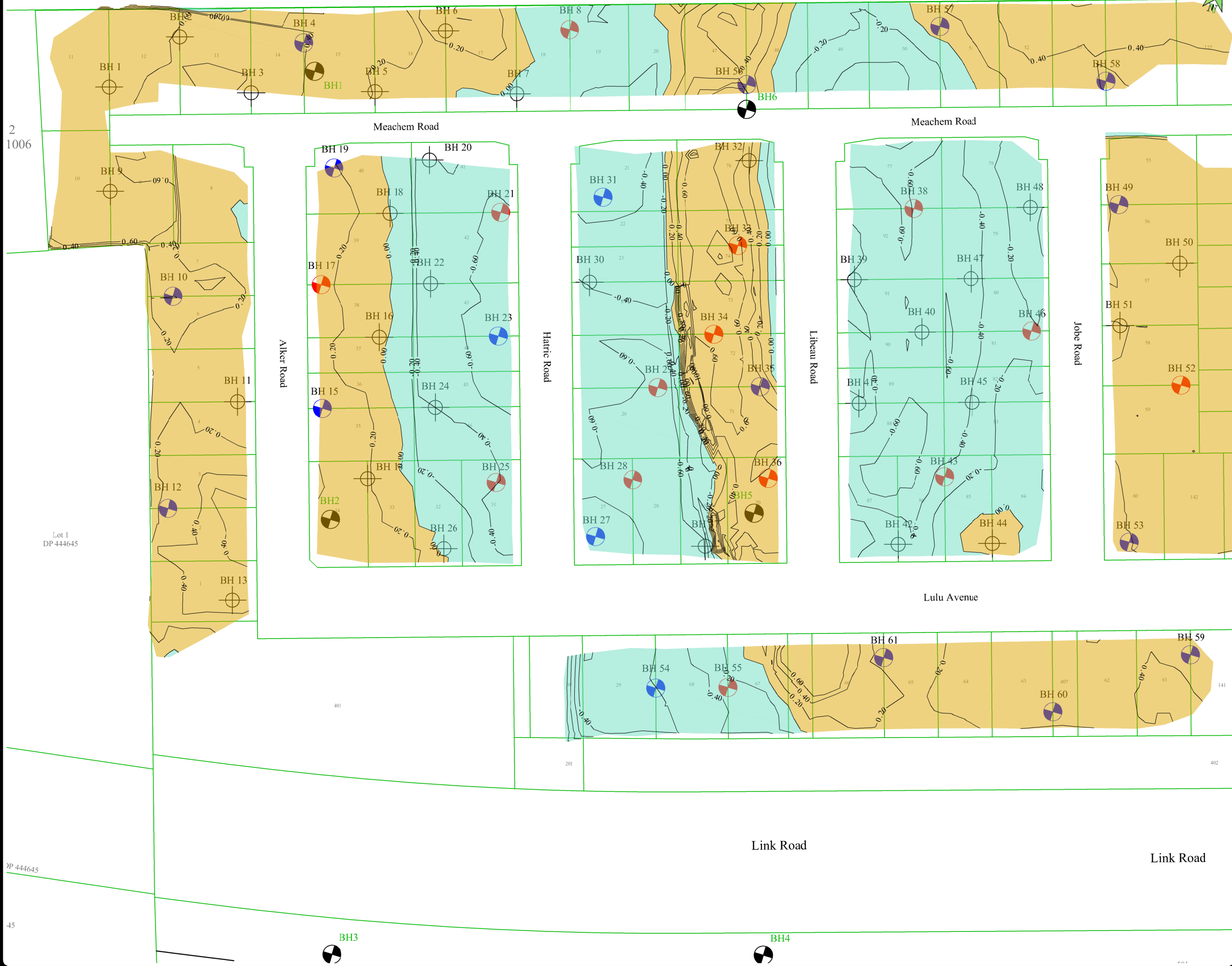
### **Reference Drawings**

20413-G05

DP 496238

Greenhill Road

Greenhill Road



Notes:

Key

- Cut - Fill Contours - 0.5m Contour Interval
- Original Borehole Investigation (26-09-2014)
- Machine Boreholes hole - 1M (9-12-2015)
- Machine Boreholes hole - 2M (10-02-2016)
- Hand Augers (February 2016)

- Area of Cut
- Area of Fill

	1	Issued for 224 Application		4/16
checked by	Rev. No.	Description		DATE
		NAME	DATE	SIGNED
Surveyed		CR	02/15	
Designed		SM	06/15	
Drawn		ADP	03/16	
Checked		LS	03/16	
Approved		TAM	03/16	

REFERENCES



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

TITLE

Chedworth Properties Ltd

Greenhill Perk, Hamilton

Geotechnical Reference Plan

Copyright on this drawing is reserved	DATE
ORIGINAL SCALES	03/16
Scale 1:1000 @ A3	
DRAWING No	
20413 - G05	
Revision	1





# Title Plan - LT 496238

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**Survey Number** LT 496238  
**Surveyor Reference** 20413-S1 - Stage 1 & 2  
**Surveyor** Timothy Andrew McBride  
**Survey Firm** S & L Consultants Ltd  
**Surveyor Declaration**

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## Survey Details

**Dataset Description** Lots 1-92, 201-205, 210-212, 401, 402, 406, 407, 409, 500, 501, 503-505, 602 and 603 Being a Subdivision of Section 26 and Section 27 SO 485482

**Status** Initiated

**Land District** South Auckland **Survey Class** Class A

**Submitted Date** **Survey Approval Date**  
**Deposit Date**

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## Territorial Authorities

Hamilton City

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## Comprised In

CT 722625

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## Created Parcels

Parcels	Parcel Intent	Area	CT Reference
Lot 1 Deposited Plan 496238	Fee Simple Title	0.0514 Ha	729831
Lot 2 Deposited Plan 496238	Fee Simple Title	0.0451 Ha	729832
Lot 3 Deposited Plan 496238	Fee Simple Title	0.0451 Ha	729833
Lot 4 Deposited Plan 496238	Fee Simple Title	0.0452 Ha	729834
Lot 5 Deposited Plan 496238	Fee Simple Title	0.0452 Ha	729835
Lot 6 Deposited Plan 496238	Fee Simple Title	0.0453 Ha	729836
Lot 7 Deposited Plan 496238	Fee Simple Title	0.0453 Ha	729837
Lot 8 Deposited Plan 496238	Fee Simple Title	0.0611 Ha	729838
Lot 9 Deposited Plan 496238	Fee Simple Title	0.0501 Ha	729839
Lot 10 Deposited Plan 496238	Fee Simple Title	0.0614 Ha	729840
Lot 11 Deposited Plan 496238	Fee Simple Title	0.0682 Ha	729841
Lot 12 Deposited Plan 496238	Fee Simple Title	0.0601 Ha	729842
Lot 13 Deposited Plan 496238	Fee Simple Title	0.0600 Ha	729843
Lot 14 Deposited Plan 496238	Fee Simple Title	0.0450 Ha	729844
Lot 15 Deposited Plan 496238	Fee Simple Title	0.0600 Ha	729845
Lot 16 Deposited Plan 496238	Fee Simple Title	0.0600 Ha	729846
Lot 17 Deposited Plan 496238	Fee Simple Title	0.0600 Ha	729847
Lot 18 Deposited Plan 496238	Fee Simple Title	0.0451 Ha	729848
Lot 19 Deposited Plan 496238	Fee Simple Title	0.0500 Ha	729849
Lot 20 Deposited Plan 496238	Fee Simple Title	0.0471 Ha	729850
Lot 21 Deposited Plan 496238	Fee Simple Title	0.0576 Ha	729851
Lot 22 Deposited Plan 496238	Fee Simple Title	0.0300 Ha	729852
Lot 23 Deposited Plan 496238	Fee Simple Title	0.0300 Ha	729853

# Title Plan - LT 496238

## Created Parcels

Parcels	Parcel Intent	Area	CT Reference
Lot 24 Deposited Plan 496238	Fee Simple Title	0.0450 Ha	729854
Lot 25 Deposited Plan 496238	Fee Simple Title	0.0450 Ha	729855
Lot 26 Deposited Plan 496238	Fee Simple Title	0.0600 Ha	729856
Lot 27 Deposited Plan 496238	Fee Simple Title	0.0500 Ha	729857
Lot 28 Deposited Plan 496238	Fee Simple Title	0.0400 Ha	729858
Lot 29 Deposited Plan 496238	Fee Simple Title	0.0600 Ha	729859
Lot 30 Deposited Plan 496238	Vesting on Deposit for Road	0.0561 Ha	
Lot 31 Deposited Plan 496238	Fee Simple Title	0.0500 Ha	729860
Lot 32 Deposited Plan 496238	Fee Simple Title	0.0400 Ha	729861
Lot 33 Deposited Plan 496238	Fee Simple Title	0.0400 Ha	729862
Lot 34 Deposited Plan 496238	Fee Simple Title	0.0497 Ha	729863
Lot 35 Deposited Plan 496238	Fee Simple Title	0.0450 Ha	729864
Lot 36 Deposited Plan 496238	Fee Simple Title	0.0300 Ha	729865
Lot 37 Deposited Plan 496238	Fee Simple Title	0.0300 Ha	729866
Lot 38 Deposited Plan 496238	Fee Simple Title	0.0450 Ha	729867
Lot 39 Deposited Plan 496238	Fee Simple Title	0.0600 Ha	729868
Lot 40 Deposited Plan 496238	Fee Simple Title	0.0576 Ha	729869
Lot 41 Deposited Plan 496238	Fee Simple Title	0.0581 Ha	729870
Lot 42 Deposited Plan 496238	Fee Simple Title	0.0600 Ha	729871
Lot 43 Deposited Plan 496238	Fee Simple Title	0.0450 Ha	729872
Lot 44 Deposited Plan 496238	Fee Simple Title	0.0300 Ha	729873
Lot 45 Deposited Plan 496238	Fee Simple Title	0.0300 Ha	729874
Lot 46 Deposited Plan 496238	Fee Simple Title	0.0450 Ha	729875
Lot 47 Deposited Plan 496238	Fee Simple Title	0.0521 Ha	729876
Lot 48 Deposited Plan 496238	Fee Simple Title	0.0521 Ha	729877
Lot 49 Deposited Plan 496238	Fee Simple Title	0.0521 Ha	729878
Lot 50 Deposited Plan 496238	Fee Simple Title	0.0600 Ha	729879
Lot 51 Deposited Plan 496238	Fee Simple Title	0.0500 Ha	729880
Lot 52 Deposited Plan 496238	Fee Simple Title	0.0450 Ha	729881
Lot 53 Deposited Plan 496238	Fee Simple Title	0.0451 Ha	729882
Lot 54 Deposited Plan 496238	Fee Simple Title	0.0600 Ha	729883
Lot 55 Deposited Plan 496238	Fee Simple Title	0.0506 Ha	729884
Lot 56 Deposited Plan 496238	Fee Simple Title	0.0453 Ha	729885
Lot 57 Deposited Plan 496238	Fee Simple Title	0.0474 Ha	729886
Lot 58 Deposited Plan 496238	Fee Simple Title	0.0460 Ha	729887
Lot 59 Deposited Plan 496238	Fee Simple Title	0.0522 Ha	729888
Lot 60 Deposited Plan 496238	Fee Simple Title	0.0510 Ha	729889
Lot 61 Deposited Plan 496238	Fee Simple Title	0.0455 Ha	729890
Lot 62 Deposited Plan 496238	Fee Simple Title	0.0500 Ha	729891
Lot 63 Deposited Plan 496238	Fee Simple Title	0.0511 Ha	729892
Lot 64 Deposited Plan 496238	Fee Simple Title	0.0453 Ha	729893
Lot 65 Deposited Plan 496238	Fee Simple Title	0.0452 Ha	729894
Lot 66 Deposited Plan 496238	Fee Simple Title	0.0601 Ha	729895

# Title Plan - LT 496238

## Created Parcels

Parcels	Parcel Intent	Area	CT Reference
Lot 67 Deposited Plan 496238	Fee Simple Title	0.0502 Ha	729896
Lot 68 Deposited Plan 496238	Fee Simple Title	0.0595 Ha	729897
Lot 69 Deposited Plan 496238	Fee Simple Title	0.0400 Ha	729898
Lot 70 Deposited Plan 496238	Fee Simple Title	0.0500 Ha	729899
Lot 71 Deposited Plan 496238	Fee Simple Title	0.0600 Ha	729900
Lot 72 Deposited Plan 496238	Fee Simple Title	0.0450 Ha	729901
Lot 73 Deposited Plan 496238	Fee Simple Title	0.0450 Ha	729902
Lot 74 Deposited Plan 496238	Fee Simple Title	0.0300 Ha	729903
Lot 75 Deposited Plan 496238	Fee Simple Title	0.0300 Ha	729904
Lot 76 Deposited Plan 496238	Fee Simple Title	0.0581 Ha	729905
Lot 77 Deposited Plan 496238	Fee Simple Title	0.0576 Ha	729906
Lot 78 Deposited Plan 496238	Fee Simple Title	0.0581 Ha	729907
Lot 79 Deposited Plan 496238	Fee Simple Title	0.0600 Ha	729908
Lot 80 Deposited Plan 496238	Fee Simple Title	0.0450 Ha	729909
Lot 81 Deposited Plan 496238	Fee Simple Title	0.0300 Ha	729910
Lot 82 Deposited Plan 496238	Fee Simple Title	0.0300 Ha	729911
Lot 83 Deposited Plan 496238	Fee Simple Title	0.0450 Ha	729912
Lot 84 Deposited Plan 496238	Fee Simple Title	0.0500 Ha	729913
Lot 85 Deposited Plan 496238	Fee Simple Title	0.0400 Ha	729914
Lot 86 Deposited Plan 496238	Fee Simple Title	0.0400 Ha	729915
Lot 87 Deposited Plan 496238	Fee Simple Title	0.0500 Ha	729916
Lot 88 Deposited Plan 496238	Fee Simple Title	0.0450 Ha	729917
Lot 89 Deposited Plan 496238	Fee Simple Title	0.0300 Ha	729918
Lot 90 Deposited Plan 496238	Fee Simple Title	0.0300 Ha	729919
Lot 91 Deposited Plan 496238	Fee Simple Title	0.0450 Ha	729920
Lot 92 Deposited Plan 496238	Fee Simple Title	0.0600 Ha	729921
Lot 210 Deposited Plan 496238	Vesting on Deposit for Local Purpose Reserve	0.0014 Ha	729922
Lot 211 Deposited Plan 496238	Vesting on Deposit for Local Purpose Reserve	0.0001 Ha	729923
Lot 212 Deposited Plan 496238	Vesting on Deposit for Local Purpose Reserve	0.0018 Ha	729924
Lot 401 Deposited Plan 496238	Vesting on Deposit for Local Purpose Reserve	0.3169 Ha	729925
Lot 402 Deposited Plan 496238	Vesting on Deposit for Local Purpose Reserve	0.5019 Ha	729926
Lot 406 Deposited Plan 496238	Vesting on Deposit for Local Purpose Reserve	0.0207 Ha	729927
Lot 407 Deposited Plan 496238	Vesting on Deposit for Local Purpose Reserve	0.0208 Ha	729928
Lot 409 Deposited Plan 496238	Vesting on Deposit for Recreation Reserve (Territorial Authority)	0.1001 Ha	729929
Lot 500 Deposited Plan 496238	Fee Simple Title	1.2703 Ha	729930
Lot 501 Deposited Plan 496238	Fee Simple Title	2.0741 Ha	729931

# Title Plan - LT 496238

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## Created Parcels

Parcels	Parcel Intent	Area	CT Reference
Lot 602 Deposited Plan 496238	Fee Simple Title	2.6303 Ha	729932
Lot 603 Deposited Plan 496238	Fee Simple Title	0.9268 Ha	729932
Lot 201 Deposited Plan 496238	Vesting on Deposit for Road	0.0281 Ha	
Lot 202 Deposited Plan 496238	Vesting on Deposit for Road	0.7387 Ha	
Lot 203 Deposited Plan 496238	Vesting on Deposit for Road	0.7881 Ha	
Lot 204 Deposited Plan 496238	Vesting on Deposit for Road	0.5301 Ha	
Lot 205 Deposited Plan 496238	Vesting on Deposit for Road	0.7966 Ha	
Lot 503 Deposited Plan 496238	Vesting on Deposit for Road	0.0037 Ha	
Lot 504 Deposited Plan 496238	Vesting on Deposit for Road	0.0940 Ha	
Lot 505 Deposited Plan 496238	Vesting on Deposit for Road	0.1605 Ha	
Area A Deposited Plan 496238	Easement		
Area B Deposited Plan 496238	Easement		
Area C Deposited Plan 496238	Easement		
<b>Total Area</b>		<hr/> 15.4344 Ha	

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**S&L CONSULTANTS LTD**  
SURVEYORS - ENGINEERS - PLANNERS

S&L File: 20413-S1&2

**Land Registration District**

**South Auckland**

**Plan Number**

**DP 496238**

**Territorial Authority (the Council)**

**Hamilton City Council**

## Schedule of Proposed Easements

Purpose	Shown	Servient Tenement	Dominant Tenement
Right of Way	A	Lot 11 <i>hereon</i>	Lot 10 <i>hereon</i>
	B	Lot 10 <i>hereon</i>	Lot 11 <i>hereon</i>

## Memorandum of Easements in Gross

Purpose	Shown	Servient Tenement	Grantee
Right of Way	C	Lot 18 <i>hereon</i>	Hamilton City Council



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**S&L CONSULTANTS LTD**  
SURVEYORS - ENGINEERS - PLANNERS

S&L File: 20413-S1&2

**Land Registration District**

**South Auckland**

**Plan Number**

**DP 496238**

**Territorial Authority (the Council)**

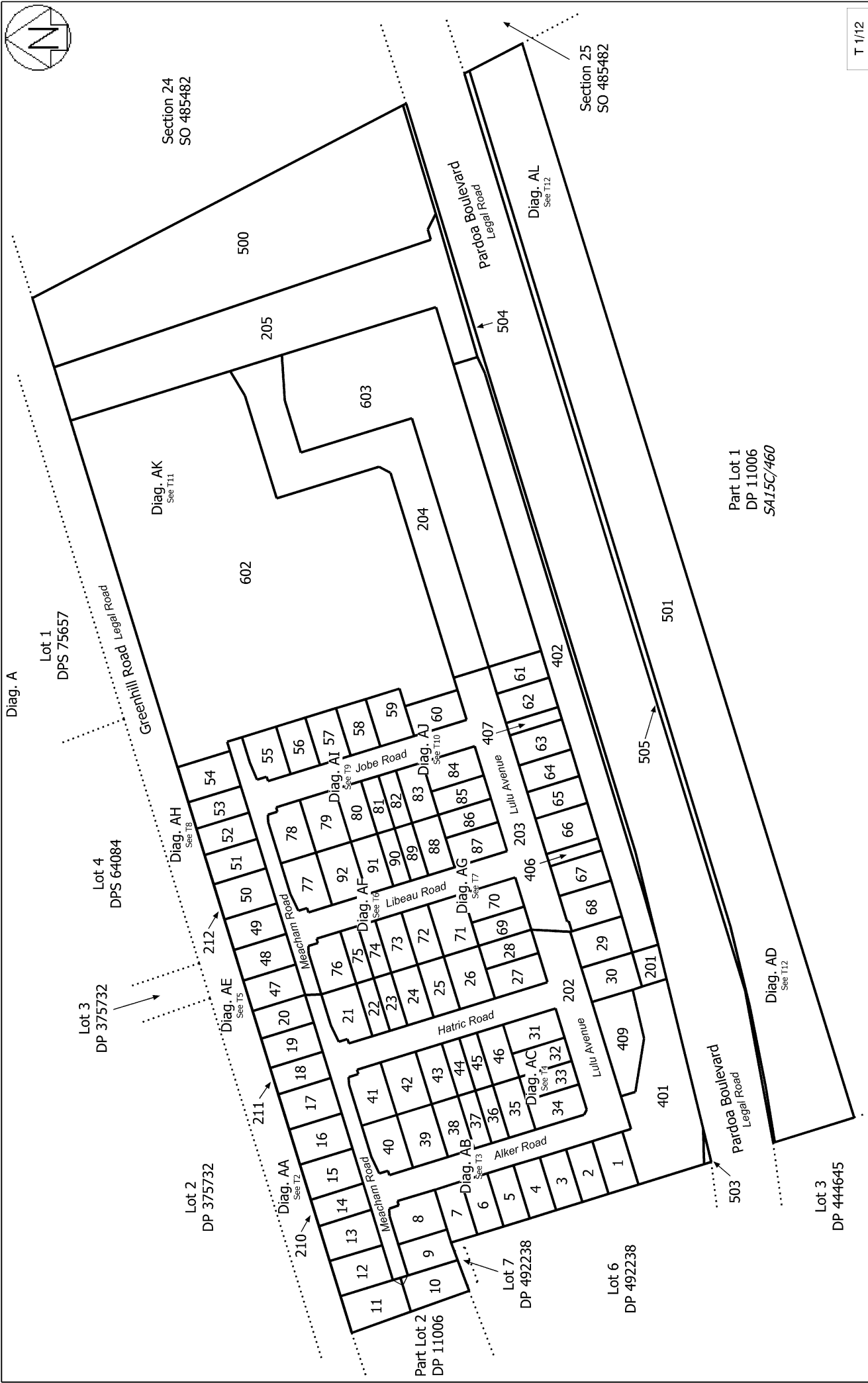
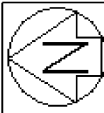
**Hamilton City Council**

**Amalgamation Conditions**

(Pursuant to s220 Resource Management Act 1991)

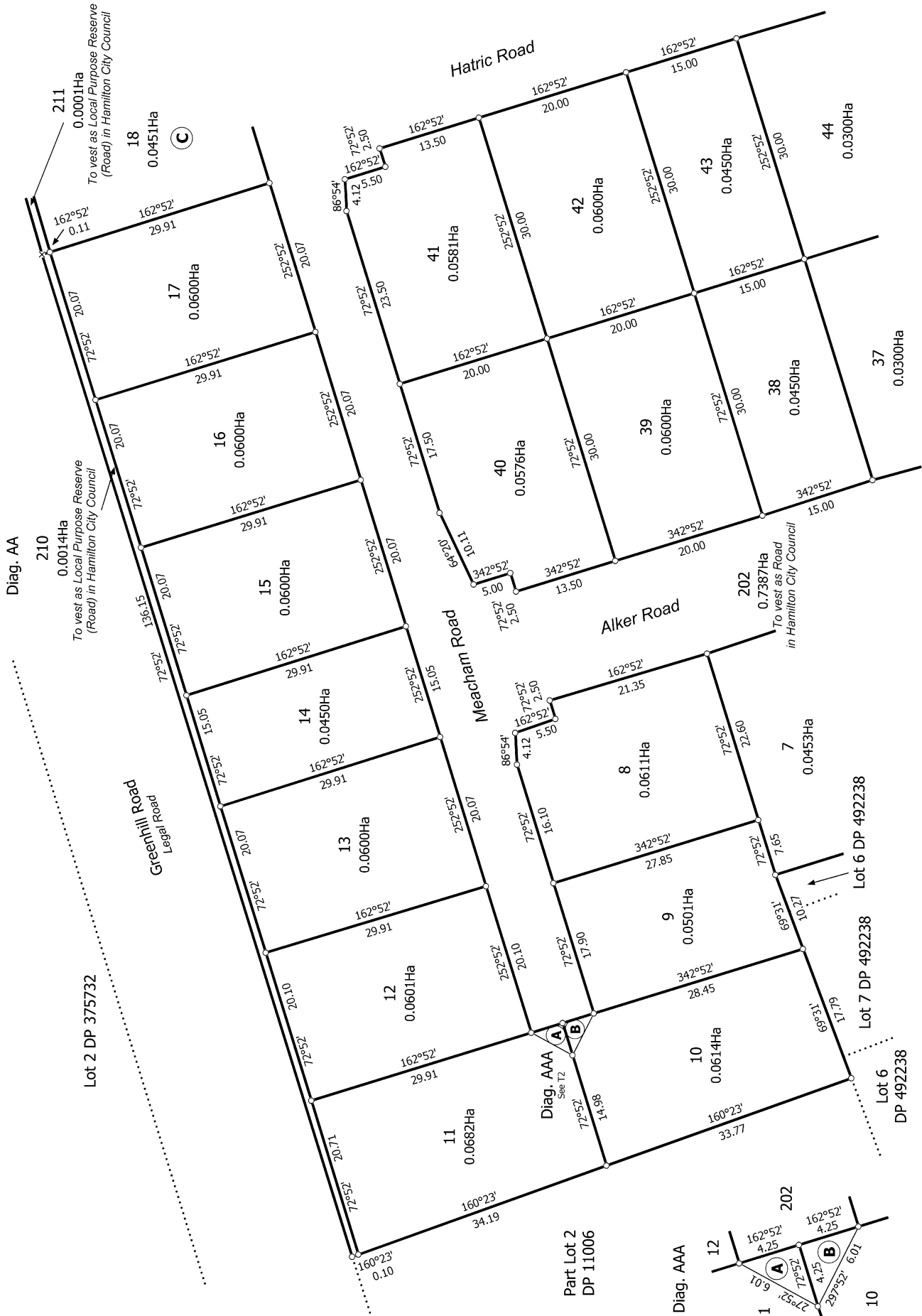
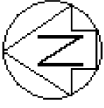
That pursuant to section 220(1)(b)(ii) Resource Management Act 1991, Lot 501 hereon and Pt Lot 1 DP 11006 be held in one Certificate of Title. [See LINZ Request 1298443]

That Lots 602 & 603 hereon be held in the one Certificate of Title. [See LINZ Request 1298443]



T 1/12

Land District: South Auckland	Surveyor: Denis John McDonald Firm: S & L Consultants Ltd	Title Plan LT 496238 DRAFT
Lots 1-92, 201-205, 210-212, 401, 402, 406, 407, 409, 500, 501, 503-505, 602 and 603 Being a Subdivision of Section 26 and Section 27 SO 485482		
Digitally Generated Plan Generated on: 11/04/2016 4:36pm Page 7 of 10		

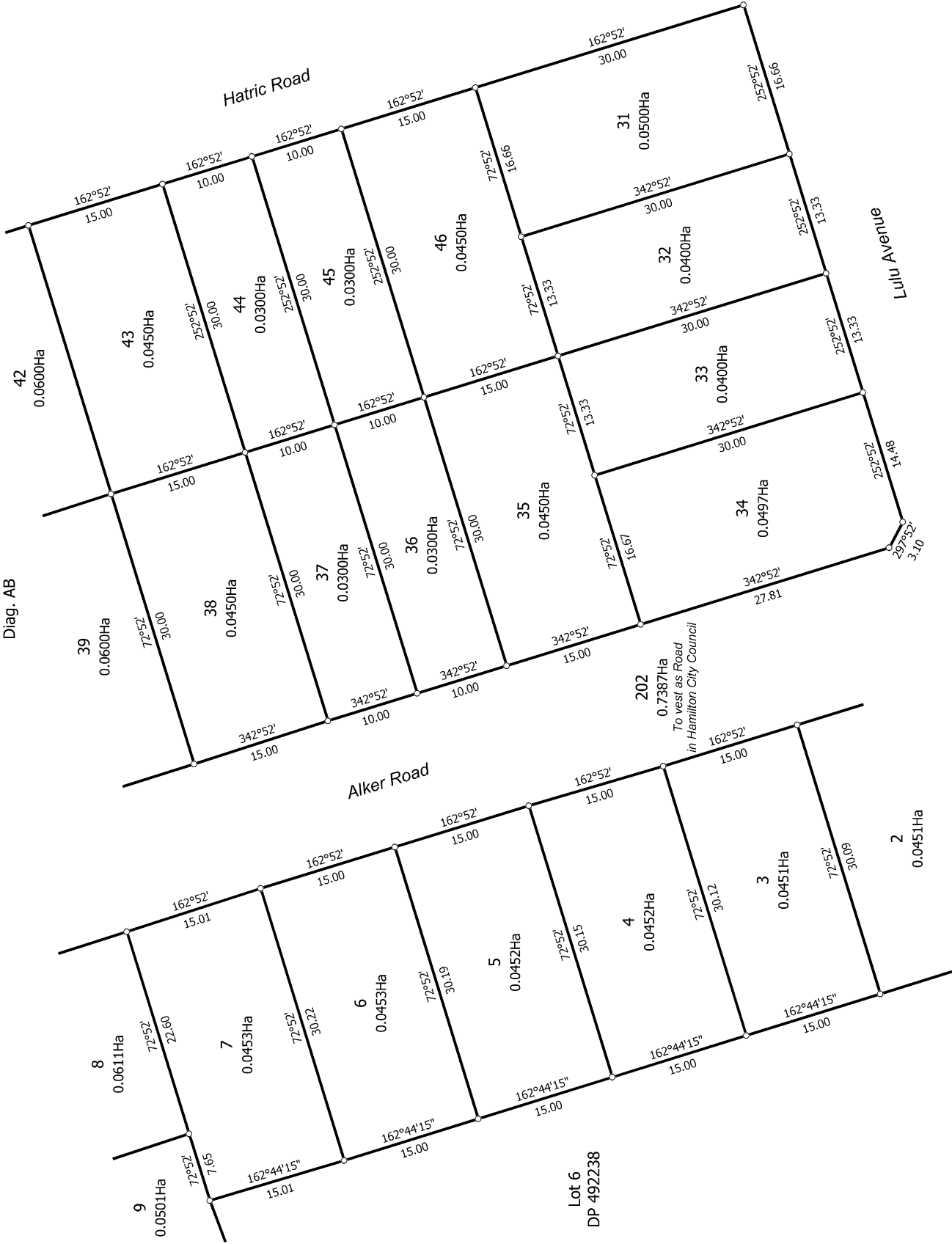


T 2/12

Land District: South Auckland	Lots 1-92, 201-205, 210-212, 401, 402, 406, 407, 409, 500, 501, 503-505, 602 and 603 Being a Subdivision of Section 26 and Section 27 SO 485482	Surveyor: Denis John McDonald Firm: S & L Consultants Ltd	Title Plan LT 496238 DRAFT
Digitally Generated Plan Generated on: 11/04/2016 4:36pm Page 8 of 18			



Diag. AB



Lot 6  
DP 492238

T 3/12

Land District: South Auckland

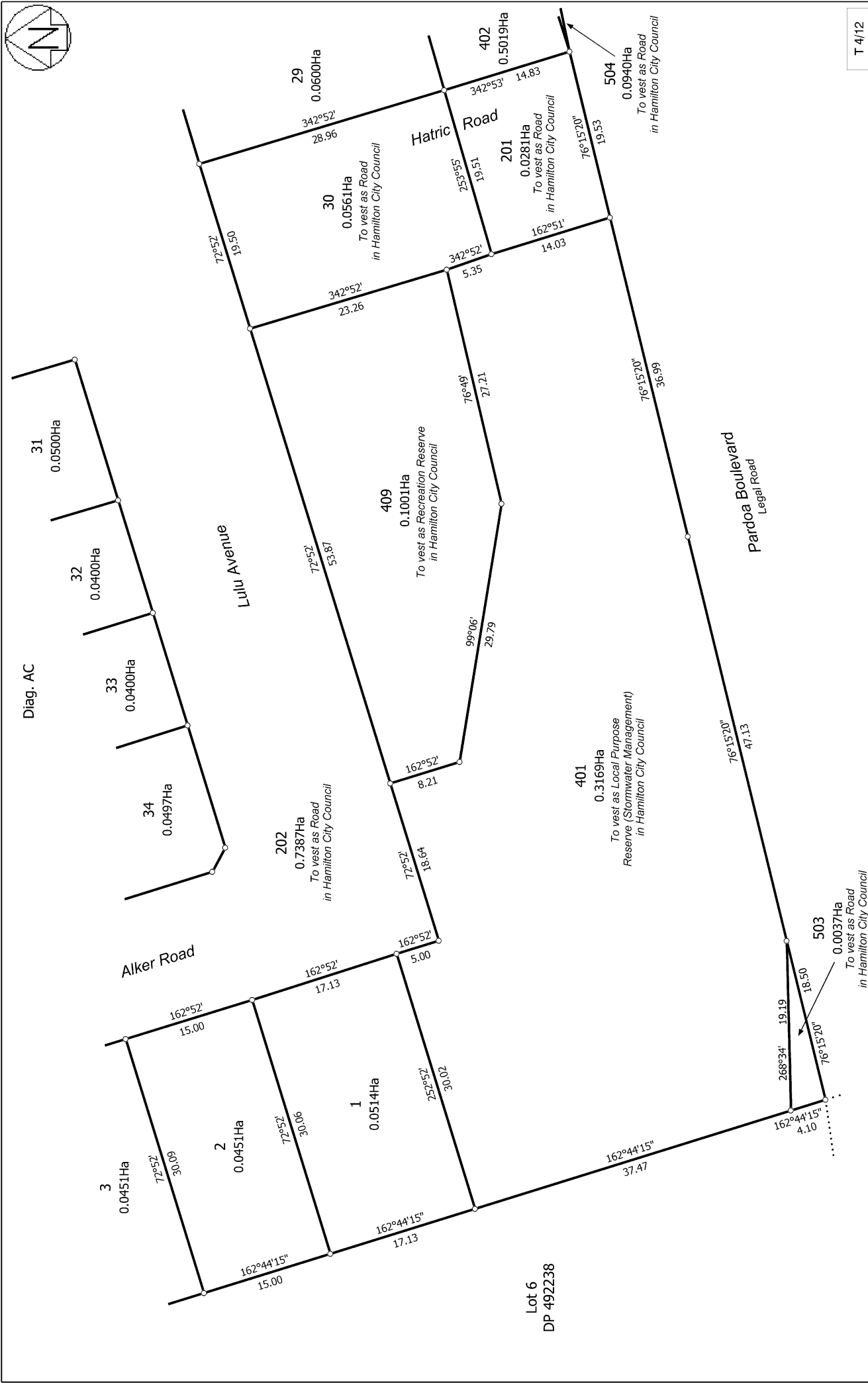
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Generated on: 11/04/2016 4:36pm Page 9 of 18

Lots 1-92, 201-205, 210-212, 401, 402, 406, 407, 409, 500, 501, 503-505, 602  
and 603 Being a Subdivision of Section 26 and Section 27 SO 485482

Surveyor: Denis John McDonald  
Firm: S & L Consultants Ltd

Title Plan  
LT 496238  
DRAFT



T 4/12

Land District: South Auckland	Lots 1-92, 201-205, 210-212, 401, 402, 406, 407, 409, 500, 501, 503-505, 602 and 603 Being a Subdivision of Section 26 and Section 27 SO 485482	Surveyor: Denis John McDonald Firm: S & L Consultants Ltd	Title Plan LT 496238 DRAFT
Digitally Generated Plan Generated on: 11/04/2016 4:36pm Page 10 of 18			



Diag. AE

Lot 2 DP 375732

Greenhill Road  
Legal Road

Meacham Road

Libeau Road

Meacham Road

Hatric Road

211  
0.0001Ha  
To vest as Local Purpose Reserve  
(Road) in Hamilton City Council

210  
0.0014Ha  
To vest as Local Purpose Reserve  
(Road) in Hamilton City Council

17  
0.0600Ha

18  
0.0451Ha  
(C)

19  
0.0500Ha

20  
0.0471Ha

21  
0.0576Ha

22  
0.0300Ha

23  
0.0300Ha

24  
0.0300Ha

25  
0.0300Ha

26  
0.0300Ha

27  
0.0300Ha

28  
0.0300Ha

29  
0.0300Ha

30  
0.0300Ha

31  
0.0300Ha

212  
0.0018Ha  
To vest as Local Purpose Reserve  
(Road) in Hamilton City Council

213  
0.0018Ha  
To vest as Local Purpose Reserve  
(Road) in Hamilton City Council

214  
0.0018Ha  
To vest as Local Purpose Reserve  
(Road) in Hamilton City Council

215  
0.0018Ha  
To vest as Local Purpose Reserve  
(Road) in Hamilton City Council

216  
0.0018Ha  
To vest as Local Purpose Reserve  
(Road) in Hamilton City Council

217  
0.0018Ha  
To vest as Local Purpose Reserve  
(Road) in Hamilton City Council

218  
0.0018Ha  
To vest as Local Purpose Reserve  
(Road) in Hamilton City Council

219  
0.0018Ha  
To vest as Local Purpose Reserve  
(Road) in Hamilton City Council

220  
0.0018Ha  
To vest as Local Purpose Reserve  
(Road) in Hamilton City Council

221  
0.0018Ha  
To vest as Local Purpose Reserve  
(Road) in Hamilton City Council

222  
0.0018Ha  
To vest as Local Purpose Reserve  
(Road) in Hamilton City Council

223  
0.0018Ha  
To vest as Local Purpose Reserve  
(Road) in Hamilton City Council

224  
0.0018Ha  
To vest as Local Purpose Reserve  
(Road) in Hamilton City Council

225  
0.0018Ha  
To vest as Local Purpose Reserve  
(Road) in Hamilton City Council

226  
0.0018Ha  
To vest as Local Purpose Reserve  
(Road) in Hamilton City Council

227  
0.0018Ha  
To vest as Local Purpose Reserve  
(Road) in Hamilton City Council

228  
0.0018Ha  
To vest as Local Purpose Reserve  
(Road) in Hamilton City Council

229  
0.0018Ha  
To vest as Local Purpose Reserve  
(Road) in Hamilton City Council

230  
0.0018Ha  
To vest as Local Purpose Reserve  
(Road) in Hamilton City Council

231  
0.0018Ha  
To vest as Local Purpose Reserve  
(Road) in Hamilton City Council

232  
0.0018Ha  
To vest as Local Purpose Reserve  
(Road) in Hamilton City Council

233  
0.0018Ha  
To vest as Local Purpose Reserve  
(Road) in Hamilton City Council

234  
0.0018Ha  
To vest as Local Purpose Reserve  
(Road) in Hamilton City Council

49  
0.0521Ha

48  
0.0521Ha

47  
0.0521Ha

203  
0.7881Ha  
To vest as Road  
in Hamilton City Council

77  
0.0576Ha

92  
0.0600Ha

76  
0.0581Ha

75  
0.0300Ha

74  
0.0300Ha

21  
0.0576Ha

22  
0.0300Ha

23  
0.0300Ha

41  
0.0581Ha

42  
0.0600Ha

T 5/12

Land District: South Auckland

Digitally Generated Plan

Generated on: 11/04/2016 4:36pm Page 11 of 18

Lots 1-92, 201-205, 210-212, 401, 402, 406, 407, 409, 500, 501, 503-505, 602  
and 603 Being a Subdivision of Section 26 and Section 27 SO 485482

Surveyor: Denis John McDonald  
Firm: S & L Consultants Ltd

Title Plan  
LT 496238  
DRAFT



Diag. AF



T 6/12

Land District: South Auckland

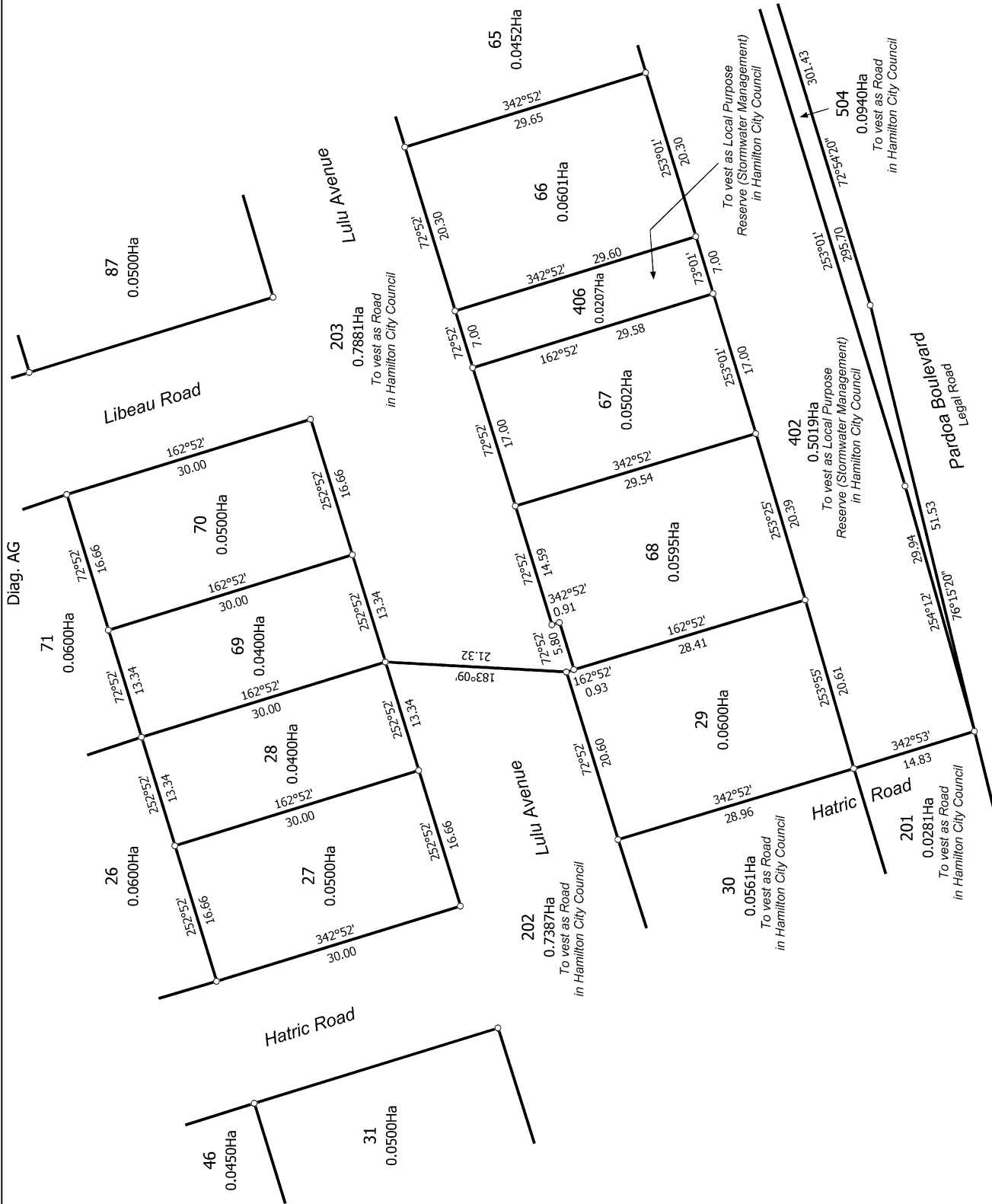
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Generated on: 11/04/2016 4:36pm Page 12 of 18

Lots 1-92, 201-205, 210-212, 401, 402, 406, 407, 409, 500, 501, 503-505, 602  
and 603 Being a Subdivision of Section 26 and Section 27 SO 485482

Surveyor: Denis John McDonald  
Firm: S & L Consultants Ltd

Title Plan  
LT 496238  
DRAFT

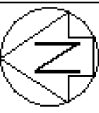


T 7/12

Land District: South Auckland	Title Plan LT 496238 DRAFT	
Digitally Generated Plan Generated on: 11/04/2016 4:36pm Page 13 of 18	Surveyor: Denis John McDonald Firm: S & L Consultants Ltd	Lots 1-92, 201-205, 210-212, 401, 402, 406, 407, 409, 500, 501, 503-505, 602 and 603 Being a Subdivision of Section 26 and Section 27 SO 485482





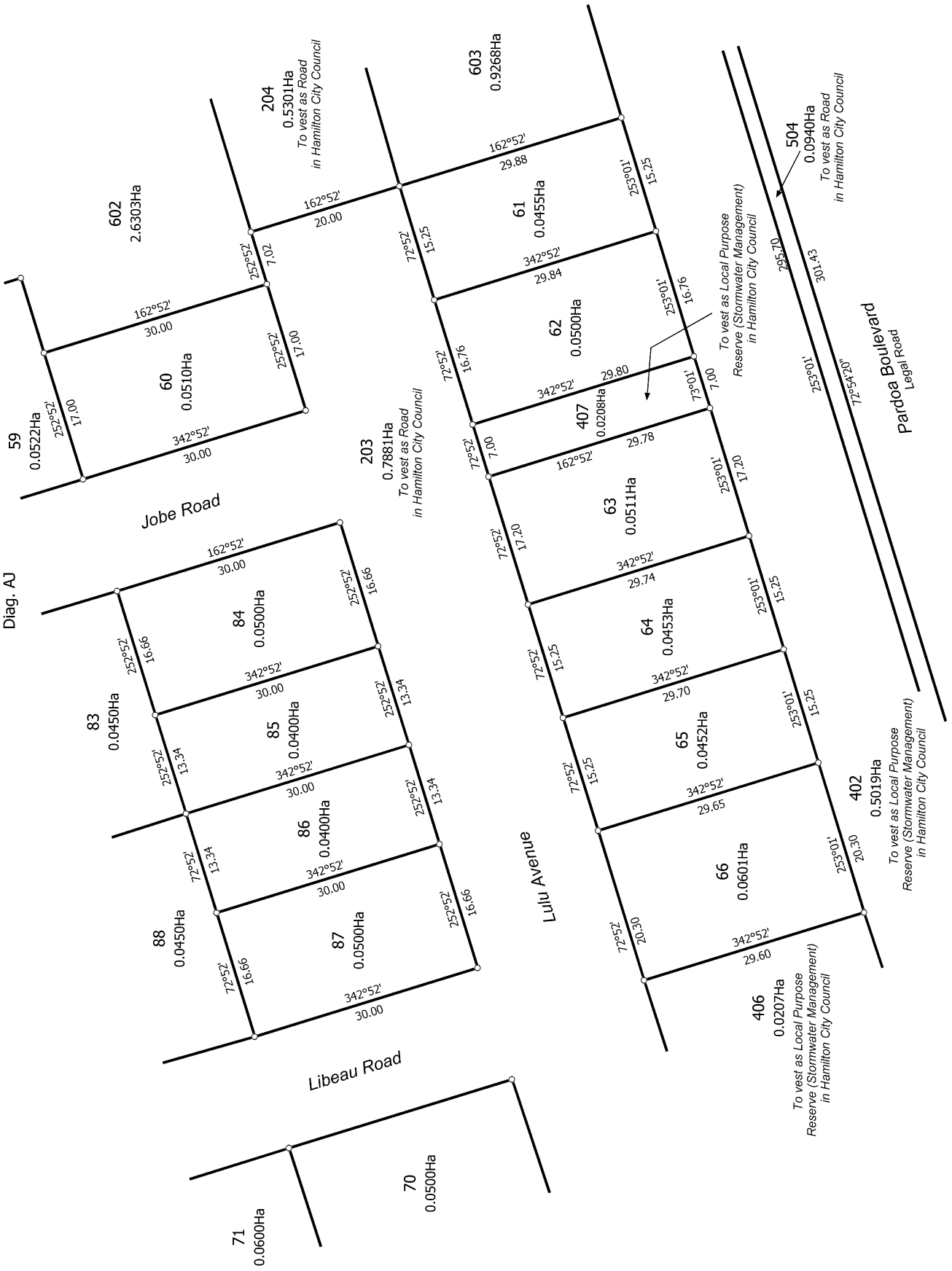
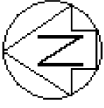


Diag. AI



T 9/12

Land District: South Auckland	Surveyor: Denis John McDonald Firm: S & L Consultants Ltd	Title Plan LT 496238 DRAFT
Lots 1-92, 201-205, 210-212, 401, 402, 406, 407, 409, 500, 501, 503-505, 602 and 603 Being a Subdivision of Section 26 and Section 27 SO 485482		
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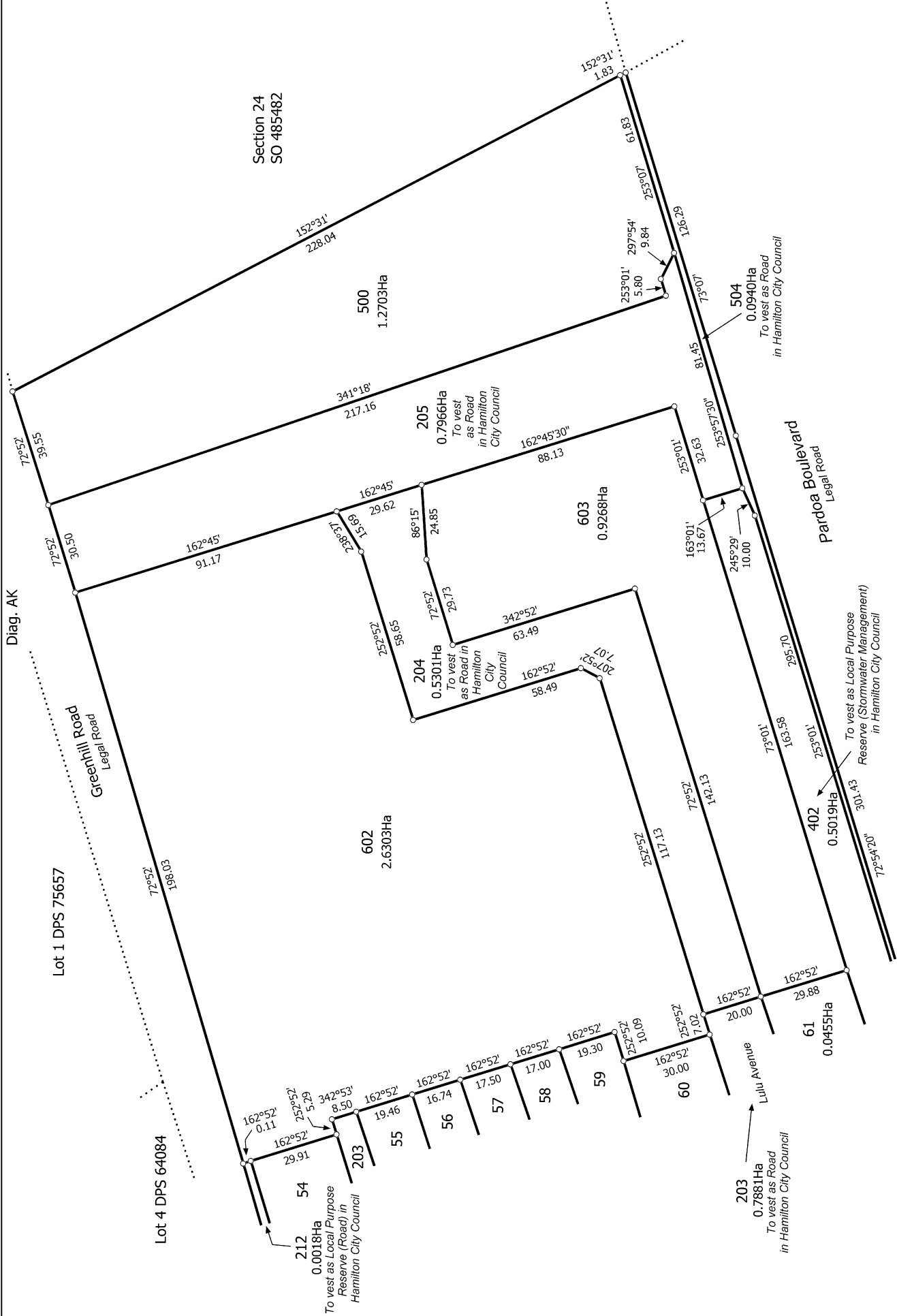


T 10/12

Lots 1-92, 201-205, 210-212, 401, 402, 406, 407, 409, 500, 501, 503-505, 602  
and 603 Being a Subdivision of Section 26 and Section 27 SO 485482

Surveyor: Denis John McDonald  
Firm: S & L Consultants Ltd

Title Plan  
LT 496238  
DRAFT



T 11/12

Land District: South Auckland

Digitally Generated Plan

Generated on: 11/04/2016 4:36pm Page 17 of 18

Lots 1-92, 201-205, 210-212, 401, 402, 406, 407, 409, 500, 501, 503-505, 602 and 603 Being a Subdivision of Section 26 and Section 27 SO 485482

Surveyor: Denis John McDonald  
Firm: S & L Consultants Ltd

Title Plan  
LT 496238  
DRAFT



Section 25  
SO 485482

Diag. AL

Pardoa Boulevard  
Legal Road

505  
0.1605Ha  
To vest as Road  
in Hamilton City Council

501  
2.0741Ha

Part Lot 1 DP 11006  
SA15C/460

Diag. AD

Pardoa Boulevard  
Legal Road

505  
0.1605Ha  
To vest as Road  
in Hamilton City Council

501  
2.0741Ha

Part Lot 1 DP 11006  
SA15C/460

Lot 3 DP 444645

T 12/12

Land District: South Auckland

Digitally Generated Plan

Generated on: 11/04/2016 4:36pm Page 10 of 18

Lots 1-92, 201-205, 210-212, 401, 402, 406, 407, 409, 500, 501, 503-505, 602  
and 603 Being a Subdivision of Section 26 and Section 27 SO 485482

Surveyor: Denis John McDonald  
Firm: S & L Consultants Ltd

Title Plan  
LT 496238  
DRAFT

## **APPENDIX II**

### **Geotechnical Completion Forms**

Checklist 2.2 - Statement of Professional Opinion

Summary of Geotechnical Data for Individual Lots

Hamilton City Development Manual	
Volume 4: Quality Systems for Land Development	Part 2 –Earthworks – Checklist 2.2
Authorised by : Programme Management Manager	Page 1 of 1

## Checklist 2.2

### GEOTECHNICAL ASSESSMENT – COMPLETION OF EARTHWORKS

To: Hamilton City Council

Private Bag

Hamilton

#### Statement Of Professional Opinion As To Suitability Of Completed Earthworks

Subdivision Greenhill Park

Owner Chedworth Properties, Ltd.

Location Hamilton

I Michael William Hughes of S&L Consultants, Ltd.,  
(full name)

102 Hamilton Street, Tauranga

(Name and Address of Firm)

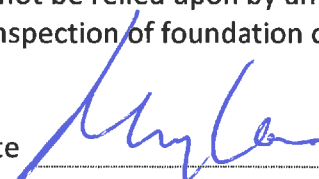
Hereby confirm that:

- I am a Registered Engineer experienced in the field of soils engineering and was retained by the subdividing owner as the Soils Engineer on the above subdivision.
- The extent of my inspections during construction, and the results of all tests carried out are described in my report dated 5 April 2016
- In my professional opinion, not to be construed as a guarantee, I consider that:
  - The earth fills shown on the attached Plan No. 20413-G05 Have been placed in compliance with the requirements of the Hamilton City Council.
  - The completed works give due regard to land slope and foundation stability considerations.
  - The filled ground is suitable for the erection thereon of residential buildings not requiring specific design in terms of NZS 3604 and related documents providing that:
    - The recommendations in Section 1.6.4.3 of my report dated 5 April 2016.
  - 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 and related documents providing that:
    - The recommendations in Section 1.6.4.3 of my report dated 5 April 2016.
- This professional opinion is furnished to the Council and the subdividing owner for their purposes 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 of any dwelling.

Signed

5 April 2016

Date



# Summary of Geotechnical Data for Individual Lots

DP No:	496238	Property Address	Alker Road, Hatric Road, Libeau Road, Jobe Road, Meacham Road and Lulu Avenue										RC No:	11/2015/6025			
Lot No:	Area (m <sup>2</sup> )	Subsurface Data				Foundations		Building Restriction Line	S/W Specific Design	S/W Soakage	S/W Reticulated	Designated Building Platform	Minimum Building Platform	Compressible Soils	On-site Effluent Disposal	Consent Notice	Comment
		Subdivision Filling	Natural Topography Unworked	Natural Topography Earthworked	Conventional Shallow Foundation to NZS 3604:2011	Specific Design											
	Shear Strength (kPa)	Y/N	Depth (m)	Y/N	Y/N	Depth (m)	Y/N/NA	Y/N/NA									
1	514	>200	Y	0.2-0.4	N		Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y	
2	451	>200	Y	0.2-0.4	N		Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y	
3	451	>200	Y	0.2-0.4	N		Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y	
4	452	>200	Y	0.2-0.4	N		Y <sup>3</sup>	N <sup>4</sup>	N	N	N	N	Y <sup>2</sup>	N	N	Y	
5	452	>200	Y	0-0.2	N		Y <sup>3</sup>	N <sup>4</sup>	N	N	N	N	Y <sup>2</sup>	N	N	Y	
6	453	>200	Y	0-0.2	N		Y <sup>3</sup>	N <sup>4</sup>	N	N	N	N	Y <sup>2</sup>	N	N	Y	
7	453	>200	Y	0-0.2	N		Y <sup>3</sup>	N <sup>4</sup>	N	N	N	N	Y <sup>2</sup>	N	N	Y	
8	611	Note 1	Y	0-0.6	N	Y	Y <sup>3</sup>	N <sup>4</sup>	N	N	N	N	Y <sup>2</sup>	N	N	Y	
9	501	Note 1	Y	0.2-0.6	N	N	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y <sup>5</sup>	N	Y <sup>2</sup>	N	N	Y	
10	614	Note 1	Y	0.2-0.6	N	N	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y <sup>5</sup>	N	Y <sup>2</sup>	N	N	Y	
11	682	Note 1	Y	0.2-0.6	N	N	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y <sup>5</sup>	N	Y <sup>2</sup>	N	N	Y	
12	601	150	Y	0.2-0.6	N	N	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y <sup>5</sup>	N	Y <sup>2</sup>	N	N	Y	
13	600	150	Y	0-0.6	N	N	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y <sup>5</sup>	N	Y <sup>2</sup>	N	N	Y	
14	450	147	Y	0.2-0.6	N	N	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y <sup>5</sup>	N	Y <sup>2</sup>	N	N	Y	
15	600	>200	Y	0.2-0.4	N	N	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y <sup>5</sup>	N	Y <sup>2</sup>	N	N	Y	
16	600	183	Y	0.2	N	N	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y <sup>5</sup>	N	Y <sup>2</sup>	N	N	Y	
17	600	Note 1	Y	0-0.4	N	Y	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y <sup>5</sup>	N	Y <sup>2</sup>	N	N	Y	
18	451	>200	Y	<0.2	N	Y	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y <sup>5</sup>	N	Y <sup>2</sup>	N	N	Y	
19	500	Note 1	N		N	Y	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y <sup>5</sup>	N	Y <sup>2</sup>	N	N	Y	
20	471	Note 1	Y	0-0.2	N	Y	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y <sup>5</sup>	N	Y <sup>2</sup>	N	N	Y	
21	576	Note 1	Y	0-0.4	N	Y	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y <sup>5</sup>	N	Y <sup>2</sup>	N	N	Y	
22	300	Note 1	Y	0-0.4	N	Y	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y <sup>5</sup>	N	Y <sup>2</sup>	N	N	Y	

NOTES:

1) Testing undertaken with Scala Penetrometer

2) Minimum building floor level required (See Table 1: Finished Levels, Section 1.6.3 of Geotechnical Completion Report)

3) Timber framed subfloor may be constructed with shallow timber piles as detailed in NZS 3604:2011.

4) See Section 1.6.4.2 of Geotechnical Completion Report

5) Soakage testing required on individual lots. Ground soakage and stormwater storage devices required in accordance with the Internal Site Stormwater Management Guide Stages 1 and 2, by S&L dated 23 March 2016. (See Appendix VI of the Geotechnical Completion Report)

- NOTES:
- 1) Testing undertaken with Scala Penetrometer
  - 2) Minimum building floor level required (See Table 1: Finished Levels, Section 1.6.3 of Geotechnical Completion Report)
  - 3) Timber framed subfloor may be constructed with shallow timber piles as detailed in NZS 3604:2011.  
(See Section 1.6.4.2 of Geotechnical Completion Report)
  - 4) See Section 0 of Geotechnical Completion Report
  - 5) Soakage testing required on individual lots. Ground soakage and stormwater storage devices required in accordance with the *Internal Site Stormwater Management Guide Stages 1 and 2*, by S&L dated 23 March 2016. (See Appendix VI of the Geotechnical Completion Report)



# Summary of Geotechnical Data for Individual Lots

DP No.	496238	Property Address	Alker Road, Hatric Road, Libeau Road, Jobe Road, Meacham Road and Lulu Avenue		RC No:	11/2015/6025										
Lot No.	Area (m <sup>2</sup> )	Subsurface Data				Foundations	Building Restriction Line	S/W Specific Design	S/W Soakage	S/W Reticulate	Designated Building Platform	Minimum Building Platform	Compressible Soils	On-site Effluent Disposal	Consent Notice	Comment
		Subdivision Filling	Natural Topography Unworked	Natural Topography Earthworked	Conventional Shallow Foundation to NZS 3604:2011											
	Shear Strength (kPa)	Y/N	Depth (m)	Y/N	Depth (m)	Y/N/NA	Y/N/NA									
23	300	Note 1	Y	0-0.2	N	Y	0-0.4	Y <sup>3</sup>	N <sup>4</sup>	N	Y <sup>5</sup>	Y	N	Y <sup>2</sup>	N	Y
24	450	Note 1	Y	0-0.8	N	Y	0-0.4	Y <sup>3</sup>	N <sup>4</sup>	N	Y <sup>5</sup>	Y	N	Y <sup>2</sup>	N	Y
25	450	Note 1	N		N	Y	0-0.6	Y <sup>3</sup>	N <sup>4</sup>	N	Y <sup>5</sup>	Y	N	Y <sup>2</sup>	N	Y
26	600	Note 1	N		N	Y	0.4-0.6	Y <sup>3</sup>	N <sup>4</sup>	N	Y <sup>5</sup>	Y	N	Y <sup>2</sup>	N	Y
27	500	Note 1	N		N	Y	0.6	Y <sup>3</sup>	N <sup>4</sup>	N	Y <sup>5</sup>	Y	N	Y <sup>2</sup>	N	Y
28	400	Note 1	N		N	Y	0.6	Y <sup>3</sup>	N <sup>4</sup>	N	Y <sup>5</sup>	Y	N	Y <sup>2</sup>	N	Y
29	600	Note 1	N		N	Y	0.4-0.6	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	Y
31	500	Note 1	N		N	Y	0.2-0.4	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	Y
32	400	>200	Y	0-0.2	N	Y	0-0.2	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	Y
33	400	>200	Y	0-0.2	N	Y	<0.2	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	Y
34	497	>200	Y	0.2-0.4	N	N		Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	Y
35	450	Note 1	Y	0-0.2	N	Y	0-0.2	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	Y
36	300	Note 1	Y	0-0.2	N	Y	0-0.2	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y <sup>5</sup>	Y	Y <sup>2</sup>	N	Y
37	300	>200	Y	0-0.2	N	Y	0-0.2	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y <sup>5</sup>	Y	Y <sup>2</sup>	N	Y
38	450	>200	Y	0-0.2	N	Y	0-0.2	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y <sup>5</sup>	Y	Y <sup>2</sup>	N	Y
39	600	>200	Y	0-0.2	N	Y	0-0.2	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y <sup>5</sup>	Y	Y <sup>2</sup>	N	Y
40	576	>200	Y	0-0.2	N	Y	0-0.2	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y <sup>5</sup>	Y	Y <sup>2</sup>	N	Y
41	581	Note 1	N		N	Y	0.2-0.6	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	Y
42	600	Note 1	N		N	Y	0.2-0.6	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	Y
43	450	Note 1	N		N	Y	0.2-0.6	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	Y
44	300	Note 1	N		N	Y	0.2-0.6	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	Y
45	300	Note 1	N		N	Y	0.2-0.6	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	Y

NOTES:

1) Testing undertaken with Scala Penetrometer

2) Minimum building floor level required (See Table 1: Finished Levels, Section 1.6.3 of Geotechnical Completion Report)

3) Timber framed subfloor may be constructed with shallow timber piles as detailed in NZS 3604:2011.

4) See Section 0 of Geotechnical Completion Report

5) Soakage testing required on individual lots. Ground soakage and stormwater storage devices required in accordance with the Internal Site Stormwater Management Guide Stages 1 and 2, by S&L dated 23 March 2016. (See Appendix VI of the Geotechnical Completion Report)

NOTES: 1) Testing undertaken with Scala Penetrometer

2) Minimum building floor level required (See Table 1: Finished Levels, Section 1.6.3 of Geotechnical Completion Report)

3) Timber framed subfloor may be constructed with shallow timber piles as detailed in NZS 3604:2011.

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5) Soakage testing required on individual lots. Ground soakage and stormwater storage devices required in accordance with the Internal Site Stormwater

Management Guide Stages 1 and 2, by S&L dated 23 March 2016. (See Appendix VI of the Geotechnical Completion Report)

# Summary of Geotechnical Data for Individual Lots

DP No.	496238	Property Address	Alker Road, Hatric Road, Libeau Road, Jobe Road, Meacham Road and Lulu Avenue										RC No.	11/2015/6025				
Lot No.	Area (m <sup>2</sup> )	Shear Strength (kPa)	Subsurface Data				Foundations		Building Restriction Line	S/W Specific Design	S/W Soakage	S/W Reticulate	Designated Building Platform	Minimum Building Platform	Compressible Soils	On-site Effluent Disposal	Consent Notice	Comment
			Subdivision Filling	Natural Topography Unworked	Natural Topography Earthworked	Conventional Shallow Foundation to NZS 3604:2011	Specific Design											
			Y/N	Depth (m)	Y/N	Depth (m)	Y/N/NA	Y/N/NA										
46	500	Note 1	N		N	0.2-0.6	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y		
47	521	>200	Y	0.2-0.8	N		Y <sup>3</sup>	N <sup>4</sup>	N	Y <sup>5</sup>	Y	N	Y <sup>2</sup>	N	N	Y		
48	521	>200	Y	0-0.4	N	0-0.2	Y <sup>3</sup>	N <sup>4</sup>	N	Y <sup>5</sup>	Y	N	Y <sup>2</sup>	N	N	Y		
49	521	Note 1	N		N	0.2-0.4	Y <sup>3</sup>	N <sup>4</sup>	N	Y <sup>5</sup>	Y	N	Y <sup>2</sup>	N	N	Y		
50	600	Note 1	Y	<0.2	N	0-0.4	Y <sup>3</sup>	N <sup>4</sup>	N	Y <sup>5</sup>	Y	N	Y <sup>2</sup>	N	N	Y		
51	500	Note 1	Y	0-0.4	N	0-0.2	Y <sup>3</sup>	N <sup>4</sup>	N	Y <sup>5</sup>	Y	N	Y <sup>2</sup>	N	N	Y		
52	450	Note 1	Y	0.2-0.4	N		Y <sup>3</sup>	N <sup>4</sup>	N	Y <sup>5</sup>	Y	N	Y <sup>2</sup>	N	N	Y		
53	451	>200	Y	0.4-0.6	N		Y <sup>3</sup>	N <sup>4</sup>	N	Y <sup>5</sup>	Y	N	Y <sup>2</sup>	N	N	Y		
54	600	>200	Y	0.4-0.6	N		Y <sup>3</sup>	N <sup>4</sup>	N	Y <sup>5</sup>	Y	N	Y <sup>2</sup>	N	N	Y		
55	506	Note 1	Y	0-0.4	N		Y <sup>3</sup>	N <sup>4</sup>	N	Y <sup>5</sup>	Y	N	Y <sup>2</sup>	N	N	Y		
56	453	Note 1	Y	0.2-0.4	N		Y <sup>3</sup>	N <sup>4</sup>	N	Y <sup>5</sup>	Y	N	Y <sup>2</sup>	N	N	Y		
57	474	>200	Y	0.2-0.4	N		Y <sup>3</sup>	N <sup>4</sup>	N	Y <sup>5</sup>	Y	N	Y <sup>2</sup>	N	N	Y		
58	460	>200	Y	0.2-0.4	N		Y <sup>3</sup>	N <sup>4</sup>	N	Y <sup>5</sup>	Y	N	Y <sup>2</sup>	N	N	Y		
59	522	>200	Y	0.2	N		Y <sup>3</sup>	N <sup>4</sup>	N	Y <sup>5</sup>	Y	N	Y <sup>2</sup>	N	N	Y		
60	510	>200	Y	0.2	N		Y <sup>3</sup>	N <sup>4</sup>	N	Y <sup>5</sup>	Y	N	Y <sup>2</sup>	N	N	Y		
61	455	Note 1	Y	0.4	N		Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y		
62	500	Note 1	Y	0.2-0.4	N		Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y		
63	511	Note 1	Y	0.2	N		Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y		
64	453	Note 1	Y	0.2	N		Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y		
65	452	Note 1	Y	0.2	N		Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y		
66	601	Note 1	Y	0.2-0.6	N		Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y		
67	502	Note 1	Y	0-0.6	N	0-0.4	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y		
NOTES:																		
1) Testing undertaken with Scala Penetrometer																		
2) Minimum building floor level required (See Table 1: Finished Levels, Section 1.6.3 of Geotechnical Completion Report)																		
3) Timber framed subfloor may be constructed with shallow timber piles as detailed in NZS 3604:2011. (See Section 1.6.4.2 of Geotechnical Completion Report)																		
4) See Section 0 of Geotechnical Completion Report																		
5) Soakage testing required on individual lots. Ground soakage and stormwater storage devices required in accordance with the <i>Internal Site Stormwater Management Guide Stages 1 and 2</i> , by S&L dated 23 March 2016. (See Appendix VI of the Geotechnical Completion Report)																		

# Summary of Geotechnical Data for Individual Lots

DP No:	496238	Property Address	Alker Road, Hatric Road, Libeau Road, Jobe Road, Meacham Road and Lulu Avenue										RC No:	11/2015/6025				
Lot No:	Area (m <sup>2</sup> )	Shear Strength (kPa)	Subsurface Data			Foundations			Building Restriction Line	S/W Specific Design	S/W Soakage	S/W Reticulate	Designated Building Platform	Minimum Building Platform	Compressible Soils	On-site Effluent Disposal	Consent Notice	Comment
			Subdivision Filling	Natural Topography Unworked	Natural Topography Earthworked	Conventional Shallow Foundation to NZS 3604:2011	Specific Design											
			Y/N	Depth (m)	Y/N	Y/N	Depth (m)	Y/N/NA	Y/N/NA									
68	595	Note 1	N		N	Y	0.2-0.4	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y	
69	400	>200	Y	0-0.8	N	Y	0-0.6	Y <sup>3</sup>	N <sup>4</sup>	N	Y <sup>5</sup>	Y	N	Y <sup>2</sup>	N	N	Y	
70	500	>200	Y	0.6	N	N		Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y	
71	600	>200	Y	0-1.0	N	Y	0-0.6	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y	
72	450	Note 1	Y	0-1.0	N	Y	<0.2	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y	
73	450	Note 1	Y	0-1.0	N	Y	<0.2	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y	
74	300	>200	Y	0-0.8	N	Y	<0.2	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y	
75	300	>200	Y	0-0.8	N	Y	<0.2	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y	
76	581	>200	Y	0-0.8	N	Y	0-0.2	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y	
77	576	>200	N		N	Y	0.6	Y <sup>3</sup>	N <sup>4</sup>	N	Y <sup>5</sup>	Y	N	Y <sup>2</sup>	N	N	Y	
78	581	>200	N		N	Y	0.2-0.4	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y	
79	600	Note 1	N		N	Y	0.2-0.4	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y	
80	450	>200	N		N	Y	0.2-0.6	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y	
81	300	>200	N		N	Y	0.2-0.6	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y	
82	300	Note 1	N		N	Y	0.2-0.6	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y	
83	450	Note 1	N		N	Y	0.2-0.4	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y	
84	500	Note 1	Y	<0.2	N	Y	0-0.2	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y	
85	400	>200	Y	<0.2	N	Y	0-0.4	Y <sup>3</sup>	N <sup>4</sup>	N	Y <sup>5</sup>	Y	N	Y <sup>2</sup>	N	N	Y	
86	400	>200	N		N	Y	0.2-0.6	Y <sup>3</sup>	N <sup>4</sup>	N	N	Y	N	Y <sup>2</sup>	N	N	Y	
87	500	Note 1	N		N	Y	0.2-0.6	Y <sup>3</sup>	N <sup>4</sup>	N	Y <sup>5</sup>	Y	N	Y <sup>2</sup>	N	N	Y	
88	450	Note 1	N		N	Y	0.4-0.6	Y <sup>3</sup>	N <sup>4</sup>	N	Y <sup>5</sup>	Y	N	Y <sup>2</sup>	N	N	Y	
89	300	Note 1	N		N	Y	0.4-0.6	Y <sup>3</sup>	N <sup>4</sup>	N	Y <sup>5</sup>	Y	N	Y <sup>2</sup>	N	N	Y	
NOTES:																		
1) Testing undertaken with Scala Penetrometer																		
2) Minimum building floor level required (See Table 1: Finished Levels, Section 1.6.3 of Geotechnical Completion Report)																		
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# Summary of Geotechnical Data for Individual Lots

Op No:	496238	Property Address	Alker Road, Hatric Road, Libeau Road, Jobe Road, Meacham Road and Lulu Avenue	RC No:	11/2015/6025
Lot No:	Area (m <sup>2</sup> )	Subsurface Data			Comment
		Subdivision Filling	Natural Topography Unworked	Natural Topography Earthworked	
	Shear Strength (kPa)	Y/N	Depth (m)	Y/N	Depth (m)
90	300	Note 1	N	N	0.4
91	450	>200	N	N	0.4
92	600	>200	N	N	0.4-0.6
NOTES: 1) Testing undertaken with Scala Penetrometer 2) Minimum building floor level required (See Table 1: Finished Levels, Section 1.6.3 of Geotechnical Completion Report) 3) Timber framed subfloor may be constructed with shallow timber piles as detailed in NZS 3604:2011. (See Section 1.6.4.2 of Geotechnical Completion Report) 4) See Section 0 of Geotechnical Completion Report 5) Soakage testing required on individual lots. Ground soakage and stormwater storage devices required in accordance with the <i>Internal Site Stormwater Management Guide Stages 1 and 2</i> , by S&L dated 23 March 2016. (See Appendix VI of the Geotechnical Completion Report)					
				Building Restriction Line	
				S/W Specific Design	
				S/W Soakage	
				S/W Reticulate	
				Designated Building Platform	
				Minimum Building Platform	
				Compressible Soils	
				On-site Effluent Disposal	
				Consent Notice	

## **APPENDIX III**



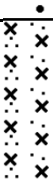






### **Pre-Construction Testing**

Site: Chedworth Properties Limited, Ruakura Development, Hamilton

Sheet: 1 Of: 1

Job No. 20413 Date Excavated: 26/09/2014 RL 37.131 m Moturiki Datum

Logged By: N.I.

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater (m)	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)		
						50	100	150
TOPSOIL - 200mm								
SAND (f-m) medium dense; moist; light yellow brown yellow mottles		0.5						
SILT; sandy (f); stiff; moist; slightly cohesive light yellow brown; orange mottles		1.0			86			
SAND (m-c); loose; moist; light brown grey orange mottles					53			
becomes wet; grey		1.5			65			
rare rounded gravels to 60mm ø		2.0			77			
some fine pumice gravels to 3mm ø								
becomes saturated		2.5						
		3.0						
EOBH 3.0m								
		3.5						
		4.0						
		4.5						
		4.7						




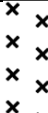
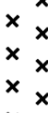


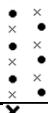



EXCAVATION METHOD: 300 mm diameter power auger

Site: Chedworth Properties Limited, Ruakura Development, Hamilton

Sheet: 1 Of: 1

Job No. 20413 Date Excavated: 26/09/2014 RL 36.713 m Moturiki Datum

Logged By: N.I.

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater (m)	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)					
						50	100	150			
TOPSOIL - 200mm											
SILT; sandy (m-c); stiff; moist; slightly cohesive; light grey brown; orange mottles		0.5									
SAND (m-c); slightly silty; loose; wet; light brown grey					74						
SILT; stiff; wet; slightly cohesive; light grey; orange mottles dilatant; sensitive		1.0									
becomes hard					utp						>>
becomes slightly sandy (f)											
SAND (f); loose; wet; light grey		1.5									
SAND (f); silty; loose; saturated; light grey		2.0			48						
SILT; very slightly sandy (f); firm; saturated; slightly cohesive; light grey											
SAND (f); silty; loose; saturated; grey		2.5			30						
					39						
EOBH 2.6m											
		3.0									
		3.5									
		4.0									
		4.5									
		4.7									
























EXCAVATION METHOD: 300 mm diameter power auger

Site: Chedworth Properties Limited, Ruakura Development, Hamilton

Sheet: 1 Of: 1

Job No. 20413 Date Excavated: 26/09/2014 RL 36.726 m Moturiki Datum

Logged By: N.I.

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater (m)	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)		
						50	100	150
TOPSOIL - 200mm								
SILT; sandy; stiff; moist; slightly cohesive light brown grey; orange mottles								
SAND (f-m); silty; loose; moist; light brown grey orange mottles		0.5			45			
SILT; firm; moist; slightly cohesive; light grey orange mottles; dilatant; sensitive								
SAND (f); silty; loose; wet; light grey		1.0			56			
SILT; stiff; wet; slightly cohesive; light grey orange mottles; dilatant; sensitive								
becomes firm		1.5			45			
becomes saturated; slightly sandy @ 1.7m - 1.9m								
		2.0			53			
								
		2.5			42			
SAND (f-m); silty; loose; saturated; light grey					68			
								
EOBH 2.8m					53			
		3.0						
								
		3.5						
								
		4.0						
								
		4.5						
								
		4.7						

EXCAVATION METHOD: 300 mm diameter power auger

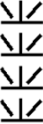
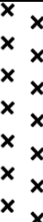




Site: Chedworth Properties Limited, Ruakura Development, Hamilton

Sheet: 1 Of: 1

Job No. 20413 Date Excavated: 26/09/2014 RL 36.997 m Moturiki Datum

Logged By: N.I.

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater (m)	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)					
						50	100	150			
TOPSOIL - 400mm											
SILT; very stiff; moist; slightly cohesive; brown becomes light brown p		0.5			98						
		1.0			146						
GRAVEL (m); sandy; silty; medium dense; wet; brown		1.5									
SAND (m-c); saturated; medium dense; light brown grey		2.0									
EOBH 2.0m											
		2.5									
		3.0									
		3.5									
		4.0									
		4.5									
		4.7									

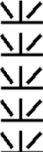





EXCAVATION METHOD: 300 mm diameter power auger

Site: Chedworth Properties Limited, Ruakura Development, Hamilton

Sheet: 1 Of: 1

Job No. 20413 Date Excavated: 26/09/2014 RL 36.975 m Moturiki Datum

Logged By: N.I.

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater (m)	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)					
						50	100	150			
TOPSOIL - 500mm		0.5									
SILT; very stiff; moist; slightly cohesive; brown					163						
SAND (f); silty; loose; moist; light grey brown		1.0	3								
SAND (m-c); gravelly (f-m); medium dense; wet; brown gravels rounded to 30 mm ø becomes dense		1.5	5 5 9 9 R		119						
GRAVEL (f-m); sandy (m-c); medium dense; saturated; brown											
SAND (f); silty; medium dense; saturated; light grey		2.0									
EOBH 2.0m		2.5									
		3.0									
		3.5									
		4.0									
		4.5									
		4.7									






















EXCAVATION METHOD: 300 mm diameter power auger

Site: Chedworth Properties Limited, Ruakura Development, Hamilton

Sheet: 1 Of: 1

Job No. 20413 Date Excavated: 26/09/2014 RL 36.967 m Moturiki Datum

Logged By: N.I.

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater (m) 2.3	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)		
						50	100	150
TOPSOIL - 200mm								
ORGANIC SILT; stiff; moist; slightly cohesive; brown to dark brown								
		0.5						
SAND (m-c); gravelly (m); medium dense; moist; brown rounded gravels to 30mm ø								
			6					
			4					
becomes loose; wet; yellow orange		1.0	2					
			3					
			3					
			3					
			4					
becomes medium dense		1.5	7					
GRAVEL (m); sandy (m-c); medium dense; wet; yellow brown; gravels to 40mm ø			7					
								
								
SAND (m-c); medium dense; wet; brown								
		2.0						
								
becomes saturated some gravels to 40mmø								
		2.5						
								
EOBH 2.6m								
		3.0						
		3.5						
		4.0						
		4.5						
		4.7						







EXCAVATION METHOD: 300 mm diameter power auger

Site: Chedworth Properties Limited, Ruakura Development, Hamilton

Sheet: 1 Of: 1

Job No. 20413 Date Excavated: 26/09/2014 RL 36.917 m Moturiki Datum

Logged By: N.I.

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater (m)	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)		
						50	100	150
TOPSOIL - 150mm			1		83			
			1					
SILT; stiff; moist; slightly cohesive; light brown			0					
			0					
		0.5	1					
SAND (f); silty; loose; saturated; light brown grey orange mottles			0					
			1					
			1					
		1.0	3					
SAND (f-m); medium dense; saturated; pumiceous; light grey			3		53			
			5					
			5					
			3					
SILT; stiff; saturated; slightly cohesive; light grey orange mottles; sensitive; dilatant		1.5			77			
		2.0			77			
EOBH 2.3m		2.5			77			
		3.0						
		3.5			77			
		4.0						
		4.5			77			
		4.7						


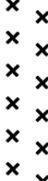

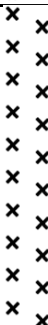

EXCAVATION METHOD: 300 mm diameter power auger

Site: Chedworth Properties Limited, Ruakura Development, Hamilton

Sheet: 1 Of: 1

Job No. 20413 Date Excavated: 26/09/2014 RL 37.009 m Moturiki Datum

Logged By: N.I.

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater (m)	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)		
						50	100	150
TOPSOIL - 200mm								
SILT; very stiff; moist; slightly cohesive; red brown becomes light brown		0.5			104			
SAND (f); silty; loose; saturated; light grey brown		1.0	1 0 1 0 1		56			
SILT; stiff; saturated; slightly cohesive; light grey orange mottles; sensitive; dilatant  becomes firm		1.5  2.0	1		62  39			
SAND (m-c); loose; saturated; light grey		2.5						
EOBH 2.5m		3.0  3.5  4.0  4.5  4.7						

EXCAVATION METHOD: 300 mm diameter power auger

Site: Chedworth Properties Limited, Ruakura Development, Hamilton

Sheet: 1 Of: 1

Job No. 20413 Date Excavated: 26/09/2014 RL 36.939 m Moturiki Datum

Logged By: N.I.

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater (m)	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)		
						50	100	150
TOPSOIL - 150mm	L L L							
SILT; firm; moist; slightly cohesive; mixed brown, dark brown and light grey	L L L							
SILT; very stiff; moist; slightly cohesive; light brown grey sensitive; dilatant	L L L	0.5			181			
SAND (f-m); silty; loose; wet; light brown grey orange mottles	L L L		2					
	L L L		2					
	L L L	1.0	3					
	L L L		2					
SILT; stiff; wet; slightly cohesive; light grey orange mottles	L L L		1		89			
	L L L		3					
SAND (f); silty; medium dense; wet; light grey	L L L		5					
	L L L	1.5	5		56			
	L L L		5					
	L L L		4					
SILT; stiff; wet; slightly cohesive; light grey orange mottles; sensitive; dilatant	L L L				56			
SAND (f); silty; loose; saturated; grey	L L L	2.0						
	L L L							
EOBH 2.2m	L L L	2.5						
	L L L							
	L L L	3.0						
	L L L							
	L L L	3.5						
	L L L							
	L L L	4.0						
	L L L							
	L L L	4.5						
	L L L							
	L L L	4.7						


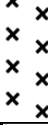
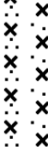


EXCAVATION METHOD: 300 mm diameter power auger

Site: Chedworth Properties Limited, Ruakura Development, Hamilton

Sheet: 1 Of: 1

Job No. 20413 Date Excavated: 26/09/2014 RL 37.061 m Moturiki Datum

Logged By: N.I.

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater (m)	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)		
						50	100	150
TOPSOIL - 100mm								
SILT; very stiff; moist; slightly cohesive; light grey		0.5						
SILT; sandy (f); very stiff; moist; slightly cohesive light brown grey; orange mottles		1.0	4		160			
SAND (m-c); medium dense; saturated; grey		1.5	4		71			
borehole collapsed @ 1.5m		2.0	4		74			
EOBH 2.0m		2.5						
		3.0						
		3.5						
		4.0						
		4.5						
		4.7						












































































EXCAVATION METHOD: 300 mm diameter power auger

Site: Chedworth Properties Limited, Ruakura Development, Hamilton

Sheet: 1 Of: 1

Job No. 20413 Date Excavated: 26/09/2014 RL 37.115 m Moturiki Datum

Logged By: N.I.

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater (m)	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)		
						50	100	150
TOPSOIL - 100mm								
SILT; very stiff; moist; slightly cohesive; brown becomes light grey								
								
								
								
becomes light grey; orange mottles		0.5						
					163			
								
								
								
		1.0						
					92			
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								

EXCAVATION METHOD: 300 mm diameter power auger



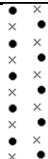
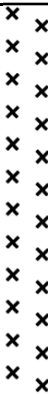




Site: Chedworth Properties Limited, Ruakura Development, Hamilton

Sheet: 1 Of: 1

Job No. 20413 Date Excavated: 26/09/2014 RL 37.059 m Moturiki Datum

Logged By: N.I.

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater (m)	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)					
						50	100	150			
TOPSOIL - 100mm			0								
SILT; firm; wet; slightly cohesive; light brown; sensitive; dilatant		0.5	1								
			0		48						
			1								
			1								
SAND (f); silty; loose; wet; light brown grey becomes medium dense		0.5	1								
			7		74						
			4								
			4								
SILT; very stiff; wet; slightly cohesive; light grey; orange mottles; sensitive becomes saturated becomes stiff		1.0	3								
					166						
		1.5									
		2.0			56						
		2.5									
		3.0									
EOBH 2.1m		3.5									
		4.0									
		4.5									
		4.7									

EXCAVATION METHOD: 300 mm diameter power auger

## **APPENDIX IV**

### **Post-Construction Testing**



**BH 1&2**

Site: Chedworth Properties Ltd; Greenhill Park, Stage 1 and 2

Sheet: 1 Of: 1

Job No. 20413

Date Excavated: 3/12/2015 & 10/2/16

Logged By: MB

Description of Soil		Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)									
BH 1 10/2/16							50	100	150							
TOPSOIL 500 mm; some gravels	Fill			6	not found											
				5												
				4												
				3												
			0.5	5												
gravelly (f) silty SAND (f-m); brown; dark brown, light brown and light grey mottles FILL medium dense; moist	Fill			14	not found											
				R												
			1.0													
SILT; yellow brown; hard; moist; slightly cohesive	Fill				not found	utp								>		
SAND (f-m); red brown; medium dense; dry			1.5					utp								>
SILT; light grey; very stiff; wet; slightly cohesive	Fill		2.0		not found	150										
EOBH 2.0 m																
BH 2 3/12/15																
50 /50 mix of TOPSOIL and SILT; with some gravels FILL mixed black and brown; hard; dry friable	Fill				not found	utp								>		
SILT; light brown; orange mottles; very stiff; moist; slightly cohesive			0.5					150								
SAND (f-c); light grey; medium dense; wet					115											
SILT; light grey; black speckles; orange mottles; very stiff; moist; slightly cohesive	Fill		1.0		not found	167										
EOBH 1.0 m																
	Fill				not found											
			1.5													
	Fill		2.0		not found											

EXCAVATION METHOD: 50mm Diameter Hand Auger and 200 mm diameter Machine Auger

**BH 3&4**

Site: Chedworth Properties Ltd; Greenhill Park, Stage 1 and 2

Sheet: 1 Of: 1

Job No. 20413

Date Excavated: 3/12/2015 &amp; 10/2/16

Logged By: MB/N.I

Description of Soil		Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
BH 3 3/12/15							50	100	150																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
50 /50 mix of TOPSOIL and SILT; with some gravels FILL mixed black and brown; hard; dry friable	Fill		0.5		not found	utp																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															

EXCAVATION METHOD: 50mm Diameter Hand Auger and 200 mm diameter Machine Auger



BH 5&amp;6

Site: Chedworth Properties Ltd; Greenhill Park, Stage 1 and 2

Sheet: 1 Of: 1

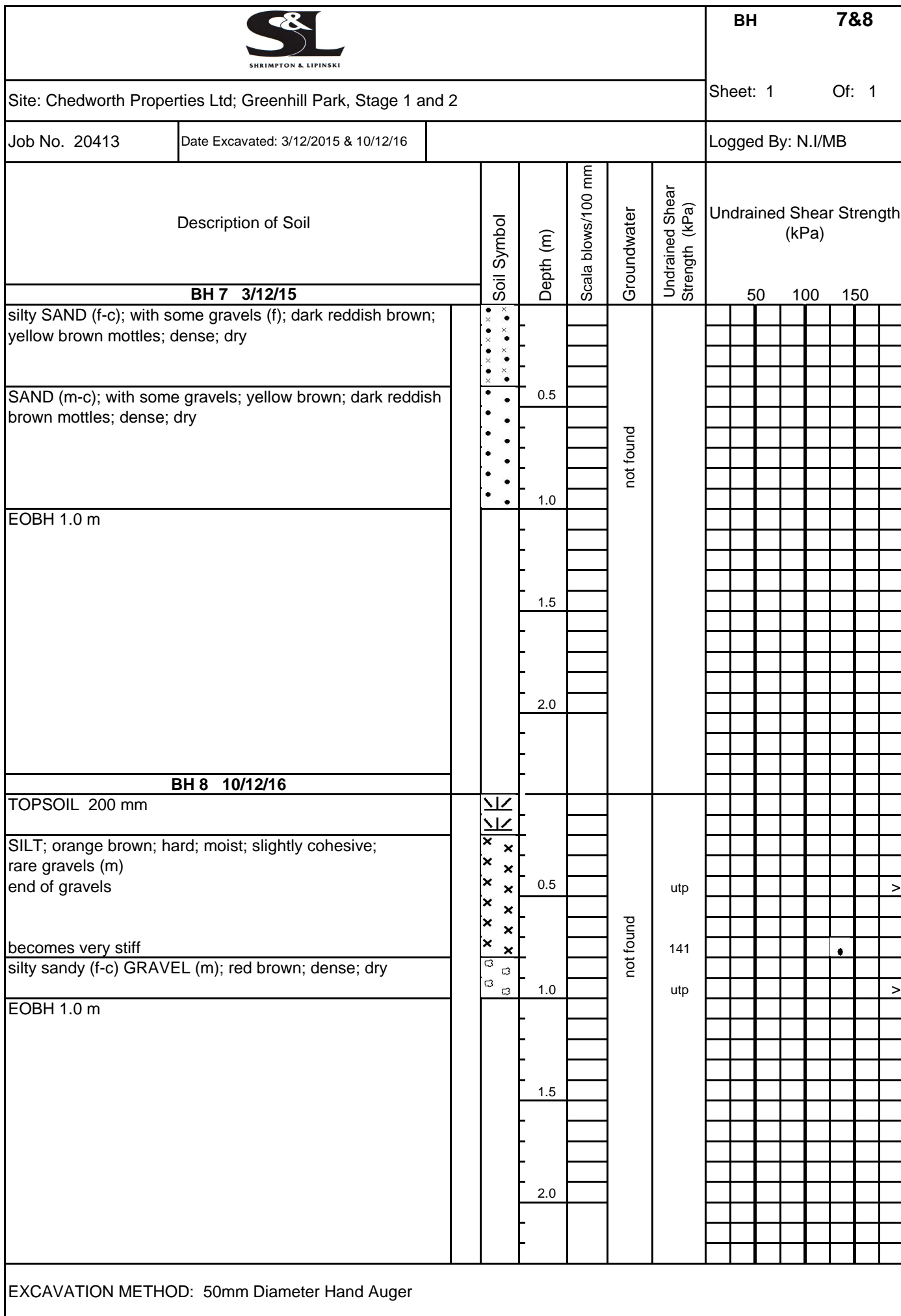
Job No. 20413

Date Excavated: 3/12/2015

Logged By: MB

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)															
						50	100	150													
BH 5																					
sandy (f-m) SILT; with minor gravels; dark reddish brown; black mottles FILL hard; dry friable	FILL				not found	utp													>		
SAND (f-c); orange brown; medium dense; dry becomes dark reddish brown			0.5																		
			1.0																		
becomes (m-c); dense																					
EOBH 1.0 m																					

EXCAVATION METHOD: 50mm Diameter Hand Auger





**BH 9&10**

Site: Chedworth Properties Ltd; Greenhill Park, Stage 1 and 2

Sheet: 1 Of: 1

Job No. 20413

Date Excavated: 3/12/2015 & 10/2/16

Logged By: N.I

Description of Soil		Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)								
BH 9 3/12/15							50	100	150						
TOPSOIL 450 mm; some gravels	Fill		0.5		not found										
silty SAND (f-m); with some gravels (m); brown; dark brown mottles FILL medium dense; moist becomes gravelly (40 % gravels)															
EOBH 1.0 m			1.0												
			1.5												
			2.0												
BH 10 10/2/16															
TOPSOIL 200 mm	Fill		0.5		not found	utp									>
silty GRAVEL (m); orange brown; medium dense; dry FILL															
SILT; with minor sand (f-m); red brown; very stiff; moist; slightly cohesive becomes light brown grey; orange mottles			1.0			130									
silty SAND (f-m); light brown grey; orange mottles; medium dense; moist						utp									>
SILT; light grey; hard; wet; slightly cohesive			1.5			utp									>
silty SAND (f); light grey; medium dense; moist			2.0			utp									>
EOBH 2.0 m															

EXCAVATION METHOD: 50mm Diameter Hand Auger and 200 mm diameter Machine Auger



**BH 11&12**


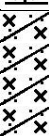








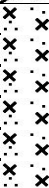



Site: Chedworth Properties Ltd; Greenhill Park, Stage 1 and 2

Sheet: 1 Of: 1

Job No. 20413

Date Excavated: 3/12/2015 & 10/2/16

Logged By: N.I

Description of Soil		Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)												
BH 11 3/12/15							50	100	150										
TOPSOIL 300 mm	Fill		0.5		not found	utp													
sandy (f-m) SILT; with some gravels (m); yellow brown; dark brown mottles FILL hard; moist; friable																		>	
silty SAND (f-c); yellow brown; orange mottles; medium dense; moist; becomes gravelly																			>
EOBH 1.0 m			1.0																
																			
																			
			1.5																
			2.0																
BH 12 10/2/16																			
TOPSOIL 200 mm	Fill		0.5		not found	utp													
silty gravelly (m) SAND (f-m); yellow brown; medium dense; dry FILL																			>
sandy (f-m) SILT; light brown grey; orange mottles; hard; moist; slightly cohesive becomes (m-c)																			
SILT; light grey; black speckles; very stiff; wet; slightly cohesive			1.5			124													
silty SAND (f-m); light grey; medium dense; moist			2.0			130													
EOBH 2.0 m																			

EXCAVATION METHOD: 50mm Diameter Hand Auger and 200 mm diameter Machine Auger





BH 13&amp;14







Site: Chedworth Properties Ltd; Greenhill Park, Stage 1 and 2

Sheet: 1 Of: 1

Job No. 20413

Date Excavated: 3/12/2015

Logged By: N.I

Description of Soil		Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)												
BH 13							50	100	150										
TOPSOIL 200 mm		Fill		0.5		not found	utp												
gravelly (f) SAND(f-c); brown; dark brown mottles FILL dense; dry																			
SILT; with some sand (m-c); light grey; orange brown mottles FILL hard; moist; friable																			
silty SAND (f-c); with some gravels (f); yellow brown; dark brown mottles FILL medium dense; moist																			
SILT; with some sand (f); mixed light grey brown and dark brown FILL hard; moist; slightly cohesive																			
EOBH 1.0 m		Fill		1.0		not found	utp												
BH 14																			
TOPSOIL 400 mm		Fill		0.5		not found	utp												
SILT; with minor sand (f-m); yellow brown; large dark brown mottles FILL hard; dry; friable																			
SAND (f-c); light brown; brown and light grey mottles; dense; moist		Fill		1.0		not found	utp												
EOBH 1.0 m																			
		Fill		1.5		not found	utp												
		Fill		2.0		not found	utp												

EXCAVATION METHOD: 50mm Diameter Hand Auger



**BH 15&16**

Site: Chedworth Properties Ltd; Greenhill Park, Stage 1 and 2

Sheet: 1 Of: 1

Job No. 20413

Date Excavated: 3/12/2015 & 10/2/16

Logged By: N.I

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)
BH 15 10/2/16						50 100 150
TOPSOIL 400 mm						
silty sandy (m-c) GRAVELS (m); yellow brown; yellow orange brown; dense; dry		0.5		not found	utp	>
silty SAND (m-c); light brown grey; medium dense; moist		1.0			133	
SILT; with minor sand (f); light grey; orange mottles; very stiff; moist; slightly cohesive						
SAND (f-c); yellow brown; medium dense; moist		1.5			130	
		2.0			101	
EOBH 2.0 m						
BH 16						
TOPSOIL 200 mm						
SILT; with minor sand (f-m); some gravels (m); yellow brown; dark brown, light grey and orange mottles FILL hard; moist; friable; becomes 20 % organic silt		0.5		not found	utp	>
					utp	>
SILT; with traces of sand (f); light brown grey; red brown mottles; very stiff; moist; slightly cohesive end of sand; becomes with orange mottles		1.0			173	
					156	
EOBH 1.0 m						
		1.5				
		2.0				

EXCAVATION METHOD: 50mm Diameter Hand Auger and 200 mm diameter Machine Auger

**BH 17&18**





Site: Chedworth Properties Ltd; Greenhill Park, Stage 1 and 2

Sheet: 1 Of: 1

Job No. 20413

Date Excavated: 3/12/2015 &amp; 10/2/16

Logged By: N.I/MB

Description of Soil		Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)											
BH 17 10/2/16							50	100	150									
TOPSOIL 200 mm		Fill			not found	utp												
silty sandy (f-c) GRAVELS (m); yellow brown; dark brown mottles FILL dense; dry				0.5														>
SILT; yellow orange brown; hard; moist; slightly cohesive																		
SAND (m-c); brown; medium dense; moist				1.0														>
EOBH 1.0 m																		
										</								

EXCAVATION METHOD: 50mm Diameter Hand Auger and 200 mm diameter Machine Auger



BH 19&amp;20

Site: Chedworth Properties Ltd; Greenhill Park, Stage 1 and 2

Sheet: 1 Of: 1

Job No. 20413

Date Excavated: 3/12/2015 &amp; 10/2/16

Logged By: N.I/MB

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)		
BH 19 10/2/16						50	100	150
TOPSOIL 300 mm	Fill			not found				
sandy (m-c); GRAVEL (m); yellow brown; dark brown mottles								
FILL dense; dry		0.5						
SILT; with minor sand (f-m); yellow brown; very stiff; moist; friable					156			
silty SAND (f-m); yellow brown; medium dense; dry		1.0			136			
SILT; light grey; black speckles; very stiff; moist; slightly cohesive		1.5			159			
silty SAND (vf); light grey; medium dense; wet								
SILT; with minor sand (f); light grey; very stiff; wet; slightly cohesive		2.0			115			
EOBH 2.0 m								
BH 20 3/12/15								
TOPSOIL 400 mm				not found				
SAND (m-c); with minor gravels (f); reddish orange brown; dense; moist		0.5						
		1.0						
		1.5						
		2.0						
EOBH 1.0 m								

EXCAVATION METHOD: 50mm Diameter Hand Auger and 200 mm diameter Machine Auger





BH 23&24

Site: Chedworth Properties Ltd; Greenhill Park, Stage 1 and 2

Sheet: 1 Of: 1

Job No. 20413 Date Excavated: 3/12/2015 & 10/2/16

Logged By: N.I

Description of Soil		Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)		
BH 23 10/2/16							50	100	150
TOPSOIL 350 mm		⚡			not found				
sandy (m-c) GRAVEL (f-c); yellow brown; medium dense; dry  becomes light brown grey; moist		⚡							
		⚡							
		⚡							
		⚡	0.5						
		⚡							
		⚡							
		⚡	1.0						
		⚡							
		⚡							
		⚡	1.5						
		⚡							
		⚡							
		⚡	2.0						
EOBH 2.0 m									
BH 24 3/12/15									
TOPSOIL 300 mm		⚡		3	not found	utp			
SAND (f-c); orange brown; medium dense; moist  becomes with some gravels (f-m) becomes dense		⚡		5					
		⚡		4					
		⚡		8					
		⚡	0.5	8					
		⚡		6					
		⚡		7					
		⚡		8					
		⚡		12					
		⚡	1.0						
		⚡							
EOBH 1.0 m		⚡							
		⚡							
		⚡							
		⚡							
		⚡							
		⚡	1.5						
		⚡							
		⚡							
		⚡							
		⚡	2.0						

EXCAVATION METHOD: 50mm Diameter Hand Auger and 200 mm diameter Machine Auger



BH 25&amp;26

Site: Chedworth Properties Ltd; Greenhill Park, Stage 1 and 2

Sheet: 1 Of: 1

Job No. 20413

Date Excavated: 3/12/2015 &amp; 10/2/16

Logged By: N.I/M.B

Description of Soil		Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)										
BH 25 10/2/16							50	100	150								
TOPSOIL 300 mm					not found	utp											
silty gravelly (f-m) SAND (m-c); yellow orange brown; medium dense; dry medium dense; dry			0.5														
			1.0														
EOBH 1.0 m																	
				1.5													
				2.0													
BH 26 3/12/15																	
TOPSOIL 350 mm								not found	200+								
SILT; light brown; dark brown mottles FILL hard; moist				0.5													
SILT; light yellow brown; brown and orange mottles; hard; moist; slightly cohesive becomes light grey																	
		1.0															
EOBH 1.0 m																	
				1.5													
				2.0													

EXCAVATION METHOD: 50mm Diameter Hand Auger and 200 mm diameter Machine Auger



BH 27&28

Site: Chedworth Properties Ltd; Greenhill Park, Stage 1 and 2

Sheet: 1 Of: 1

Job No. 20413 Date Excavated: 9/2/2016

Logged By: N.I

Description of Soil		Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)														
BH 27							50	100	150												
TOPSOIL 300 mm		<div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></di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EXCAVATION METHOD: 200 mm diameter Machine Auger





**BH 31&32**

Site: Chedworth Properties Ltd; Greenhill Park, Stage 1 and 2

Sheet: 1 Of: 1

Job No. 20413

Date Excavated: 3/12/2015 &amp; 9/2/16

Logged By: N.I

Description of Soil		Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)												
BH 31 9/2/16							50	100	150										
TOPSOIL 400 mm					not found	utp													
gravelly (f) SAND (m-c); light yellow grey; dense; dry			0.5														>		
			1.0														>		
			1.5														>		
			2.0														>		
			EOBH 2.0 m																
			BH 32 3/12/15																
TOPSOIL 400 mm								not found	utp										
SILT; with minor sand (f); yellow brown; orange mottles; hard; moist; friable		0.5														>			
																>			
																>			
		1.0														>			
sandy (m-c) GRAVEL; brown; orange mottles; dense; moist																			
		1.5																	
		2.0																	
EOBH 1.0 m																			

EXCAVATION METHOD: 50mm Diameter Hand Auger and 200 mm diameter Machine Auger



BH 33&34

Site: Chedworth Properties Ltd; Greenhill Park, Stage 1 and 2

Sheet: 1 Of: 1

Job No. 20413

Date Excavated: 9/2/2016

Logged By: N.I

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)											
BH 33						50	100	150									
TOPSOIL 300 mm	Fill			not found	utp												
sandy (f-c) SILT; with some gravels (m); yellow brown; dark brown mottles FILL hard; moist; friable		0.5															>
SILT; light brown grey; very stiff; moist; friable																	>
127																	
silty sandy (m-c) GRAVEL (m); brown; dense; dry		1.0		not found	utp												>
EOBH 1.1 m																	
		1.5															
		2.0															
BH 34																	
TOPSOIL 300 mm				not found	utp												
silty sandy (m-c) GRAVEL (m); orange brown; dense; dry		0.5															>
SILT; with minor sand (f-m); light brown grey; hard; moist; slightly cohesive		1.0															>
EOBH 1.0 m																	
		1.5															
		2.0															

EXCAVATION METHOD: 200 mm diameter Machine Auger



BH 35&36

Site: Chedworth Properties Ltd; Greenhill Park, Stage 1 and 2

Sheet: 1 Of: 1

Job No. 20413

Date Excavated: 9/2/2016

Logged By: N.I

Description of Soil		Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)		
BH 35							50	100	150
TOPSOIL 300 mm									
sandy (m-c) GRAVEL (m-c) ; orange brown; medium dense; dry			0.5			utp			>
SILT; red brown; hard; moist; slightly cohesive									
sandy (m-c) GRAVEL (m-c) ; brown grey; medium dense; dry			1.0			utp			>
becomes grey			1.5						
			2.0						
EOBH 2.0 m									
BH 36									
TOPSOIL 200 mm									
SILT; with minor sand (f-m); brown; dark brown mottles									
FILL hard; moist; friable									
silty GRAVEL (m-c); brown grey; medium dense; dry			0.5			utp			>
becomes sandy (m-c)			1.0			utp			>
EOBH 1.0 m									
			1.5						
			2.0						

EXCAVATION METHOD: 200 mm Diameter Machine Auger



BH 37&amp;38

Site: Chedworth Properties Ltd; Greenhill Park, Stage 1 and 2

Sheet: 1 Of: 1

Job No. 20413

Date Excavated: 3/12/15 &amp; 4/2/16

Logged By: N.I

Description of Soil		Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)														
							50	100	150												
BH 37 3/12/15																					
TOPSOIL 300 mm	Fill				not found	utp															
sandy (m-c) GRAVEL; brown; dark brown mottles FILL																					
SILT; with some sand (f-c); red brown; hard; moist; friable			0.5																		
silty SAND (f-c); dark red brown; dense; slightly moist																					
becomes with some gravels																					
EOBH 1.0 m			1.0																		
			1.5																		
			2.0																		
BH 38 4/2/16																					
TOPSOIL 500 mm				1	not found	utp															
				1																	
				1																	
				6																	
			0.5	6																	
silty SAND (m-c); red brown; medium dense; moist				6																	
rare gravels to 20 mm diameter				4																	
				4																	
			1.0	6																	
silty sandy (m-c) GRAVEL (f-m); brown; medium dense; moist																					
moist																					
silty SAND (m-c); red brown; medium dense; moist																					
			1.5																		
SAND (f-m); brown; medium dense; moist									101												
									utp												
EOBH 2.0 m		2.0				utp															

EXCAVATION METHOD: 50mm Diameter Hand Auger



Site: Chedworth Properties Ltd; Greenhill Park, Stage 1 and 2

Sheet: 1      Of: 1

Job No. 20413

Date Excavated: 4/2/2016

Logged By: N.I

[illegible]

EXCAVATION METHOD: 50mm Diameter Hand Auger



BH 41&amp;42

Site: Chedworth Properties Ltd; Greenhill Park, Stage 1 and 2

Sheet: 1 Of: 1

Job No. 20413

Date Excavated: 4/2/2016

Logged By: N.I

Description of Soil		Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
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EXCAVATION METHOD: 50mm Diameter Hand Auger

**BH 43&44**

Site: Chedworth Properties Ltd; Greenhill Park, Stage 1 and 2

Sheet: 1 Of: 1

Job No. 20413

Date Excavated: 4/2/2016

Logged By: N.I

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
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TOPSOIL 400 mm				not found	200+																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												

EXCAVATION METHOD: 50mm Diameter Hand Auger





BH 45&amp;46

Site: Chedworth Properties Ltd; Greenhill Park, Stage 1 and 2

Sheet: 1 Of: 1

Job No. 20413

Date Excavated: 4/2/2016

Logged By: N.I

Description of Soil		Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)													
BH 45							50	100	150											
TOPSOIL 400 mm			0.5	1	not found	utp														
				1																
				2																
				4																
silty SAND (f-m); red brown; medium dense; dry				6																>
				5																>
				6																>
				2																>
				3																>
				1.0																>
EOBH 1.0 m																				
			1.5																	
			2.0																	
BH 46																				
TOPSOIL 400 mm			0.5		not found	200+														
SILT; light brown grey; hard; moist; slightly cohesive																				>
																				>
silty SAND (f); light grey; black speckles; medium dense; moist																				>
																				>
							1.0													>
SILT; with minor sand (f); light grey; hard; moist; slightly cohesive																				>
																				>
																				>
silty SAND (f); light grey; orange mottles; medium dense; moist																				>
							1.5													>
																				>
SAND (f-m); light grey; medium dense; moist																				>
							2.0													>
EOBH 2.0 m																				

EXCAVATION METHOD: 50mm Diameter Hand Auger



BH 47&48

Site: Chedworth Properties Ltd; Greenhill Park, Stage 1 and 2

Sheet: 1 Of: 1

Job No. 20413

Date Excavated: 4/2/2016

Logged By: M.B

Description of Soil		Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)											
BH 47							50	100	150									
TOPSOIL 300 mm				5	not found													
				2														
				4														
SAND (f-m); dark reddish brown; medium dense; moist				7														
				5														
				6														
				5														
becomes (m-c)				4														
				6														
				1.0														
EOBH 1.0 m																		
			1.5															
			2.0															
BH 48																		
TOPSOIL 400 mm		Fill			not found	utp												
SILT; with minor sand (f-m); mixed reddish brown, brown, yellow brown, black FILL hard; dry; friable			0.5												>			
SILT; with minor sand (f); light grey; hard; moist; slightly cohesive						utp									>			
			1.0			200+									>			
EOBH 1.0 m																		
			1.5															
			2.0															

EXCAVATION METHOD: 50mm Diameter Hand Auger



**BH 51&52**

Site: Chedworth Properties Ltd; Greenhill Park, Stage 1 and 2

Sheet: 1 Of: 1

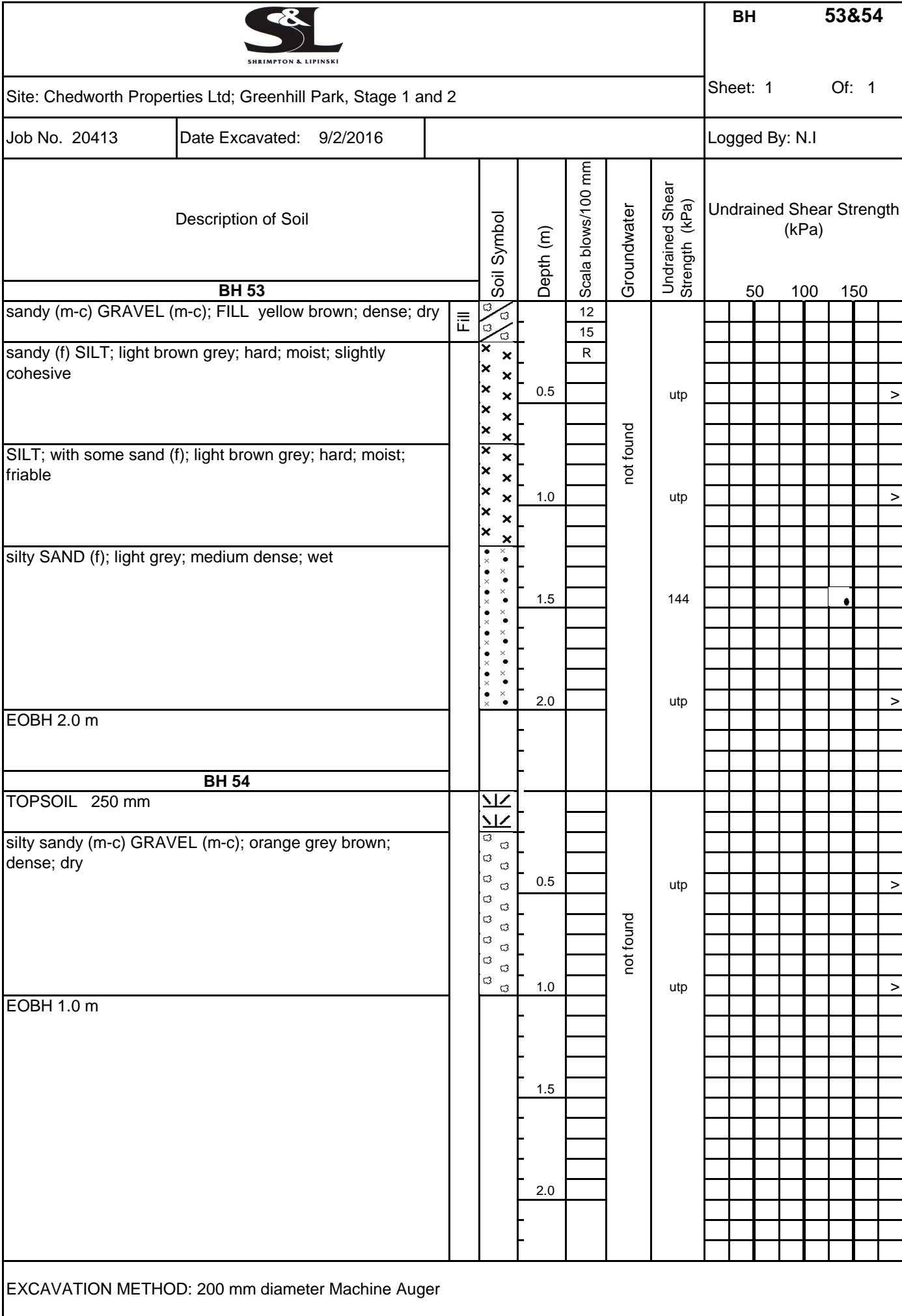
Job No. 20413

Date Excavated: 4/2/16 &amp; 9/02/16

Logged By: N.I

Description of Soil		Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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EXCAVATION METHOD: 50mm Diameter Hand Auger and 200 mm diameter Machine Auger





BH 55&amp;56



Site: Chedworth Properties Ltd; Greenhill Park, Stage 1 and 2

Sheet: 1 Of: 1

Job No. 20413

Date Excavated: 9/2/2016

Logged By: N.I

Description of Soil		Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)															
							50	100	150													
BH 55																						
TOPSOIL 300 mm					not found	utp																
SAND (f-m); light brown grey; medium dense; moist			0.5																			>
silty sandy (f-c) GRAVEL (m-c); orange brown; dense; dry																						
			1.0																			>
becomes grey brown																						
becomes wet			1.5																			>
			2.0																			>
EOBH 2.0 m																						
BH 56																						
TOPSOIL 300 mm					not found	utp																
SILT; light brown; red orange mottles; hard; moist; slightly cohesive			0.5																		>	
becomes with minor gravels (m-c)																						
			1.0																		>	
sandy (f-c) GRAVEL (f-m); red brown; medium dense; dry																						
			1.5																		>	
SAND (m-c); rare gravels (f); light brown; dense; dry			2.0																		>	
EOBH 2.0 m																						

EXCAVATION METHOD: 200 mm diameter Machine Auger



BH 57&amp;58

Site: Chedworth Properties Ltd; Greenhill Park, Stage 1 and 2

Sheet: 1 Of: 1

Job No. 20413

Date Excavated: 9/2/2016

Logged By: N.I

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)											
BH 57						50	100	150									
TOPSOIL 350 mm	Fill			not found	utp												
silty sandy (f-m) GRAVEL (m-c); brown FILL medium dense; dry		0.5															>
SILT; light grey; black speckles; hard; dry; friable		1.0															>
silty SAND (f-m); light grey; medium dense; moist		1.5															>
SILT; with some sand (f); light grey; black speckles; hard; moist; friable		2.0															>
EOBH 2.0 m																	
BH 58																	
TOPSOIL 200 mm	Fill			not found	utp												
silty sandy (m-c) GRAVEL (m-c); brown FILL dense; dry		0.5															>
SILT; brown; orange mottles; hard; dry; friable		1.0															
becomes very stiff; moist; slightly cohesive becomes with minor sand (f); light brown; orange mottles		1.5															>
silty SAND (f-m); yellow brown; medium dense; moist becomes light grey		2.0															
SILT; light grey; stiff; wet; slightly cohesive																	
EOBH 2.0 m																	

EXCAVATION METHOD: 200 mm diameter Machine Auger



BH 59&amp;60

Site: Chedworth Properties Ltd; Greenhill Park, Stage 1 and 2

Sheet: 1 Of: 1

Job No. 20413

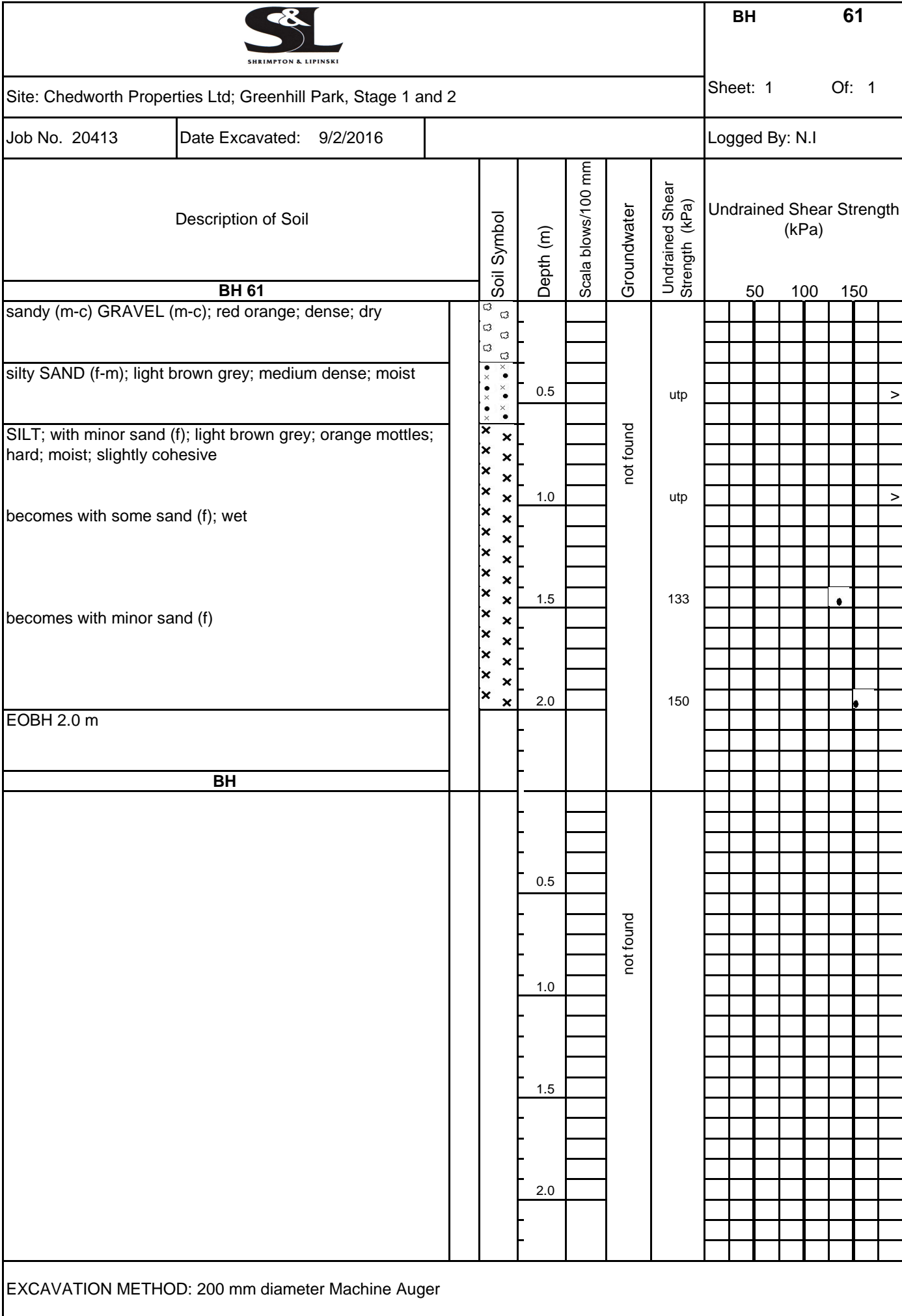
Date Excavated: 9/2/2016

Logged By: N.I

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa)		
BH 59						50	100	150
sandy (f-m) gravelly (m) SILT; red brown; dark brown mottles FILL hard; moist; friable	FILL							
SILT; with minor sand (f-m); light brown grey; black speckles; hard; moist; slightly cohesive		0.5		not found	utp			>
silty SAND (f); light brown grey; medium dense; moist		1.0			utp			>
SILT; light grey; very stiff; wet; slightly cohesive becomes with some sand (f-m)		1.5			110			
silty SAND (f-m); light grey; medium dense; saturated		2.0			98			
EOBH 2.0 m								
BH 60								
TOPSOIL 300 mm								
silty SAND (f-m); light grey; medium dense; moist		0.5		not found	utp			>
SILT; with some sand (f-m); red brown; hard; moist; friable		1.0			utp			>
		1.5			124			
silty SAND (f); light grey; medium dense; wet		2.0			utp			>
EOBH 2.0 m								

EXCAVATION METHOD: 200 mm diameter Machine Auger





## **APPENDIX V**

### **Liquefaction Analysis Plots**



## LIQUEFACTION ANALYSIS REPORT

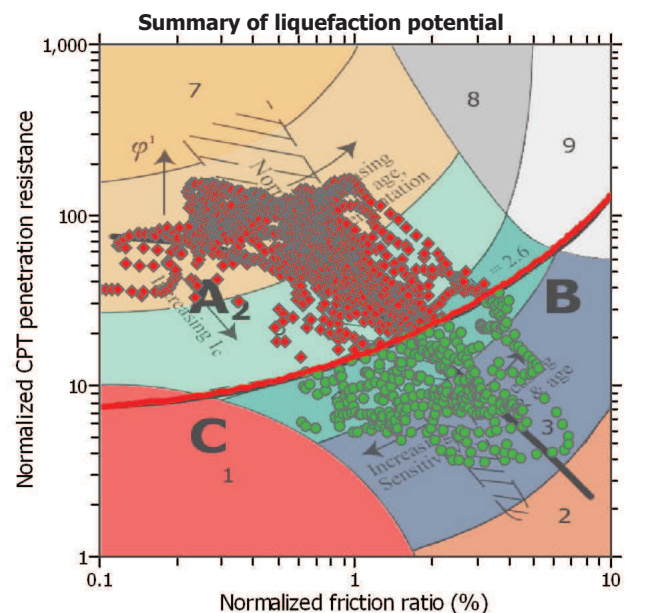
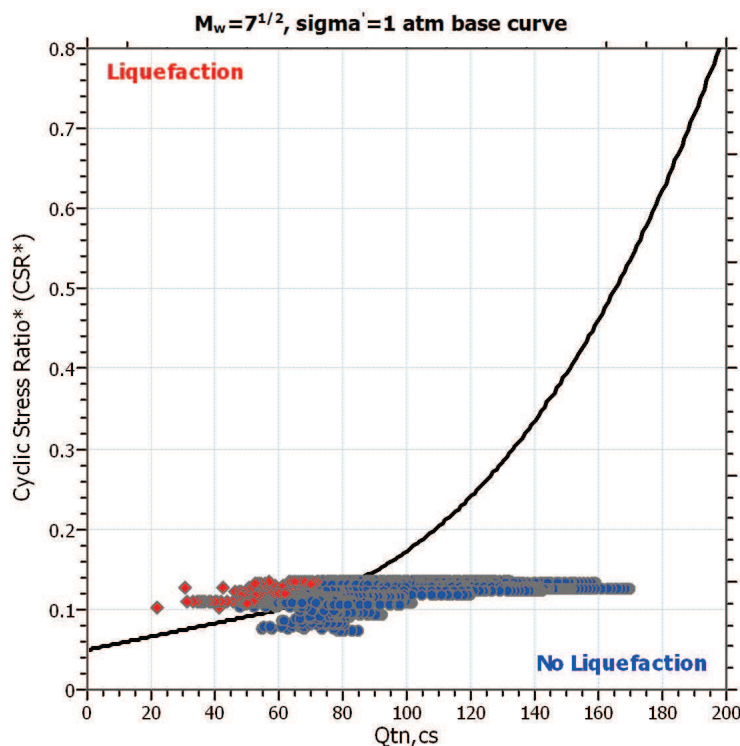
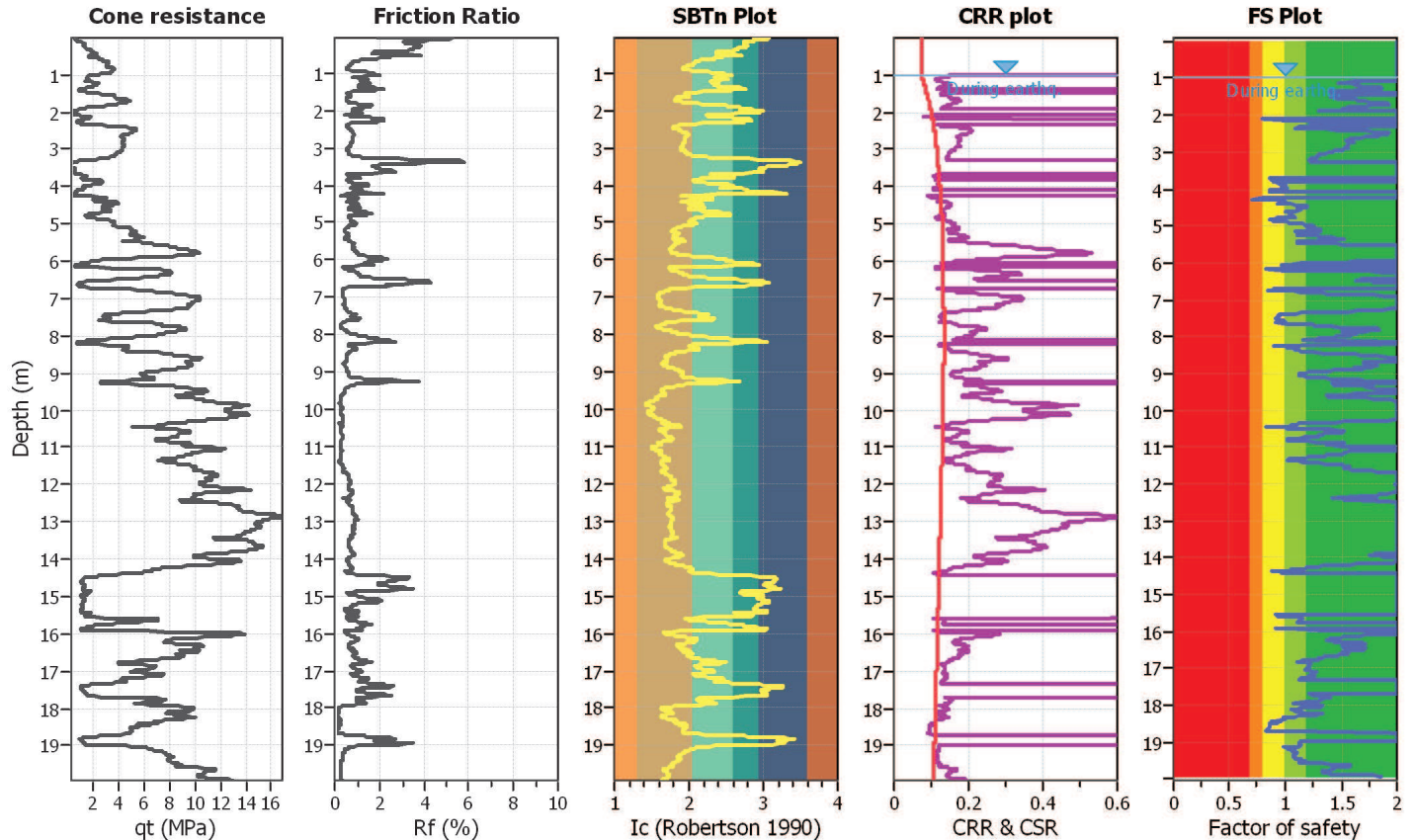
Project title : 20413 Ruakura Development

Location : Hamilton

CPT file : CPT 1

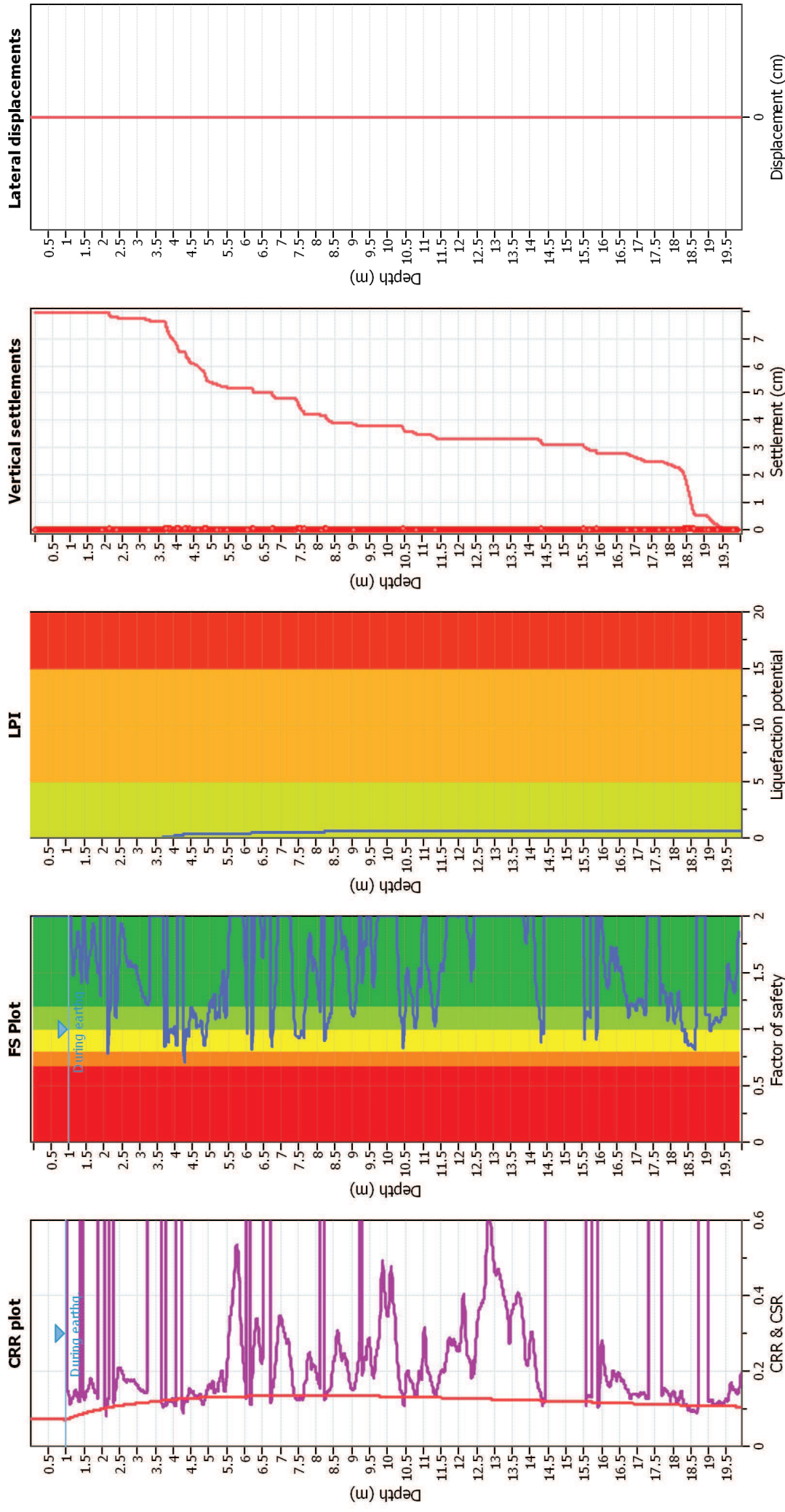
### Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	1.00 m	Use fill:	No	Clay like behavior	
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude $M_w$ :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	N/A
Peak ground acceleration:	0.11	Unit weight calculation:	Based on SBT	$K_0$ applied:	Yes	MSF method:	Method based



Zone A<sub>1</sub>: Cyclic liquefaction likely depending on size and duration of cyclic loading  
Zone A<sub>2</sub>: Cyclic liquefaction and strength loss likely depending on loading and ground geometry  
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening  
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

## Liquefaction analysis overall plots



### Input parameters and analysis data

Analysis method: NCEER (1998)  
Fines correction method: NCEER (1998)  
Points to test: Based on  $I_c$  value  
Earthquake magnitude  $M_w$ : 7.50  
Peak ground acceleration: 0.11  
Depth to water table (insitu): 1.00 m

Depth to water table (earthq.): 1.00 m  
Average results interval: 3  
 $I_c$  cut-off value: 2.60  
Unit weight calculation: Based on SBT  
Use fill: No  
Fill height: N/A

Fill weight: N/A  
Transition detect. applied: No  
 $K_\sigma$  applied: Yes  
Clay like behavior applied: Sands only  
Limit depth applied: No  
Limit depth: N/A

### F.S. color scheme

Almost certain it will liquefy  
Very likely to liquefy  
Liquefaction and no liq. are equally likely  
Unlike to liquefy  
Almost certain it will not liquefy

### LPI color scheme

Very high risk  
High risk  
Low risk

## **APPENDIX VI**

### **Stormwater Management**

Internal Site Stormwater Management Guide Stages 1 & 2

Greenhill Park Ruakura North, Stage 1, Soakage Test Report





23 March 2016

## **Internal Site Stormwater Management Guide Stages 1 & 2**

### **Introduction**

A stormwater soakage investigation and capability report has been prepared for Stage 1 of the Greenhill Park Subdivision.

The report identified that ground conditions provided opportunities for the disposal of stormwater by:

- i. full onsite soakage
- ii. mix of onsite soakage and reticulation off site
- iii. full offsite disposal

Soakage capability varies across the site. The soakage investigation report recommended that in line with Council's policy of optimising soakage wherever possible that the individual sites be tested for soakage capability and soakage utilised whenever possible.

This Internal Site Stormwater Management Report provides guidance for the disposal of stormwater for the individual lots in Stages 1 & 2 based on the results of the Stage 1 investigation.

All Lots have some soakage capability however few lots can rely solely on soakage and a small number are very limited. Lots which appear to be capable of fully treating stormwater by on site soakage (rates > 300 mm/hr) are to utilise this soakage capability. The overflow connection provides additional run off control when the onsite devices(s) are overloaded.

Lots which have kerb outlet connections need to limit the duration of the discharge from the outlets. With the below recommendations ongoing discharges from the kerb outlets are expected to occur for only short periods after rainfall events.

Where on site soakage is not sufficient then a mix of offsite disposal and soakage is to be utilised which provides for onsite storage of the 1 year storm in a soakage field/pit which will slowly empty by soakage. Larger events will be catered for by connecting the top of the soakage field/pit to the stormwater connection provided.

Sites which are provided with connections to the roadside swales or the main swale do not require any onsite soakage or storage to be provided as there is no need to control the discharges at the swale outlet.

This approach ensures that the larger events are provided for by way of the reticulation while the smaller events will be largely dealt with by ground soakage.

Based on the soakage test results from Stage 1 the following internal stormwater management requirements are to be implemented as part of the Lot site development works.

### **Stage 1 – Lots 1-46**

#### **Lots 1-8**

Lots 1-8 have soakage rates of less than 200 mm/hr and are not considered totally soakage suitable. These sites have been provided with stormwater connections draining to the roadside swale in Road 3. On site stormwater reticulation is to be connected to the swale connection provided.

#### **Lots 9-11**

Lots 9-11 are not considered soakage suitable. These sites are required to be individually tested to confirm the available soakage rate. On the basis that the tests confirm that on site soakage is not available these Lots are required to provide onsite storage for the 1 year return period storm by means of either a soakage field/soak pit or similar.

All roof runoff is to be directed to this storage which is to be fitted with an overflow pipe connected to the kerb outlet provided. The overflow will function when the available storage is at capacity. When the storm is over, the overflow will stop discharging and the stored volume will gradually soak away.

#### **Lots 12-17, 35**

Lots 12-17, 35 have variable soakage rates below 300mm/hr and are to be tested to confirm the individual lot soakage rates.

If soakage rates confirm that on site soakage is practical then stormwater is to be disposed of to soakage. The soakage devices are to be provided with an overflow connected to the kerb outlet provided which will provide a controlled discharge when the capacity of the soak pits (or similar) is exceeded.

If soakage is not practical then these lots are to be provided with a storage device (soakpit/soakage field) which has the capacity to store the 1 year storm. As above all roof water is to be diverted to the storage devices which are to be connected to the kerb connection provided, by an overflow pipe which functions when the storage facility is full. Discharges to the kerb will stop once the level of water in the storage device falls below the outlet level.

#### **Lots 18-28, 36-40**

Lots 18-28, 36 - 40 appear to have soakage rates over 300 mm/hr and are considered to be soakage suitable. Each Lot is to be individually tested to confirm it is soakage suitable. On the basis they are soakage suitable then on site soakage is to be used and the soakage pits etc connected to the kerb outlet provided by means of an overflow pipe out of the top of the soakage field/pit. The overflow discharges to the kerb outlet only when the soakage devices are at capacity. Should soakage tests reveal that any of these sites are not soakage suitable then a storage device(s) is to be provided, as for Lots 12-17 above.

Lot 29 has been provided with a connection to the main swale. All roof water runoff is to be diverted to this connection.

Lot 31 has been provided with a connection which discharges to the swale in Road 4. All stormwater is to be diverted to this lot connection.

Lots 32, 33 and 34 have been provided with stormwater connections which are connected to the piped reticulation. All roof runoff is to be diverted to these connection points.

#### **Lots 41-46**

Lots 41-46 have been provided with stormwater connections which discharge into the roadside swale in Road 4.

### **Stage 2**

#### **Lots 47-92**

No soakage testing has been carried out in this stage. The same provisions apply to these sites as for Stage 1

Lots 47-60, 69, 77, and 85-92 are required to be tested on an individual basis for soakage capability. Those sites which prove to be soakage capable (soakage rate > 300 mm/hr) are to dispose of roof runoff to ground soakage. The soakage devices are to be connected by an overflow pipe to the kerb connections provided, from the top of the storage device.

For those sites which have lower soakage rates than 300mm/hr, then as for Lots 12-17, 35 in Stage 1 these sites are to be provided with a storage device (soakage pit/soakage field) which has the capacity to store the 1 year storm. Stormwater runoff from the roof is to be connected to the device and the device fitted with an overflow pipe connected to the kerb outlet, which will function when the storage capacity is fully utilised.

#### **Lots 61-68, 70-76 and 78-84**



Lots 61-68 have been provided with stormwater connections to the main swale. All roof runoff is to be directed to this connection.

Lots 70-76 have been provided with stormwater connections to the roadside swale in Road 5. All roof runoff is to be directed to the outlet provided.

Lots 78-85 have been provided with stormwater connections to the roadside swale in Road 6. All roof runoff is to be directed to the connection provider.

### **On site Soakage Device Sizing**

All on site soakage fields/soakpits are to be sized for the development proposed for those sites which are totally soakage suitable using HCC soakage design criteria.

Those sites which are not soakage suitable and which discharge to a kerb outlet are to be provided with a soakage field/soakpit capable of storing the runoff from the site development for a 1 year return period storm. Soakage fields are recommended as they provide a greater surface area for soakage to occur.

As an indication the volume of storage required for a 1year 1hour storm – for a roof area of 200m<sup>2</sup> Using a runoff coefficient Of 0.9 and a rainfall intensity of 15mm/hr a storage volume of 2.7m<sup>3</sup> is required.

A soakage field 1m wide by 1m deep rock filled needs to be 7m long. Alternatively a plastic crate soakpit design need only be 1m wide by 0.5m deep by 5.4 metres long.

Yours faithfully

**S & L Consultants Ltd**



R P Woods  
MIPENZ CPEng



T McBride  
Managing Director

**Encl. Greenhill Park Ruakura North Stage 1 Soakage Test Report dated 24 September 2015  
Soakage Test Locations and Data – Dwg 20413 – D25 Rev 1 08/15**



# Greenhill Park Ruakura North Stage 1

## Soakage Test Report

Ref: 20413-S1  
Prepared for Chedworth Properties Ltd  
24 September 2015

**S&L CONSULTANTS LTD** - SURVEYORS - ENGINEERS - PLANNERS

102 Hamilton Street PO Box 231 Tauranga 3140 New Zealand Phone 07 577 6069 Fax 07 577 6065 Email [slconsultants@sltga.co.nz](mailto:slconsultants@sltga.co.nz)

## 1.0 Introduction

S & L Consultants Ltd have been engaged to carry out site soakage testing on a representative sample of the proposed lots in Stage 1 of Area J of the Ruakura Development Area.

Area J comprises approximately 14 ha and Stage 1 of 46 lots is at the western end of the Area fronting Greenhill Road and the Wairere Drive / Gordonton Road roundabout.

## 2.0 Area Geology

Geology of the Hamilton basin generally comprises alluvial and colluvial sediments of the Tauranga group from the Holocene and Pleistocene ages to depths of 400 – 500 m. Within the Tauranga Group, recent Pleistocene age sediments associated with the shallow Hinuera formation are mapped in the vicinity of the site along with surface manifestations of the deeper middle to early Pleistocene age Walton subgroup.

The Walton subgroup is described as pumiceous silt, sand and gravel, interbedded peat and rhyolitic pumice including non-welded ignimbrite, tephra and alluvial pumice deposits.

The Hinuera formation is described as cross bedded pumice sand, silt and gravel with interbedded peat. Based on "Introduction to Landscapes and Soils of the Hamilton Basin," the Hinuera formation is approximately 18,000 years old and found at depths of 40 to 60 cm below the surface.

## 3.0 Site Description.

Stage 1 adjoins the Western boundary of the CPL land and extends from the proposed Link Road connection off the roundabout through to Greenhill Road.

The area is generally flat  $\pm 1$  m.

## 4.0 Test Procedure

The subdivision consent issued by Hamilton City Council 11/2015/6025 condition 37(8) states that

*"a stormwater soakage test report by a suitably qualified and experienced professional engineer or scientist shall be submitted for at least each third residential lot".*

Accordingly 16 separate soakage tests were undertaken over a period of 4 days on 18, 19, 27 & 28 August following significant rainfall. These were carried out in accordance with the Building Code E1 document and over a 4 hour period.

The holes were presoaked and 1 cycle in each was measured. The tests were undertaken on Lots 1, 4, 7, 10, 13, 16, 19, 22, 25, 27, 31, 34, 37, 40, 43, 46.

## 5.0 Test Results

The soakage rates varied from 27 mm/hr to 780 mm/hr, the average rate is 300 mm/hr, only 10 tests were over 200 mm/hr and 7 are over 300 mm/hr.

Lot 19 has the 780 mm/hr rate and Lot 22 is the next lowest at 600 mm/hr, rates then drop to 480 mm/hr on Lot 40. The lowest rate, 27 mm/hr, occurs on Lot 10 and Lot 1 has 60 mm/hr.

## 6.0 Soakage Systems

The Building Code Clause E1 Acceptable Solutions recommends that soakage systems be designed for rates 500 mm/hr and over. Below this rate a storage component is required to ensure the system will comply with a 1: 10 year storm of 1 hour duration. For a theoretical system of 250 m<sup>2</sup> of roof with a 300 mm/hr soakage rate discharging to a soakage area of 10 m<sup>2</sup> there would need to be storage of 7m<sup>3</sup> for the 1:10 year 60 minute duration rainfall event. If the soakage area increased to 15 m<sup>2</sup> then 2.5 m<sup>3</sup> of storage would be required.

The water table was measured at 1.4 m to 2.0 m plus below ground level at the time of the tests. It is also known to fluctuate.

## 7.0 Council Requirements

The discussions with Council held in conjunction with the resource consents and engineering approval included soakage disposal as their preferred option. Knowing that soakage may not be available the swale drainage systems for Area J have been designed to cater for the runoff from the fully developed roads and lots.

Councils ITS and proposed ICMP recommend a treatment train approach with soakage, onsite storage, recycling of stormwater to be included within the building consenting process, as options and/or combinations.

## 8.0 Recommendations

We consider it will only be practical to dispose of stormwater runoff from the lots with more than 300 mm/hr soakage and in all cases an overflow is to be provided to the road/swale drain.

## 9.0 Conclusions

There are only some lots where soakage disposal will be practical based on the tests we have done to date.

These are shown on our drawing 20413-D25.

Lots 18 to 28, 31 and 36 – 40 would appear to have 300 mm/hr or over so soakage should be incorporated in the stormwater design for these lots.

Lots 1 -11 are all below 200 mm/hr so are not considered soakage suitable.

Lots 12 – 17, 29, 30, 32 – 35 and 41 – 46 have variable soakage rates below 300 mm/hr so further investigation should be undertaken when the house layout is known and the results incorporated into the stormwater system design.

## 10.0 Applicability

Recommendations contained in this document are based on data from observations of soil exposure, boreholes and soakage tests. Inferences about the nature and continuity of soils and soakage rates away from these locations are made but cannot be guaranteed.

In all circumstances, if variations in the soakage rates occur which differ from those described or are 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 proposed Ruakura Development in Hamilton - Area J 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.



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**S & L Consultants Ltd**  
**R P Woods**  
**MIPENZ CPEng**

**Job:** Green Hill Park; Hamilton

**Job Number:** 20413-S1

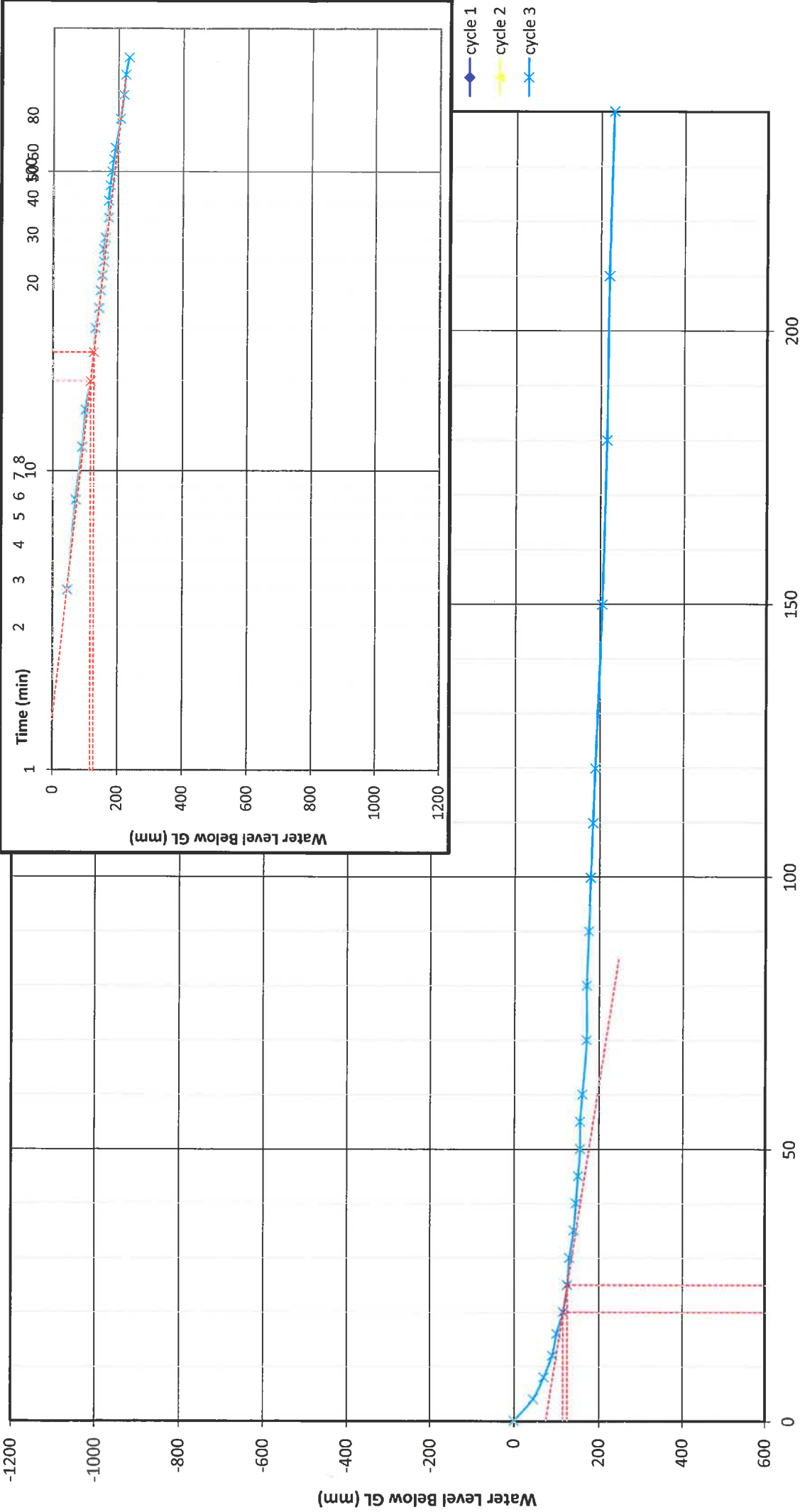
**Date:** 19/8/15

**Test Number:** 1

Time (min)			1st Cycle
0			0
4			45
8			70
12			90
16			100
20			115
25			125
30			130
35			140
40			145
45			150
50			155
55			155
60			160
70			170
80			170
90			175
100			180
110			185
120			190
150			205
180			215
210			220
240			230

Our Ref: 20413-S1  
Date: 19/8/15

Green Hill Park Subdivision - Stage 1; Hamilton  
Soakage Test Position # 1



Time (min) Water Level (mm)

Time 1	20	115
Time 2	25	125

Soakage Rate = 120 mm/hr

## Soak Hole Notes:

Job #:	20413-S1
Test Location:	SH1 / Lot1
Date:	19/8/15
Tested By:	M.Bryant

Soak Hole Diameter:	150 mm
Soak Hole Depth:	600 mm
Water Table Depth:	1700 mm

Cross If Applicable:	
4 hour preparation soak	<input checked="" type="checkbox"/>
hole refilled at 0.25 m above base	<input type="checkbox"/>
measurement Interval > 30 minutes	<input checked="" type="checkbox"/>
test continued for 4 hours	<input checked="" type="checkbox"/>
test continued until empty	<input type="checkbox"/>
test stopped 0.25 m above base	<input type="checkbox"/>

Weather Conditions 1-3 Days Prior To Test: Heavy rain from 12 hours until testing. Light showers on the previous day. Light to moderate winds, and moderate temperatures.

Weather Conditions On Day Of Test: Overcast with light winds. Moderate temperatures

Soil Conditions & Composition: Wet, orange brown silt for approx 1.0 m. Very sensitive white wet silt from approx 1.0 m to 2.0 m

Other Significant Information: High possibility of fluctuating water table due to orange mottles being found throughout all soils.



**Job:** Green Hill Park; Hamilton

**Job Number:** 20413-S1

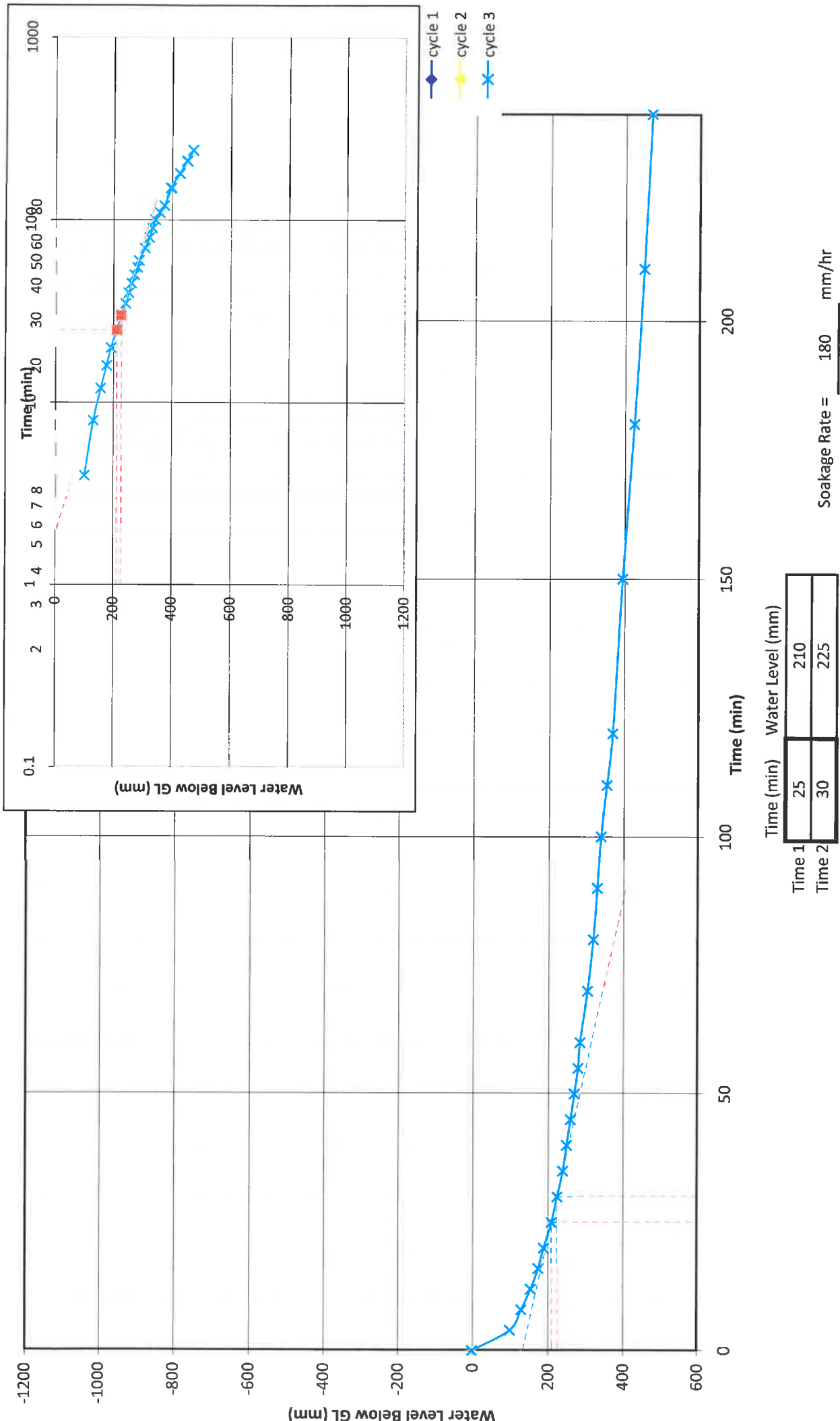
**Date:** 19/8/15

**Test Number:** 4

Time (min)			1st Cycle
0			0
4			100
8			130
12			155
16			175
20			190
25			210
30			225
35			240
40			250
45			260
50			270
55			280
60			285
70			305
80			320
90			330
100			340
110			355
120			370
150			395
180			425
210			450
240			470

Our Ref: 20413-S1  
Date: 19/8/15

Green Hill Park Subdivision - Stage 1; Hamilton  
Soakage Test Position # 4



## Soak Hole Notes:

Job #:	20413-S1
Test Location:	SH4 / Lot4
Date:	19/8/15
Tested By:	M.Bryant

Soak Hole Diameter:	150 mm
Soak Hole Depth:	950 mm
Water Table Depth:	1700mm

Cross If Applicable:	
4 hour preparation soak	<input checked="" type="checkbox"/>
hole refilled at 0.25 m above base	<input type="checkbox"/>
measurement Interval > 30 minutes	<input checked="" type="checkbox"/>
test continued for 4 hours	<input checked="" type="checkbox"/>
test continued until empty	<input type="checkbox"/>
test stopped 0.25 m above base	<input type="checkbox"/>

Weather Conditions 1-3 Days Prior To Test: Heavy rain from 12 hours until testing. Light showers on the previous day. Light to moderate winds, and moderate temperatures.

Weather Conditions On Day Of Test: Overcast with light winds. Moderate temperatures

Soil Conditions & Composition: Wet, orange brown silt for approx 1.0 m. Very sensitive white wet silt from approx 1.0 m to 2.0 m

Other Significant Information: High possibility of fluctuating water table due to orange mottles being found throughout all soils.

**Job:** Green Hill Park; Hamilton

**Job Number:** 20413-S1

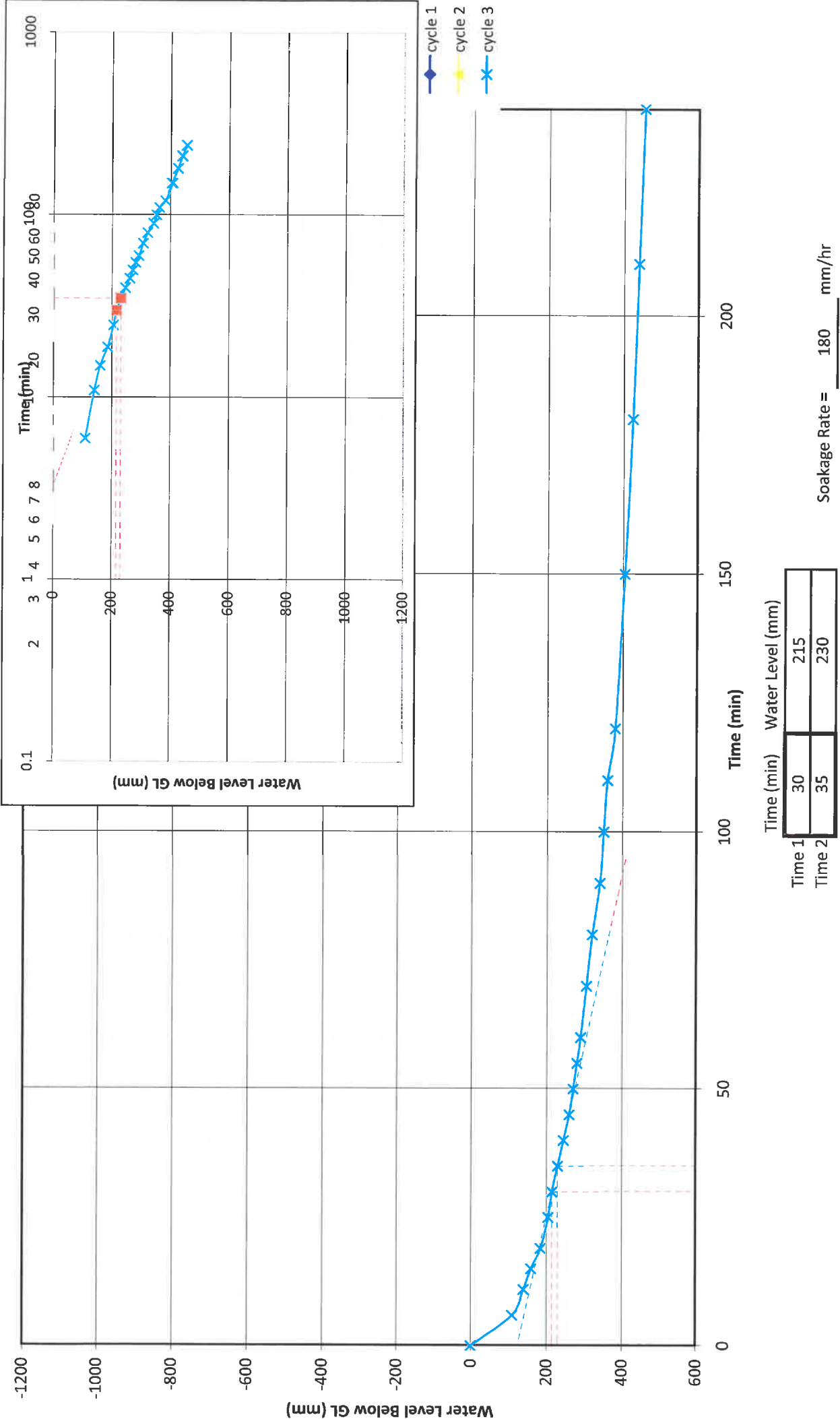
**Date:** 18/8/15

**Test Number:** 7

Time (min)			1st Cycle
0			0
6			110
11			140
15			160
19			185
25			205
30			215
35			230
40			245
45			260
50			270
55			280
60			290
70			305
80			320
90			340
100			350
110			360
120			380
150			405
180			425
210			440
240			455

Our Ref: 20413-S1  
Date: 18/8/15

Green Hill Park Subdivision - Stage 1; Hamilton  
Soakage Test Position # 7



## Soak Hole Notes:

Job #:	20413-S1
Test Location:	SH7 / Lot7
Date:	18/8/15
Tested By:	M.Bryant

Soak Hole Diameter:	150 mm
Soak Hole Depth:	1100 mm
Water Table Depth:	1500 mm

Cross If Applicable:	
4 hour preparation soak	<input checked="" type="checkbox"/>
hole refilled at 0.25 m above base	<input type="checkbox"/>
measurement Interval > 30 minutes	<input checked="" type="checkbox"/>
test continued for 4 hours	<input checked="" type="checkbox"/>
test continued until empty	<input type="checkbox"/>
test stopped 0.25 m above base	<input type="checkbox"/>

Weather Conditions 1-3 Days Prior To Test: No rain up to three days prior to test. Overcast days, moderate winds, and moderate temperatures.

Weather Conditions On Day Of Test: Overcast with light winds. Some light showers in the afternoon. Moderate to warm temperatures.

Soil Conditions & Composition: Wet, orange brown silt for approx 1.0 m. Very sensitive white wet silt from approx 1.0 m to 2.0 m

Other Significant Information: High possibility of fluctuating water table due to orange mottles being found throughout all soils.

**Job:** Green Hill Park; Hamilton

**Job Number:** 20413-S1

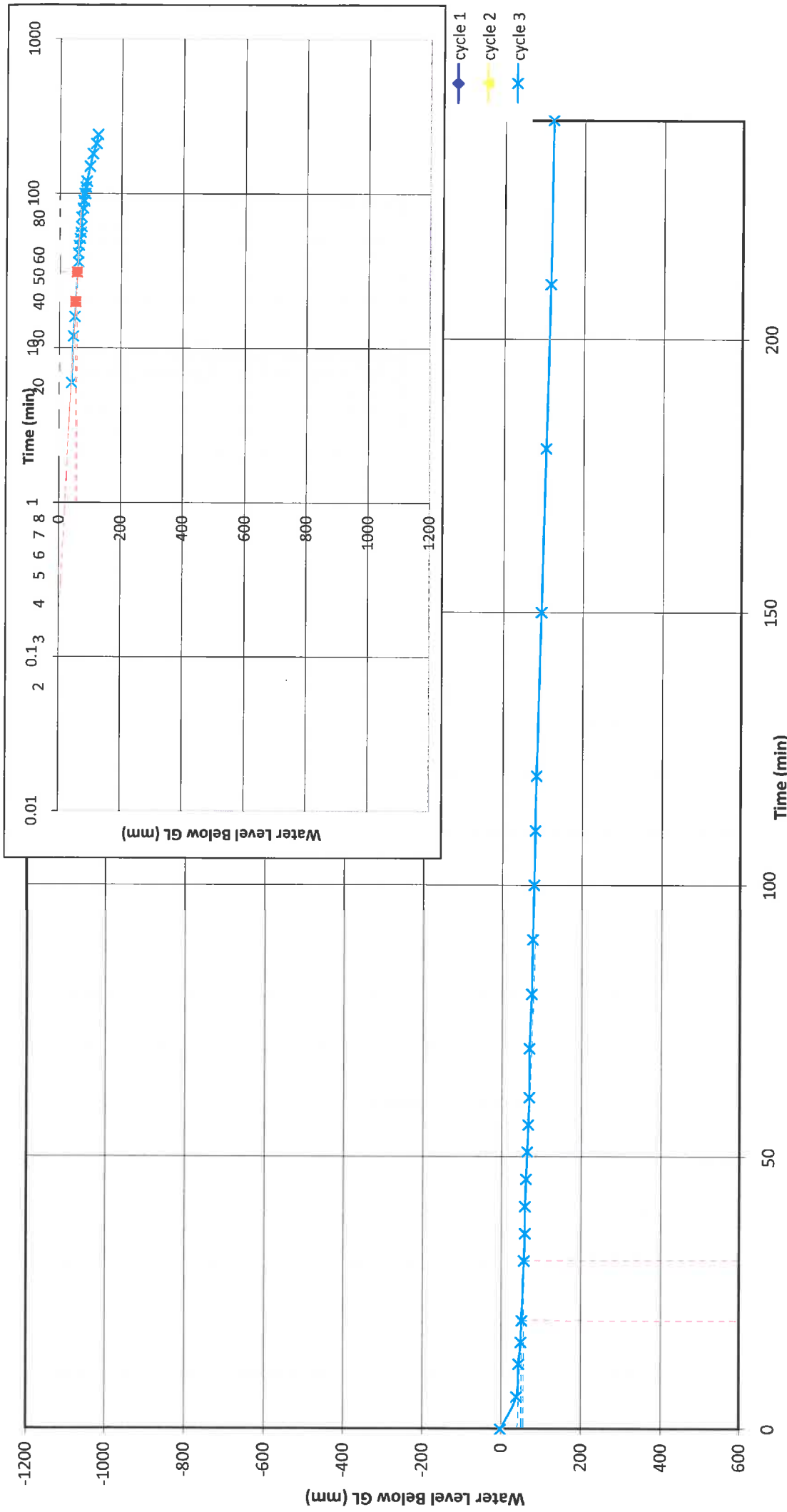
**Date:** 18/8/15

**Test Number:** 10

Time (min)			1st Cycle
0			0
6			40
12			45
16			50
20			52.5
31			57.5
36			60
41			60
46			62.5
51			65
56			67.5
61			70
70			70
80			75
90			77.5
100			80
110			82.5
120			85
150			95
180			105
210			115
240			120

Our Ref: 20413-S1  
Date: 18/8/15

Green Hill Park Subdivision - Stage 1; Hamilton  
Soakage Test Position # 10



Time (min)		Water Level (mm)	
Time 1	20	52.5	
Time 2	31	57.5	

Soakage Rate = 27 mm/hr



## Soak Hole Notes:

Job #:	20413-S1
Test Location:	SH10 / Lot10
Date:	18/8/15
Tested By:	M.Bryant

Soak Hole Diameter:	150 mm
Soak Hole Depth:	700 mm
Water Table Depth:	1400 mm

Cross If Applicable:	
4 hour preparation soak	<input checked="" type="checkbox"/>
hole refilled at 0.25 m above base	<input type="checkbox"/>
measurement Interval > 30 minutes	<input checked="" type="checkbox"/>
test continued for 4 hours	<input checked="" type="checkbox"/>
test continued until empty	<input type="checkbox"/>
test stopped 0.25 m above base	<input type="checkbox"/>

Weather Conditions 1-3 Days Prior To Test: No rain up to three days prior to test. Overcast days, moderate winds, and moderate temperatures.

Weather Conditions On Day Of Test: Overcast with light winds. Some light showers in the afternoon. Moderate to warm temperatures.

Soil Conditions & Composition: Wet, orange brown silt for approx 1.0 m. Very sensitive white wet silt from approx 1.0 m to 2.0 m

Other Significant Information: High possibility of fluctuating water table due to orange mottles being found throughout all soils.

**Job:** Green Hill Park; Hamilton

**Job Number:** 20413-S1

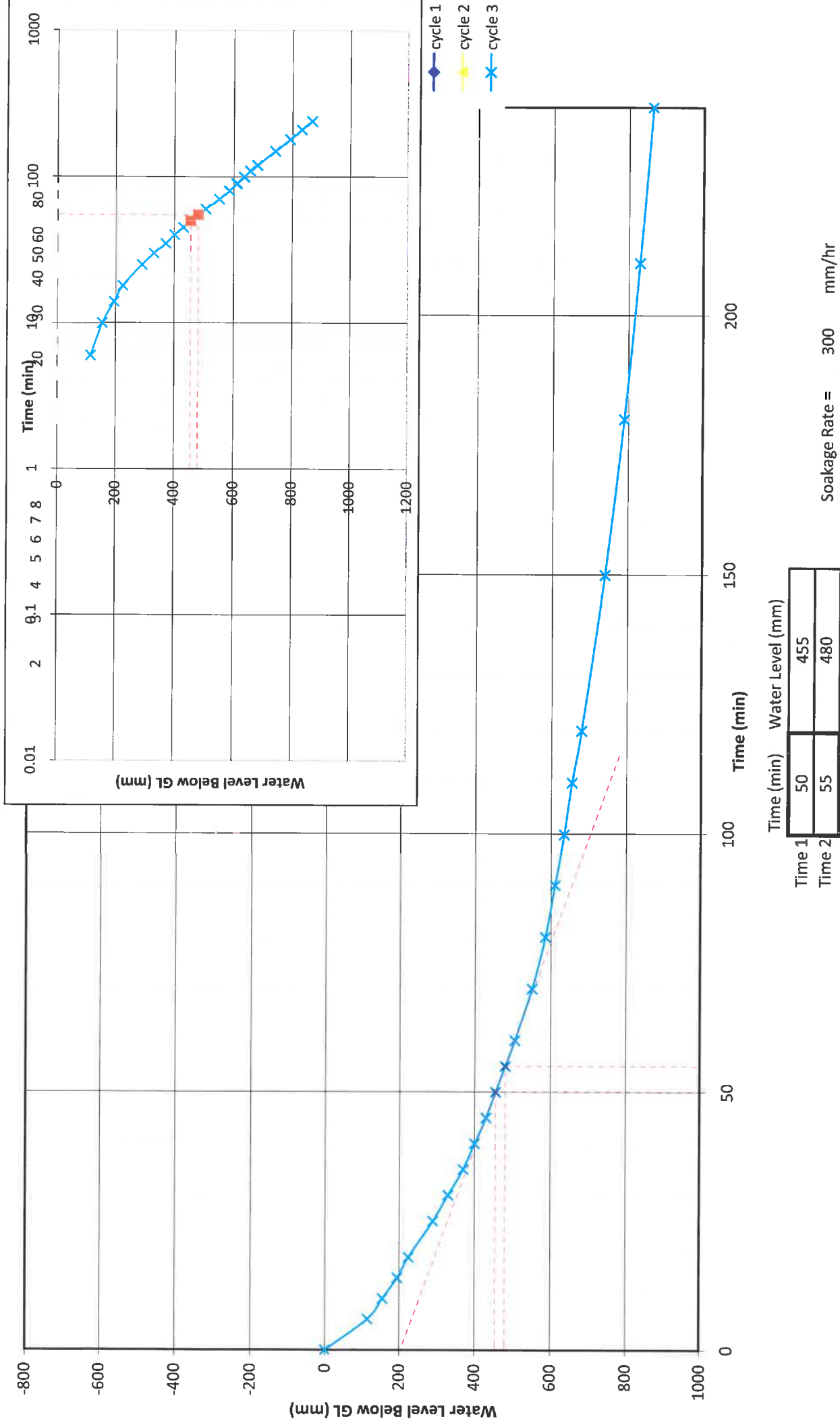
**Date:** 18/8/15

**Test Number:** 13

Time (min)			1st Cycle
0			0
6			115
10			155
14			195
18			225
25			290
30			330
35			370
40			400
45			430
50			455
55			480
60			505
70			550
80			585
90			610
100			635
110			655
120			680
150			740
180			790
210			830
240			865

Our Ref: 20413-S1  
Date: 18/8/15

# Green Hill Park Subdivision - Stage 1; Hamilton Soakage Test Position # 13



## **Soak Hole Notes:**

Job #:	20413-S1
Test Location:	SH13 / Lot13
Date:	18/8/15
Tested By:	M.Bryant

Soak Hole Diameter:	150 mm
Soak Hole Depth:	1100 mm
Water Table Depth:	1400 mm

Cross If Applicable:	
4 hour preparation soak	<input checked="" type="checkbox"/>
hole refilled at 0.25 m above base	<input type="checkbox"/>
measurement Interval > 30 minutes	<input checked="" type="checkbox"/>
test continued for 4 hours	<input checked="" type="checkbox"/>
test continued until empty	<input type="checkbox"/>
test stopped 0.25 m above base	<input type="checkbox"/>

**Weather Conditions 1-3 Days Prior To Test:** No rain up to three days prior to test. Overcast days, moderate winds, and moderate temperatures.

**Weather Conditions On Day Of Test:** Overcast with light winds. Some light showers in the afternoon. Moderate to warm temperatures.

**Soil Conditions & Composition:** Wet, orange brown silt for approx 1.0 m. Very sensitive white wet silt from approx 1.0 m to 2.0 m

**Other Significant Information:** High possibility of fluctuating water table due to orange mottles being found throughout all soils.

Job: Green Hill Park, Hamilton

Job Number: 20413-S1

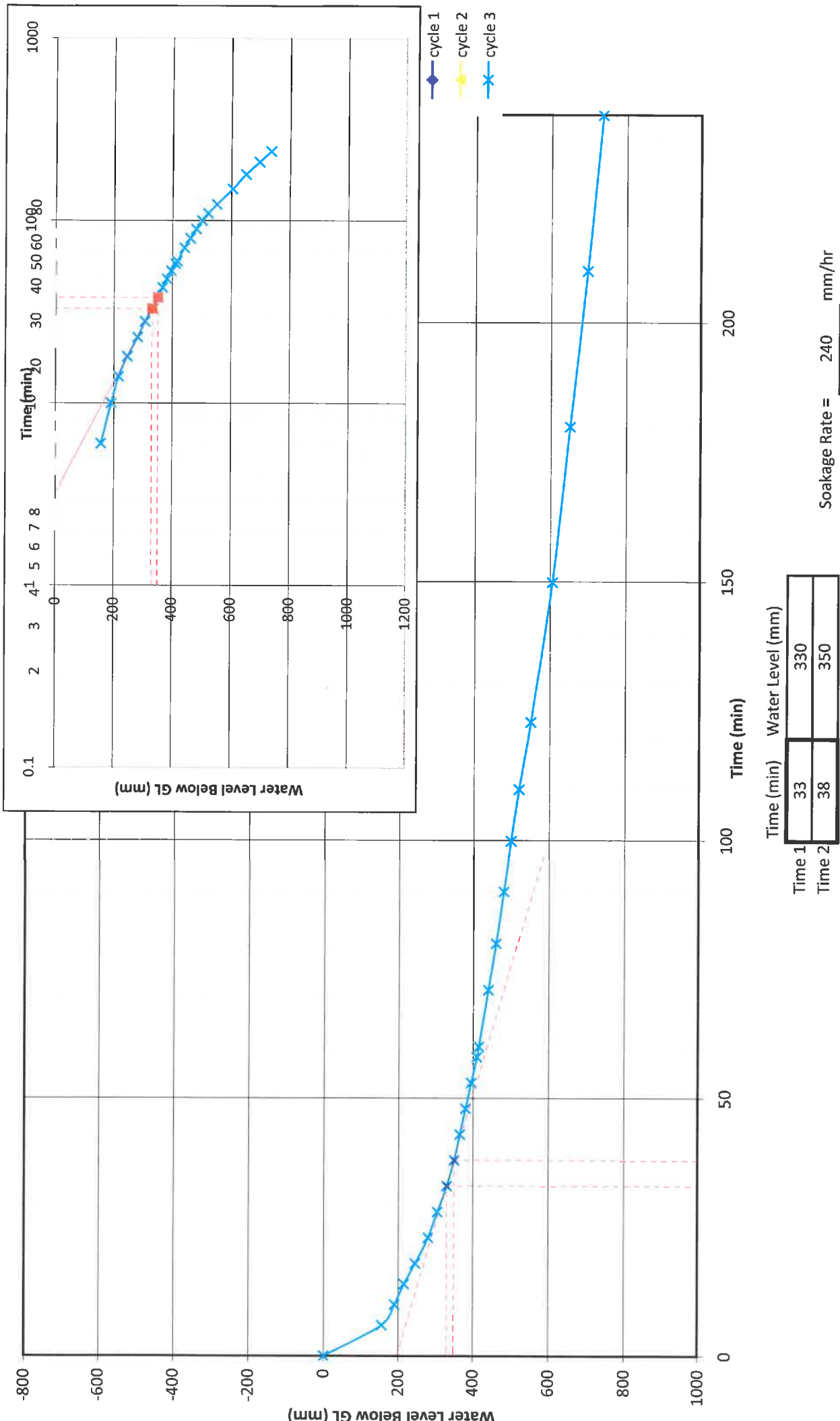
Date: 28/8/15

Test Number: 16

Time (min)			1st Cycle
0			0
6			155
10			190
14			215
18			245
23			280
28			305
33			330
38			350
43			365
48			380
53			395
58			410
60			415
71			440
80			460
90			480
100			500
110			520
123			550
150			605
180			650
210			695
240			735

Our Ref: 20413-S1  
Date: 28/8/15

Green Hill Park Subdivision - Stage 1; Hamilton  
Soakage Test Position # 16



## **Soak Hole Notes:**

Job #:	20413-S1
Test Location:	SH16 / Lot16
Date:	28/8/15
Tested By:	M.Bryant

Soak Hole Diameter:	150 mm
Soak Hole Depth:	1680 mm
Water Table Depth:	below 2.0 m

Cross If Applicable:	
4 hour preparation soak	
hole refilled at 0.25 m above base	
measurement interval > 30 minutes	<input checked="" type="checkbox"/>
test continued for 4 hours	<input checked="" type="checkbox"/>
test continued until empty	
test stopped 0.25 m above base	

Weather Conditions 1-3 Days Prior To Test: Overcast and sunny days with light winds. Moderate to warm temperatures

Weather Conditions On Day Of Test: Sunny with overcast periods. Little to no wind with warm temperatures

Soil Conditions & Composition: Small amount of topsoil then a very sensitive, wet white silt to the bottom of the hole

Other Significant Information: High possibility of fluctuating water table due to orange mottles being found throughout all soils.

**Job:** Green Hill Park; Hamilton

**Job Number:** 20413-S1

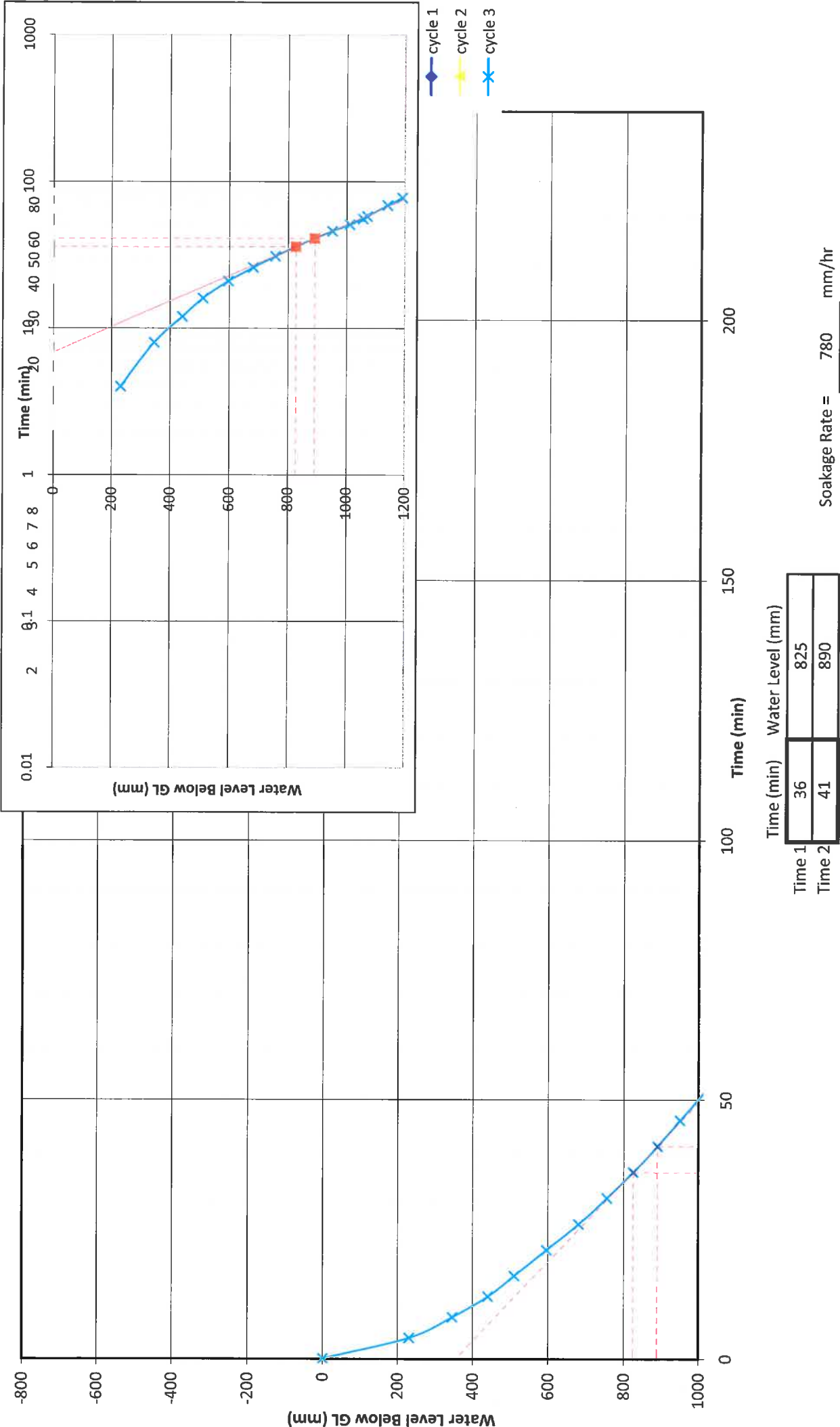
**Date:** 28/8/15

**Test Number:** 19

Time (min)			1st Cycle
0			0
4			230
8			345
12			440
16			510
21			595
26			680
31			755
36			825
41			890
46			950
51			1010
56			1055
58			1070
69			1140
78			1190



Green Hill Park Subdivision - Stage 1; Hamilton  
Soakage Test Position # 19



## Soak Hole Notes:

Job #:	20413-S1
Test Location:	SH19 / Lot19
Date:	28/8/15
Tested By:	M.Bryant

Soak Hole Diameter:	150 mm
Soak Hole Depth:	1420 mm
Water Table Depth:	below 2.0 m

Cross If Applicable:	
4 hour preparation soak	<input type="checkbox"/>
hole refilled at 0.25 m above base	<input type="checkbox"/>
measurement Interval > 30 minutes	<input checked="" type="checkbox"/>
test continued for 4 hours	<input type="checkbox"/>
test continued until empty	<input type="checkbox"/>
test stopped 0.25 m above base	<input checked="" type="checkbox"/>

Weather Conditions 1-3 Days Prior To Test: Overcast and sunny days with light winds. Moderate to warm temperatures

Weather Conditions On Day Of Test: Sunny with overcast periods. Little to no wind with warm temperatures

Soil Conditions & Composition: For approx the first 1.0 m was an orange brown Silt. From approx 1.0 m becomes a reddish orange and grey silty sand. The sand grains were moderate to coarse. All soils were wet but not saturated.

Other Significant Information: High possibility of fluctuating water table due to orange mottles being found throughout all soils.

**Job:** Green Hill Park, Hamilton

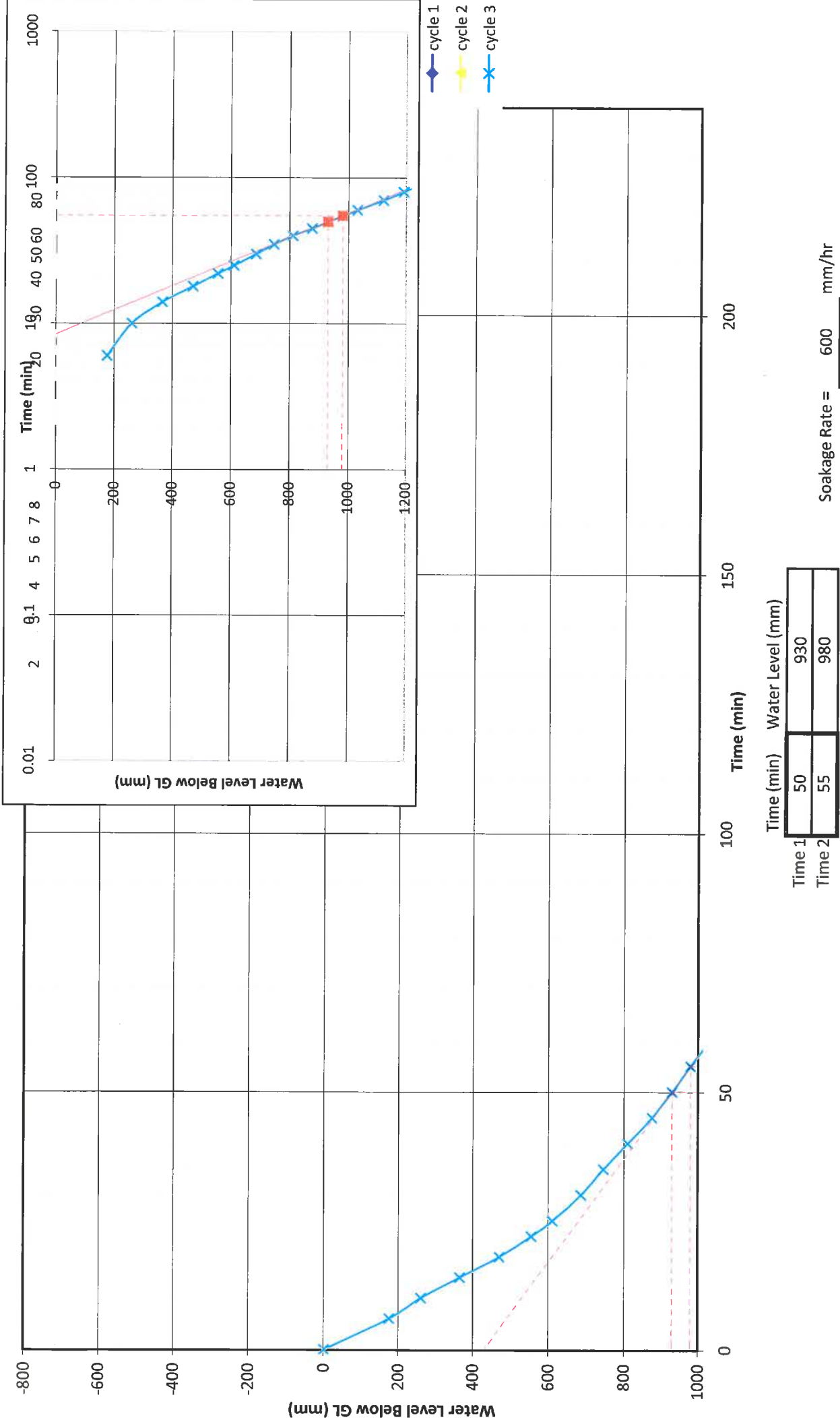
**Job Number:** 20413-S1

**Date:** 28/8/15

**Test Number:** 22

Time (min)			1st Cycle
0			0
6			175
10			260
14			365
18			470
22			555
25			610
30			685
35			745
40			810
45			875
50			930
55			980
60			1030
70			1120
80			1190
90			1245
100			1290

Green Hill Park Subdivision - Stage 1; Hamilton  
Soakage Test Position # 22



## **Soak Hole Notes:**

Job #:	20413-S1
Test Location:	SH22 / Lot22
Date:	28/8/15
Tested By:	M.Bryant

Soak Hole Diameter:	150 mm
Soak Hole Depth:	1520 mm
Water Table Depth:	below 2.0 m

Cross If Applicable:	
4 hour preparation soak	<input type="checkbox"/>
hole refilled at 0.25 m above base	<input type="checkbox"/>
measurement Interval > 30 minutes	<input checked="" type="checkbox"/>
test continued for 4 hours	<input type="checkbox"/>
test continued until empty	<input type="checkbox"/>
test stopped 0.25 m above base	<input checked="" type="checkbox"/>

Weather Conditions 1-3 Days Prior To Test: Overcast and sunny days with light winds. Moderate to warm temperatures

Weather Conditions On Day Of Test: Sunny with overcast periods. Little to no wind with warm temperatures

Soil Conditions & Composition: Greyish brown, moderate to coarse grained sands were found from below the topsoil to the base of the soak hole. All soils were wet but not saturated.

Other Significant Information: High possibility of fluctuating water table due to orange mottles being found throughout all soils.

**Job:** Green Hill Park; Hamilton

**Job Number:** 20413-S1

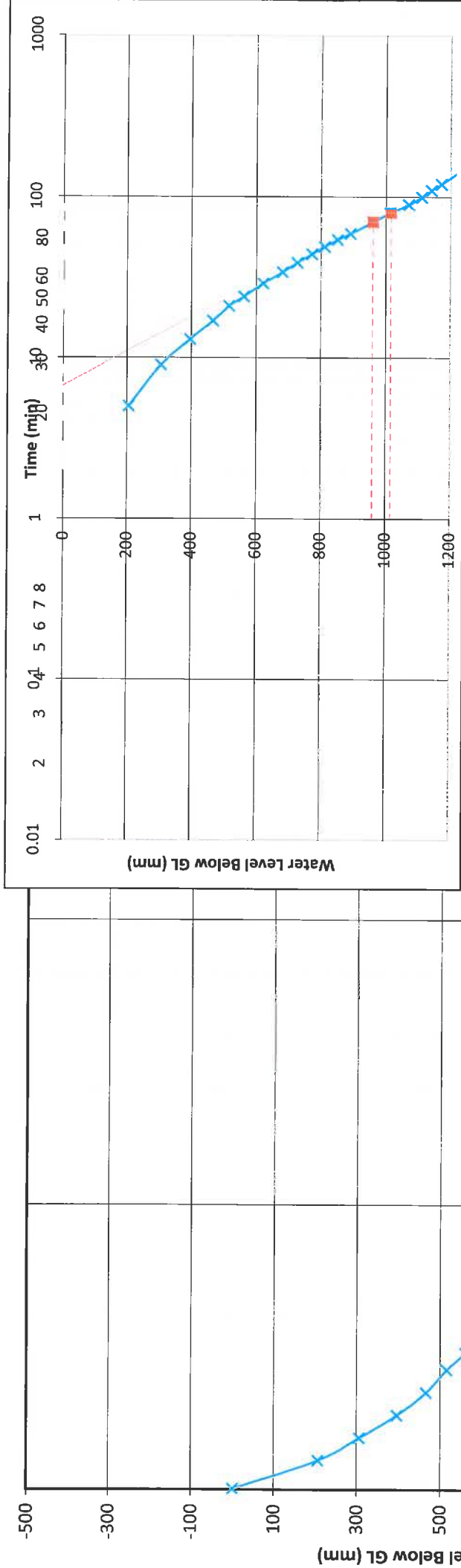
**Date:** 28/8/15

**Test Number:** 25

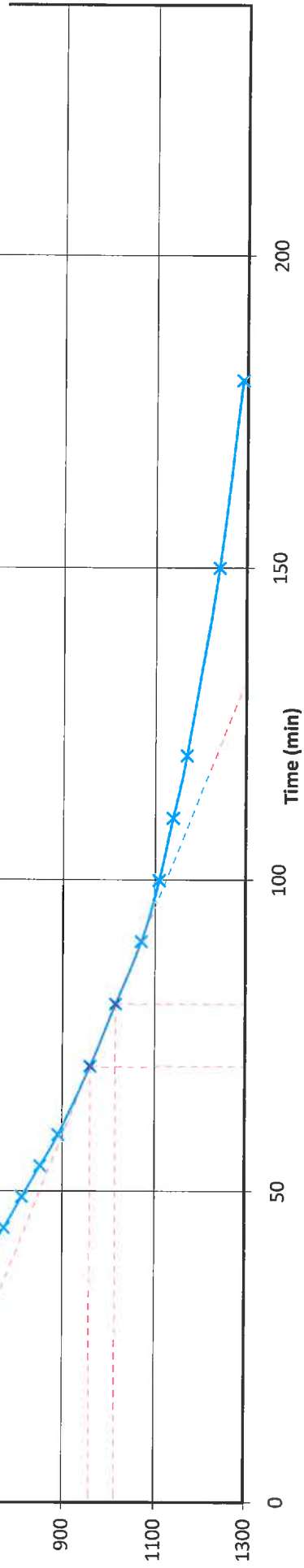
Time (min)			1st Cycle
0			0
5			205
9			305
13			395
17			465
21			515
24			560
29			620
34			680
39			725
44			770
49			810
54			850
59			890
70			960
80			1015
90			1070
100			1110
110			1140
120			1170
150			1240
180			1290

Our Ref: 20413-S1  
Date: 28/8/15

Green Hill Park Subdivision - Stage 1; Hamilton  
Soakage Test Position # 25



- cycle 1
- cycle 2
- cycle 3



Time (min) Water Level (mm)

Time 1	70	960
Time 2	80	1015

Soakage Rate = 330 mm/hr

## Soak Hole Notes:

Job #:	20413-S1
Test Location:	SH25 / Lot25
Date:	28/8/15
Tested By:	M.Bryant

Soak Hole Diameter:	150 mm
Soak Hole Depth:	1510 mm
Water Table Depth:	below 2.0 m

Cross If Applicable:	
4 hour preparation soak	<input type="checkbox"/>
hole refilled at 0.25 m above base	<input type="checkbox"/>
measurement Interval > 30 minutes	<input checked="" type="checkbox"/>
test continued for 4 hours	<input type="checkbox"/>
test continued until empty	<input type="checkbox"/>
test stopped 0.25 m above base	<input checked="" type="checkbox"/>

Weather Conditions 1-3 Days Prior To Test: Overcast and sunny days with light winds. Moderate to warm temperatures

Weather Conditions On Day Of Test: Sunny with overcast periods. Little to no wind with warm temperatures

Soil Conditions & Composition: From below the topsoil an orange brown wet silt was found for approx the first 1.0 m. a light brown coarse grained sand was found below approx 1.0 m. All soils were wet but not saturated.

Other Significant Information: High possibility of fluctuating water table due to orange mottles being found throughout all soils.



**Job:** Green Hill Park; Hamilton

**Job Number:** 20413-S1

**Date:** 28/8/15

**Test Number:** 27

Time (min)			1st Cycle
0			0
4			115
8			195
12			265
16			345
20			420
23			470
28			545
33			615
38			680
43			735
48			785
53			830
58			865
70			940
80			1000
90			1050
100			1100
110			1130
120			1170
150			1255
180			1325
210			1375
240			1405

Our Ref: 20413-S1

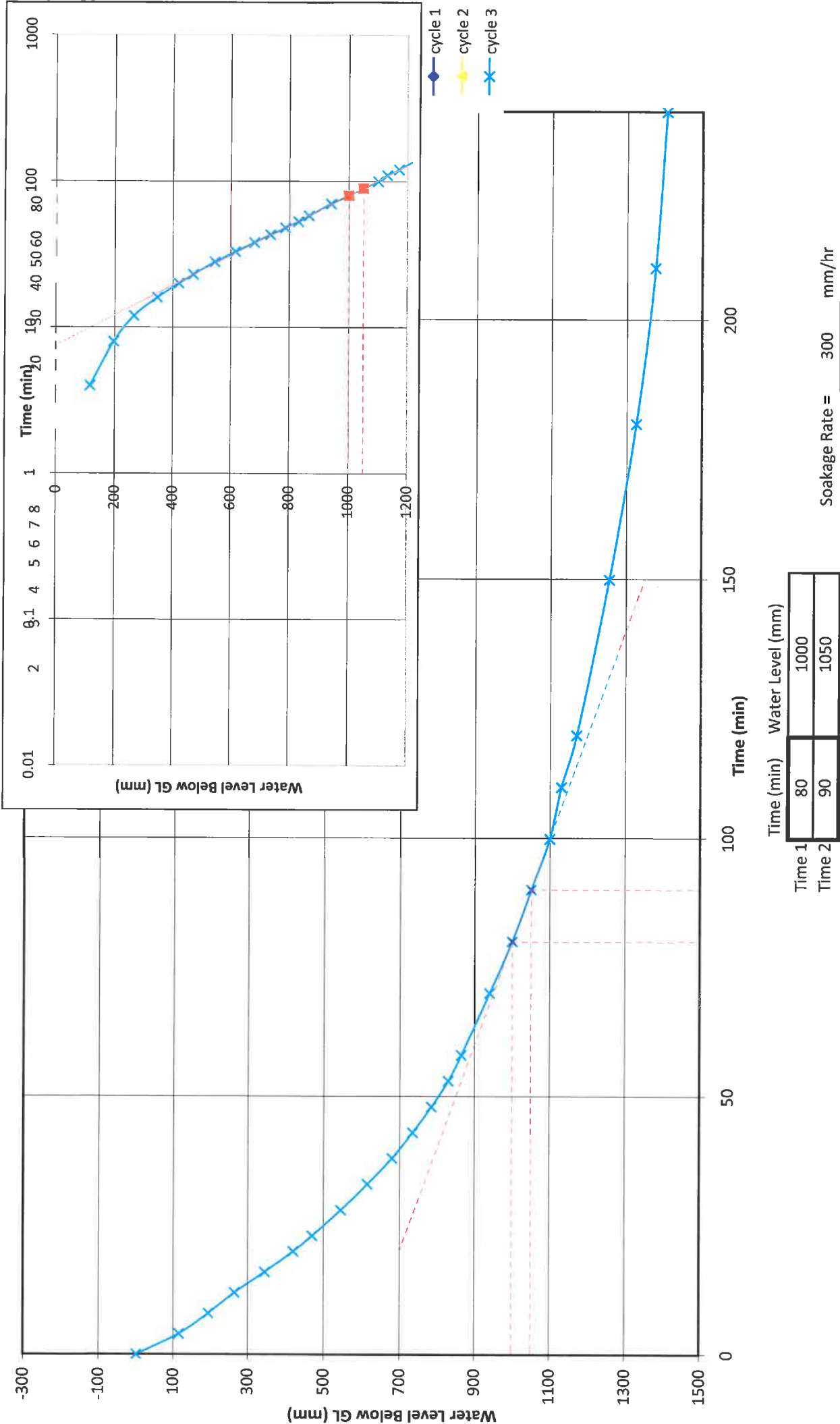
Date: 28/8/15

## Green Hill Park Subdivision - Stage 1; Hamilton

### Soakage Test Position # 27



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## Soak Hole Notes:

Job #:	20413-S1
Test Location:	SH27 / Lot27
Date:	28/8/15
Tested By:	M.Bryant

Soak Hole Diameter:	150 mm
Soak Hole Depth:	1670 mm
Water Table Depth:	1.8 m

Cross If Applicable:	
4 hour preparation soak	
hole refilled at 0.25 m above base	
measurement Interval > 30 minutes	X
test continued for 4 hours	X
test continued until empty	
test stopped 0.25 m above base	

Weather Conditions 1-3 Days Prior To Test: Overcast and sunny days with light winds. Moderate to warm temperatures

Weather Conditions On Day Of Test: Sunny with overcast periods. Little to no wind with warm temperatures

Soil Conditions & Composition: From below the topsoil an orange brown wet silt was found for approx the first 1.0 m. a light brown coarse grained sand was found below approx 1.0 m. All soils were wet but not saturated.

Other Significant Information: High possibility of fluctuating water table due to orange mottles being found throughout all soils.

**Job:** Green Hill Park, Hamilton

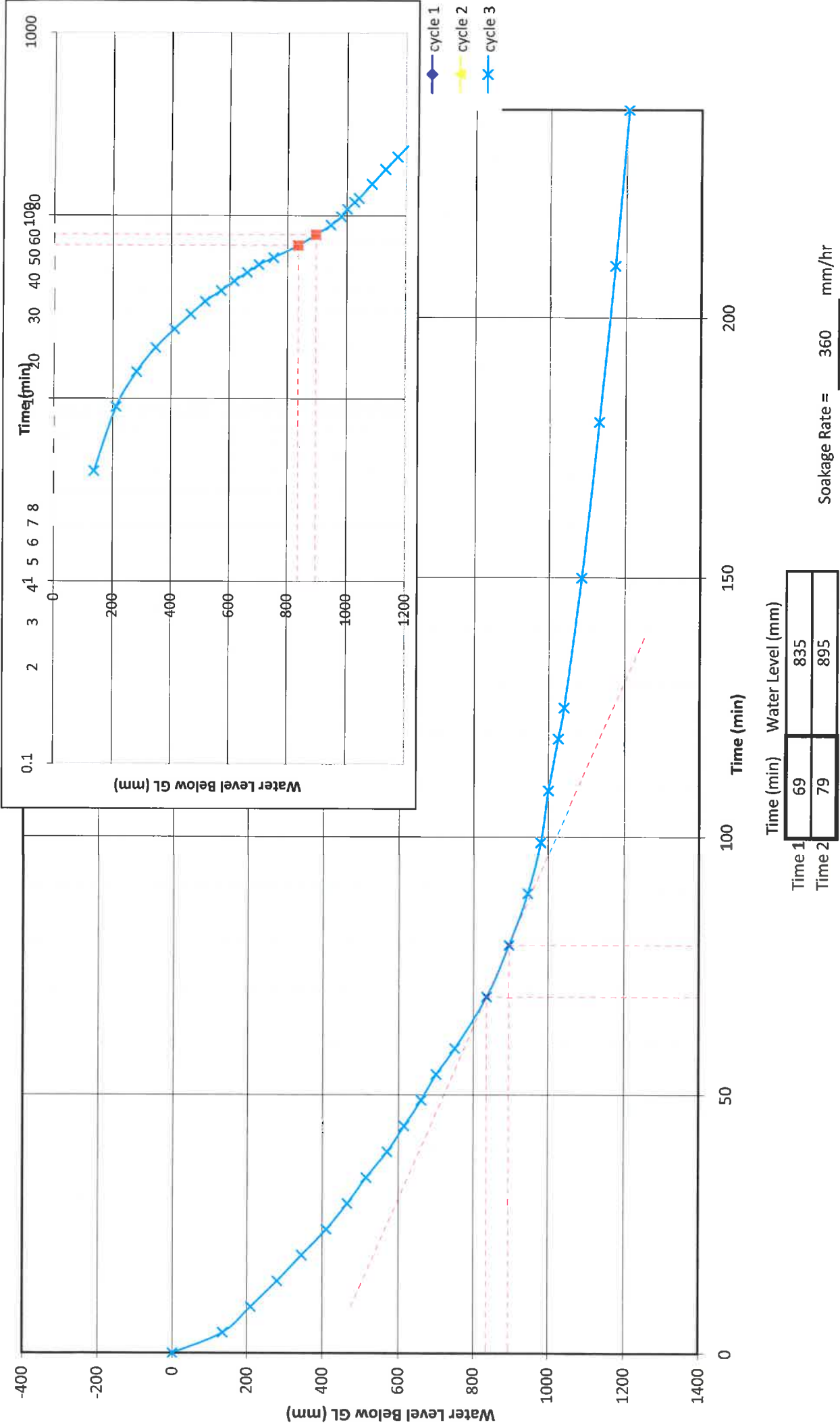
**Job Number:** 20413-S1

**Date:** 27/8/15

**Test Number:** 31

Time (min)			1st Cycle
0			0
4			135
9			210
14			280
19			345
24			410
29			465
34			515
39			570
44			615
49			660
54			700
59			750
69			835
79			895
89			945
99			980
109			1000
119			1025
125			1040
150			1085
180			1130
210			1170
240			1205

Green Hill Park Subdivision - Stage 1; Hamilton  
Soakage Test Position # 31



## Soak Hole Notes:

Job #:	20413-S1
Test Location:	SH31 / Lot31
Date:	27/8/15
Tested By:	M.Bryant

Soak Hole Diameter:	150 mm
Soak Hole Depth:	1450 mm
Water Table Depth:	1.4 m

Cross If Applicable:	
4 hour preparation soak	
hole refilled at 0.25 m above base	
measurement Interval > 30 minutes	X
test continued for 4 hours	X
test continued until empty	
test stopped 0.25 m above base	

Weather Conditions 1-3 Days Prior To Test: Overcast and sunny days with light winds. Moderate to warm temperatures

Weather Conditions On Day Of Test: Sunny with overcast periods. Little to no wind with warm temperatures

Soil Conditions & Composition: Only a reddish brown / orange brown clayey silt was found. Wet from the surface until 1.4 m then become saturated (water table).

Other Significant Information: High possibility of fluctuating water table due to orange mottles being found throughout all soils.

**Job:** Green Hill Park, Hamilton

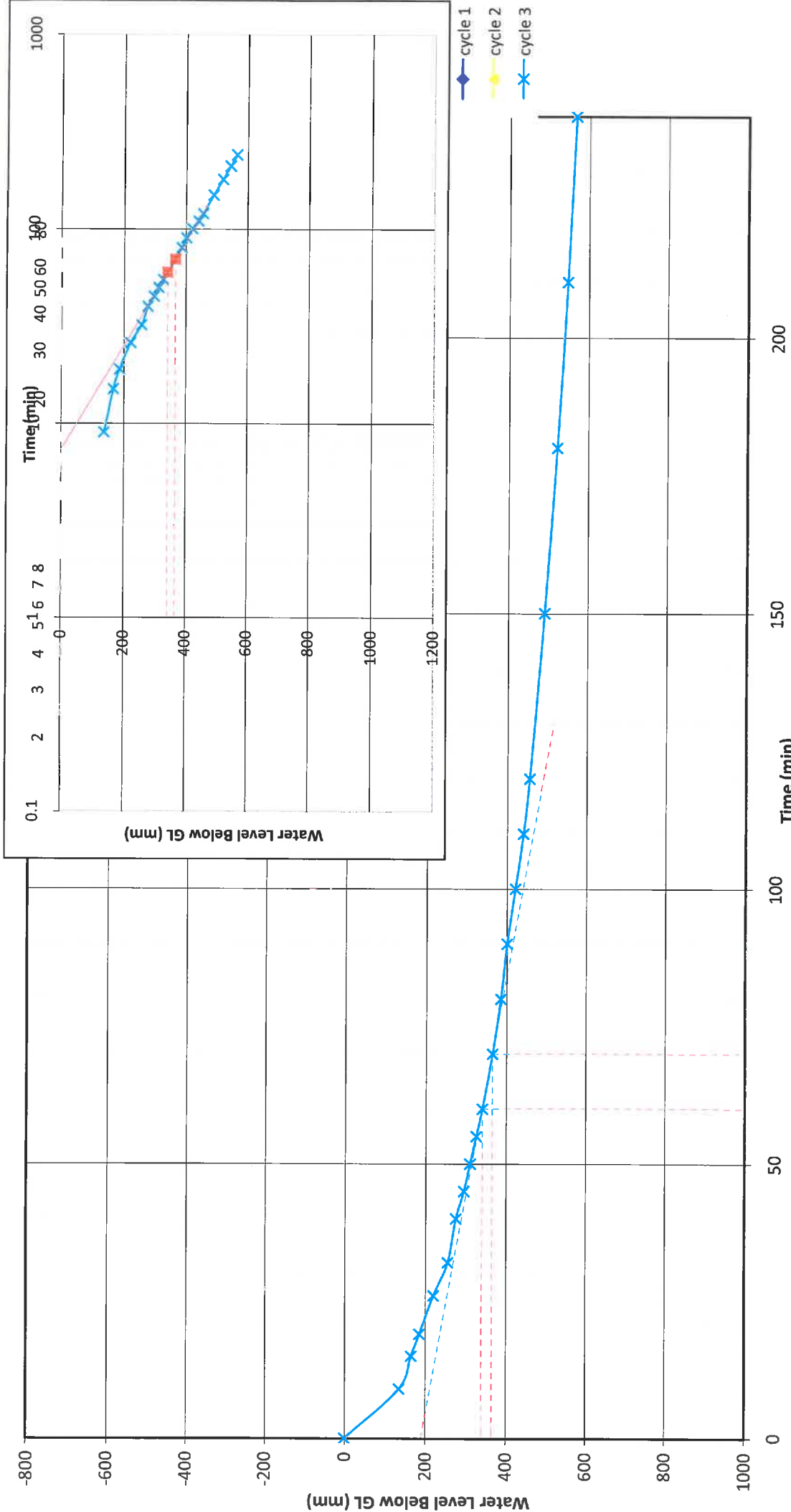
**Job Number:** 20413-S1

**Date:** 27/8/15

**Test Number:** 34

Time (min)			1st Cycle
0			0
9			135
15			165
19			185
26			220
32			255
40			275
45			295
50			310
55			325
60			340
70			365
80			385
90			400
100			420
110			440
120			455
150			490
180			520
210			545
240			565

Green Hill Park Subdivision - Stage 1; Hamilton  
Soakage Test Position # 34



Time (min) Water Level (mm)

Time 1	60	340
Time 2	70	365

Soakage Rate = 150 mm/hr



## Soak Hole Notes:

Job #:	20413-S1
Test Location:	SH34 / Lot34
Date:	27/8/15
Tested By:	M.Bryant

Soak Hole Diameter:	150 mm
Soak Hole Depth:	1020 mm
Water Table Depth:	1.2 m

Cross If Applicable:	
4 hour preparation soak	<input type="checkbox"/>
hole refilled at 0.25 m above base	<input type="checkbox"/>
measurement Interval > 30 minutes	<input checked="" type="checkbox"/>
test continued for 4 hours	<input checked="" type="checkbox"/>
test continued until empty	<input type="checkbox"/>
test stopped 0.25 m above base	<input type="checkbox"/>

Weather Conditions 1-3 Days Prior To Test: Overcast and sunny days with light winds. Moderate to warm temperatures

Weather Conditions On Day Of Test: Sunny with overcast periods. Little to no wind with warm temperatures

Soil Conditions & Composition: Only a white very sensitive silt was found. Wet from the surface to 1.2 m then became saturated and the hole began to collapse (water table).

Other Significant Information: High possibility of fluctuating water table due to orange mottles being found throughout all soils.

**Job:** Green Hill Park; Hamilton

**Job Number:** 20413-S1

**Date:** 27/8/15

**Test Number:** 37

Time (min)			1st Cycle
0			180
9			280
14			345
19			395
24			470
33			580
38			625
43			665
48			710
53			755
58			790
68			870
78			940
88			995
98			1055
108			1110
118			1150
148			1265

Our Ref: 20413-S1

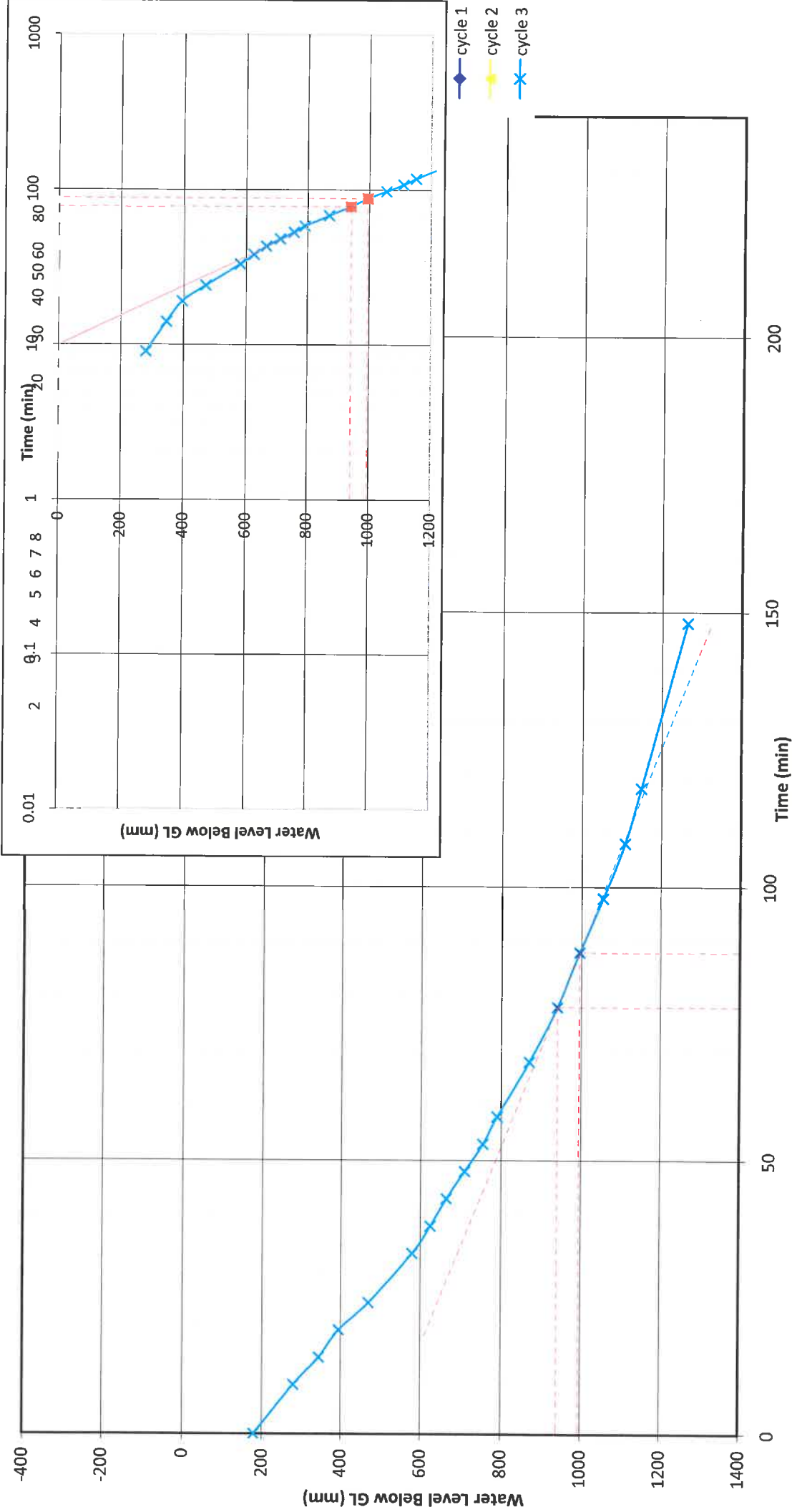
Date: 27/8/15

## Green Hill Park Subdivision - Stage 1; Hamilton

### Soakage Test Position # 37



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Time (min) Water Level (mm)

Time 1

78

940

Time 2

88

995

Soakage Rate = 330 mm/hr

## Soak Hole Notes:

Job #:	20413-S1
Test Location:	SH37 / Lot37
Date:	27/8/15
Tested By:	M.Bryant

Soak Hole Diameter:	150 mm
Soak Hole Depth:	1480 mm
Water Table Depth:	1.4 m

Cross If Applicable:	
4 hour preparation soak	<input type="checkbox"/>
hole refilled at 0.25 m above base	<input type="checkbox"/>
measurement Interval > 30 minutes	<input checked="" type="checkbox"/>
test continued for 4 hours	<input type="checkbox"/>
test continued until empty	<input type="checkbox"/>
test stopped 0.25 m above base	<input checked="" type="checkbox"/>

Weather Conditions 1-3 Days Prior To Test: Overcast and sunny days with light winds. Moderate to warm temperatures

Weather Conditions On Day Of Test: Sunny with overcast periods. Little to no wind with warm temperatures

Soil Conditions & Composition: Only a light yellow sensitive silt was found. Wet from the surface until 1.4 m then became saturated (water table)

Other Significant Information: High possibility of fluctuating water table due to orange mottles being found throughout all soils.

Job: Green Hill Park; Hamilton

Job Number: 20413-S1

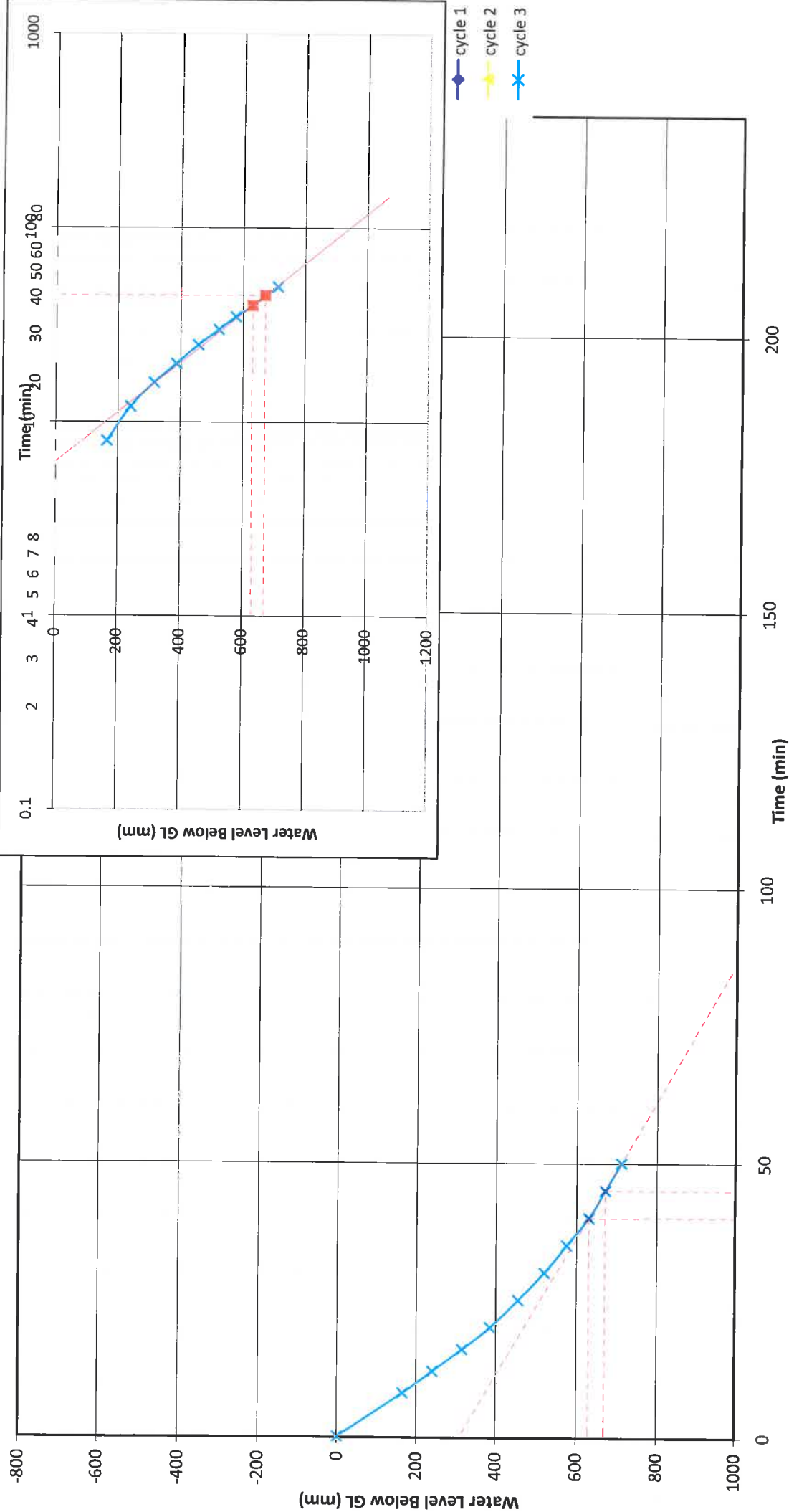
Date: 28/8/15

Test Number: 40

Time (min)			1st Cycle
0			0
8			165
12			240
16			315
20			385
25			455
30			520
35			575
40			630
45			670
50			710

Our Ref: 20413-S1  
Date: 28/8/15

Green Hill Park Subdivision - Stage 1; Hamilton  
Soakage Test Position # 40



Time (min) Water Level (mm)

Time 1	40	630
Time 2	45	670

Soakage Rate = 480 mm/hr

## Soak Hole Notes:

Job #:	20413-S1
Test Location:	SH40 / Lot40
Date:	28/8/15
Tested By:	M.Bryant

Soak Hole Diameter:	150 mm
Soak Hole Depth:	950 mm
Water Table Depth:	1.4 m

Cross If Applicable:	
4 hour preparation soak	
hole refilled at 0.25 m above base	
measurement Interval > 30 minutes	X
test continued for 4 hours	
test continued until empty	
test stopped 0.25 m above base	X

Weather Conditions 1-3 Days Prior To Test: Overcast and sunny days with light winds. Moderate to warm temperatures

Weather Conditions On Day Of Test: Sunny with overcast periods. Little to no wind with warm temperatures

Soil Conditions & Composition: White sensitive wet silt from the base of the topsoil to approx 1.0 m. from approx 1.0 m to bottom on soak hole was a light brown, wet, silty, moderate to coarse grained sand. The soils became saturated and the hole began to collapse from 1.4 m.

Other Significant Information: High possibility of fluctuating water table due to orange mottles being found throughout all soils.

**Job:** Green Hill Park, Hamilton

**Job Number:** 20413-S1

**Date:** 27/8/15

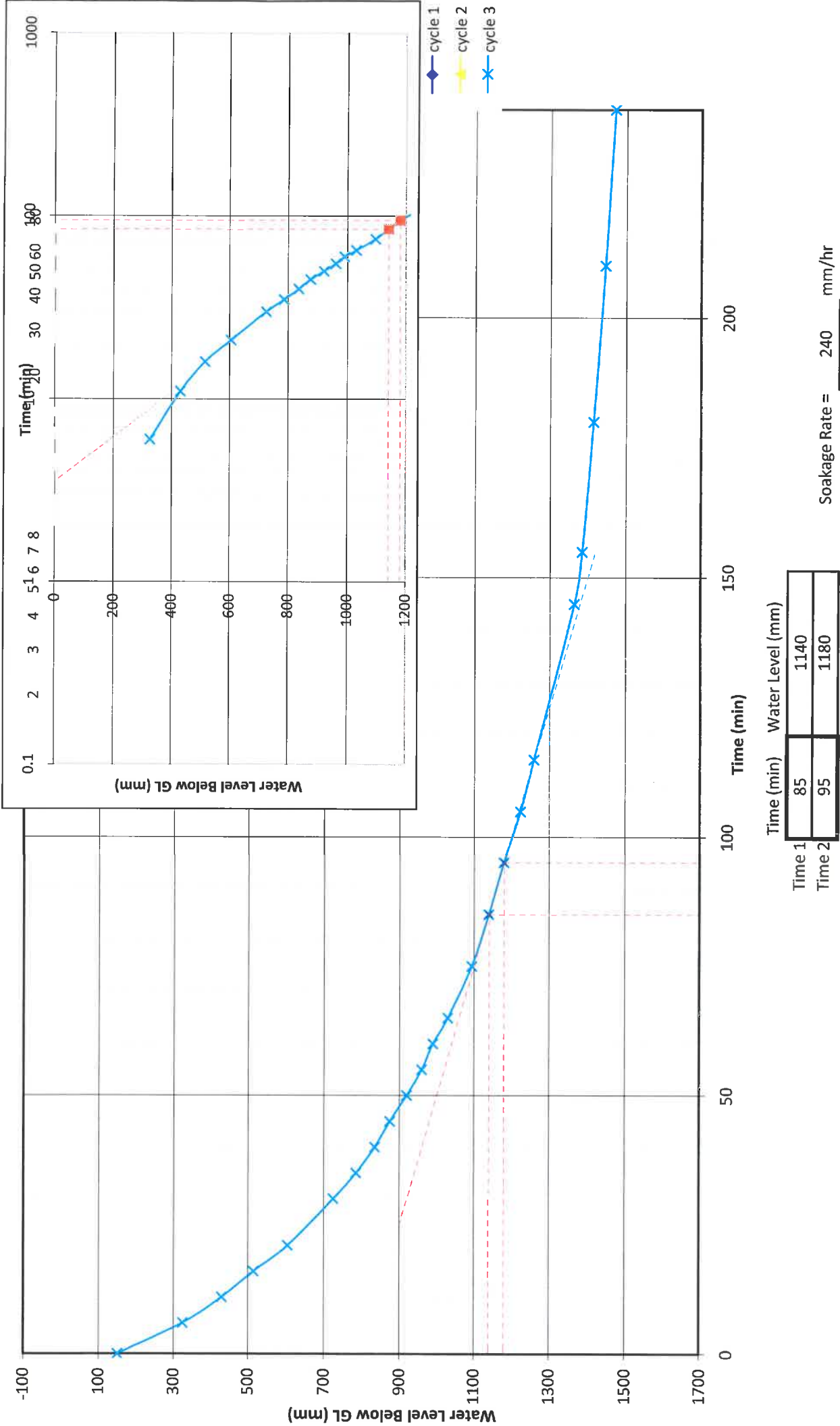
**Test Number:** 43

Time (min)			1st Cycle
0			150
6			325
11			430
16			515
21			605
30			725
35			785
40			835
45			875
50			920
55			960
60			990
65			1030
75			1095
85			1140
95			1180
105			1225
115			1260
145			1365
155			1385
180			1415
210			1445
240			1470



Our Ref: 20413-S1  
Date: 27/8/15

Green Hill Park Subdivision - Stage 1; Hamilton  
Soakage Test Position # 43



## **Soak Hole Notes:**

Job #:	20413-S1
Test Location:	SH43 / Lot43
Date:	27/8/15
Tested By:	M.Bryant

Soak Hole Diameter:	150 mm
Soak Hole Depth:	1920 mm
Water Table Depth:	below 2.0 m

Cross If Applicable:	
4 hour preparation soak	<input type="checkbox"/>
hole refilled at 0.25 m above base	<input type="checkbox"/>
measurement Interval > 30 minutes	<input checked="" type="checkbox"/>
test continued for 4 hours	<input checked="" type="checkbox"/>
test continued until empty	<input type="checkbox"/>
test stopped 0.25 m above base	<input type="checkbox"/>

Weather Conditions 1-3 Days Prior To Test: Overcast and sunny days with light winds. Moderate to warm temperatures

Weather Conditions On Day Of Test: Sunny with overcast periods. Little to no wind with warm temperatures

Soil Conditions & Composition: From below the topsoil an orange brown wet silt was found for approx the first 1.0 m. a light brown coarse grained sand was found below approx 1.0 m. All soils were wet but not saturated.

Other Significant Information: High possibility of fluctuating water table due to orange mottles being found throughout all soils.

Job:

Green Hill Park; Hamilton

Job Number:

20413-S1

Date:

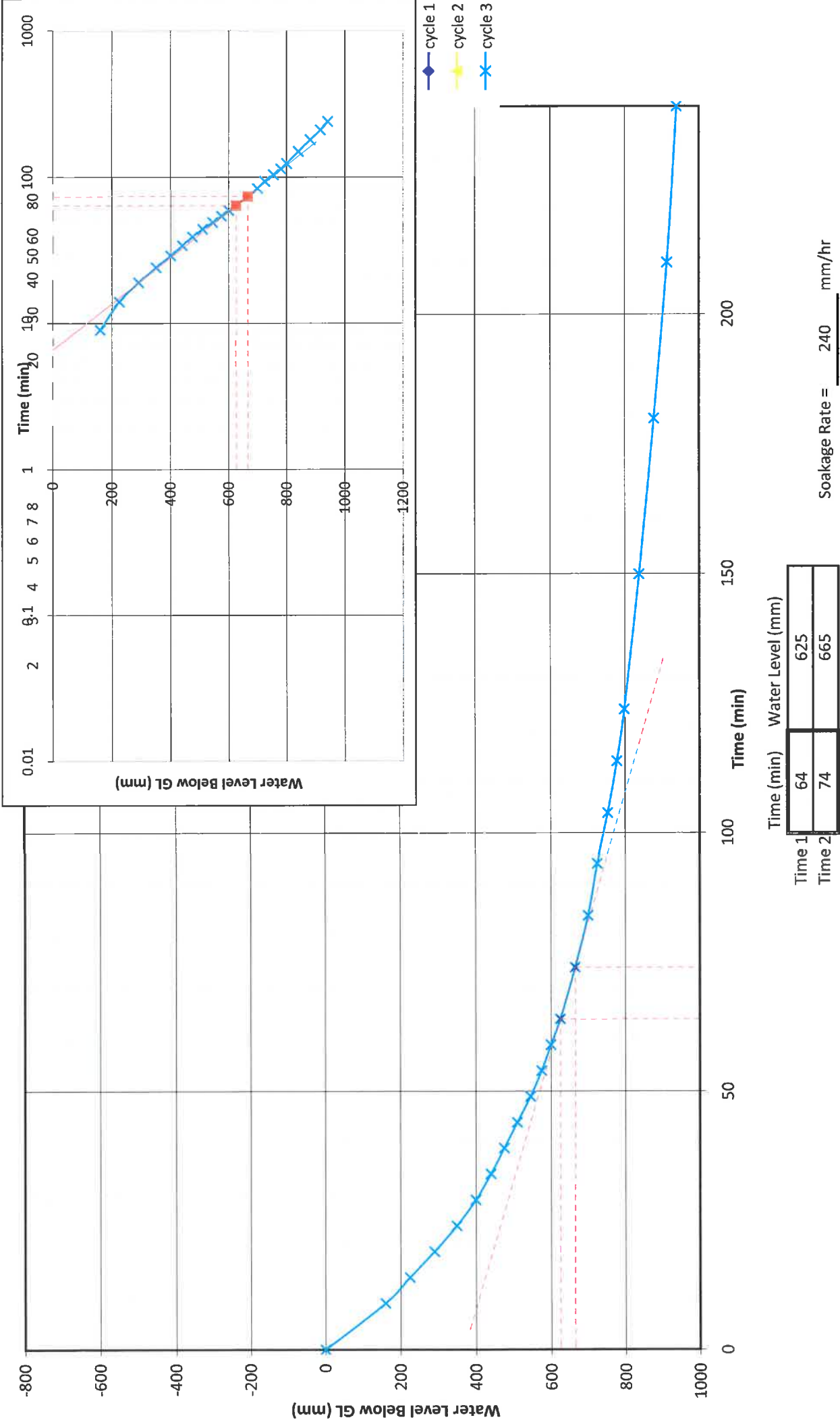
27/8/15

Test Number:

46

Time (min)			1st Cycle
0			0
9			160
14			225
19			290
24			350
29			400
34			440
39			475
44			510
49			545
54			575
59			600
64			625
74			665
84			700
94			725
104			755
114			780
124			800
150			840
180			880
210			915
240			940

Green Hill Park Subdivision - Stage 1; Hamilton  
Soakage Test Position # 46



## Soak Hole Notes:

Job #:	20413-S1
Test Location:	SH46 / Lot46
Date:	27/8/15
Tested By:	M.Bryant

Soak Hole Diameter:	150 mm
Soak Hole Depth:	1700 mm
Water Table Depth:	below 2.0 m

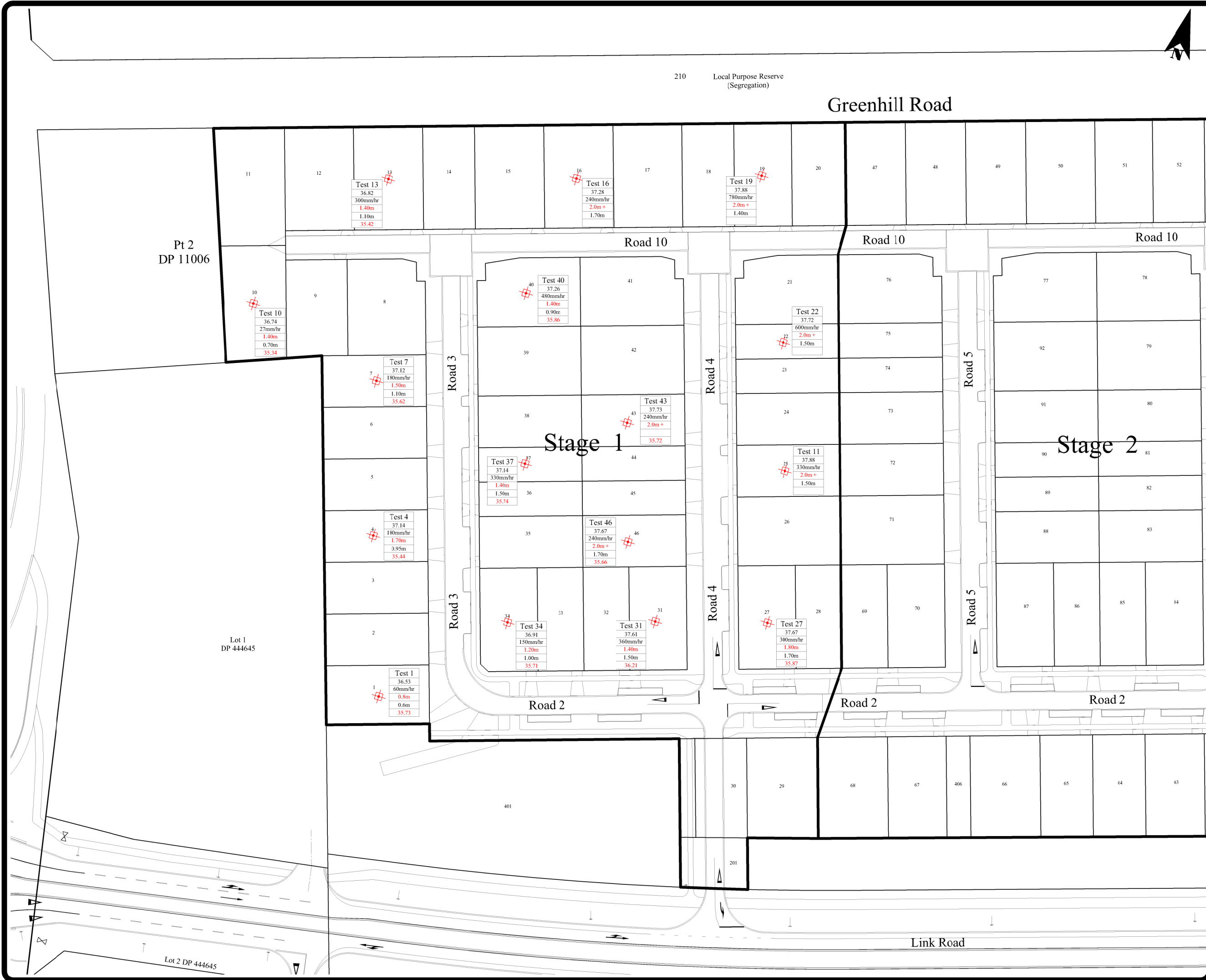
Cross If Applicable:	
4 hour preparation soak	
hole refilled at 0.25 m above base	
measurement Interval > 30 minutes	<input checked="" type="checkbox"/>
test continued for 4 hours	<input checked="" type="checkbox"/>
test continued until empty	
test stopped 0.25 m above base	

Weather Conditions 1-3 Days Prior To Test: Overcast and sunny days with light winds. Moderate to warm temperatures

Weather Conditions On Day Of Test: Sunny with overcast periods. Little to no wind with warm temperatures

Soil Conditions & Composition: From below the topsoil an orange brown wet silt was found for approx the first 1.0 m. a light brown coarse grained sand was found below approx 1.0 m. All soils were wet but not saturated.

Other Significant Information: High possibility of fluctuating water table due to orange mottles being found throughout all soils.



NOTES:

Test no. refers to the Lot Number

Test 9	Ground Level
37.74	Soakage Rate Calculated
330mm/hr	Depth to Water Table
1.40m	Depth of Soakhole
1.50m	Ground Water Level
35.74	

1	Issued for Engineering Approval	08/15	
Checked by	Rev No.	Description	DATE
Surveyed	CR	02/15	SIGNED
Designed	SM	06/15	
Drawn	ADP	06/15	
Checked	BK	07/15	
Approved	TAM	08/15	

REFERENCES

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Email: slconsultants@sltga.co.nz

TITLE

Chedworth Properties Ltd

Greenhill Park, Hamilton

Soak Test Locations  
and Data

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ORIGINAL SCALES	DATE
Scale 1:1000 @ A3	09/15
DRAWING No	
20413 - D25	
Revision	1