BEFORE THE QUEENSTOWN LAKES DISTRICT COUNCIL HEARINGS PANEL

UNDER	the Resource Management Act 1991
IN THE MATTER	of the review of parts of the Queenstown Lakes District Council's District Plan under the First Schedule of the Act
AND	
IN THE MATTER	of submissions and further submissions by **REMARKABLES PARK LIMITED AND QUEENSTOWN PARK LIMITED**

STATEMENT OF EVIDENCE OF JUSTIN GREGORY RALSTON ON BEHALF OF REMARKABLES PARK LIMITED AND QUEENSTOWN PARK LIMITED

(ROADING GEOMETRY AND 3 WATERS INFRASTRUCTURE)

STREAM 13 REZONING HEARINGS

9 June 2017

BROOKFIELDS
LAWYERS
J D Young / M Broekman
Telephone No. 09 379 2155
Fax No. 09 379 3224
P O Box 240
DX CP24134
AUCKLAND

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1 QUALIFICATIONS AND EXPERIENCE

1.1 My name is Justin Gregory Ralston. I am a consulting civil engineer and hold the position of Senior Civil Engineer with the consulting engineering company Airey Consultants Limited (**ACL**), based in Queenstown.

1.2 I hold the qualifications of Bachelor of Engineering (Civil) from the University of Auckland. I have 25 years' experience in the design and construction of civil infrastructure with expertise in site investigation and assessment along with the design and construction of development infrastructure including roading, water supply, wastewater and stormwater disposal systems. I have experience in the design and implementation of infrastructure works for both private companies and for Local Authorities in both Queenstown and Auckland.

2 CODE OF CONDUCT

2.1 I have read and am familiar with the Code of Conduct for Expert Witnesses in the current Environment Court Practice Note (2014), have complied with it, and will follow the Code when presenting evidence to the Council. I also confirm that the matters addressed in this statement of evidence are within my area of expertise, except when relying on the opinion or evidence of other witnesses. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

3 SUMMARY

3.1 My main conclusions are as follows:

(a) It is feasible to develop the proposed activity areas with their own self-contained 3 waters networks; and

(b) Upgrade of the road access to the property to the current road geometry standards for a Rural Road of E3 category as per the QLDC land development and subdivision code of practice is achievable.

4 INTRODUCTION

4.1 ACL has been engaged by the Queenstown Park Ltd (**QPL**) to assess and report on engineering related matters involving potential rezoning of the subject land (the **Site**).

4.2 The rezoning request has been made as part of the review of the Queenstown Lakes District Council (**QLDC**) District Plan.

4.3 My evidence is limited to infrastructure issues and in particular the feasibility of servicing the site with stormwater, wastewater and water supply services and road geometry with regards to the site access.

5 ROAD GEOMETRY

5.1 The subject property can be accessed by two existing farm roads. One enters the property via Chard Farm to the east and the other from Boyd Road to the west. Further development of access to the property has only been considered from Boyd Road to the west.

5.2 A number of options have been considered for a road alignment to reach the western boundary of the property from Boyd Road. These involve using either the existing paper road alignment or agreeing to alternative alignments with neighboring landowners.

5.3 Initial concept designs along the various alignments have indicated that creating a road corridor through the land from Boyd Road to the west property boundary would be reasonably straight forward due to the moderately undulating topography. Having undertaken initial concept designs I am confident a roading corridor design compliant with current QLDC road geometry requirements for a Rural Road of E3 category as per the QLDC land development and subdivision code of practice is achievable.

5.4 It should be noted that this section of the road alignment allows for the potential future proofing of a road corridor to a second bridge across the Kawarau River. A potential launching point for a bridge exists just short of the west boundary of the subject property. A future bridge in this location would allow for the construction of a southern bypass road and services corridor that could be either joined to Hawthorne Drive in the

vicinity of the RESA or continued north along the Shotover Delta Road and connected onto State Highway 6 at Tucker Beach Road.

5.5 If such a bridge was to be constructed at a future date, then a higher standard of geometrical road constraints would need to be applied at that time in accordance with NZTA and Austroad Standards. These are still likely to be achievable within the moderately undulating topography.

5.6 From the western property boundary, an existing farm track extends 5.5 km to RV3, next to the Rastus Burn. This track traverses some areas of steep topography at the toe of The Remarkables.

5.7 Preliminary concept road models show that it will be possible to extend a 5.5-5.7 wide E3 category rural road corridor along this existing farm track alignment. There are, however, some areas along the alignment that currently have width constraints due to the topography. To deal with these areas the width of the corridor could be narrowed for localised sections or the road bench widened by cutting or filling to either side of the existing road bench.

5.8 It should be noted that this section of road is only envisaged as residential and service vehicle access, with the proposed Gondola seen as the primary means of access to the Site for tourism related activities.

5.9 The extent of cuts or fills along this section of the access road could be minimised by fine tuning the concept design during a detailed design phase.

5.10 The topography further east from pods RR2 to RR6 reverts to be moderately undulating. No initial concept design work has been done for this section of access road. However, it has been driven a number of times and I am confident that a 5.5-5.7m E3 category style rural road could be formed to access these proposed pods.

6 WATER SUPPLY

6.1 The Site is surrounded by potential water supply sources. The Kawarau River adjoins the Site to the north. Two large stormwater catchment basins cover a large majority of the face of The Remarkables to the south and feed fresh water into the Rastus Burn and Owens Creek watercourses.

6.2 It is envisaged that a self-contained water supply and reticulation system for the proposed development areas could be established on the Site in a number of ways.

6.3 Water could be extracted directly from the Kawarau River or a bore neighbouring the river as has been done for the Shotover country development across the Kawarau River from the subject property. QPL has in the past year installed such a bore adjacent to Owen Creek to service the farm manager's house.

6.4 Water could also be extracted from the Owen Creek or Rastus Burn catchments and stored in a suitable reservoir constructed in a discreet location in the valleys uphill of the proposed areas of development. This could be appropriately sized to provide adequate fire fighting and potable water supply.

6.5 The permitted volume of water extraction from these sources as discussed in our infrastructure report is 1,075,000 litres per day well in excess of any projected potable drinking water supply demand.

7 WASTEWATER

7.1 It is envisaged that the wastewater disposal systems for the site will be self contained.

7.2 Preliminary ground investigations undertaken by Holmes Consulting Limited (**HCL**) for development area RV3 and by ACL in respect of the other development areas have shown that the ground conditions are suitable for disposal to ground wastewater systems. The HCL and ACL reports are **attached** and marked "**A**" and "**B**". I can confirm that I have read and understood the HCL report and that its results are in line with the results of the ACL report.

7.3 Initial estimations of wastewater production and site design infiltration rates have indicated in our infrastructure report the areas required to be set aside for wastewater disposal beds are readily available. The most intensively developed part of the site

would be RV3 and the proposal would limit buildings footprint areas in RV3 to 30% of the area on the lower terrace and 20% of the area on the upper terrace. This would leave more than sufficient land that could be used for the projected 3.3 ha of disposal beds and re-grassed or otherwise landscaped. Development in the proposed RR areas would be limited to one residential unit per 4,000m^2 and again there would be more than sufficient land available to accommodate the required 800m^2 per lot for wastewater disposal.

8 STORMWATER

8.1 As previously mentioned, the Site contains a number of watercourses and adjoins the Kawarau River to the north.

8.2 Existing stormwater from the property drains to the watercourses traversing the Site and ultimately into the Kawarau River. Any proposed areas of development will drain stormwater from the Site in a similar fashion. However, the quality and quantity of the discharge will change due to the introduction of increased impervious areas and will need to be addressed.

8.3 In order to prevent the concentration of runoff, it is expected that the provision of stormwater drainage for the Site will necessarily involve usage of Low Impact Design principles (**LID**).

8.4 LID is a term used to describe a land planning and engineering design approach to manage stormwater runoff. LID emphasises conservation and use of on-site natural features to protect water quality. This approach implements engineered small-scale hydrologic controls to replicate the pre-development hydrologic regime of watersheds through infiltrating, filtering, storing, attenuating and detaining runoff close to its source. This approach has been used to some extent on developments in the QLDC district, most notably in a recent large-scale green fields' development in Wanaka.

8.5 I would expect that this approach could be successfully implemented on the subject land following detailed investigations, analysis and design. The approach to stormwater runoff would be a key driver in developing an overall development plan for the site.

9 CONCLUSION

9.1 Roading to access the Site can be upgraded to appropriate standards.

9.2 Numerous suitable water supplies for the Site are available and feasible to extract from.

9.3 Wastewater treatment and disposal to ground within the proposed area of development is readily achievable.

9.4 Stormwater is currently being managed using LID principles at other developments around QLDC. Subject to recommendations and appropriate evolution of lot layout concepts, I expect that this approach will be able to implemented on the Site in order to adequately manage stormwater runoff.

Justin Gregory Ralston
9 June 2017

ATTACHMENT A

HOLMES CONSULTING GONDOLA STATION INFRASTRUCTURE REPORT

HolmesConsultingGroup

REPORT

STRUCTURAL AND CIVIL ENGINEERS

REMARKABLES PARK GONDOLA MID-STATION, REMARKABLES PARK FARM

INFRASTRUCTURE REPORT

REMARKABLES PARK GONDOLA MID-STATION

INTRODUCTION

Holmes Consulting Group have been engaged by Remarkables Park Ltd to assess the feasibility of servicing a gondola mid-station building located within Remarkables Park Farm as shown on the aerial photograph below.

SCOPE OF WORK

The scope of work for this project included the following:

- Site walk over/assessment to identify features that may affect infrastructure.
- Undertake a site specific soils assessment including soakage tests to assess the feasibility of on-site wastewater and stormwater disposal.
- Investigate and report on the feasibility of providing a water supply to the building, treatment options and required volumes.
- Determine if any consents from the Otago Regional Council are required and report on our findings.
- Investigate and report on requirements for firefighting water supply/reserves.
- Obtain confirmation from power and telecommunication providers that the building can be adequately serviced.
- Collate findings and recommendations into a report to support a resource consent application to Queenstown Lakes District Council.

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LIMITATIONS

Findings presented as a part of this project are for the sole use of Remarkables Park Ltd and the Queenstown Lakes District Council (QLDC) in their evaluation of the subject property. The findings are not intended for use by other parties, and may not contain sufficient information for the purposes of other parties or other uses. Our professional services are performed using a degree of care and skill normally exercised, under similar circumstances, by reputable consultants practicing in this field at this time. No other warranty, expressed or implied, is made as to the professional advice presented in this report.

WASTEWATER

Topography

The proposed mid-station building is located on a terraced area that has a gentle slope with a north-west aspect, this terrace sits between the Rastus Burn and the Kawarau River at an elevation of approximately 330 metres above sea level.

Sensitive Receiving Environments

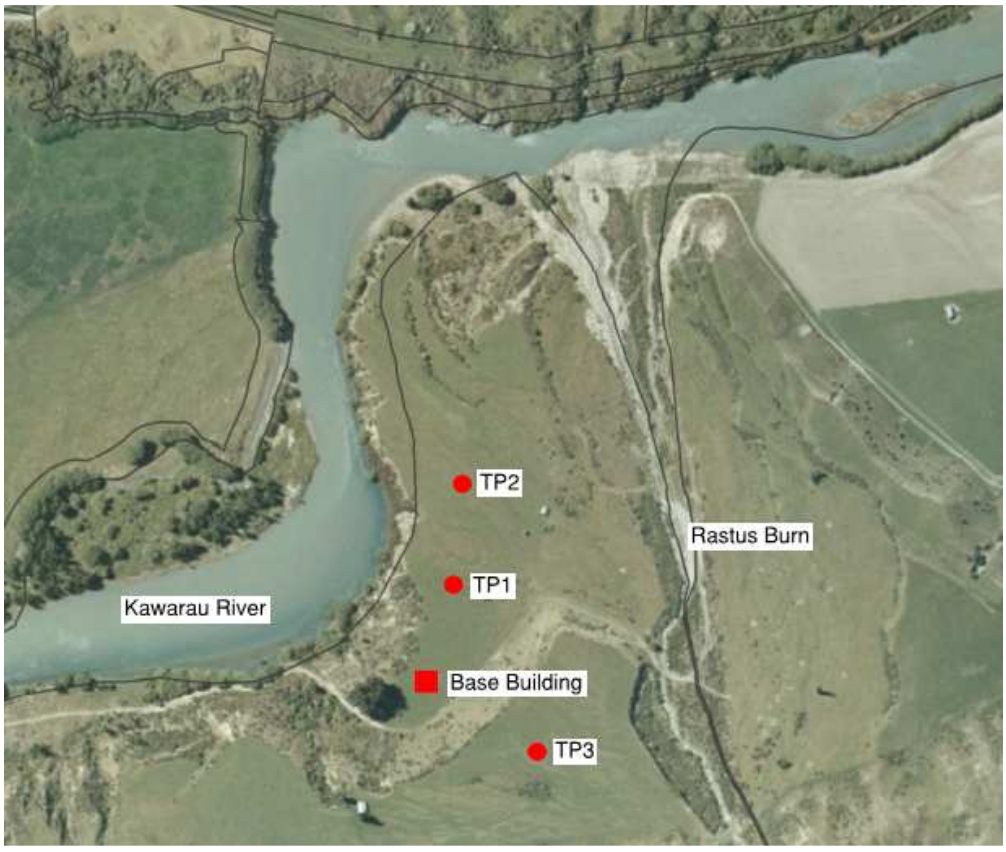
As mentioned above the subject site is located between the Rastus Burn and Kawarau River, to ensure the disposal of treated wastewater does not affect these waterways it is proposed that any disposal field is located more than 50 metres away, this is in accordance with AS/NZS 1547:2012. There is sufficient space within the site to comply with this requirement.

Climatic Conditions

The subject site receives moderate annual rainfall and experiences high evaporation during summer months, lower evaporation and periods of ground frosts occur in the winter months. The final position of the disposal field should be chosen to receive reasonable sunshine and regular wind. A depth of 400 mm or greater is considered adequate protection from frost for this area.

Site Observations

Site observations and soil permeability tests were undertaken on the 13th of May 2016. The location of the test locations are indicated below:



Test Pit 1

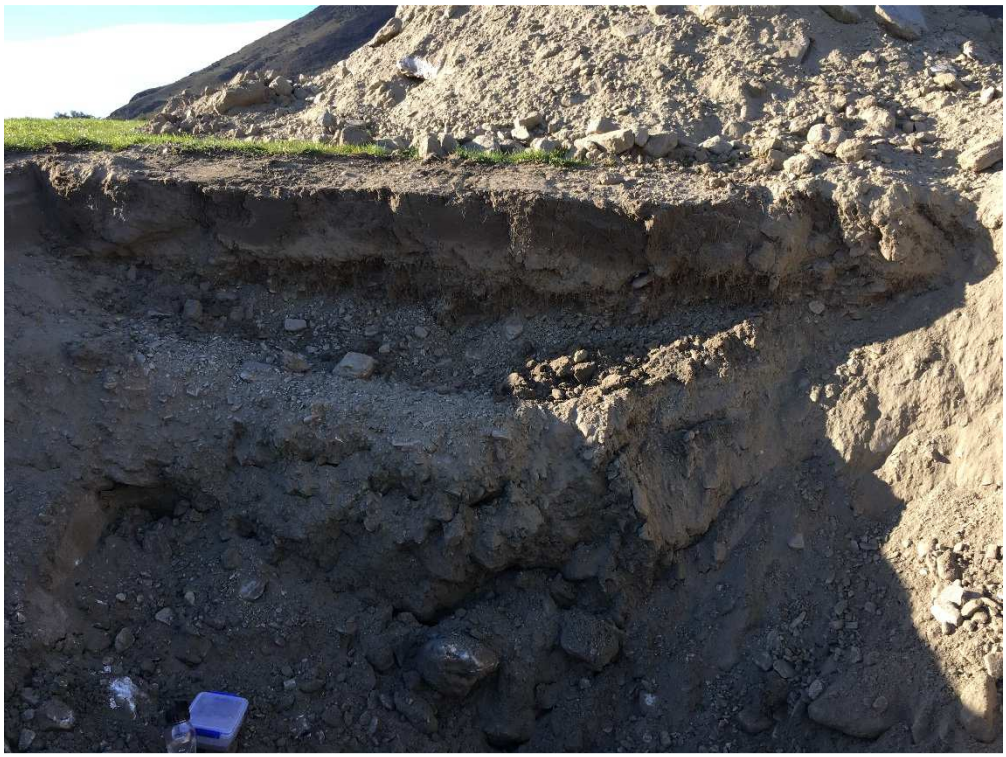
Test Pit 1 was excavated to a depth of 1.6 m, soakage testing was undertaken within the Sandy Loam layer. The soil profile discovered was as follows:

Ground level to 600 mm – Top Soil

600 mm to 1.2 m – Sandy Loam

1.2 m to 1.6 m – Sandy Loam with large stones

Permeability rate **2.36 m/day,** (calculations appended to this report)



Test Pit 1 – Soil Profile

Test Pit 2

Test Pit 2 was excavated to a depth of 1.8 m (location shown on attached plan) soakage testing was undertaken within the Sandy Loam layers. The soil profile discovered was as follows:

Ground level to 400 mm – Top Soil

400 mm to 1.6 m – Sandy Loam

1.6 m – 1.8 m – Sandy Loam with large stones

Permeability rate **2.03 m/day,** (calculations appended to this report)

Test Pit 2 – Soil Profile

Test Pit 3

Test Pit 3 was excavated to a depth of 1.2 m (location shown on attached plan) soakage testing was undertaken within the Sandy Gravel layer. The soil profile discovered was as follows:

Ground level to 400 mm – Top Soil

400 mm to 1.2 m – Sandy Gravels

Permeability rate **4.59 m/day,** (calculations appended to this report)

Test Pit 3 – Soil Profile

Soil Category

The soil category in Test Pits 1 and 2 have been assessed to be Category 2 (Sandy Loam) with Test Pit 3 has been assessed to be Category 1 (Gravels and Sands) as prescribed by Table 5.2 of AS/NZS 1547:2012.

Test Pits 1 and 2 are located on the same terrace as the proposed base building with Test Pit 3 located on the terrace above therefore during the design phase only the soakage rates measured within Test Pits 1 and 2 should be used.

For Category 2 soils, Table 5.2 specifies a Design Loading Rate (DLR) of 15-25 mm/day for primary treated effluent and 50 mm/day for secondary treated effluent.

Wastewater production

The amount of wastewater produced by the proposed mid-station cannot be accurately determined at this stage of the development. It is not yet known how many staff will be based at the building, or if there will be an opportunity for the customers to exit the gondola at this point to use the facilities.

It is however expected that the amount of treated wastewater that will be discharged for soakage to land will not exceed 2,000 litres per day and therefore is considered a Permitted Activity under the Otago Regional Council (ORC) Water Plan (Section 12.6.1.4).

If it is found during Detailed Design that more than 2,000 litres per day of treated wastewater will be generated then a Resource Consent from the ORC will be required.

Based on the soakage rates tested within the site, and the amount of land available for a disposal field, HCG is satisfied that a suitable wastewater treatment and disposal system will be feasible for the proposed mid-station once further details around its use are known.

STORMWATER

The proposed site is not serviced by an existing connection to a stormwater disposal system; it is proposed that stormwater generated by the development's impervious areas will drain to an on-site soak pit. Based on the soakage rates measured on site it is considered that onsite stormwater disposal is feasible and that there is sufficient space within the site to provide onsite disposal.

The size and specific location of the soak pit can be determined at the Building Consent stage.

WATER

The proposed location of the mid-station has no connections to a reticulated water supply system. As such, a water supply will need to be established and connected to the building prior to its occupation.

There are a number of water supply options for this particular site.

Option 1 - Kawarau River.

A surface take from the Kawarau River is a Permitted Activity under Section 12.1.2.2 of the Otago Regional Council (ORC) Water Plan with a limit of 1 million litres per day.

Option 2 - Rastus Burn.

A surface take from the Rastus Burn is a Permitted Activity under Section 12.1.2.5 of the Otago Regional Council (ORC) Water Plan with a limit of 25,000 litres per day.

Option 3 – Ground Water via bore

A ground water take from a bore that is installed within the site is a Permitted Activity under Section 12.2.2.2 of the Otago Regional Council (ORC) Water Plan with a limit of 25,000 litres per day.

As noted above there are several options for providing this development with suitable volumes of water. The specific volumes of water required to supply this building cannot be calculated until further details of its occupancy are known, however it is not expected that more than 25,000 litres per day will be required.

Treatment considerations will include the fact that stormwater runoff from the nearby Shotover Country and Lake Hayes Estate subdivisions flow directly to the Kawarau River, the amount of silt in the Kawarau River will also be a consideration. As such, the cost of treatment for this water supply to meet New Zealand Drinking Water Standards may exclude the Kawarau River option. Likewise, with the Rastus Burn, which has the Remarakables Ski Field wastewater disposal field in its catchment, the cost of treatment required may also exclude this option. The preferred option for supplying the development with water will not be known until further investigation is undertaken regarding the quality of water from the proposed sources and the extent of required treatment is known.

However, with the water supply options available to this site, and the water take volumes permitted, it is considered that it is feasible to provide suitable volumes to the development. The specifics of the water supply, including treatment methods, can only be determined once further design details are known.

FIRE FIGHTING

There are no Council owned fire hydrants located within a suitable distance to the proposed mid-station. It is proposed that a static fire-fighting reserve will be provided prior to occupation of the development's building. The proposed fire-fighting reserve will be in accordance with the New Zealand Fire Fighting Standard PAS SNZ4509:2008.

The size and specific location of the static fire-fighting reserve can only be determined once a detailed design of the development's building is finalised, there is however sufficient space within the site to accommodate an on-site firefighting reserve.

POWER

An overhead power supply currently runs through the site and a connection to this supply can be made to provide power to the development.

The existing power supply currently provides power to the Remarkables Ski Field and will require alterations and additions to the existing network prior to the connection of this development. A letter from PowerNet confirming that an electricity supply with sufficient total capacity for the proposed development is attached in the Appendices.

TELECOMMUNICATIONS

There are no connections to an existing telecommunication service provided to the site. Due to the remote location of the site a hard line connection to a telecommunication service is not practical therefore it is proposed that a cellular network is used to service the mid station and associated buildings.

Yours sincerely

Richard Powell
DESIGN ENGINEER
16 June 2016

Reviewed by

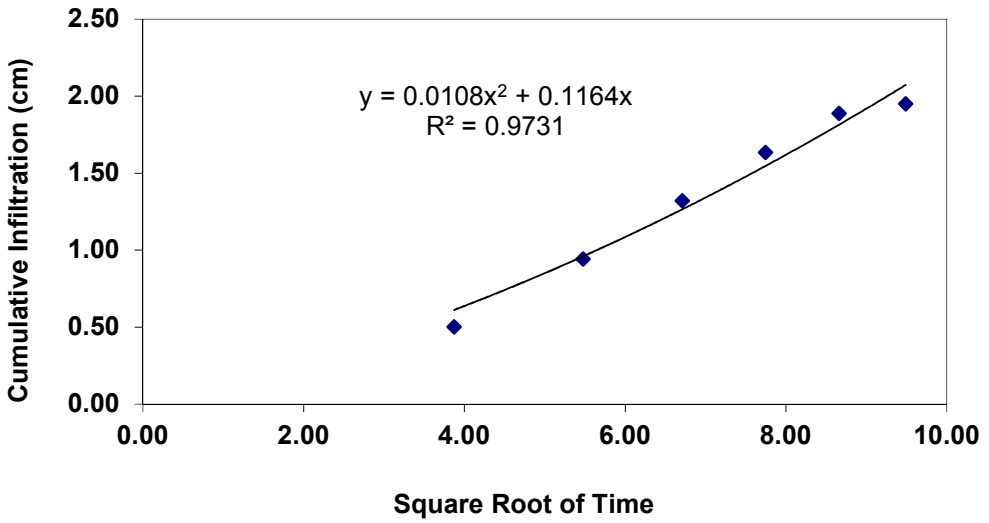
Andrea Jarvis

Appendix A – Soil Soakage Calculations

HolmesConsultingGroup

Project Name:	Remarkables Park Gondola Mid Base Building
Project No:	131628
Calcs By:	Richard Powell
Date:	24/05/2016
Test Pit No:	Test Pit 1

Time (s)	sqrt (t)	Volume (mL)	Infilt (cm)
0		90	0.00
15	3.87	82	0.50
30	5.48	75	0.94
45	6.71	69	1.32
60	7.75	64	1.64
75	8.66	60	1.89
90	9.49	59	1.95
105	10.25	57	2.08
120	10.95	54	2.26
135	11.62	51	2.45
150	12.25	49	2.58
165	12.85	46	2.77
180	13.42	44	2.89
195	13.96	42	3.02
210	14.49	39	3.21
225	15.00	37	3.33
240	15.49	35	3.46

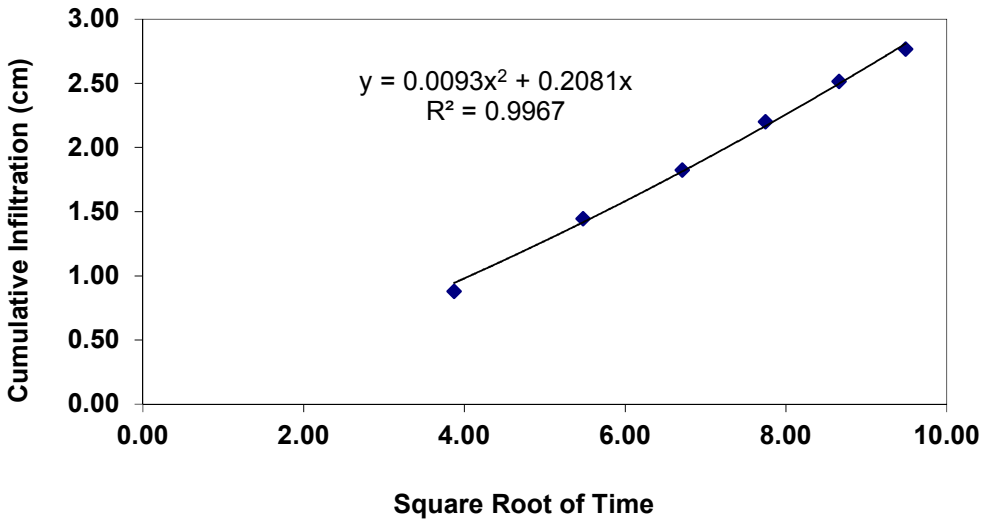


Soil Suction	**4 cm**	
Soils	**Sandy Loams**	
A (from Table 2)	**3.95**	
k = c1/A	**0.00273**	**cm/s**
K	**236.23**	**cm/day**
	2.36	**m/day**
	98.43	**mm/hr**

HolmesConsultingGroup

Project Name:	Remarkables Park Gondola Mid Base Building
Project No:	131628
Calcs By:	Richard Powell
Date:	24/05/2016
Test Pit No:	Test Pit 2

Time (s)	sqrt (t)	Volume (mL)	Infilt (cm)
0		93	0.00
15	3.87	79	0.88
30	5.48	70	1.45
45	6.71	64	1.82
60	7.75	58	2.20
75	8.66	53	2.52
90	9.49	49	2.77
105	10.25	43	3.14
120	10.95	38	3.46
135	11.62	34	3.71
150	12.25	29	4.03
165	12.85	24	4.34
180	13.42	20	4.59
195	13.96	15	4.91
210	14.49	11	5.16
225	15.00	6	5.47
240	15.49	2	5.72

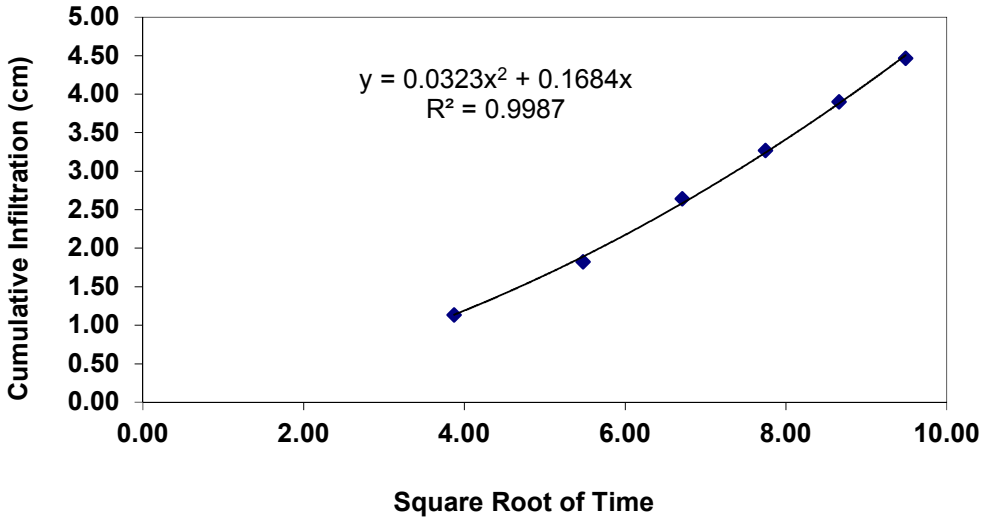


Soil Suction	**4 cm**	
Soils	**Sandy Loams**	
A (from Table 2)	**3.95**	
k = c1/A	**0.00235**	**cm/s**
K	**203.42**	**cm/day**
	2.03	**m/day**
	84.76	**mm/hr**

HolmesConsultingGroup

Project Name:	Remarkables Park Gondola Mid Base Building
Project No:	131628
Calcs By:	Richard Powell
Date:	24/05/2016
Test Pit No:	Test Pit 3

Time (s)	sqrt (t)	Volume (mL)	Infilt (cm)
0		85	0.00
15	3.87	67	1.13
30	5.48	56	1.82
45	6.71	43	2.64
60	7.75	33	3.27
75	8.66	23	3.90
90	9.49	14	4.47
105	10.25	4	5.09



Soil Suction	**4 cm**	
Soils	**Sandy Gravels**	
A (from Table 2)	**3.95**	
k = c1/A	**0.00532**	**cm/s**
K	**459.34**	**cm/day**
	4.59	**m/day**
	191.39	**mm/hr**

Appendix B – Power Confirmation Letter

PowerNet Limited
251 Racecourse Road, PO Box 1642,
Invercargill 9840, New Zealand
P: 03 211 1899
F: 03 211 1880
E: enquiries@powernet.co.nz

31st May 2016

Remarkables Park Limited
Level 3, Von House
Remarkables Park Town Centre
Queenstown 9348

Attention: Jenny Carter

Dear Jenny

Electrical Supply Availability: Gondola and Associated Buildings

In reply to your enquiry regarding the availability of a supply of electricity for the proposed Gondola and buildings.

On behalf of Electricity Southland Ltd (ESL), the network provider, we advise that an electricity supply with sufficient total capacity for the proposed development can be made available.

The supply will require alterations and additions to the existing Electricity Southland Network and possibly the associated Networks which will be subject to a specific design and will have cost implications for the developer.

Yours faithfully

Chris Way
ESL Project Manager
137 Glenda Drive, Queenstown, PO Box 1642, Invercargill 9840, New Zealand
Phone: +64 3 211 1899 DDI:+64 3 450 9086 Mobile:+64 27 403 3225
Email: cway@powernet.co.nz
www.powernet.co.nz

ATTACHMENT B

AIREYS CONSULTANTS PLAN CHANGE INFRASTRUCTURE REPORT

Queenstown Park Station,

Infrastructure Report

May 2017

Document Control Record

GENERAL INFORMATION - Consultant

Document Prepared By:

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Quality Assurance Statement	
Queenstown Park Ltd **Proposed Plan Change** Queenstown Park Station, Queenstown	**Prepared by:** Tomas Nydrle (TN)
	Reviewed by: Justin Ralston (JR)
Project Manager: Justin Ralston	**Approved for issue by:** Justin Ralston

Revision Schedule					
Rev. No.	Date	Description	Prepared by	Reviewed by	Approved by

Executive Summary

This report covers the civil engineering services aspects of the proposed plan change application, for the creation of development lots within the Queenstown Park Station, which borders the south bank of the Kawarau River at the toe of the Remarkables Mountain range.

It is proposed to rezone a number of pockets of land within the Queenstown Park Station. These areas are referred to as pods and designated the descriptors RR 1 to 7 for Rural Residential Areas and RV 1 to 4 for Rural Visitor Areas.

The Rural Residential (RR) pods cover a combined area of 54.3ha and it is proposed to accommodate 90 residential dwellings within these pods with typical lot areas of 4000m^2.

The Rural Visitor (RV) pods cover a combined area of 38.51ha of which approximately 13.5ha is proposed to be developed into a range of visitor facilities clustered around a Gondola Turn Station proposed at the base of the Rastus Burn valley.

In order to confirm civil infrastructure requirements can be met internally on site, initial assumptions made with regards to water consumption and wastewater generation have been made. Within this report site investigations of existing ground conditions are documented that confirm that onsite disposal to ground of wastewater and stormwater water is feasible

Based on the initial assumptions and site investigations it is concluded that the development can be serviced internally on the site on with water, stormwater & wastewater discharge and connects can be made to the local power and telecommunications reticulation.

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Content

1 INTRODUCTION

Aireys Consultants Limited (ACL) have been engaged by Queenstown Park Limited to assess the feasibility of servicing a number of development pods located within Queenstown Park Station as shown on the aerial photo below and labelled Rural Residential (RR) 1 to 7 and Rural Visitor (RV) 1 to 4.

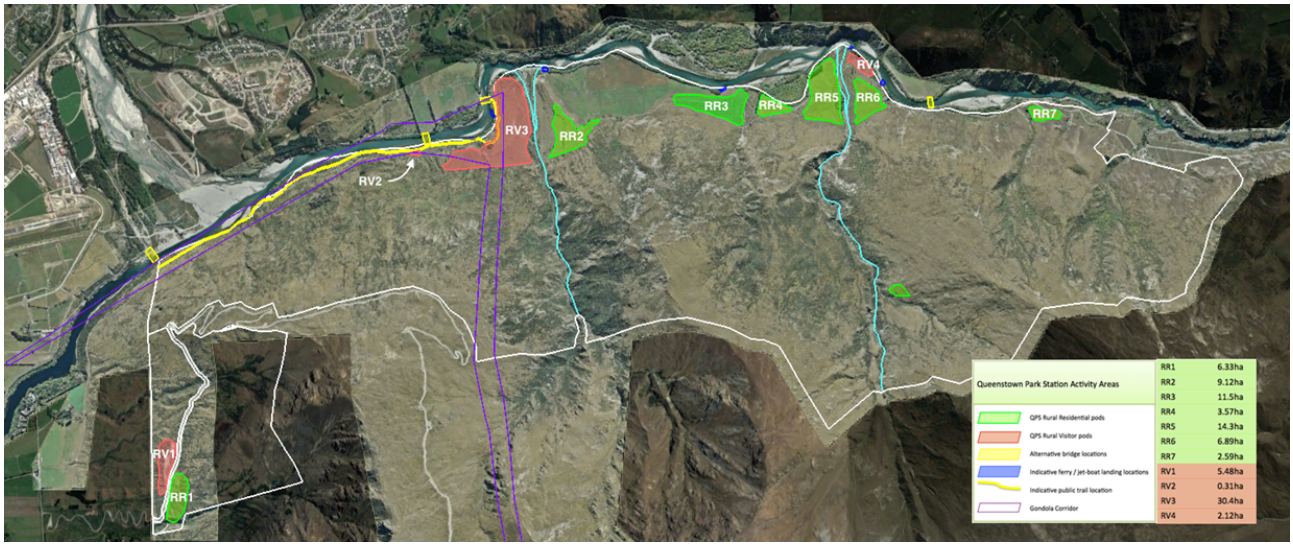


Figure 1 Locations of Pods of proposed development

1.1 Scope of Work

The following tasks were requested to be undertaken

- A site walk over and assessment to identify features that may affect construction of civil infrastructure
- site specific soil assessment including infiltration tests to assess the soil category and feasibility of on-site wastewater and stormwater disposal.
- Investigate and report on the options available for providing potable and fire fighting water supply to the proposed areas of development.
- Determine permitted water extraction and wastewater discharge limits and if any consents from Otago Regional Council are required.

2 SITE DESCRIPTION

2.1 General

Queenstown Park Station is located on the south bank of the Kawarau River and covers an area of approximately 1825ha. The station spans 16 km's east to west from Chard Farm to Boyd Road.

2.1 Pod Locations and Topography

The locations of the proposed development pods are situated along the south bank of the Kawarau River between Rastus Burn, Owens Creek and Kawarau River as depicted in Figure 1 above.

All pods are located on areas of lower elevation topography typically on alluvial fans in the elevation range of 320-400m above sea level. The alluvial fans or flatter terraced areas gently slope downhill from the toe of the Remarkables to the Kawarau River and have a sunny northern aspect.

2.2 Climatic Conditions

The pod sites receive moderate annual rainfall and experiences high evaporation during summer months, lower evaporation and periods of ground frosts occur in the winter months.

3 Wastewater

3.1 Wastewater Flow Estimates

3.1.1 Rural Residential

Within the 54.3ha of proposed Rural Residential it is proposed to accommodate upto 90 dwellings. It is expected that these will be reasonably sized houses that maybe infrequently occupied. It is expected that each residence will be self-contained with regards to wastewater treatment and that they will treat and discharge their own wastewater to ground with in their lot. It is envisaged that the daily wastewater discharge per lot will not exceed 2000 litres per day as allowed as a Permitted Activity under the Otago Regional Council Water Plan (Section 12.6.1.4)

3.1.2 Rural Visitor

Approximately 13.5 ha of the 38.5ha of Rural Visitor development pods are proposed to be developed into facilities and buildings. Estimation of the volume of wastewater from these building can only be considered at a reasonably high level at this stage. It is considered that the areas to be developed in the Rural Visitor Pods with have less density than other developed areas in the Wakatipu Basin. Assumed this to be the case then if the observed wastewater flows from these existing areas can be used to project a conservative upper bound limit for wastewater discharge from the areas of development.

On this basis if we consider the current wastewater discharge from the south west wastewater catchment of Frankton Flats we obtain a per hectare daily discharge of 12.35 m3/ha (400m3/32.4ha).

Therefore it is expected that the daily discharge from 13.5ha of development of the Rural Visitor pods could generate 167m3/day of wastewater.

3.2 Site Investigations

Test pits and infiltration tests of soil with in the Rural Visitor pod was undertaken on the xx.xxx.xx by Holmes Consulting Group and are documented in their report dated the xx.xx.xx and attached separately.

Test pits and infiltration tests of soil within and next to the Rural Residential Pods were undertaken by Aireys Consultants Limited on 10th of May 2017. The position of these test locations are indicated below. The results of the infiltration tests are provided in Appendix A. Infiltration rates ranging from 18 mm/hr to 261 mm/hr were recorded.

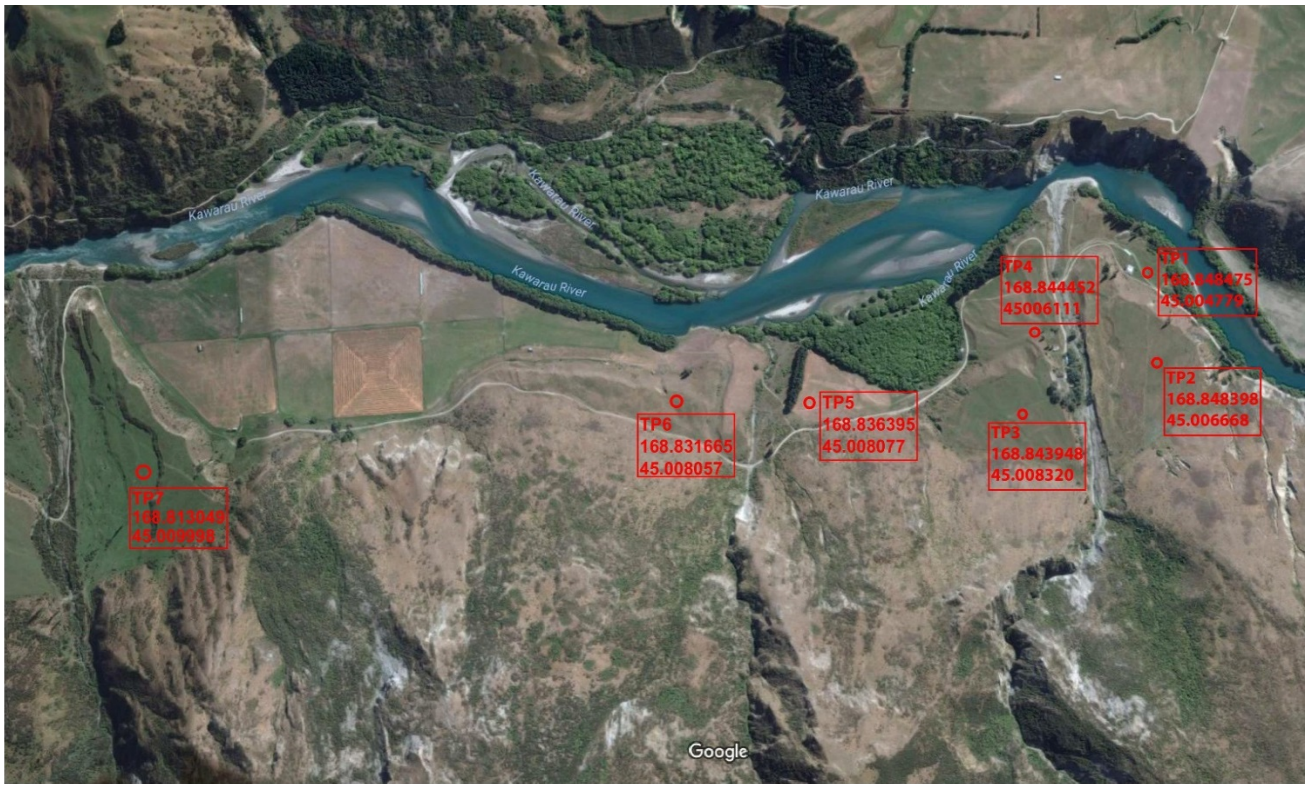


Figure 2 Ground Soakage Test Locations

3.2.1 Soil Category

Based on the soil profiles observe red and the infiltration testing with reference to Table 5.2 of AS/NZS 1547:2002 the Otago Regional council soil map as attached in Appendix B. The soil category in Test Pits 1, 2, 3, 4, 5 & 7 has been assessed to be Category 2 – Sandy loam soil texture and Test Pit 6 to be Category 4 – Clay loam soil texture.

It is therefore recommended that a design soakage rate of 5mm/day for dripper irrigation be used.

3.3 On Site Disposal Areas

3.3.1 Rural Residential

Based on a maximum permitted discharge of 2000 litres per day per lot and a design infiltration rate of 5mm/day a disposal bed area of 400m2 is required with a 400m2 reserve area. Seeing the proposed lots are to be 4000m^2 only 20% of the lot area will need to be set aside for wastewater disposal to ground. It can be concluded that this will be achievable and disposal of wastewater to ground is a viable solution.

3.3.2 Rural Visitor

Based on the estimated 167 m3/day upper bound limit of discharge and a design infiltration rate of 5mm/day and area of 3.34 ha is required to be set aside for wastewater disposal. With 3.34 ha being only 8.7% of the pod area it can be can be concluded that this will be achievable and disposal of wastewater to ground is a viable solution. The disposal area could be centralised into one location or alternatively separated into pockets which could be fitted around and between any clusters of proposed development.

3.3.3 General

To assist with the most efficient operation of any disposal field's final position of the disposal field should be chosen to receive reasonable sunshine and regular wind. A depth of 400mm or greater is considered adequate protection from frost for this area.

4 STORMWATER

No existing stormwater infrastructure exists on site. Stormwater generated by any introduced impervious areas will have to drain to on site soakage areas or existing watercourses. Prior to discharge the stormwater will need to be treated and/or attenuated using low impact design techniques to limit post development affects on the receiving environment. Due to the area of land available and its rounding topography it will be possible to develop a number of stormwater disposal solutions to allow the development to occur.

5 WATER

5.1 Potable Water Supply

No existing water infrastructure exists on site. However the development pods are located next to numerous potential sources of water. These provide a number of water supply options for the development pods all of which have permitted daily water extraction limits will above those required to meet the water demand requirements.

The options available for water sources are:-

Option 1 – Kawarau River (Permitted Activity under Section 12.1.2.2 of the Otago Regional Council Water plan with a limit of 1 million litres per day).

Option 2 – Rastus Burn (Permitted Activity under Section 12.1.2.5 of the Otago Regional Council Water plan with a limit of 25,000 litres per day).

Option 3 – Owens Creek (Permitted Activity under Section 12.1.2.5 of the Otago Regional Council Water plan with a limit of 25,000 litres per day).

Option 4 – Ground Water via bore (Permitted Activity under Section 12.1.2.5 of the Otago Regional Council Water plan with a limit of 25,000 litres per day).

All these options show water can be sources to allow the development to occur.

5.2 Fire Fighting Water Supply

In order to provide firefighting water volumes and flows it is envisaged that some form of water reservoir will be built at a higher elevation in the mountains above the development pods. Water could be provided to this reservoir by either extraction from a nearby stream or by extraction from a bore at a lower level and

pumping to the reservoir. The proposed fire-fighting reserve will be in accordance with the New Zealand Fire Fighting Standard PAS SNZ4509:2008.

6 POWER

Over head power lines from two different power operators currently run through the site (Aurora and Electricity Southland) and can provide a connection to supply for the development.

The existing Aurora power supply from Boyd Road currently provides power to the Remarkables Ski Field and will require alterations and additions to the existing network prior to the connection of this development that could occur in conjunction with the planned upgrade of the Ski field power supply.

Alternatively a supply from Electricity Southland can be provided by upgrading an existing overhead line across the Kawarau River. A letter from PowerNet confirming that an electricity supply with sufficient total capacity for the proposed development is attached in the Appendix C.

7 TELECOMMUNICATION

Connections to the Chorus telecommunications infrastructure could be made at either the west or eastern end of the property or by spanning over the Kawarau River.

Due to the remote location of the site a hard line connection to a telecommunication service may not be cost effective therefore it is proposed that a cellular network maybe a better option.

8 GAS RETICULATION

There is no any Gas reticulation at this location. If gas was to be provided did could be done so by a communal gas bottle farm or separate gas bottles at each building.

9 ROADING & ACCESS

9.1 Existing

Currently the site is accessed by a gravel farm road connected via Boyd Rd to the West and via Chard Road to the Gibbston Highway in the East.

9.2 Proposed

The preferred means of access will be by the proposed Gondola. However limited vehicular access with will provided by the upgrade of the Farm road entering the property from Boyd Road to the west. Extensive road modelling work has shown that a 6 metre wide upgraded access from the west is achievable following the existing farm road.

10 SUMMARY

Based on the above investigates it can be confirmed that civil engineering services can be established to the development pods as per NZS4404:2004 (Land Development and Subdivision Engineering and Councils amendments dated September 2015) requirements.

All civil engineering work required to service the development is of limited complexity and straight forward as is generally carried out in association with development of other parcels of land of a similar nature within the Queenstown Lakes district.

Civil Engineering servicing should not be seen as limitation as to why the proposed development should not be granted.

Appendix A

11 SOAKAGE TESTS

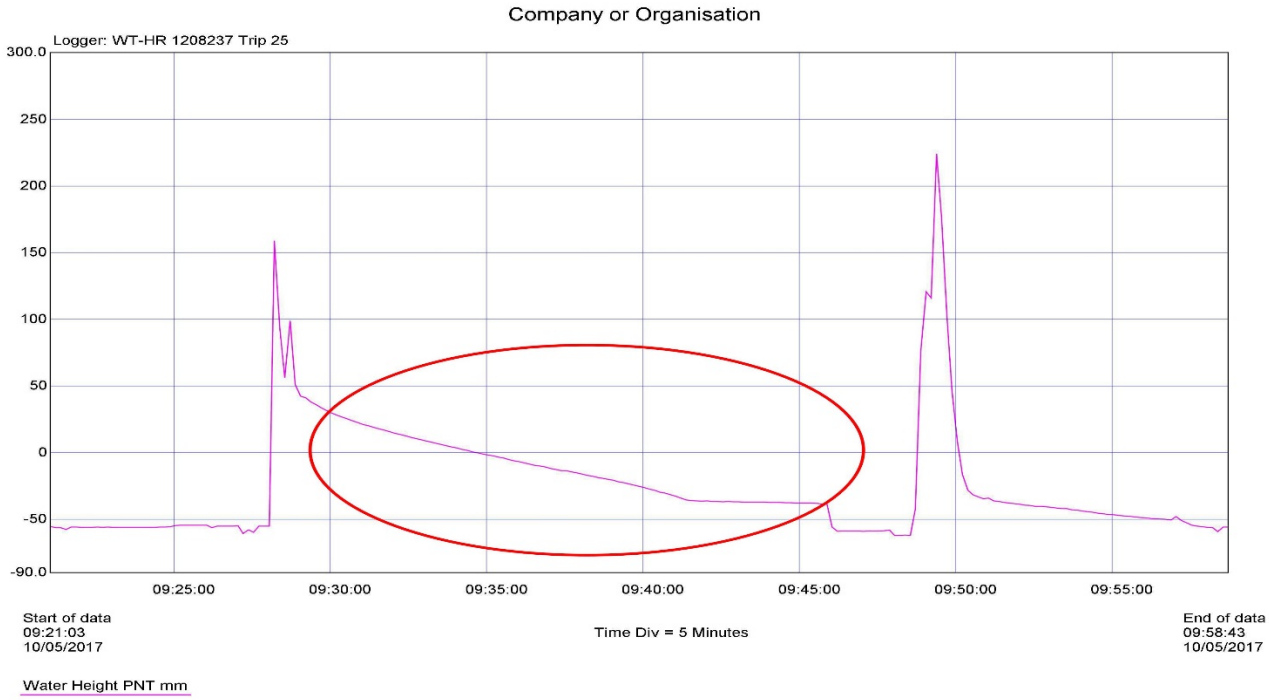
11.1 **Test Pit 1** (location: 168.848475 / 45.004779)

Soil Profile: (Excavation depth 1500mm)

- Top soil Ground level – 300mm

- Sandy loam 300 - 1400mm
- Sandy loam with small stones 1400 - 1500mm

TP 1 - Ring infiltrometer test



T1 - 09:30:03s T2 – 09:45:53s Td = T2-T1 = 00:15:50s = 0.2638hr
H1 – 30mm H2 – (-39)mm Hd = H1-H2= 69mm

Infiltration rate: 261.56 mm/hr = 6.277 m/d
Soil Texture: Sandy Loam

TABLE 5.2
SOIL CATEGORIES AND RECOMMENDED DESIGN IRRIGATION/LOADING RATES (DIR/DLR) FOR LAND-APPLICATION SYSTEMS

Soil Category	Soil texture	Structure	Indicative permeability (K_{sat}) (m/d)	Design irrigation/loading rate (DIR/DLR) (mm/day)						
				Trenches and beds (see Table L1)			ETA/ETS beds and trenches (Table L1)	Drip and spray irrigation (Table M1)	LPED irrigation (Table M1)	Mounds (basal area) (Table N1)
				Primary treated effluent		Secondary treated effluent				
				Conservative rate	Maximum rate					
1	Gravels and sands	Structureless (massive)	> 3.0	(see Note 1 of Table L1 for DLR values)			(see Note 4 of Table L1)	5 (see Note 2 of Table M1)	(see Note 3 of Table M1)	32
2	Sandy loams	Weakly structured massive	> 3.0						4	24
			1.4 – 3.0	15	25	50				
3	Loams	High/ moderate structured	1.5 – 3.0	15	25	50		4 (see Note 1 of Table M1)	3.5	24
		Weakly structured or massive	0.5 – 1.5	10	15	30				16
4	Clay loams	High/ moderate structured	0.5 – 1.5	10	15	30	12	3.5 (see Note 1 of Table M1)	3	16
		Weakly structured	0.12 – 0.5	6	10	20	8			8
		Massive	0.06 – 0.12	4	5	10	5			(see Note to Table N1)
5	Light clays	Strongly structured	0.12 – 0.5	5	8	12	8	3 (see Note 1 of Table M1)	2.5 (see Note 4 of Table M1)	8
		Moderately structured	0.06 – 0.12	(see Notes 2 and 3 of Table L1)	5	10	5 (see Notes 2, 3, and 5 of Table L1)			(see Note to Table N1)
		Weakly structured or massive	< 0.06			8				
6	Medium to heavy clays	Strongly structured	0.06 – 0.5					2 (see Note 2 of Table M1)	(see Note 3 of Table M1)	
		Moderately structured	< 0.06							
		Weakly structured or massive	< 0.06							

11.2 Test Pit 2 (location: 168.848398 / 45.006668)

Soil Profile: (Excavation depth 1500mm)

- Top soil	Ground level – 200mm
- Sandy loam	200 - 1000mm
- Sandy loam with small stones	1000 - 1500mm

TP 2 - Ring infiltrometer test

T1 - 10:33:51s T2 – 10:39:41s Td = T2-T1 = 00:05:50s = 0.0972hr
H1 – (-36)mm H2 – (-42)mm Hd = H1-H2= 6mm

Infiltration rate: 61.716 mm/hr = 1.481 m/d
Soil Texture: Sandy Loam

TABLE 5.2
SOIL CATEGORIES AND RECOMMENDED DESIGN IRRIGATION/LOADING RATES (DIR/DLR) FOR LAND-APPLICATION SYSTEMS

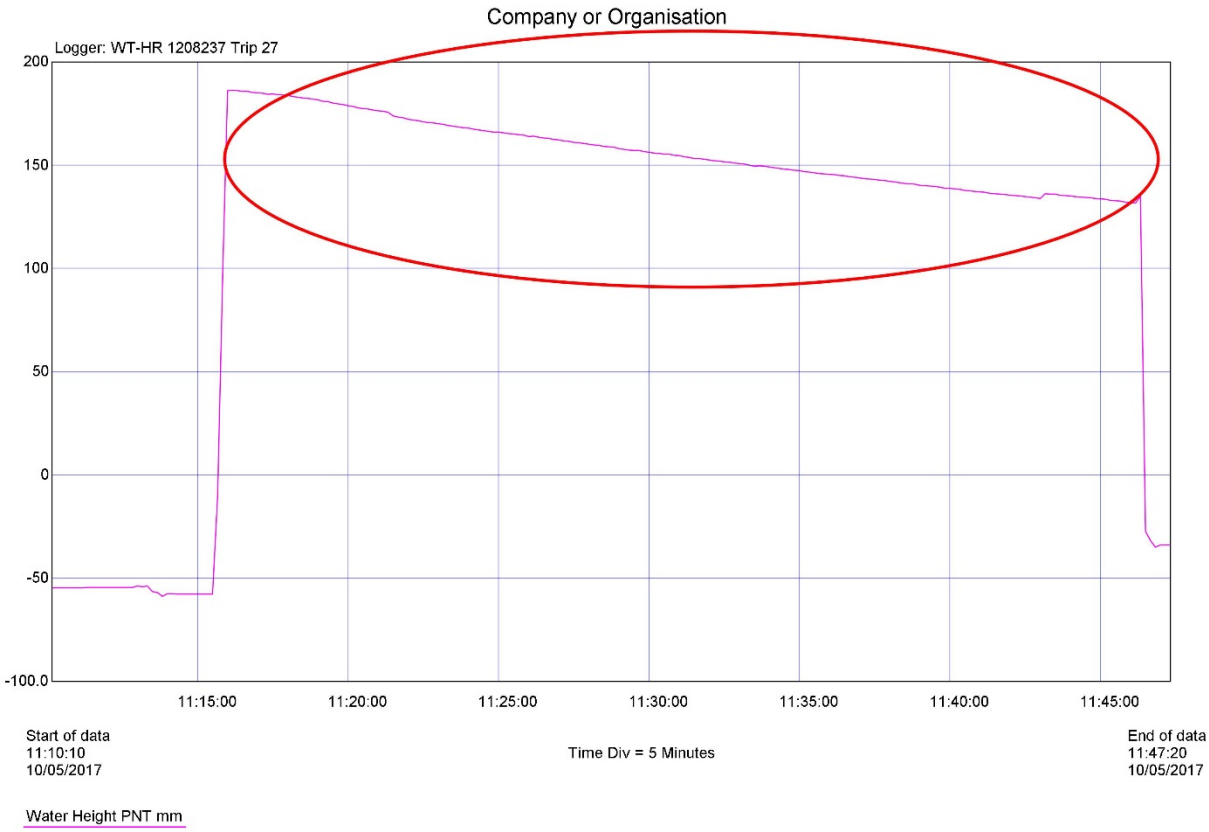
Soil Category	Soil texture	Structure	Indicative permeability (K_{sat}) (m/d)	Design irrigation/loading rate (DIR/DLR) (mm/day)						
				Trenches and beds (see Table L1)			ETA/ETS beds and trenches (Table L1)	Drip and spray irrigation (Table M1)	LPED irrigation (Table M1)	Mounds (basal area) (Table N1)
				Primary treated effluent		Secondary treated effluent				
				Conservative rate	Maximum rate					
1	Gravels and sands	Structureless (massive)	> 3.0	(see Note 1 of Table L1 for DLR values)			(see Note 4 of Table L1)	5 (see Note 2 of Table M1)	(see Note 3 of Table M1)	32
2	Sandy loams	Weakly structured massive	> 3.0							
			1.4 – 3.0	15	25	50			4	24
3	Loams	High/ moderate structured	1.5 – 3.0	15	25	50		4 (see Note 1 of Table M1)	3.5	24
		Weakly structured or massive	0.5 – 1.5	10	15	30				16
4	Clay loams	High/ moderate structured	0.5 – 1.5	10	15	30	12	3.5 (see Note 1 of Table M1)	3	16
		Weakly structured	0.12 – 0.5	6	10	20	8			8
		Massive	0.06 – 0.12	4	5	10	5			(see Note to Table N1)
5	Light clays	Strongly structured	0.12 – 0.5	5	8	12	8	3 (see Note 1 of Table M1)	2.5 (see Note 4 of Table M1)	8
		Moderately structured	0.06 – 0.12	(see Notes 2 and 3 of Table L1)	5	10	5 (see Notes 2, 3, and 5 of Table L1)			(see Note to Table N1)
		Weakly structured or massive	< 0.06			8				
6	Medium to heavy clays	Strongly structured	0.06 – 0.5					2 (see Note 2 of Table M1)	(see Note 3 of Table M1)	
		Moderately structured	< 0.06							
		Weakly structured or massive	< 0.06							

11.3 Test Pit 3 (location: 168.843948 / 45.008320)

Soil Profile: (Excavation depth 1500mm)

- Top soil	Ground level – 400mm
- Sandy loam	400 - 800mm
- Sandy loam with stones	800 - 1500mm

TP 3 - Ring infiltrometer test



T1 - 11:16:11s T2 – 11:46:11s Td = T2-T1 = 00:30:00s = 0.50hr
H1 – 178mm H2 – 133mm Hd = H1-H2= 45mm

Infiltration rate: **90.0 mm/hr = 2.160 m/d**
Soil Texture: **Sandy loam**

TABLE 5.2
SOIL CATEGORIES AND RECOMMENDED DESIGN IRRIGATION/LOADING RATES (DIR/DLR) FOR LAND-APPLICATION SYSTEMS

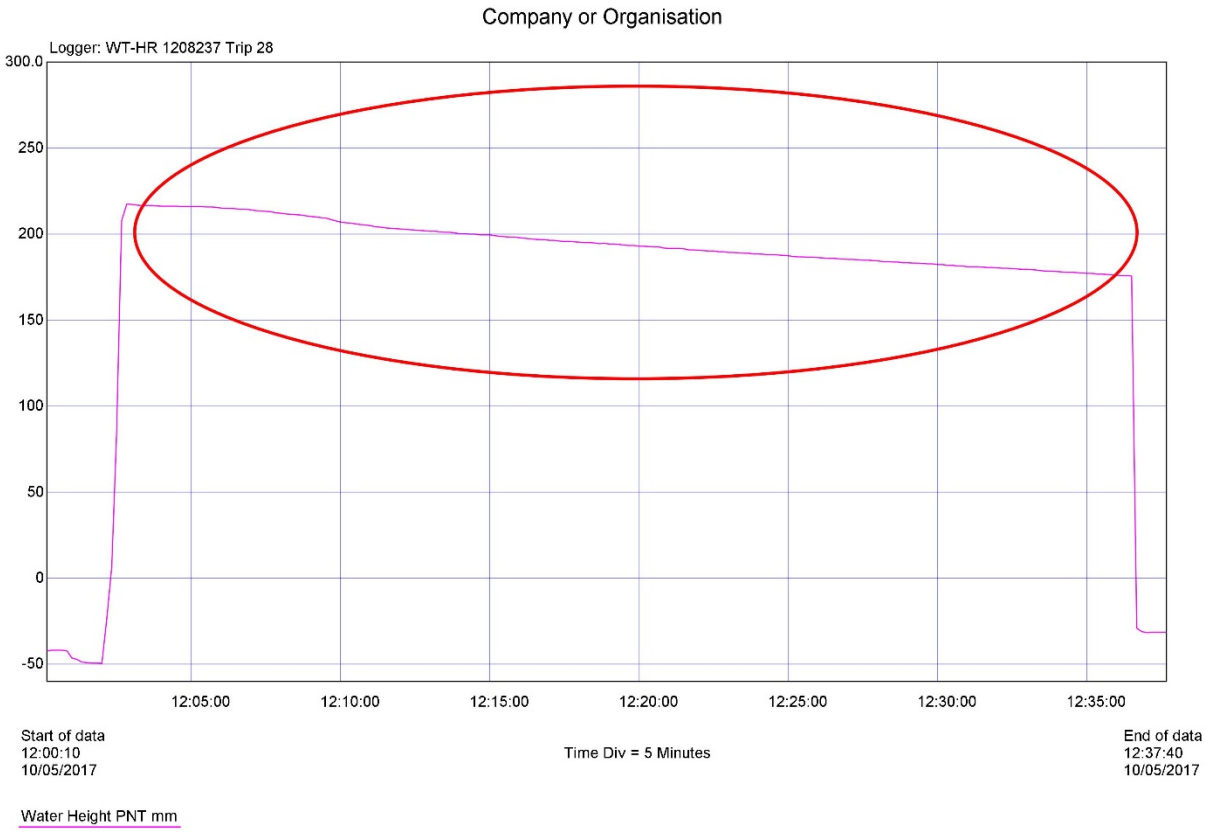
Soil Category	Soil texture	Structure	Indicative permeability (K_{sat}) (m/d)	Design irrigation/loading rate (DIR/DLR) (mm/day)						
				Trenches and beds (see Table L1)			ETA/ETS beds and trenches (Table L1)	Drip and spray irrigation (Table M1)	LPED irrigation (Table M1)	Mounds (basal area) (Table N1)
				Primary treated effluent		Secondary treated effluent				
				Conservative rate	Maximum rate					
1	Gravels and sands	Structureless (massive)	> 3.0	(see Note 1 of Table L1 for DLR values)			(see Note 4 of Table L1)	5 (see Note 2 of Table M1)	(see Note 3 of Table M1)	32
2	Sandy loams	Weakly structured massive	> 3.0						4	24
			1.4 – 3.0	15	25	50				
3	Loams	High/ moderate structured	1.5 – 3.0	15	25	50		4 (see Note 1 of Table M1)	3.5	24
		Weakly structured or massive	0.5 – 1.5	10	15	30				16
4	Clay loams	High/ moderate structured	0.5 – 1.5	10	15	30	12	3.5 (see Note 1 of Table M1)	3	16
		Weakly structured	0.12 – 0.5	6	10	20	8			8
		Massive	0.06 – 0.12	4	5	10	5			(see Note to Table N1)
5	Light clays	Strongly structured	0.12 – 0.5	5	8	12	8	3 (see Note 1 of Table M1)	2.5 (see Note 4 of Table M1)	8
		Moderately structured	0.06 – 0.12	(see Notes 2 and 3 of Table L1)	5	10	5 (see Notes 2, 3, and 5 of Table L1)			(see Note to Table N1)
		Weakly structured or massive	< 0.06			8				
6	Medium to heavy clays	Strongly structured	0.06 – 0.5					2 (see Note 2 of Table M1)	(see Note 3 of Table M1)	
		Moderately structured	< 0.06							
		Weakly structured or massive	< 0.06							

11.4 **Test Pit 4** (location: 168.844452 / 45.006111)

Soil Profile: (Excavation depth 1500mm)

- Top soil	Ground level – 150mm
- Sandy loam	150 - 300mm
- Sandy loam with stones	300 - 1500mm

TP 4 - Ring infiltrometer test



T1 - 12:03:11s T2 – 12:36:11s Td = T2-T1 = 00:33:00s = 0.55hr
H1 – 199mm H2 – 165mm Hd = H1-H2= 34mm

Infiltration rate: **68.0 mm/hr = 1.632 m/d**
Soil Texture: **Sandy Loam**

TABLE 5.2
SOIL CATEGORIES AND RECOMMENDED DESIGN IRRIGATION/LOADING RATES (DIR/DLR) FOR LAND-APPLICATION SYSTEMS

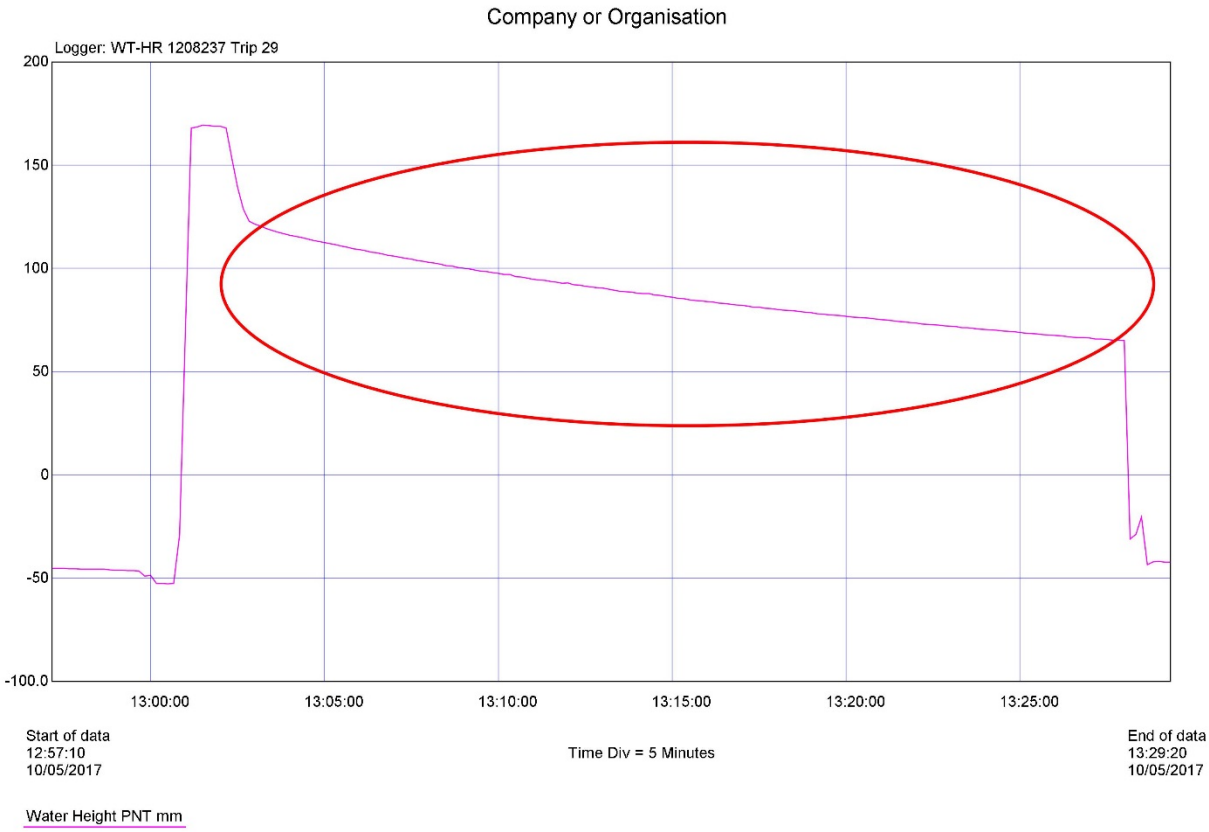
Soil Category	Soil texture	Structure	Indicative permeability (K_{sat}) (m/d)	Design irrigation/loading rate (DIR/DLR) (mm/day)						
				Trenches and beds (see Table L1)			ETA/ETS beds and trenches (Table L1)	Drip and spray irrigation (Table M1)	LPED irrigation (Table M1)	Mounds (basal area) (Table N1)
				Primary treated effluent		Secondary treated effluent				
				Conservative rate	Maximum rate					
1	Gravels and sands	Structureless (massive)	> 3.0	(see Note 1 of Table L1 for DLR values)			(see Note 4 of Table L1)	5 (see Note 2 of Table M1)	(see Note 3 of Table M1)	32
2	Sandy loams	Weakly structured massive	> 3.0						4	24
			1.4 – 3.0	15	25	50				
3	Loams	High/ moderate structured	1.5 – 3.0	15	25	50		4 (see Note 1 of Table M1)	3.5	24
		Weakly structured or massive	0.5 – 1.5	10	15	30				16
4	Clay loams	High/ moderate structured	0.5 – 1.5	10	15	30	12	3.5 (see Note 1 of Table M1)	3	16
		Weakly structured	0.12 – 0.5	6	10	20	8			8
		Massive	0.06 – 0.12	4	5	10	5			(see Note to Table N1)
5	Light clays	Strongly structured	0.12 – 0.5	5	8	12	8	3 (see Note 1 of Table M1)	2.5 (see Note 4 of Table M1)	8
		Moderately structured	0.06 – 0.12	(see Notes 2 and 3 of Table L1)	5	10	5 (see Notes 2, 3, and 5 of Table L1)			(see Note to Table N1)
		Weakly structured or massive	< 0.06			8				
6	Medium to heavy clays	Strongly structured	0.06 – 0.5					2 (see Note 2 of Table M1)	(see Note 3 of Table M1)	
		Moderately structured	< 0.06							
		Weakly structured or massive	< 0.06							

11.5 **Test Pit 5** (location: 168.836395 / 45.008057)

Soil Profile: (Excavation depth 1500mm)

- Top soil	Ground level – 150mm
- Sandy loam with small stones	150 - 1500mm

TP 5 - Ring infiltrometer test



T1 - 13:03:21s T2 – 13:27:21s Td = T2-T1 = 00:24:00s = 0.40hr
H1 – 112mm H2 – 61mm Hd = H1-H2= 51mm

Infiltration rate: **127.5 mm/hr = 3.06 m/d**
Soil Texture: **Sandy loam**

TABLE 5.2
SOIL CATEGORIES AND RECOMMENDED DESIGN IRRIGATION/LOADING RATES (DIR/DLR) FOR LAND-APPLICATION SYSTEMS

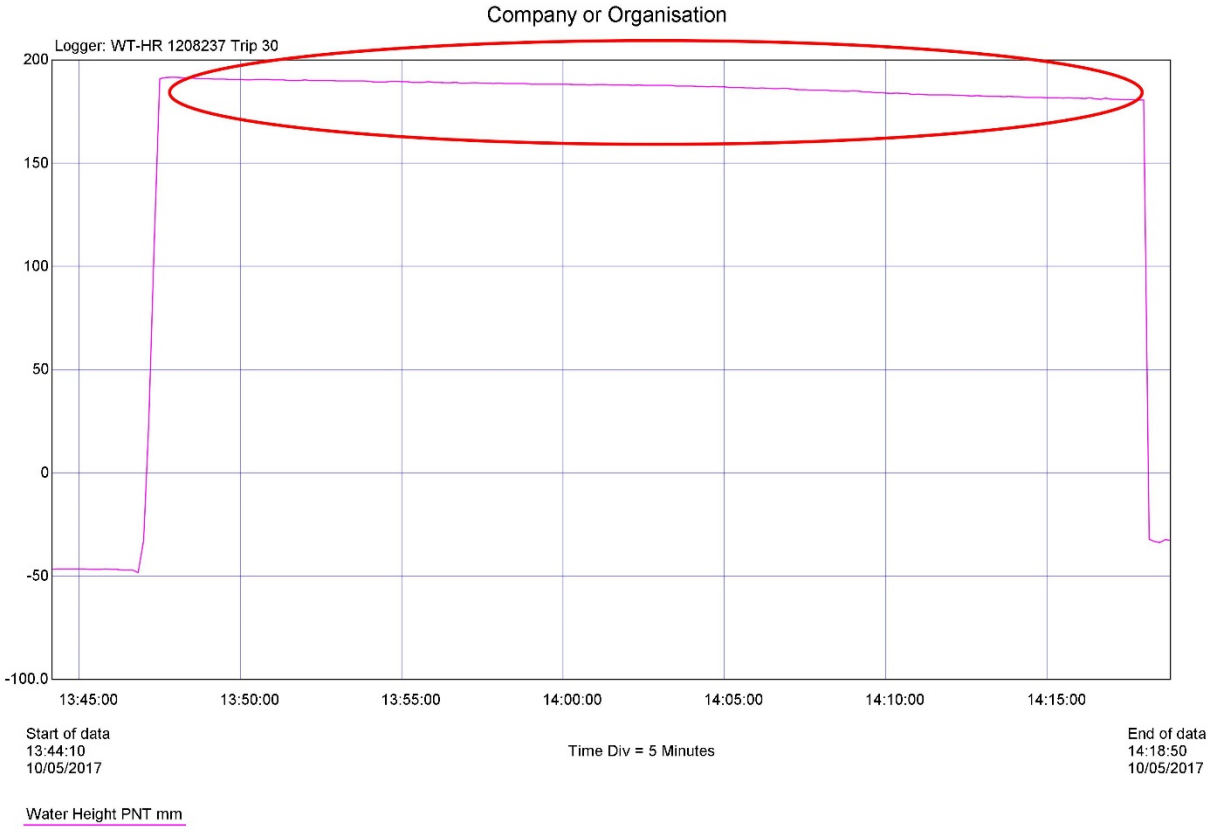
Soil Category	Soil texture	Structure	Indicative permeability (K_{sat}) (m/d)	Design irrigation/loading rate (DIR/DLR) (mm/day)						
				Trenches and beds (see Table L1)			ETA/ETS beds and trenches (Table L1)	Drip and spray irrigation (Table M1)	LPED irrigation (Table M1)	Mounds (basal area) (Table N1)
				Primary treated effluent		Secondary treated effluent				
				Conservative rate	Maximum rate					
1	Gravels and sands	Structureless (massive)	> 3.0	(see Note 1 of Table L1 for DLR values)			(see Note 4 of Table L1)	5 (see Note 2 of Table M1)	(see Note 3 of Table M1)	32
2	Sandy loams	Weakly structured massive	> 3.0						4	24
			1.4 – 3.0	15	25	50				
3	Loams	High/ moderate structured	1.5 – 3.0	15	25	50		4 (see Note 1 of Table M1)	3.5	24
		Weakly structured or massive	0.5 – 1.5	10	15	30				16
4	Clay loams	High/ moderate structured	0.5 – 1.5	10	15	30	12	3.5 (see Note 1 of Table M1)	3	16
		Weakly structured	0.12 – 0.5	6	10	20	8			8
		Massive	0.06 – 0.12	4	5	10	5			(see Note to Table N1)
5	Light clays	Strongly structured	0.12 – 0.5	5	8	12	8	3 (see Note 1 of Table M1)	2.5 (see Note 4 of Table M1)	8
		Moderately structured	0.06 – 0.12	(see Notes 2 and 3 of Table L1)	5	10	5 (see Notes 2, 3, and 5 of Table L1)			(see Note to Table N1)
		Weakly structured or massive	< 0.06			8				
6	Medium to heavy clays	Strongly structured	0.06 – 0.5					2 (see Note 2 of Table M1)	(see Note 3 of Table M1)	
		Moderately structured	< 0.06							
		Weakly structured or massive	< 0.06							

11.6 **Test Pit 6** (location: 168.836395 / 45.008057)

Soil Profile: (Excavation depth 1500mm)

- Top soil	Ground level – 150mm
- Clay loam	150 - 1200mm
- Clay loam with small stones	1200 - 1500mm

TP 6 - Ring infiltrometer test



T1 - 13:47:51s T2 – 14:17:51s Td = T2-T1 = 00:30:00s = 0.50hr
H1 – 177mm H2 – 168mm Hd = H1-H2= 9mm

Infiltration rate: **18 mm/hr = 0.432 m/d**
Soil Texture: **Clay loam**

TABLE 5.2
SOIL CATEGORIES AND RECOMMENDED DESIGN IRRIGATION/LOADING RATES (DIR/DLR) FOR LAND-APPLICATION SYSTEMS

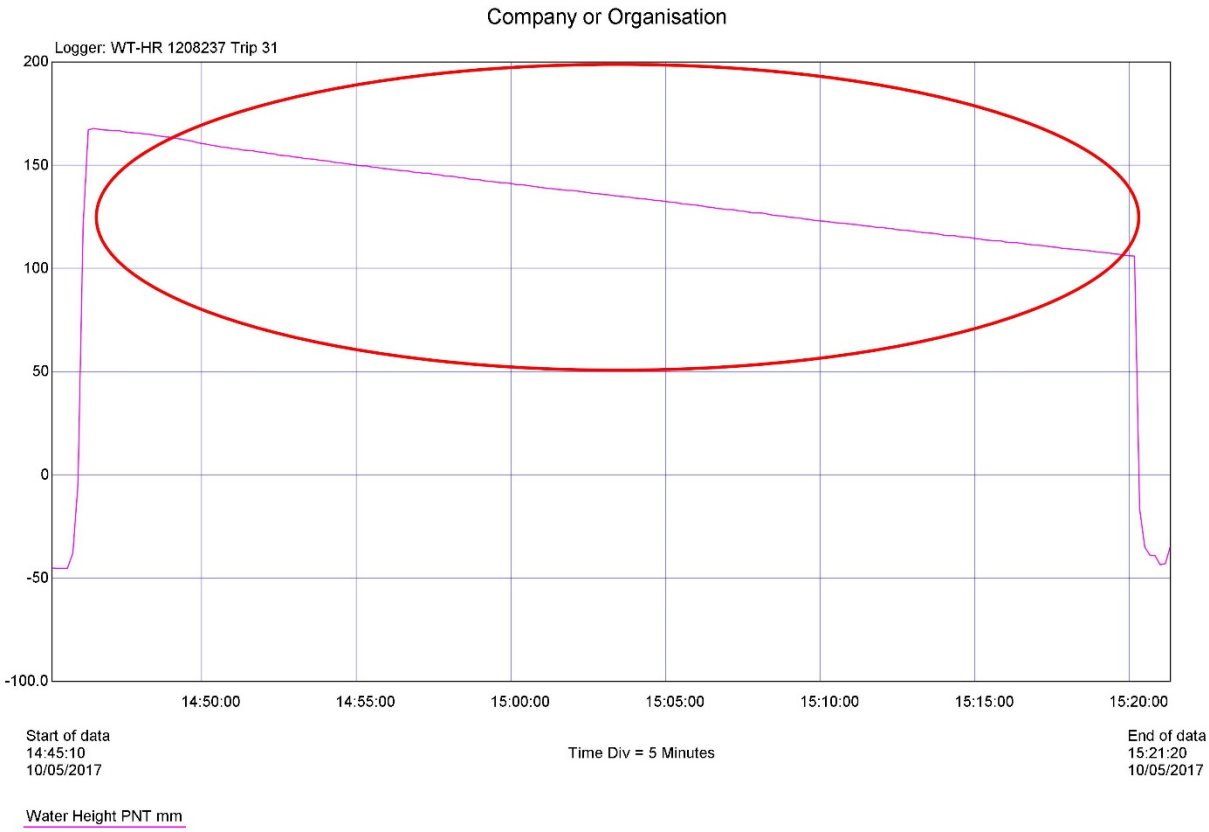
Soil Category	Soil texture	Structure	Indicative permeability (K_{sat}) (m/d)	Design irrigation/loading rate (DIR/DLR) (mm/day)						
				Trenches and beds (see Table L1)			ETA/ETS beds and trenches (Table L1)	Drip and spray irrigation (Table M1)	LPED irrigation (Table M1)	Mounds (basal area) (Table N1)
				Primary treated effluent		Secondary treated effluent				
				Conservative rate	Maximum rate					
1	Gravels and sands	Structureless (massive)	> 3.0	(see Note 1 of Table L1 for DLR values)			(see Note 4 of Table L1)	5 (see Note 2 of Table M1)	(see Note 3 of Table M1)	32
2	Sandy loams	Weakly structured massive	> 3.0						4	24
			1.4 – 3.0	15	25	50				
3	Loams	High/ moderate structured	1.5 – 3.0	15	25	50		4 (see Note 1 of Table M1)	3.5	24
		Weakly structured or massive	0.5 – 1.5	10	15	30				16
		High/ moderate structured	0.5 – 1.5	10	15	30	12	3.5 (see Note 1 of Table M1)	3	16
4	Clay loams	Weakly structured	0.12 – 0.5	6	10	20	8			8
		Massive	0.06 – 0.12	4	5	10	5			(see Note to Table N1)
5	Light clays	Strongly structured	0.12 – 0.5	5	8	12	8	3 (see Note 1 of Table M1)	2.5 (see Note 4 of Table M1)	8
		Moderately structured	0.06 – 0.12	(see Notes 2 and 3 of Table I 1)	5	10	5 (see Notes 2, 3, and 5 of Table L1)			(see Note to Table N1)
		Weakly structured or massive	< 0.06			8				
6	Medium to heavy clays	Strongly structured	0.06 – 0.5					2 (see Note 2 of Table M1)	(see Note 3 of Table M1)	
		Moderately structured	< 0.06							
		Weakly structured or massive	< 0.06							

11.7 Test Pit 7 (location: 168.813049 / 45.009998)

Soil Profile: (Excavation depth 1500mm)

- Top soil	Ground level – 200mm
- Sandy loam	200 - 700mm
- Sandy loam with stones	700 - 1500mm

TP 7 - Ring infiltrometer test



T1 - 14:46:51s T2 – 15:19:51s Td = T2-T1 = 00:33:00s = 0.55hr
H1 – 157mm H2 – 101mm Hd = H1-H2= 56mm

Infiltration rate: **101.818 mm/hr = 2.443 m/d**
Soil Texture: **Sandy loam**

TABLE 5.2
SOIL CATEGORIES AND RECOMMENDED DESIGN IRRIGATION/LOADING RATES (DIR/DLR) FOR LAND-APPLICATION SYSTEMS

Soil Category	Soil texture	Structure	Indicative permeability (K_{sat}) (m/d)	Design irrigation/loading rate (DIR/DLR) (mm/day)						
				Trenches and beds (see Table L1)			ETA/ETS beds and trenches (Table L1)	Drip and spray irrigation (Table M1)	LPED irrigation (Table M1)	Mounds (basal area) (Table N1)
				Primary treated effluent		Secondary treated effluent				
				Conservative rate	Maximum rate					
1	Gravels and sands	Structureless (massive)	> 3.0	(see Note 1 of Table L1 for DLR values)			(see Note 4 of Table L1)	5 (see Note 2 of Table M1)	(see Note 3 of Table M1)	32
2	Sandy loams	Weakly structured massive	> 3.0						4	24
			1.4 – 3.0	15	25	50				
3	Loams	High/ moderate structured	1.5 – 3.0	15	25	50		4 (see Note 1 of Table M1)	3.5	24
		Weakly structured or massive	0.5 – 1.5	10	15	30				16
4	Clay loams	High/ moderate structured	0.5 – 1.5	10	15	30	12	3.5 (see Note 1 of Table M1)	3	16
		Weakly structured	0.12 – 0.5	6	10	20	8			8
		Massive	0.06 – 0.12	4	5	10	5			(see Note to Table N1)
5	Light clays	Strongly structured	0.12 – 0.5	5	8	12	8	3 (see Note 1 of Table M1)	2.5 (see Note 4 of Table M1)	8
		Moderately structured	0.06 – 0.12	(see Notes 2 and 3 of Table L1)	5	10	5 (see Notes 2, 3, and 5 of Table L1)			(see Note to Table N1)
		Weakly structured or massive	< 0.06			8				
6	Medium to heavy clays	Strongly structured	0.06 – 0.5					2 (see Note 2 of Table M1)	(see Note 3 of Table M1)	
		Moderately structured	< 0.06							
		Weakly structured or massive	< 0.06							

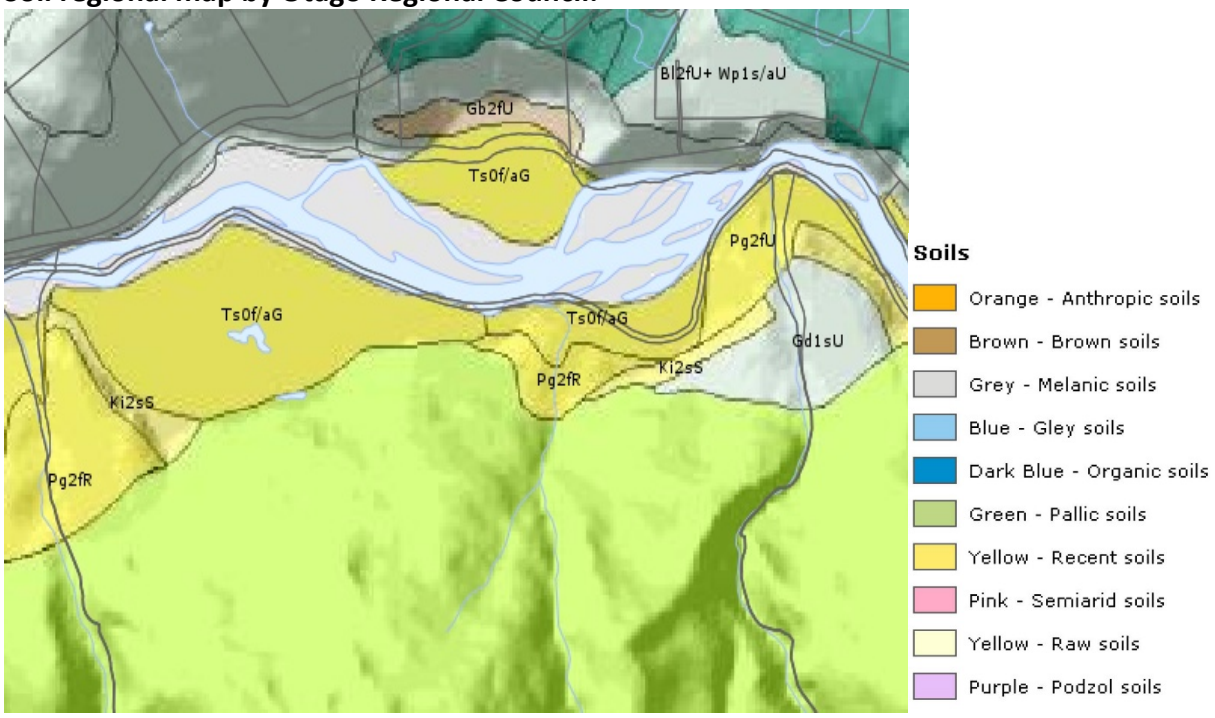
Appendix B

Soil class:

TABLE 5.2
SOIL CATEGORIES AND RECOMMENDED DESIGN IRRIGATION/LOADING RATES (DIR/DLR) FOR LAND-APPLICATION SYSTEMS

Soil Category	Soil texture	Structure	Indicative permeability (K_{sat}) (m/d)	Design irrigation/loading rate (DIR/DLR) (mm/day)						
				Trenches and beds (see Table L1)			ETA/ETS beds and trenches (Table L1)	Drip and spray irrigation (Table M1)	LPED irrigation (Table M1)	Mounds (basal area) (Table N1)
				Primary treated effluent		Secondary treated effluent				
				Conservative rate	Maximum rate					
1	Gravels and sands	Structureless (massive)	> 3.0	(see Note 1 of Table L1 for DLR values)			(see Note 4 of Table L1)	5 (see Note 2 of Table M1)	(see Note 3 of Table M1)	32
2	Sandy loams	Weakly structured massive	> 3.0						4	24
			1.4 – 3.0	15	25	50				
3	Loams	High/ moderate structured	1.5 – 3.0	15	25	50		4 (see Note 1 of Table M1)	3.5	24
		Weakly structured or massive	0.5 – 1.5	10	15	30				16
4	Clay loams	High/ moderate structured	0.5 – 1.5	10	15	30	12	3.5 (see Note 1 of Table M1)	3	16
		Weakly structured	0.12 – 0.5	6	10	20	8			8
		Massive	0.06 – 0.12	4	5	10	5			(see Note to Table N1)
5	Light clays	Strongly structured	0.12 – 0.5	5	8	12	8	3 (see Note 1 of Table M1)	2.5 (see Note 4 of Table M1)	8
		Moderately structured	0.06 – 0.12	(see Notes 2 and 3 of Table L1)	5	10	5 (see Notes 2, 3, and 5 of Table L1)			(see Note to Table N1)
		Weakly structured or massive	< 0.06			8				
6	Medium to heavy clays	Strongly structured	0.06 – 0.5					2 (see Note 2 of Table M1)	(see Note 3 of Table M1)	
		Moderately structured	< 0.06							
		Weakly structured or massive	< 0.06							

Soil regional map by Otago Regional Council:



Appendix C

PowerNet letter (for gondola Mid-station)

PowerNet Limited
251 Racecourse Road, PO Box 1642,
Invercargill 9840, New Zealand
P: 03 211 1899
F: 03 211 1880
E: enquiries@powernet.co.nz

31st May 2016

Remarkables Park Limited
Level 3, Von House
Remarkables Park Town Centre
Queenstown 9348

Attention: Jenny Carter

Dear Jenny

Electrical Supply Availability: Gondola and Associated Buildings

In reply to your enquiry regarding the availability of a supply of electricity for the proposed Gondola and buildings.

On behalf of Electricity Southland Ltd (ESL), the network provider, we advise that an electricity supply with sufficient total capacity for the proposed development can be made available.

The supply will require alterations and additions to the existing Electricity Southland Network and possibly the associated Networks which will be subject to a specific design and will have cost implications for the developer.

Yours faithfully

Chris Way
ESL Project Manager
137 Glenda Drive, Queenstown, PO Box 1642, Invercargill 9840, New Zealand
Phone: +64 3 211 1899 DDI:+64 3 450 9086 Mobile:+64 27 403 3225
Email: cway@powernet.co.nz
www.powernet.co.nz