



Derek Booth Consultancy t/a DBCON  
Corner of Spa Road and Rotokawa Street  
PO Box 1123  
TAUPO 3351

Ph: 0800 232266  
www.dbcon.co.nz

Date: 27 October 2016

Our Job Ref: 161958

**CAMBRIDGE PARK SUBDIVISION**  
**Stage 4 Lot 207**  
**Jarrett Terrace and West Thompson Street, Cambridge**

**REPORT ON SUBDIVISION COMPLETION AND**  
**RECOMMENDATIONS FOR BUILDING DEVELOPEMENT**

**Lots 1-5, 7-17**

Prepared by:

Michael Richardson \_\_\_\_\_  
Chartered Professional Engineer  
CPENG - 1005467

## 1.0 Background

The Cambridge Park Subdivision is the development of cultivated and/or pastoral land for residential development. The subdivision is accessed off Cambridge Road via an existing round a bout. The fully developed subdivision will consist of approximately 210 residential lots. This report covers the subdivision of Stage 4 Lot 207, consisting of sixteen residential lots. The access way lot has not been tested. Lots are numbered 1-17, with Lot 6 excluded (not included in the current plans).

The land form upon which Lot 207 DP496516 is located was generally fairly flat and so only minor earthworks were undertaken during the construction of the subdivision.

## 2.0 Geological Description of the Land

Geologically, the landform on which the Cambridge Park residential development is located is an old river terrace. The strata underlying the subdivision comprises the Hinuera Formation. This consists of alluvial sediments (pumiceous sand, silt and gravel).

## 3.0 Subdivision Earthworks

This section of subdivision involved minimal earthworks, with the formation of the right-of-way and associated drainage.

No earthworks of significance affect the residential lots. No earthworks testing has been included in this scope or reporting.

## 4.0 Ground Conditions

Ground conditions across the Cambridge Park Subdivision are generally consistent with predominant medium dense to dense granular deposits underlying the majority of the sites. The site specific testing carried out for Lot 207 was completed in October 2016 and included machine augers and scala tests extending up to 2m below ground. Testing confirmed the predominantly medium dense sandy Gravel strata underlying the sites, with thin layers of dense deposits. Limited zones of loose deposits (Lot 9) were identified with higher silt and sand component.

Logs of the materials encountered in the drill holes and the soil strengths are attached in Appendix A.

Based on the auger hole results *and* our experience with similar sub soils in the area, subsurface conditions on the lots in the Lot 207 area of Cambridge Park generally consist of 0.1m to 0.3m of dark brown gravelly SILT (mixed topsoil) overlying alternating layers of sandy silt and gravelly sands to a depth of at least 2.0m below ground level.

The soil densities are generally dense from close to the surface and varying with depth.

The soils strength tests on the lots indicate that the soils generally have sufficient density to provide the required 300 kPa ultimate foundation bearing capacity for standard residential development in accordance with NZS 3604:2011, but the depth to 300kPa (ultimate bearing capacity) ground varied from a depth of 0.2m to 0.3m (with the exception of lot 9 that had a softer zone at 0.8-0.9m). Static groundwater level (the ground water table) was not encountered to a depth of at least 2m below ground level at the date of testing and is not expected within 4m of the ground surface.

## 5.1 Building Development Recommendations

Based on the results to date and subject to the recommendations in this report, the lots in Cambridge Park Subdivision of Lot 207 are considered suitable for residential development in accordance with NZS 3604:2011 *"Timber Framed Buildings"*: Excavations to remove the shallow topsoil followed by the placement of controlled fill may be required where the near surface soils are not able to provide an ultimate foundation bearing pressure of 300 kPa.

To provide guidance on the soil strengths and foundation systems recommended for each lot in Cambridge Park Lot 207, the following table has been prepared. Higher foundation capacities are available subject to the foundation review and specific designed by an engineer. Lot 9 has been identified as required a raft foundation due to a softer deeper layer.

The foundation recommendations detailed in the attached table are based on the assumption that the foundations for the proposed dwellings on each lot will be formed at a minimum depth of 0.3m below current ground level with all topsoil removed. Alternatively, a raft foundation may be used once all topsoil has been removed and backfilled with engineered fill. Foundation excavations should be checked to confirm all topsoil has been removed and there are appropriate founding conditions for the given foundation design.

Foundation Recommendations for Stage 3B – Lot 211 Cambridge Park			
Lot No.	Depth to 300 kPa Ultimate bearing capacity	Recommended Foundation System	Minimum Foundation Excavation Depth Below Finished Ground Level
1	0.3m	NZS3604 foundations	0.3m
2	0.3m	NZS3604 foundations	0.3m
3	0.3m	NZS3604 foundations	0.3m
4	0.3m	NZS3604 foundations	0.3m
5	0.3m	NZS3604 foundations	0.3m
6	-	-	-
7	0.3m	NZS3604 foundations	0.3m
8	0.3m	NZS3604 foundations	0.3m
9	0.9m	Codemark Ribraft	0.3m (sandfill)
10	0.3m	NZS3604 foundations	0.3m
11	0.3m	NZS3604 foundations	0.3m
12	0.3m	NZS3604 foundations	0.3m
13	0.3m	NZS3604 foundations	0.3m
14	0.3m	NZS3604 foundations	0.3m
15	0.3m	NZS3604 foundations	0.3m
16	0.3m	NZS3604 foundations	0.3m
17	0.3m	NZS3604 foundations	0.3m

## 5.2 Cambridge Park Slope Stability and Building Setbacks

Lot 207 is located in the middle of the larger Cambridge Park Subdivision and away from any slopes or river banks. There are no setback lines or building restrictions lines recommended for Lot 207.

## 5.3 Cambridge Park Stage 4 Lot 207 Stormwater Recommendations

The machine augered percolation tests were limited by the compact nature of the underlying strata. This limited soakage rates for the tests carried out, and indicated moderate soakage potential for this site. Results varied between 400 mm/hour and 620 mm/hour. Soakage testing on other parts of the subdivision indicated good soakage (up to 1000 mm/hour). Previous testing on this lot and the preliminary stormwater design reported values of 280 mm/hr to 720 mm/hr. The lower bound rate of 280 mm/hour should be used for design of soakage systems on these lots.

**Table 1 Percolation rates obtained for lots within site**

<b>Lot #</b>	<b>Percolation rate (mm/hr)</b>
2	480
5	480
8	460
10	400
13	620
16	500
Average	490

**Table 2 Percolation rates obtained from previous testing**

<b>Lot #</b>	<b>Percolation rate (mm/hr)</b>
5	720
10	700
12	280
16	300

The lower bound rate of 280 mm/hour should be used for design of soakage systems on these lots. A reduction factor should be applied to the soakage rates to allow for reduced performance over time. This results in a soakage rate of 140 mm/hour for use in design of soakage systems on the subject sites.

The areas of impervious surfaces assumed for each lot (including the access lot) are presented below. The calculations presented here assume all lots are developed with a maximum of 60 % impervious area, including all roof and paved (patio and driveway) areas. The road and the access lot are assumed to be impervious. Paved areas are assumed here to be impervious, however a permeable pavement system may be selected for the driveways and other paved areas.

We note the previous stormwater report for Cambridge Park Stage 4 (dated 4 April 2016 Ref: 160199) included a slightly different lot layout and areas and included lot 6.

**Table 3 Impervious areas**

Lot #	Lot area m <sup>2</sup>	Total Impervious Area	
		m <sup>2</sup>	%
1	385	231	60
2	281	169	60
3	272	163	60
4	275	165	60
5	273	164	60
(6 not included)			
7	355	213	60
8	363	218	60
9	334	200	60
10	354	212	60
11	339	203	60
12	407	244	60
13	440	264	60
14	368	221	60
15	366	220	60
16	354	212	60
17	365	219	60
18 Access	1084	1084	100
<b>Total</b>	<b>6615</b>	<b>4403</b>	

Preliminary recommendations for infiltration systems on the property were determined based on the following design parameters:

- Depth to the ground water table exceeds 3 m
- Design soakage rate is 140 mm/hour
- For the house sites, the design storm event is a 10 year return period event of one hour duration (40.4 mm)
- The soakage trench is to be 2 m deep and filled with drainage rockfill
- The impermeable area on each lot (house, patio, driveway etc.) has been assumed as below.

Using the above parameters, we have calculated the following will be required:

Combined impermeable area (roof and driveway/patios) (m <sup>2</sup> )	Soakage pit area (m <sup>2</sup> )
200	9.3
250	11.6
300	14.0
350	16.3
400	18.6

**Table 4 Soakage trench areas required for each lot (based on 10-year ARI)**

<b>Lot</b>	<b>Trench Area</b>	<b>AquaCell Area</b>
<b>#</b>	<b>m<sup>2</sup></b>	<b>m<sup>2</sup></b>
1	10.8	5.3
2	7.9	3.9
3	7.6	3.8
4	7.7	3.8
5	7.6	3.8
-		
7	9.9	4.9
8	10.1	5.0
9	9.3	4.6
10	9.9	4.9
11	9.5	4.7
12	11.4	5.6
13	12.3	6.1
14	10.3	5.1
15	10.2	5.1
16	9.9	4.9
17	10.2	5.1
18 Access	50.5	25.1
<b>Total</b>	<b>205.1</b>	<b>101.6</b>

Overflow is to be diverted via a bubble up chamber in the driveway to the right-of-way and to the overland flow path on the road. A clear fall from around any buildings towards the right-of-way and road will be required to accommodate over design storm events in the event of blockages or the system being over capacity.

The soakage trench shape can be altered providing overall area and volume is maintained. Soakage trenches should be located a minimum of 3 m from any building foundations and 1.5 m from the property boundaries. If variations from the above assumptions are required or alternative designs needed, then we recommend the size and location of the system be specifically designed once the final development proposals are available.

If specific design of the soakage trench is required due to variations from the above, then we recommend an additional soakage test be carried at the location of the proposed soakage area.

For storm events exceeding the design 10-year period noted above, a designated overland flow path will need to be provided to ensure that storm water can be safely discharged to the street via the right-of-way to the north of each lot.

## 6.1 Conclusion

Based on the investigations undertaken to date and subject to the development recommendations contained in this report, the land designated as the Cambridge Park Subdivision Lot 207 (Stage 4) is considered suitable for residential development in accordance with NZS 3604:2011. The following recommendations are given to guide building construction on the lots:

- For Lots 1-5, 7-8, 10-17 an ultimate foundation bearing pressure of 300 kPa is available at a depth of 0.3m below ground level. A standard concrete slab (NZS3604) foundation is expected to be appropriate for these lots
- For Lot 9 a standard Codemark Ribraft foundation is recommended. Alternative designs for Lot 9 will require further engineering further, and may require additional testing.
- Stormwater disposal by soakage pits on site will provide a feasible stormwater control method.
- Stormwater overflow will need to go via the right-of-way to the road.

A Statement of Professional Opinion as to the Suitability of Land for Building Construction (i.e. the NZS 4404:2004 Schedule 2A Certificate for the Cambridge Park Stage 4 Lot 207 Subdivision) is attached.

## 7.0 Limitations

The recommendations and options contained in this report are based on data from the field investigations described above. Inferences about the nature and continuity of ground conditions away from test locations are considered reasonable, but cannot be guaranteed. During development of the lots, a person competent to assess should examine ground conditions exposed in foundation excavations and cuttings to confirm whether the conditions are compatible with the assumptions made in this report. In all circumstances, if ground conditions differ from those described in this report the matter should be referred to a geotechnical engineer. This professional opinion does not remove the requirement for the normal inspection and verification of foundation conditions for all buildings constructed on the lots. This report has been prepared for the particular project described in the owner's brief to us. No responsibility is accepted for the use of any part of this report in other contexts or for any other purposes.

**STATEMENT OF PROFESSIONAL OPINION AS TO SUITABILITY  
OF LAND FOR BUILDING CONSTRUCTION**

Development: Cambridge Park Subdivision Stage Lot 207

Developer: Cambridge Park Ltd

Stage 4 Lot 207 Cambridge Park, Cambridge

I, Michael Richardson  
(Full Name)

of DBCON, PO Box 1123, Taupo

Hereby confirm that:

- 1.0 I am a geo-professional as defined in clause 1.2.2 of NZS 4404:2010 and was retained by the developer as the geo-professional on the above development.
- 2.0 The extent of my inspections during construction, and the results of all tests carried out are described in my geotechnical completion report dated 27 October 2016 (reference 161958).
- 3.1 In my professional opinion, not to be construed as a guarantee, I consider that:
  - a. The completed works give due regard to land slope and foundation stability considerations.
  - b. The original ground not affected by filling is suitable for the erection thereon of buildings designed according to NZS 3604 provided that:
    - i. Those lots where the ultimate bearing pressure is less than 300 kPa can have the proposed houses supported on either a stiffened floor slab (if a minimum of 225 kPa is available) or a Raft Style floor slab (if a minimum of 150 kPa is available)
    - ii. For the balance of the lots an ultimate foundation bearing pressure of 300 kPa is available at a depth of 0.3m below ground level. A standard concrete slab foundation supported on a sand pad can be used to support the proposed houses on these lots.
    - iii. Site specific inspections are recommended on all lots during development to confirm the foundation recommendations provided above are appropriate
- 4.0 This professional opinion is furnished to Waipa District Council and the developer 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.
- 5.1 This certificate shall be read in conjunction with my geotechnical report referred to in clause 2 above and shall not be copied or reproduced except in conjunction with the full geotechnical completion report.

Signed.....

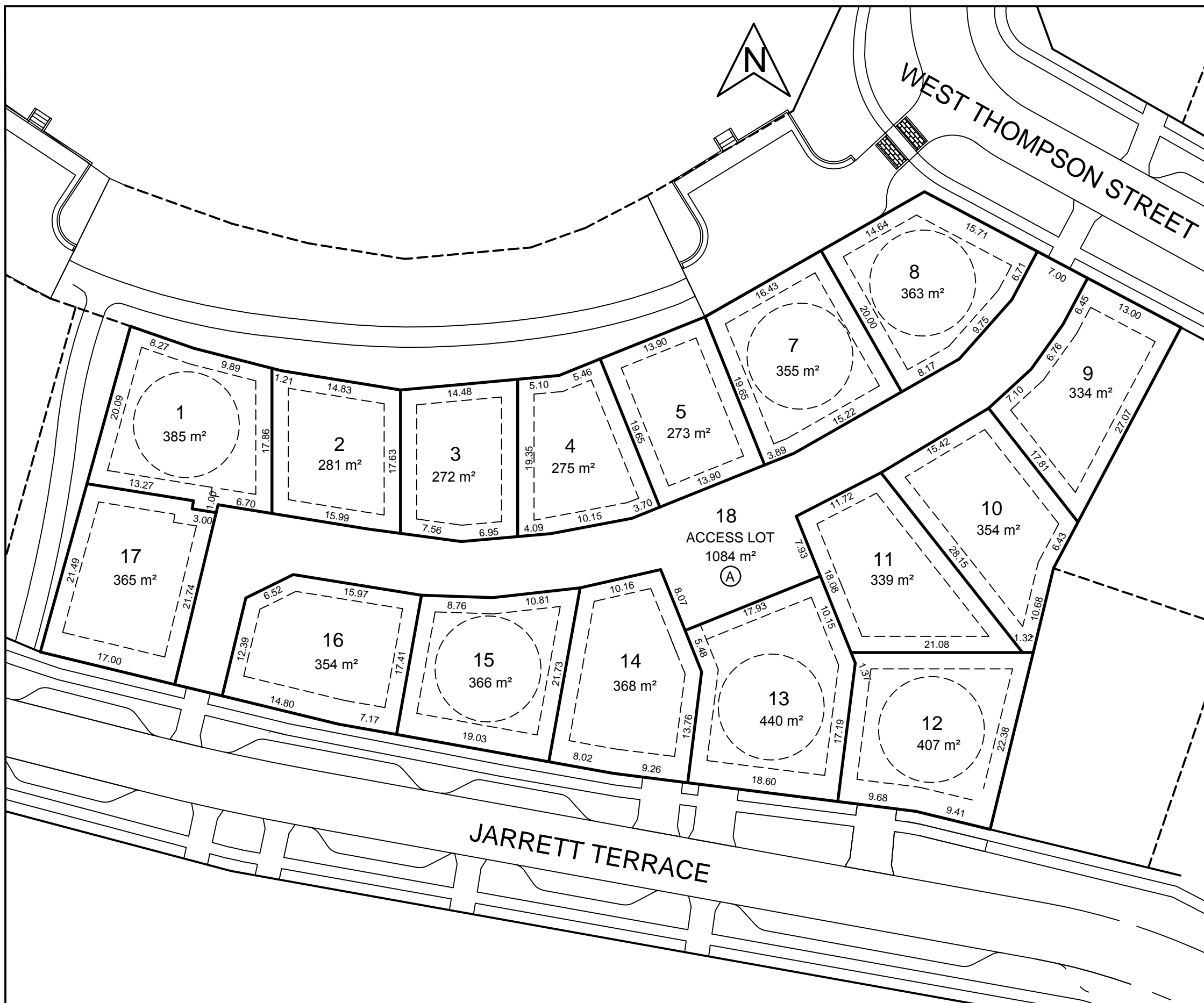
Date.....27 October 2016

Michael Richardson  
Chartered Professional Engineer  
CPEng 1005467

.....  
(Name, title and professional qualifications)



APPENDIX A  
*TEST RESULTS*



**NOTE:**  
 1) LAYOUT, AREAS AND DIMENSIONS SUBJECT TO FINAL SURVEY AND APPROVAL FROM THE WAIPA DISTRICT COUNCIL  
 2) LEGAL DESCRIPTION: LOT 207 DP 496516 CT 719910  
 3) TOTAL AREA:  
 4) ZONE: RESIDENTIAL (PDP)

MEMORANDUM OF EASEMENTS			
PURPOSE	SERV. TENE.	SHOWN	DOM. TENE
RIGHT OF WAY RIGHT TO DRAIN SEWAGE AND STORMWATER, RIGHT TO CONVEY WATER, ELECTRICITY, TELECOMMUNICATIONS AND COMPUTER MEDIA,	LOT 18	A	LOTS 1 - 5 7- 11 AND 13 - 17
PARTY WALL	LOT 1	B	LOT 2
	LOT 2	C	LOT 1
	LOT 4	D	LOT 5
	LOT 5	E	LOT 4
	LOT 7	H	LOT 8
	LOT 8	I	LOT 7
	LOT 9	J	LOT 10
	LOT 10	K	LOT 9
	LOT 10	L	LOT 11
	LOT 11	M	LOT 10
	LOT 13	N	LOT 14
	LOT 14	O	LOT 13
LOT 15	P	LOT 16	
LOT 16	Q	LOT 15	

**LEGEND:**

SIDE YARDS : 3m FROM ROAD BOUNDARIES,  
SHOWN 2.0m ON ALL SIDE BOUNDARIES  
ALLOWANCE FOR REDUCTION TO 1.5m ON ONE BOUNDARY

13mØ SHAPE FACTOR CIRCLE

**AMALGAMATION CONDITIONS**

THAT LOT 18 HEREON (LEGAL ACCESS) BE HELD AS TO FIFTEEN UNDIVIDED ONE-FIFTEENTH SHARES BY THE OWNERS OF LOTS 1 -5, 7 - 11 AND 13 - 17 HEREON AS TENANTS IN COMMON IN THE SAID SHARES AND THAT INDIVIDUAL CERTIFICATES OF TITLE BE ISSUED IN ACCORDANCE THEREWITH  
 SEE LINZ REF:.....  
 SECTION 220(1)(b)(iv)  
 Client Reference:

**RAD SURVEYING LIMITED**  
 07 843 1587 027 411 8496  
 237 DIXON ROAD, RD 2 HAMILTON  
 troy@radsurveying.co.nz  
 Designed. TDR 29 June 2014

**SCHEME PLAN  
 PROPOSED SUBDIVISION  
 JARRETT TERRACE, CAMBRIDGE PARK**

PREPARED FOR: CAMBRIDGE PARK DEVELOPMENTS      SCALE: 1:500 @ A3      DATE: APRIL 2016

**15022**

Sheet: **1**      Version: **4**



P.O Box 1123, Taupo

0800 22 23 66

www.dbcon.co.nz

Project

Lot 207 Cambridge Park

Job ref

161958

Drawing ref

calculations by

revision

sheet no

AMack

1

Element

Lot 1

Date

Sep-16

Depth	Scala (blows/100mm)	Shear Vane (kPa)	Soil Description	Percolation Test	
100	0		TOPSOIL/FILL	Time (min)	Drop (mm)
200	4			5	
300	3			10	
400	8			15	
500	11			20	
600	8		Gravelly SANDS, silt, some fine to medium pumiceous material orange/brown, moist	25	
700	14			30	
800	17			35	
900	11		Fine to medium gravelly SANDS, some silt and pumiceous material, light brown, moist	40	
1000	18			45	
1100	24	UTP		50	
1200			SANDS, well graded, some fine gravels, light brown, moist	55	
1300	17			60	
1400	11				
1500	9				
1600	10		Gravelly SANDS, some pumiceous material, some cobbles, orange/brown/grey, moist	Soakage rate (mm/hr) =	0
1700	8				
1800	7				
1900	8				
2000	10				
2100			EOB @ 2.0 m		
2200			Target Depth		
2300					
2400					
2500		UTP	Unable To Penetrate		
2600					
2700					
2800					
2900					
3000					
3100					
3200					
3300					
3400					
3500					

Notes:

- 1 Weather was overcast and cool after some days of rain
- 2 No Ground water was detected
- 3 Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)
- 4 Shear Vane records include Re-moulded values where possible
- 5 Shear Vane C350, calibration due 4-12-16, Certificate 564



**dbcon**  
Consulting Engineers

P.O Box 1123, Taupo

0800 22 23 66

www.dbcon.co.nz

Project			Job ref
Lot 207 Cambridge Park			161958
Drawing ref	calculations by	revision	sheet no
	AMack		2
Element			Date
Lot 2			Sep-16

Depth	Scala (blows/100mm)	Shear Vane (kPa)	Soil Description	Percolation Test	
100	0			Time (min)	Drop BGL
200	5		TOPSOIL/FILL, angular gravels	5	1200
300	5			10	1400
400	7			15	1460
500	24			20	1500
600			Gravelly SANDS, silt, some fine gravels, minor pumiceous material	25	1550
700			dark brown, moist	30	1600
800				35	1650
900				40	1690
1000	9			45	1740
1100	14			50	1780
1200	16		Gravelly SANDS, pumiceous material, minor silt, orange brown, moist	55	1810
1300	15			60	1840
1400	11				
1500	8				
1600	8			Soakage rate (mm/hr) =	480
1700	6				
1800	3		SANDS, well graded, some fine gravels/pumiceous material, greys/browns, moist		
1900	3				
2000	6				
2100			EOB @ 2.0m		
2200			Target Depth		
2300					
2400					
2500			UTP Unable To Penetrate		
2600					
2700					
2800					
2900					
3000					
3100					
3200					
3300					
3400					
3500					

Notes:
1 Weather was overcast and cool after some days of rain
2 No Ground water was detected
3 Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)
4 Shear Vane records include Re-moulded values where possible
5 Shear Vane C350, calibration due 4-12-16, Certificate 564



**dbcon**  
Consulting Engineers

P.O Box 1123, Taupo

0800 22 23 66

www.dbcon.co.nz

Project			Job ref
Lot 207 Cambridge Park			161958
Drawing ref	calculations by	revision	sheet no
	AMack		3
Element			Date
Test Location 3			Sep-16

Depth	Scala (blows/100mm)	Shear Vane (kPa)	Soil Description	Percolation Test		
100	0		TOPSOIL/FILL	Time (min)	Drop (mm)	
200	5			5		
300	7			10		
400	22			15		
500	20			20		
600	22		Gravelly SANDS, silt, dark brown, moist	25		
700	14			30		
800	12			35		
900	14			40		
1000	11			45		
1100	9		Gravelly SAND, some silt/pumiceous material, minor cobbles orange/brown, moist	50		
1200	8			55		
1300	8			60		
1400	8					
1500	6					
1600	24	UTP	SANDS, well graded, some gravels/pumiceous material grey/brown, moist	Soakage rate (mm/hr) =	0	
1700						
1800					Average (last 6 results)	
1900					0.00	mm/5mins
2000						
2100			EOB @ 2.0 m			
2200			Target Depth			
2300						
2400						
2500		UTP	Unable To Penetrate			
2600						
2700						
2800						
2900						
3000						
3100						
3200						
3300						
3400						
3500						

Notes:
1 Weather was overcast and cool after some days of rain
2 No Ground water was detected
3 Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)
4 Shear Vane records include Re-moulded values where possible
5 Shear Vane C350, calibration due 4-12-16, Certificate 564



**dbcon**  
Consulting Engineers

P.O Box 1123, Taupo

0800 22 23 66

www.dbcon.co.nz

Project			Job ref
Lot 207 Cambridge Park			161958
Drawing ref	calculations by	revision	sheet no
	AMack		4
Element			Date
Lot 4			Sep-16

Depth	Scala (blows/100mm)	Shear Vane (kPa)	Soil Description	Percolation Test	
				Time (min)	Drop (mm)
100	0		TOPSOIL/FILL, some angular gravels	5	
200	6			10	
300	14			15	
400	16			20	
500	14			25	
600	24		Gravelly SAND, silt, some pumiceous material, dark brown, moist	30	
700				35	
800				40	
900				45	
1000	3		Gravelly SAND, some pumiceous material, orange-brown, moist	50	
1100	3			55	
1200	4			60	
1300	6				
1400	8		SAND, some gravel, light grey/brown, moist		
1500	6				
1600	4			Soakage rate (mm/hr) =	0
1700	14		Gravelly SAND, light grey/brown, moist		
1800	24	UTP	EOB @ 1700mm		
1900			Refusal - Gravels	Average (last 6 results)	
2000				0.00	mm/5mins
2100					
2200					
2300					
2400					
2500		UTP	Unable To Penetrate		
2600					
2700					
2800					
2900					
3000					
3100					
3200					
3300					
3400					
3500					

- Notes:
- 1 Weather was overcast and cool after some days of rain
  - 2 No Ground water was detected
  - 3 Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)
  - 4 Shear Vane records include Re-moulded values where possible
  - 5 Shear Vane C350, calibration due 4-12-16, Certificate 564



**dbcon**  
Consulting Engineers

P.O Box 1123, Taupo

0800 22 23 66

www.dbcon.co.nz

Project			Job ref
Lot 207 Cambridge Park			161958
Drawing ref	calculations by	revision	sheet no
	AMack		5
Element			Date
Lot 5			Sep-16

Depth	Scala (blows/100mm)	Shear Vane (kPa)	Soil Description	Percolation Test	
100	0			Time (min)	Drop BGL
200	3		TOPSOIL/FILL, some angular gravels	5	820
300	5			10	1140
400	11			15	1230
500	15		Gravelly SANDS, silt, some pumiceous material, dark brown, moist	20	1320
600	24	UTP		25	1390
700				30	1460
800				35	1510
900				40	1550
1000	9			45	1600
1100	20		Gravelly SANDS, some silt, some pumiceous material, minor cobbles, orange/brown, moist	50	1640
1200	24	UTP		55	1680
1300				60	1700
1400					
1500					
1600				Soakage rate (mm/hr) =	480
1700			EOB@ 1600		
1800			Refusal, cobbles		
1900					
2000					
2100					
2200					
2300					
2400					
2500		UTP	Unable To Penetrate		
2600					
2700					
2800					
2900					
3000					
3100					
3200					
3300					
3400					
3500					

Notes:
1 Weather was overcast and cool after some days of rain
2 No Ground water was detected
3 Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)
4 Shear Vane records include Re-moulded values where possible
5 Shear Vane C350, calibration due 4-12-16, Certificate 564



P.O Box 1123, Taupo

0800 22 23 66

www.dbcon.co.nz

Project			Job ref
Lot 207 Cambridge Park			161958
Drawing ref	calculations by	revision	sheet no
	Amack		6
Element			Date
Lot 7			Sep-16

Depth	Scala (blows/100mm)	Shear Vane (kPa)	Soil Description	Percolation Test
100	0		TOPSOIL/FILL	Time (min)
200	1			Drop (mm)
300	1			5
400	1			10
500	15			15
600	16			20
700	24	ND, well graded, some silt, fine to medium gravels, some pumiceous material, brown, r		25
800				30
900				35
1000				40
1100	3			45
1200	4			50
1300	5			55
1400	8			60
1500	14	Gravelly SAND, some pumiceous material, light orange-brown, moist		Soakage rate (mm/hr) =
1600	24	UTP		0
1700				Average (last 6 results)
1800				0.00 mm/5mins
1900				
2000				
2100			EOB @ 2.0 m	
2200			Target Depth	
2300				
2400				
2500		UTP	Unable To Penetrate	
2600				
2700				
2800				
2900				
3000				
3100				
3200				
3300				
3400				
3500				

Notes:
1 Weather was overcast and cool after some days of rain
2 No Ground water was detected
3 Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)
4 Shear Vane records include Re-moulded values where possible
5 Shear Vane C350, calibration due 4-12-16, Certificate 564





P.O Box 1123, Taupo

0800 22 23 66

www.dbcon.co.nz

Project

Lot 207 Cambridge Park

Job ref

161958

Drawing ref

calculations by

revision

sheet no

AMack

1

Element

Lot 8

Date

Sep-16

Depth	Scala (blows/100mm)	Shear Vane (kPa)	Soil Description	Percolation Test	
100	0		TOPSOIL/FILL	Time (min)	Drop (mm)
200	6			5	930
300	14			10	1040
400	10			15	1110
500	14			20	1180
600	16		Gravelly SANDS, well graded, some silt, some pumiceous material, dark brown, moist	25	1250
700	24	UTP		30	1400
800				35	1440
900				40	1490
1000	5			45	1540
1100	7		Gravelly SANDS, well graded, some fine to medium pumiceous material brown/grey, moist	50	1570
1200	7			55	1610
1300	18			60	1630
1400	24	UTP		Soakage rate (mm/hr) = 460	
1500					
1600			SANDS, well graded, some fine to medium pumiceous material, browns/greys, moist		
1700					
1800					
1900					
2000					
2100			EOB @ 2.0 m		
2200			Target Depth		
2300					
2400					
2500		UTP	Unable To Penetrate		
2600					
2700					
2800					
2900					
3000					
3100					
3200					
3300					
3400					
3500					

Notes:

- 1 Weather was overcast and cool with some rain
- 2 No Ground water was detected
- 3 Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)
- 4 Shear Vane records include Re-moulded values where possible
- 5 Shear Vane C350, calibration due 4-12-16, Certificate 564



Consulting Engineers

P.O Box 1123, Taupo

0800 22 23 66

www.dbcon.co.nz

Project			Job ref
Lot 207 Cambridge Park			161958
Drawing ref	calculations by	revision	sheet no
	AMack		2
Element			Date
Lot 9			Sep-16

Depth	Scala (blows/100mm)	Shear Vane (kPa)	Soil Description	Percolation Test	
100	0		TOPSOIL/FILL, angular gravels	Time (min)	Drop (mm)
200	3			5	
300	8			10	
400	9			15	
500	14			20	
600	9		Gravelly SANDS, well graded, some silt, some pumiceous material orange/brown, moist	25	
700	3			30	
800	2			35	
900	2			40	
1000	4			45	
1100	5		Gravelly SANDS, minor silt, some medium pumiceous material, brown/grey, moist	50	
1200	10			55	
1300	14			60	
1400	19				
1500	24	UTP	Gravelly SANDS, pumiceous material, grey/brown, moist	Soakage rate (mm/hr) =	0
1600					
1700					
1800	14			Average (last 6 results)	
1900	16		SANDS, well graded, some pumiceous material, orange/greys, moist	0.00	mm/5mins
2000	16				
2100			EOB @ 2.0m		
2200			Target Depth		
2300					
2400					
2500		UTP	Unable To Penetrate		
2600					
2700					
2800					
2900					
3000					
3100					
3200					
3300					
3400					
3500					

Notes:
1 Weather was overcast and cool with some rain
2 No Ground water was detected
3 Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)
4 Shear Vane records include Re-moulded values where possible
5 Shear Vane C350, calibration due 4-12-16, Certificate 564



**dbcon**  
Consulting Engineers

P.O Box 1123, Taupo

0800 22 23 66

www.dbcon.co.nz

Project			Job ref
Lot 207 Cambridge Park			161958
Drawing ref	calculations by	revision	sheet no
	AMack		3
Element			Date
Lot 10			Sep-16

Depth	Scala (blows/100mm)	Shear Vane (kPa)	Soil Description	Percolation Test	
100	0		TOPSOIL/FILL	Time (min)	Drop BGL
200	5			5	900
300	7			10	1150
400	7			15	1270
500	7			20	1340
600	6		Gravelly SANDS, silt, dark brown, moist	25	1380
700	4			30	1420
800	4			35	1450
900	4			40	1490
1000	5			45	1520
1100	9		Gravelly SANDS, some fine to medium pumiceous material, minor cobbles light brown, moist	50	1550
1200	14			55	1590
1300	8			60	1620
1400	16				
1500	24	UTP			
1600			SANDS, well graded, pumiceous material, greys/browns, orange, moist	Soakage rate (mm/hr) =	400
1700					
1800					
1900					
2000					
2100			EOB @ 2.0 m		
2200			Target Depth		
2300					
2400					
2500		UTP	Unable To Penetrate		
2600					
2700					
2800					
2900					
3000					
3100					
3200					
3300					
3400					
3500					

Notes:
1 Weather was overcast and cool with some rain
2 No Ground water was detected
3 Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)
4 Shear Vane records include Re-moulded values where possible
5 Shear Vane C350, calibration due 4-12-16, Certificate 564



**dbcon**  
Consulting Engineers

P.O Box 1123, Taupo

0800 22 23 66

www.dbcon.co.nz

Project			Job ref
Lot 207 Cambridge Park			161958
Drawing ref	calculations by	revision	sheet no
	AMack		4
Element			Date
Lot 11			Sep-16

Depth	Scala (blows/100mm)	Shear Vane (kPa)	Soil Description	Percolation Test	
				Time (min)	Drop (mm)
100	0			5	
200	8		TOPSOIL/FILL	10	
300	9			15	
400	6			20	
500	7		Fine to medium gravelly SANDS, well graded, silt, some pumiceous material	25	
600	24	UTP	orange/brown, moist	30	
700				35	
800				40	
900				45	
1000	11			50	
1100	8			55	
1200	8		Gravelly SANDS, minor cobbles, minor silt, some pumiceous material	60	
1300	8		brown/grey, moist		
1400	14				
1500	6				
1600	6			Soakage rate (mm/hr) = 0	
1700	6			Average (last 6 results)	
1800	4		SANDS, well graded, minor fine gravels, light grey/brown, moist	0.00	mm/5mins
1900	6				
2000	4				
2100			EOB @ 2.0 m		
2200			Target Depth		
2300					
2400					
2500		UTP	Unable To Penetrate		
2600					
2700					
2800					
2900					
3000					
3100					
3200					
3300					
3400					
3500					

- Notes:
- 1 Weather was overcast and cool with some rain
  - 2 No Ground water was detected
  - 3 Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)
  - 4 Shear Vane records include Re-moulded values where possible
  - 5 Shear Vane C350, calibration due 4-12-16, Certificate 564



**dbcon**  
Consulting Engineers

P.O Box 1123, Taupo

0800 22 23 66

www.dbcon.co.nz

Project			Job ref
Lot 207 Cambridge Park			161958
Drawing ref	calculations by	revision	sheet no
	AMack		5
Element			Date
Lot 12			Sep-16

Depth	Scala (blows/100mm)	Shear Vane (kPa)	Soil Description	Percolation Test	
100	0		TOPSOIL/FILL	Time (min)	Drop (mm)
200	7			5	
300	6			10	
400	8			15	
500	5			20	
600	8		Gravelly SANDS, some silt, some cobbles/pumiceous material	25	
700	9		dark brown, moist	30	
800	12			35	
900	12			40	
1000	8			45	
1100	8		Gravelly SANDS, cobbles, some pumiceous material, minor silt	50	
1200	9			55	
1300	12			60	
1400	15				
1500	13			EOB @ 1400mm	
1600	7		Refusal - cobbles	Soakage rate (mm/hr) =	0
1700	5				
1800	4				
1900	6				
2000	6			Average (last 6 results)	
				0.00	mm/5mins
2100					
2200					
2300					
2400					
2500			UTP Unable To Penetrate		
2600					
2700					
2800					
2900					
3000					
3100					
3200					
3300					
3400					
3500					

Notes:
1 Weather was overcast and cool with some rain
2 No Ground water was detected
3 Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)
4 Shear Vane records include Re-moulded values where possible
5 Shear Vane C350, calibration due 4-12-16, Certificate 564



P.O Box 1123, Taupo

0800 22 23 66

www.dbcon.co.nz

Project			Job ref
Lot 207 Cambridge Park			161958
Drawing ref	calculations by	revision	sheet no
	Amack		6
Element			Date
Lot 13			Sep-16

Depth	Scala (blows/100mm)	Shear Vane (kPa)	Soil Description	Percolation Test		
100	0		TOPSOIL/FILL	Time (min)	Drop (mm)	
200	9			5	400	
300	5			10	510	
400	5			15	590	
500	9			20	680	
600	8		Gravelly SANDS, silt, dark brown, moist	25	780	
700	16			30	860	
800	14			35	930	
900	14			40	990	
1000	14			45	1050	
1100	14		Gravelly SANDS, some cobbles/pumiceous material, grey/brown, moist	50	1100	
1200	9			55	1140	
1300	9			60	1170	
1400	6			Soakage rate (mm/hr) = 620		
1500	4					
1600	2					
1700	2					
1800	6					
1900	9		Silty SANDS, some gravels, dark brown, greys, moist			
2000	12					
2100						
2200						
2300						
2400			Silty gravelly SANDS, some pumiceous material, greys/browns, moist			
2500						
2600						
2700						
2800						
2900			EOB @ 2.0 m Target Depth			
3000						
3100						
3200						
3300						
3400			UTP Unable To Penetrate			
3500						

Notes:
1 Weather was overcast and cool with some rain
2 No Ground water was detected
3 Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)
4 Shear Vane records include Re-moulded values where possible
5 Shear Vane C350, calibration due 4-12-16, Certificate 564



P.O Box 1123, Taupo

0800 22 23 66

www.dbcon.co.nz

Project

Lot 207 Cambridge Park

Job ref

161958

Drawing ref

calculations by

revision

sheet no

AMack

1

Element

Lot 14

Date

Sep-16

Depth	Scala (blows/100mm)	Shear Vane (kPa)	Soil Description	Percolation Test	
100	0		TOPSOIL/FILL	Time (min)	Drop (mm)
200	9			5	
300	10			10	
400	22			15	
500	24	UTP		20	
600			Gravelly SANDS, silt, dark brown, moist	25	
700				30	
800				35	
900				40	
1000	9			45	
1100	10		Gravelly SANDS, some cobbles/pumiceous material, grey/brown, moist	50	
1200	9			55	
1300	12			60	
1400	10				
1500	8			Soakage rate (mm/hr) = 0	
1600	6		Silty SANDS, some gravels, dark brown, greys, moist	Average (last 6 results)	
1700	4			0.00	mm/5mins
1800	6				
1900	5		Silty gravelly SANDS, some pumiceous material, greys/browns, moist		
2000	4				
2100			EOB @ 2.0 m		
2200			Target Depth		
2300					
2400					
2500		UTP	Unable To Penetrate		
2600					
2700					
2800					
2900					
3000					
3100					
3200					
3300					
3400					
3500					

Notes:

- 1 Weather was overcast and cool after some previous days of rain.
- 2 No Ground water was detected
- 3 Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)
- 4 Shear Vane records include Re-moulded values where possible
- 5 Shear Vane C350, calibration due 4-12-16, Certificate 564



**dbcon**  
Consulting Engineers

P.O Box 1123, Taupo

0800 22 23 66

www.dbcon.co.nz

Project			Job ref
Lot 207 Cambridge Park			161958
Drawing ref	calculations by	revision	sheet no
	AMack		2
Element			Date
Lot 15			Sep-16

Depth	Scala (blows/100mm)	Shear Vane (kPa)	Soil Description	Percolation Test	
100	0		TOPSOIL/FILL	Time (min)	Drop (mm)
200	7			5	
300	5			10	
400	6			15	
500	13			20	
600	22			25	
700	24	UTP		30	
800			Gravelly SANDS, silt, some pumiceous material, dark brown, moist	35	
900				40	
1000	9			45	
1100	8			50	
1200	10			55	
1300	12			60	
1400	14		Gravelly SANDS, coarse, some pumiceous material, minor cobbles, browns/greys, moist		
1500	8			Soakage rate (mm/hr) =	0
1600	7			Average (last 6 results)	
1700	4		SANDS, well graded, some pumiceous material, greys/browns, moist	0.00	mm/5mins
1800	2				
1900	3				
2000	8				
2100			EOB @ 2.0m		
2200			Target Depth		
2300					
2400					
2500		UTP	Unable To Penetrate		
2600					
2700					
2800					
2900					
3000					
3100					
3200					
3300					
3400					
3500					

Notes:

- 1 Weather was overcast and cool after some previous days of rain.
- 2 No Ground water was detected
- 3 Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)
- 4 Shear Vane records include Re-moulded values where possible
- 5 Shear Vane C350, calibration due 4-12-16, Certificate 564





**dbcon**  
Consulting Engineers

P.O Box 1123, Taupo

0800 22 23 66

www.dbcon.co.nz

Project			Job ref
Lot 207 Cambridge Park			161958
Drawing ref	calculations by	revision	sheet no
	AMack		3
Element			Date
Lot 16			Sep-16

Depth	Scala (blows/100mm)	Shear Vane (kPa)	Soil Description	Percolation Test	
100	0		TOPSOIL/FILL	Time (min)	Drop (mm)
200	7			5	750
300	5			10	980
400	7			15	1120
500	5			20	1200
600	8		Gravelly SANDS, silt, pumiceous material, minor cobbles, orange/brown, moist	25	170
700	10			30	1350
800	13			35	1400
900	24	UTP		40	1450
1000	14			45	1500
1100	9		Gravelly coarse SANDS, some pumiceous material, light grey/brown, moist	50	1540
1200	10			55	1570
1300	8			60	1600
1400	6				
1500	9				
1600	4		SANDS, well graded, some fine gravels, brown/orange, moist	Soakage rate (mm/hr) =	500
1700	6				
1800	4				
1900	4				
2000	4				
2100			EOB @ 2.0 m		
2200			Target Depth		
2300					
2400					
2500		UTP	Unable To Penetrate		
2600					
2700					
2800					
2900					
3000					
3100					
3200					
3300					
3400					
3500					

Notes:
1 Weather was overcast and cool after some previous days of rain.
2 No Ground water was detected
3 Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)
4 Shear Vane records include Re-moulded values where possible
5 Shear Vane C350, calibration due 4-12-16, Certificate 564



**dbcon**  
Consulting Engineers

P.O Box 1123, Taupo

0800 22 23 66

www.dbcon.co.nz

Project			Job ref
Lot 207 Cambridge Park			161958
Drawing ref	calculations by	revision	sheet no
	AMack		4
Element			Date
Lot 17			Sep-16

Depth	Scala (blows/100mm)	Shear Vane (kPa)	Soil Description	Percolation Test	
				Time (min)	Drop (mm)
100	0			5	
200	7		TOPSOIL/FILL, angular gravels	10	
300	7			15	
400	9			20	
500	14		FILL, sandy silt, light brown, moist	25	
600	25			30	
700	24	UTP	Gravelly silty SAND, brown, moist	35	
800				40	
900				45	
1000	14			50	
1100	12			55	
1200	11		Gravelly SAND, well graded, pumiceous material, minor silt	60	
1300	16		minor cobbles, reddish brown, moist		
1400	17				
1500	8				
1600	14			Soakage rate (mm/hr) = 0	
1700	17			Average (last 6 results)	
1800	8		Coarse SANDS, minor pumiceous material, browns/greys, moist	0.00	mm/5mins
1900	8				
2000	9				
2100			EOB @ 2.0 m		
2200			Target Depth		
2300					
2400					
2500		UTP	Unable To Penetrate		
2600					
2700					
2800					
2900					
3000					
3100					
3200					
3300					
3400					
3500					

Notes:
1 Weather was overcast and cool after some previous days of rain.
2 No Ground water was detected
3 Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)
4 Shear Vane records include Re-moulded values where possible
5 Shear Vane C350, calibration due 4-12-16, Certificate 564

APPENDIX B  
*SOAKAGE TRENCH DRAWING*

**STORMWATER MANAGEMENT**

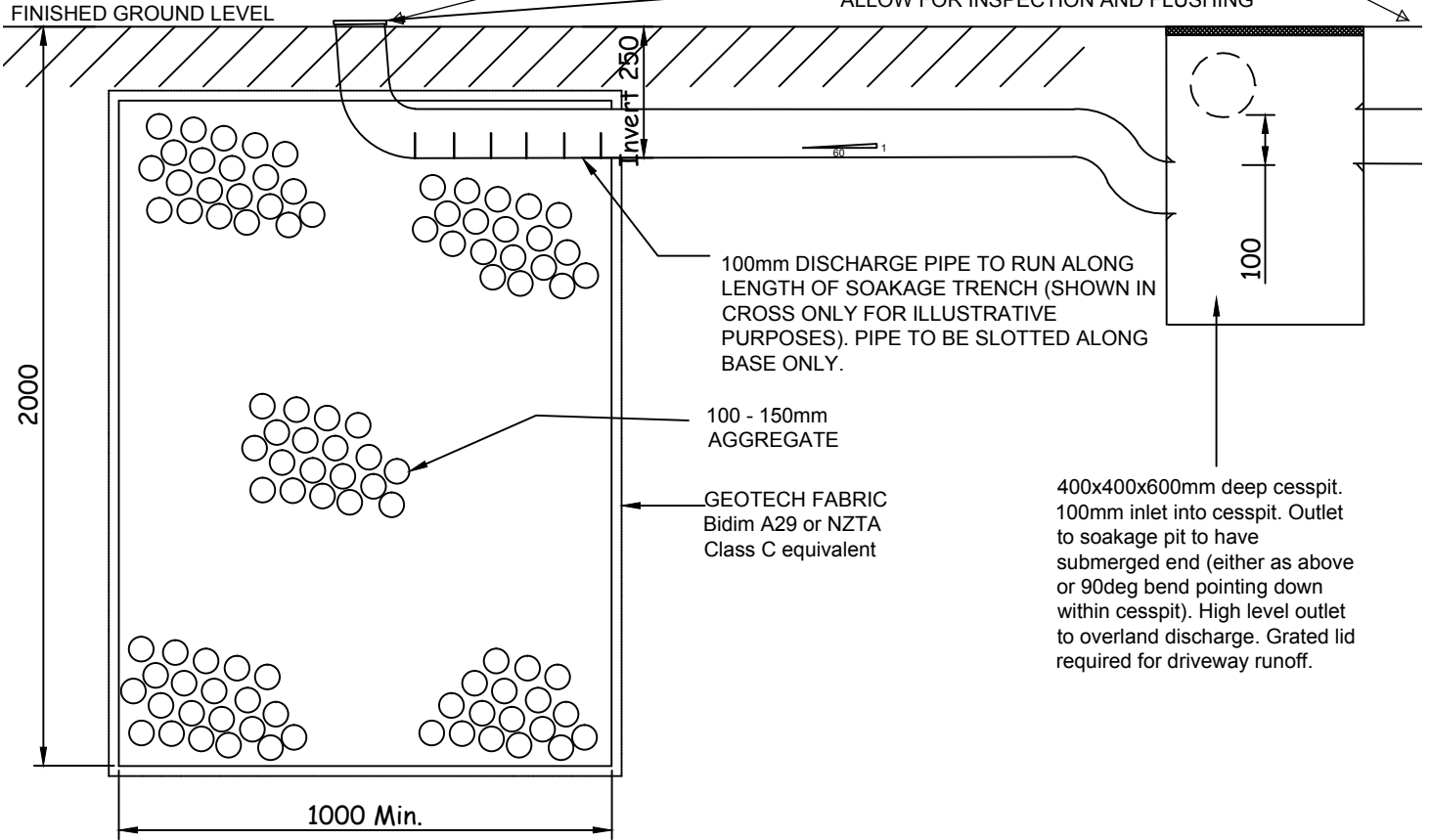
**INSPECTIONS**

(48 Hrs NOTICE REQUIRED)

1. SOIL CONDITIONS AT BARE INFILTRATION PIT INTERFACE
2. INSTALLATION PRIOR TO BACK FILLING

MINIMUM 100 mm FALL FROM INLET (GRATE) OF BUBBLE-UP CHAMBER TO LID LEVEL OF UPSTAND PIPE

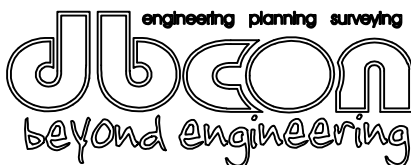
END OF PIPE TO BE FITTED WITH CAP TO ALLOW FOR INSPECTION AND FLUSHING



**STORMWATER INFILTRATION TRENCH DETAIL**  
SCALE 1:15

**NOTES**

- STORMWATER DESIGN, USING NZ BUILDING CODE E1/VM1 SEC9 AND WERF ONSITE STORMWATER MANAGEMENT GUIDE, AUCKLAND REGIONAL COUNCIL TP10 DESIGN MANUAL STORMWATER TREATMENT DEVICES.
- INFILTRATION TRENCH MUST BE LOCATED IN A READILY ACCESSIBLE LOCATION.
- INFILTRATION TRENCH GENERAL LOCATION AND CLEARANCES SHOWN ON PLAN.
- PIPE SIZES, 100mm PIPE SERVICING UP TO 250m<sup>2</sup>, 150mm PIPE SERVICING UP TO 500m<sup>2</sup>.
- ALL DRAINAGE WORK MUST BE IN ACCORDANCE WITH NZ BUILDING CODE G13 & E1.
- ALL GUTTERS MUST BE FITTED WITH LEAF GUARDS.
- AN OVERFLOW (SECONDARY) FLOW PATH MUST BE ALLOWED FOR FROM THE CESSPIT TO AN APPROPRIATE DISCHARGE LOCATION (AWAY FROM THE HOUSE) TO ALLOW FOR BLOCKAGES WITHIN THE PIPED SYSTEM
- FUTURE VEGETATION PLANTINGS MUST BE LOCATED TO AVOID ROOT SYSTEMS COMPROMISING THE INFILTRATION TRENCH.
- OVERFLOW PIPE TO STREAM OR SWALE SHALL BE AT A SUITABLE LEVEL TO FUNCTION PROPERLY



Cnr Spa Road and Rotokawa Street  
PO Box 1123 Taupo 2730 New Zealand  
Phone : 07 378 5067 Fax : 07 378 2800

Job Title	Scale	Design by	Drawn by	Date
Stage 4, Lot 207 Cambridge Park, Cambridge	NTS	mchr	mchr	Apr 16
Drg. Title	Job No.			
TYPICAL SOAKAGE TRENCH DETAIL	160199		01	



Building Code Clause(s) .....

# PRODUCER STATEMENT – PS1 – DESIGN

(Guidance notes on the use of this form are printed on the reverse side\*)

ISSUED BY: .....  
(Design Firm)

TO: .....  
(Owner/Developer)

TO BE SUPPLIED TO: .....  
(Building Consent Authority)

IN RESPECT OF: .....  
(Description of Building Work)

AT: .....  
(Address)

..... LOT..... DP ..... SO .....

We have been engaged by the owner/developer referred to above to provide .....  
.....services in respect of the requirements of  
..... Clause(s) ..... of the Building Code for  
All or Part only (as specified in the attachment to this statement), of the proposed building work.

The design carried out by us has been prepared in accordance with:  
Compliance Documents issued by Department of Building & Housing .....  
..... OR  
Alternative solution as per the attached schedule .....

The proposed building work covered by this producer statement is described on the .....  
..... and numbered .....;  
together with the specification, and other documents set out in the schedule attached to this statement.

On behalf of the Design Firm, and subject to:  
(i) Site verification of the following design assumptions .....  
(ii) All proprietary products meeting their performance specification requirements;

I believe on reasonable grounds the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the attached schedule, will comply with the relevant provisions of the Building Code.

I, ..... am: CPEng ..... #  
.....  
Reg Arch ..... #

I am a Member of: IPENZ NZIA and hold the following qualifications: .....

The Design Firm issuing this statement holds a current policy of Professional Indemnity Insurance no less than \$200,000\*.

SIGNED BY ..... ON BEHALF OF .....  
(Design Firm)

Date..... (signature).....

Note: This statement shall only be relied upon by the Building Consent Authority named above. Liability under this statement accrues to the Design Firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in contract, tort or otherwise (including negligence), is limited to the sum of \$200,000\*.

This form is to accompany Form 2 of the Building (Forms) Regulations 2004 for the application of a Building Consent.