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Greater Wellington Regional Council  
PO Box 11646  
Wellington 6142

18 October 2012

**Attention: Consents Team**

Dear Sir/Madam

**Application for Resource Consent - Groundwater take Heretaunga Water Ltd**

Please find attached an application for resource consent, made on behalf of the Heretaunga Water Limited. The application relates to the take of groundwater at 1-5 Refreshment Place, Upper Hutt.

The proposed activity has status as a discretionary activity in terms of Rule 16 of the Wellington Regional Freshwater Plan. Having considered the proposal we consider that it will not result in any adversely affected persons and we consider that the effects will be no more than minor.

A cheque for \$1,518.00 (GST inclusive), being the required deposit, is also attached. Please provide a receipt in due course.

If you require any additional information, or wish to discuss any aspect of the application, please do not hesitate to contact the undersigned.

Yours faithfully

**Belinda Van Eyndhoven**  
Senior Planner

A handwritten signature in blue ink, appearing to be "B. Van Eyndhoven", with a long horizontal flourish extending to the right.

on behalf of

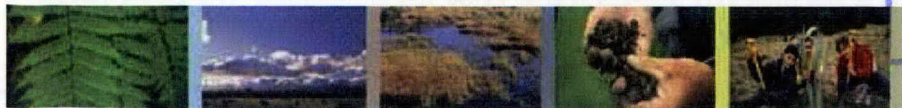
**Beca Carter Hollings & Ferner Ltd**

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██████████



Scanned  
Date 23/10/2012

Wellington Regional Council  
23 OCT 2012



greater WELLINGTON  
REGIONAL COUNCIL  
Te Pane Matua Taiao

# Form 1: Application for resource consent

(All sections must be completed in full – failure to do so may result in your application not being accepted and/or returned)

1. Location of proposed activity		Office use only:	
Describe the location of activity and/or property address		FILE REF:	
Bore R2716978	Map reference: NZTM: E2682121 N6006419	WGN/13/00/85	
1-5 Refreshment Place	Valuation reference [from rates]: 1599003301	-VI	
Include the name of any relevant stream, river or other waterbody to which the application may relate, proximity to any well know landmark, etc. (Note: a location map is required in your activity form.)		Doc. No. 1136466	
Legal description [from rates notice]		Referred to	Int
Lots 1-3 DP 31196		A-CROSS	
		WESTPAC CHEQUE	
		CBECA CORPORATE	
		HOLDINGS LIMITED)	
		FOR \$1518.00	
		SENT TO A/CS	
2. Description of proposed activity			
See attached report			
3. Consents from Greater Wellington – activity forms you need to fill in			
Consent(s) being applied for. You will need to fill in an activity form for each of the following activities: Make sure you attach the forms for your activity			
<b>Water:</b>		<b>Land Use:</b>	
Dam/Divert (Form 2a)	<input type="checkbox"/>	General river/stream works (Form 6a)	<input type="checkbox"/>
Take and use surface water (Form 2b)	<input type="checkbox"/>	Bore/well construction (Form 6b)	<input type="checkbox"/>
Take and use groundwater (Form 2c)	<input checked="" type="checkbox"/>	Bridge/culvert/pipe (Form 6c)	<input type="checkbox"/>
<b>Discharge to Land:</b>		Erosion protection structures (Form 6d)	<input type="checkbox"/>
General discharges (Form 3a)	<input type="checkbox"/>	Land clearing/tracking/logging soil disturbance (Form 6e)	<input type="checkbox"/>
Agricultural discharge (Form 3b)	<input type="checkbox"/>	<b>Coastal:</b>	
On-site wastewater (Form 3c)	<input type="checkbox"/>	General coastal (Form 7a)	<input type="checkbox"/>
<b>Discharge to Water:</b>		Boatshed (Form 7b)	<input type="checkbox"/>
General discharges (Form 4a)	<input type="checkbox"/>	Swing mooring (Form 7c)	<input type="checkbox"/>
<b>Discharge to Air:</b>			<input type="checkbox"/>
Air discharge (Form 5a)	<input type="checkbox"/>		

Note: All information provided in your application is available to the public.



#### 4. Applicant's details

**Applicant(s) name(s) and address** ie, whose name will be on the consent. Note if a private or family trust is the applicant, all the trustees are required to provide contact details and sign the application form (see 6. below)

Heretaunga Water Ltd T: Business [Redacted] T: Private [Redacted]  
41 Edgecumbe Rd Fax: [Redacted] T: Mobile [Redacted]  
Tauranga 3110 Email address: [Redacted]

**The applicant is the:**

Owner  Occupier  Lessee  Prospective Purchaser  The Crown   
Network Utility Operator  Other  Please specify: \_\_\_\_\_

#### 5. Agent's details

**Agent's name and address** [Please note that all correspondence will be sent to the Agent as the first point of contact during the application process]

Belinda van Eyndhoven T: Business [Redacted] T: Private [Redacted]  
c/o Beca, PO Box 3942 Fax: [Redacted] T: Mobile: [Redacted]  
Wellington, 6140 Email address: [Redacted]

#### 6. Partnership/unincorporated entity details

For partnerships or unincorporated entities (such as private trusts or unincorporated bodies or societies) you **must** provide details of all authorised partners, trustees or members. Any consent granted will then include these names, and all individuals will be legally responsible for the consent and any associated costs. Should these persons change, then you must notify us.

Full name of person: \_\_\_\_\_  
Status (eg, partner, trustee): \_\_\_\_\_  
Address: \_\_\_\_\_  
Email address: \_\_\_\_\_ Phone: \_\_\_\_\_

Full name of person: \_\_\_\_\_  
Status (eg, partner, trustee): \_\_\_\_\_  
Address: \_\_\_\_\_  
Email address: \_\_\_\_\_ Phone: \_\_\_\_\_

Full name of person: \_\_\_\_\_  
Status (eg, partner, trustee): \_\_\_\_\_  
Address: \_\_\_\_\_  
Email address: \_\_\_\_\_ Phone: \_\_\_\_\_

Include details of any further partners/trustees/members on a separate page if necessary



### 7. Property owner's name (if different from above)

<input type="text"/>	T: Business	<input type="text"/>	T: Private	<input type="text"/>
<input type="text"/>	Fax:	<input type="text"/>	T: Mobile:	<input type="text"/>
<input type="text"/>	Email address:	<input type="text"/>		

If your proposed activity will take place on land not owned by the applicant, the written approval of the property owner should be provided below.

Signature of property owner  Date:

Name [block capitals]:

### 8. Consents from local authorities

Territorial authority in which land is situated:

Wellington City Council	<input type="checkbox"/>	Kapiti Coast District Council	<input type="checkbox"/>
Hutt City Council	<input type="checkbox"/>	Masterton District Council	<input type="checkbox"/>
Upper Hutt City Council	<input checked="" type="checkbox"/>	South Wairarapa District Council	<input type="checkbox"/>
Porirua City Council	<input type="checkbox"/>	Carterton District Council	<input type="checkbox"/>

Do you require any other resource consents from your local council? Yes  No

If yes, please list:

Have these consents been applied for? Yes  No

### 9. Other documentation

Please list any documents in addition to your application forms that form part of your application. Note: if multiple other documents exist, please attach a separate sheet of paper.

No other documents

Reports

Title	<input type="text" value="Groundwater Abstraction, 1-5 Refreshment Place"/>
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Plans

Title	<input type="text" value="Upper Hutt. AEC &amp; associated appendices."/>
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Other documents

Title	<input type="text"/>
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### 10. Consultation and written approval of affected parties

Consultation with all parties potentially affected by your activity prior to lodging your application may result in considerable time and cost savings.

#### Non-notified applications

Non-notified consents are for activities which have minor effects on the environment. For your activity to be considered on a non-notified basis you must consult and obtain written approval from all parties potentially affected by your activity (eg, neighbours, iwi, Fish and Game Council, Department of Conservation). If you are unsure who may be an affected party, please call us. **Non-notified consents are significantly cheaper and quicker to process.**

#### Limited notified and fully notified applications

Notified consents (either limited notified or fully notified consents) are for activities which do not meet requirements in the RMA for processing on a non-notified basis.








I/we understand that the Council may charge me/us for all costs actually and reasonably incurred in processing this application and, if granted, for any subsequent monitoring charges. Subject to my/our rights under sections 357B and 358 of the RMA to object to any costs, I/we undertake to pay all and future processing costs and monitoring costs incurred by the Council. Without limiting the Council's legal rights, if any steps, including the use of debt collectors, are necessary to recover unpaid processing costs, I/we agree to pay all costs of recovering those processing costs. If this application is made on behalf of a trust (private or family), a society (incorporated or unincorporated) or a company in signing this application I/we are binding the trust, society or company to pay all the above costs and guaranteeing to pay all the above costs in my/our personal capacity.

Full name: Haretonga Water Limited Date: 7-8-2012  
JANA MICHAEL COOKIN  
 Address: 41 EDGECOMBE RD. Signature: [Signature]  
TAKUARA 8110  
 Email: JANA.MICHAEL@HARETONGA.CO.NZ Phone: 07-578001  
021-5780001

Please note the name and address supplied here will be the billing address used for all invoices and annual monitoring charges (where applicable). The fees and charges are set out in the Greater Wellington "Resource Management Charging Policy".

I/we hereby certify that, to the best of my knowledge and belief, the information given in this application is true and correct.

Full name: Belinda van Eyndhoven Date: 10/8/12  
 Signature: [Signature]





## 2c Water permit application to take and use groundwater

Please answer all questions fully. Officers from Greater Wellington's Environmental Regulation department are available to assist with filling out this form or to clarify information to include with your application.

This form is required to be filled out in conjunction with Form 1 Resource Consent Application

### Part A: General information on nature and scale of your activity

1. Is this application a renewal of a water permit to take/use groundwater from your bore/well?  
 Yes  No  If Yes, what is the water permit number? WAR/WGN PREVIOUS PERMIT WGN 040019
2. What is the land use consent (bore permit) number for the bore/well where water will be taken from?  
 WGN/WAR BORE PRE-DATES RMA - BORE PERMIT NO. NOT KNOWN.

Note: All bores/wells are required to have a land use consent (bore permit). If a permit for your bore/well has not been obtained you will need to apply for a land use consent (bore permit) as well. Use application form 9.

3. **Locality map**  
 Show the location of your proposed abstraction point on an appropriately scaled aerial map/plan. Please show the area to be irrigated (if applicable), the location of any buildings, septic tanks, location of any neighbouring bores/wells, other known abstraction points, freshwater springs, streams, rivers, wetlands that you know of and any other relevant features of the surrounding environment. - SEE ATTACHED REPORT

4. What is the bore/well number for the bore/well where ground water will be taken from?  
R27/6978 (eg, S26/0727)

5. What will be the maximum rate at which water is taken?
- |                      |                                |                 |                         |
|----------------------|--------------------------------|-----------------|-------------------------|
| <u>16 hrs/day</u>    |                                | <u>10</u>       | litres per second       |
| <u>6 days/week</u>   | <u>576m<sup>3</sup>/day</u>    | <u>16</u>       | hours per day           |
| <u>52 weeks/year</u> | <u>3,456m<sup>3</sup>/wk</u>   | <u>1769,712</u> | m <sup>3</sup> per year |
|                      | <u>179,712m<sup>3</sup>/yr</u> |                 |                         |

Note: (1) For **water permits for irrigation use**, the annual quantity will be allocated based on the outcome of an irrigation allocation report. Please include this report with your application. Greater Wellington can provide you with a SPASMO-IR allocation assessment report. Please contact us if you would like us to provide you with an allocation assessment report.

- (2) If you require more water than the allocation report suggests you will need to provide adequate justification for the amount of groundwater required in question 7 below.
- (3) A year is measured from 1 July to 30 June inclusive.



6. What will groundwater be used for? [Tick the appropriate box(es)]

- Industry State type of industry and major use of water: \_\_\_\_\_
- Community State no. of households or population: \_\_\_\_\_
- Other State use: BOTTLING FOR RETAIL SALE
- Irrigation State method of irrigation  spray  trickle  border-dyke  other

- If spray irrigation, what method of spray irrigation will be used?
- centre pivot
  - travelling irrigator
  - K line or Bosch sprinklers
  - other

What is the total area will you be irrigating?

- Crop(s) \_\_\_\_\_ ha Crop type: \_\_\_\_\_
- Pasture \_\_\_\_\_ ha
- Horticulture \_\_\_\_\_ ha Horticulture type: \_\_\_\_\_
- Other \_\_\_\_\_ ha Please specify: \_\_\_\_\_

(Please show clearly the area to be irrigated on a scaled aerial map.)

Please describe the soil type and characteristics for the area to be irrigated below:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

7. Please justify the amount of groundwater requested in question 5 above (eg, please provide any usage records/calculations/design relating to the proposed groundwater take). Use a separate sheet if required.

SEE ATTACHED REPORT

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

8. Is there a water meter on the bore/well? Yes  No

If Yes, what is the water meter serial number and brand type? \_\_\_\_\_

If No, when do you plan to install a water meter? WHEN CONSENT GRANTED

Note: The Resource Management (Measurement and Reporting of Water Takes) Regulations 2010 require most water takes of 5 litres per second or more to install a water meter

9. What is the pump make, type and model? Grundfos Submersible

What is the maximum capacity of your pump? 4 litres per second

\* Noted-if consent is granted a new pump will be required if 10l/s is required.



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## Part B: Assessment of effects on the environment (AEE)

Where your take could have a significant adverse effect on the environment a more detailed environmental assessment is required in accordance with the Fourth Schedule of the Resource Management Act 1991. This will be the case for most new applications. As part of this assessment an aquifer test (pump test) will be required to be done on your bore/well and analysis presented in order to answer the questions detailed below. (Further information on aquifer (pump) tests can be gained from our Environmental Monitoring and Investigations department)

1. Has an aquifer test (pump test) been carried out on your bore/well? Yes  No

(Please provide a copy of your aquifer test or summary details of your aquifer test in the space provided below eg, length of test, pumping rate, drawdown in pumped bore, drawdown in monitored bores, assessment of aquifer transmissivity and storage co-efficient)

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PLEASE SEE ATTACHED REPORT

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2. Please show any of the following on your scaled aerial map

- (1) Other bores/wells
- (2) All springs and surface waterbodies (including wetlands)
- (3) Any septic tanks and/or other waste disposal areas

3. What are the anticipated effects of your proposed groundwater take on nearby bores/wells?

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PLEASE SEE ATTACHED REPORT

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4. What are the anticipated effects of your proposed groundwater take on any springs or surface water bodies (including wetlands)?

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PLEASE SEE ATTACHED REPORT

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5. What are the anticipated effects of your proposed groundwater take on features within the surrounding environment (eg, stands of native vegetation, waste disposal areas etc.)?

*See Attached Report.*

6. Is your proposed groundwater take within 1 kilometre of any coastline?  Yes  No

If Yes, what are the anticipated effects of your proposed groundwater take on the risk of saltwater intrusion?

7. Are there any alternative water sources available to you? Yes  No

If yes, please explain why you have chosen this option and not alternative options:

*Quality, reliability, consistency with WREF policies.*

### Part C: Monitoring and management of your activity

1. What monitoring and management do you propose to ensure any potential adverse effects on the environment are avoided, remedied or mitigated?

(This may include, but is not limited to, what abstraction data you plan to record, when information will be submitted to Greater Wellington, any groundwater levels that may be taken in your or any other bore/well, any monitoring of surface water bodies including wetlands that may be undertaken)

*See Attached Report.*



23 OCT 2012

Report

# Groundwater Abstraction, 1-5 Refreshment Place, Upper Hutt

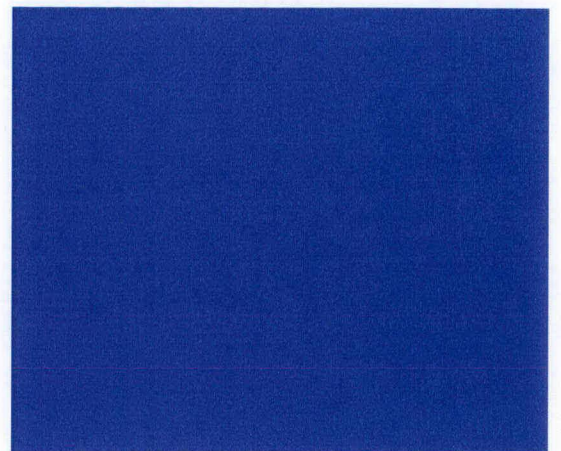
Prepared for Heretaunga Water Limited

By Beca Carter Hollings & Ferner Ltd (Beca)

18 October 2012

© Beca 2012 (unless Beca has expressly agreed otherwise with the Client in writing).

This report has been prepared by Beca on the specific instructions of our Client. It is solely for our Client's use for the purpose for which it is intended in accordance with the agreed scope of work. Any use or reliance by any person contrary to the above, to which Beca has not given its prior written consent, is at that person's own risk.





## Revision History

Revision N°	Prepared By	Description	Date
A	Charlotte Crack/ Sarah Garty	Initial draft	2009
B	Belinda van Eyndhoven	Revised and updated draft for client review	15/03/12
C	Belinda van Eyndhoven	Final for submission	15/10/12

## Document Acceptance

Action	Name	Signed	Date
Prepared by	Belinda van Eyndhoven		15/03/12
Reviewed by	Nathan Baker		15/03/12
Approved by	Nathan Baker		15/10/12
on behalf of	Beca Carter Hollings & Ferner Ltd		



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**Appendix A - Lapsed Water Permit WGN 040019**

**Appendix B - Analyses and Assessments of Hydraulic Impacts - 72 Hour  
Constant Rate Pumping Test Refreshment Place Well R27/6978**



## 1 Introduction

This application for resource consent is made on behalf of Heretaunga Water Limited in accordance with section 88 of the Resource Management Act 1991 (RMA) and relates to the abstraction of groundwater from an existing bore on the property of 1-5 Refreshment Place, Upper Hutt. Heretaunga Water Limited require the water take for their water bottling activities on site.

The purpose of this report is to provide a description of the proposed activity, an assessment of the effects on the environment and an assessment of the relevant provisions of the Wellington Regional Freshwater Plan (WRFP).

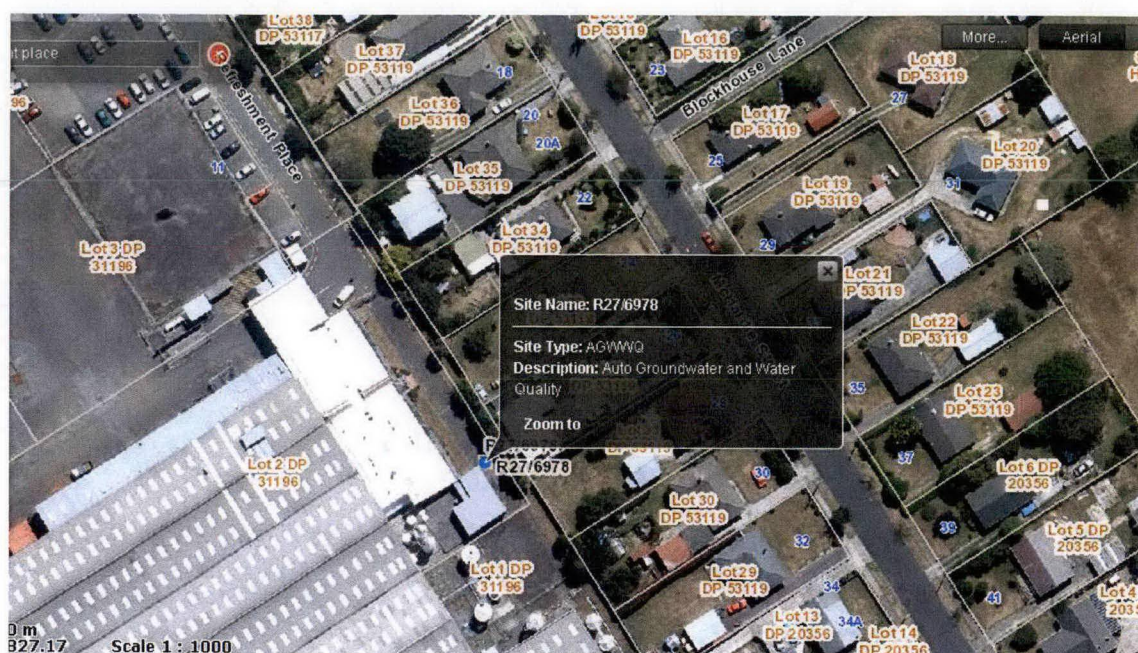
The key findings of this report are:

- the environmental effects of this proposal are considered no more than minor and able to be sufficiently managed and mitigated by conditions of consent; in practical terms
  - even with the Refreshment Place well pumping at the 10 l/s sought, the amount of groundwater available for additional development up to the safe yield cap from the Upper Hutt Aquifer (above 50 m in depth) is still about 95%.
  - drawdown interferences are so small that they are unlikely to be noticed by any of the consented groundwater users and permitted activity wells and are in line with Policy 6.2.8 regarding avoiding excessive reductions in other bores from the water take.
  - comparison of low flows in the river (1.2 m<sup>3</sup>/s – one day, 1 in 100 years event) with the proposed peak pumping rate suggests that effects of the proposed take on surface water bodies would not be measureable.
- the proposal is not inconsistent with the relevant objectives and policies of the WRFP and follows guidance from Policies 6.23 and 6.27 regarding managing the aquifer within the safe yield and preferentially abstracting groundwater over surface water.
- the proposal is not inconsistent with purpose and principles of RMA.
- no other resource users are considered adversely affected.

## 2 Background

The site at 1-5 Refreshment Place, Upper Hutt, was previously owned by Coca-Cola Bottlers (Wellington) Limited and used as a bottling plant until its closure several years ago. It is understood that the bore on the site was one of the major water sources for the property from 1988 until the bottling plant closed.





Site location map from Greater Wellington SLUR database

The water permit history for the site is as follows:

- Water permit WGN 8590996 was issued in 1988 and expired in 1992.
- An application for renewal of the water permit was lodged in 1992 and water permit WGN 920129 was issued. This expired in 1997.
- An application for renewal was lodged in 2003, and water permit WGN 040019 was issued. This consent lapsed in 2008. A copy of this consent is attached as Appendix A.

Heretaunga Water Limited engaged Beca in 2009 to lodge a replacement consent application for the lapsed 040019. Advice received from Greater Wellington Regional Council (Amy Holden and Doug McAlister via e-mail 09/11/2009) stated that a pump test of the bore would be required for a new consent. Heretaunga Water Limited subsequently contracted Griffiths Drilling Ltd to conduct a constant rate aquifer test in well R27/6978 on the 2<sup>nd</sup> to 5<sup>th</sup> of November 2010, followed by the collection of water level recovery data for an additional 40 minutes on the 5<sup>th</sup> of November 2010.

Beca (Mark Utting, Senior Hydrogeologist) was recently engaged to analyse these results and make an assessment of drawdown interference on other consented users. Mark's report (hereby referred to as the Hydrogeology Report) is titled *Analyses and Assessments of Hydraulic Impacts - 72 Hour Constant Rate Pumping Test Refreshment Place Well R27/6978* and is attached as Appendix B.

A consent pre-lodgement meeting was held between Jude Weggery and Malory Osmond (GWRC) and Belinda van Eyndhoven (Senior Planner, Beca) on the 12<sup>th</sup> of March 2012 to discuss consenting issues and requirements.

### 3 The Proposal

On behalf of Heretaunga Water Limited, we now seek a new consent for the abstraction of groundwater from the existing bore on the site. The water abstracted from the bore will be bottled for retail sale.



Heretaunga Water Limited wish to abstract groundwater from bore R27/6978 (sometimes referred to as Unibag or the Refreshment Place well). The volume requested is 10 litres of water per second, 16hrs a day (576 m<sup>3</sup> per day), six days a week (Monday-Saturday), 52 weeks a year. This gives a total abstraction of 179,712 m<sup>3</sup> per year (260 days).

Given the considerable amount of capital investment and business certainty required for this project, sufficient certainty of future resource availability is required.

We are unaware of any plan specific guidance on consent duration. We note that the Resource Management Act (RMA) sets a maximum duration of 35 years. Heretaunga Water Limited therefore requests a **30 year consent duration** based on the proposal not being inconsistent with the relevant objectives and policies of the WRFPP and taking into account the scale of take, predicted effects and given the large amount of available safe yield in the Upper Hutt aquifer in addition to the proposed review and monitoring conditions.

## 4 Existing Environment - Upper Hutt Groundwater Zone

The Hydrogeology Report (Appendix B) describes the Upper Hutt Groundwater zone as follows:

*The Upper Hutt Groundwater Zone consists of a highly permeable alluvial aquifer bounded on four sides by bedrock with permeability many orders of magnitude less than that of the alluvial aquifer (greywacke). Geological maps indicate that the aquifer is about 1½ to 3 km wide and about 9 to 10 km long. The bedrock sides to the valley generally act as 'no-flow' boundaries which cause drawdowns from pumping wells to increase in the long term.*

*The Hutt River also interacts hydraulically with the aquifer system. It loses water to the aquifer (aquifer recharge) and regains it (aquifer discharge) at various locations. The MWH study indicates that surface water recharges the groundwater system above Maoribank with groundwater discharging back to the river below Moonshine Bridge. Pumping from the aquifer could induce more recharge from the river and reduce discharge back to the river, thereby allowing a larger total yield from the aquifer (at the expense of river flow). In addition the MWH study indicates that direct rainfall recharges the Upper Hutt aquifer."*

## 5 Wellington Regional Freshwater Plan

The Wellington Regional Freshwater Plan (WRFPP) became operative on 17 December 1999, and was prepared to assist the Greater Wellington Regional Council (GWRC) manage water resources in a sustainable manner.

The site is located in the Upper Hutt Groundwater Zone, in the Hutt Catchment, as identified on Figure 9.3 in Appendix 9 of the WRFPP.

### 5.1 WRFPP Rules

Rule 7 in the WRFPP provides for the following as a permitted activity:

*"The taking or use of less than 20,000 litres per day of fresh water (including fresh water from any aquifer), other than the taking of water from the Lower Hutt Groundwater Zone, is a Permitted Activity, provided that it complies with the conditions specified below:*

*(1) The water shall be taken at a rate of no more than 2.5 litres per second.*

*(2) In the case of groundwater, there are no adverse effects on the take from adjacent bores.*

*(3) There shall be no more than one abstraction point serving the land described in a particular certificate of title.*

*(4) Fish, including small fish, are prevented from entering the reticulation system”*

The proposed water abstraction does not meet the criteria within the above rule as the rate of take is greater than is provided for. Therefore, the abstraction must be considered under **Rule 16** of the Plan.

Rule 16 in the WRFP makes provision for the taking, use, damming or diversion of water, or the transfer to another site of any water permit to take or use water, as follows:

*“The taking, use, damming, or diversion of any fresh water, or the transfer to another site of any water permit to take or use water:*

- That is not specifically provided for in any other rules in this Plan; and*
- Which cannot meet the requirements of those rules; and*
- That, for takes of water from the Lower Hutt Groundwater Zone (Taita Alluvium/Waiwhetu aquifers), would not cause the maximum rate of takes authorised by resource consents to exceed 32.85 million cubic metres per year; and*
- Which is not a non-complying activity in Rules 17, 18 or 19*

*is a Discretionary Activity”*

In this instance, the water abstraction can comply with the provisions of Rule 16 of the WRFP, and will therefore require resource consent for a **Discretionary Activity**.

## **5.2 WRFP Objectives and Policies**

Section 6 of the WRFP lists two objectives and associated policies that are most relevant to this application, as follows:

### **5.2.1 Objectives**

*6.1.2 People and communities are able to take and use groundwater while ensuring that the construction of bores and abstractions do not:*

- Exceed the safe yields of aquifers; or*
- Adversely affect the yields of nearby bores through interference, inefficient borehole construction, or excessive drawdown; or*
- Adversely affect water quality.*

*6.1.3 Water abstracted from rivers, streams, lakes and aquifers is used efficiently and water conservation is promoted.*



## 5.2.2 Policies

Policies to achieve these objectives, which are relevant to the current proposal, are:

6.2.3 *To manage the aquifers in each groundwater zone in Tables 6.2-6.5 using the safe yield shown and to maintain discretion over the allocation of aquifers not identified in the Tables.*

6.2.7 *To encourage users to take groundwater as an alternative to surface water resources where:*

- *The groundwater is of sufficient quality and quantity for the prospective use; and*
- *There are no significant environmental, technical, or financial constraints associated with abstracting groundwater.*

6.2.8 *To ensure that water permits to take groundwater:*

- *Consider excessive reductions in the yields of nearby bores (including excessive interference drawdowns); and*
- *Avoid significant adverse effects on surface water bodies.*

These matters are addressed in the assessment of effects on the environment, in Section 7 of this report.

## 6 Resource Management Act 1991 (RMA)

The sections of the RMA that are of particular relevance to the proposal are as follows:

### 6.1 Section 5

Section 5 of the RMA sets out the overall purpose of the Act that promotes the sustainable management of natural and physical resources. Sustainable management is defined in section 5 (2) and includes managing the development of natural and physical resources in way that enables people and communities to provide for their economic, social and cultural wellbeing and for their health and safety while *inter alia* avoiding, remedying or mitigating adverse effects.

### 6.2 Section 6

Section 6 of the RMA sets out matters of national importance that must be recognised and provided for. There are no matters within this section that are considered directly relevant to this proposal.

### 6.3 Section 7

Section 7 of the RMA provides a list of further matters that particular regard must be given to. This includes the maintenance and enhancement of the quality of the environment, and amenity values.

### 6.4 Section 8

Section 8 of the RMA requires that the Principles of the Treaty of Waitangi be taken into account.

The application for resource consent will be assessed in terms of matters listed in section 104 of the RMA that serves as a framework for the consideration of an application for resource consent.

Section 104B of the RMA states that when considering an application for resource consent for a discretionary activity or non-complying activity, a consent authority –

*“(a) may grant or refuse the application; and*

*(b) if it grants the application, may impose conditions under section 108”*

Based on the findings of the hydrogeological analysis and taking into account the proposed conditions this application is not considered inconsistent with Sections 5, 6, 7 or 8 of the RMA.

## **7 Assessment of Effects on the Environment**

Based on the results of consultation with Greater Wellington Regional Council (12/03/2012), Beca's experience with similar applications and reference to GWRC's web-site, the following effects on the environment have been scoped as relevant to the proposal:

- Adverse effect of take on surrounding groundwater users
- Cumulative effects
- Adverse effect of take on other users from seawater intrusion
- Adverse effect of take on aquifer stability
- Adverse effect from cross-connection on groundwater quality
- Adverse effect of take on surface water flows.

Groundwater has been drawn periodically from this source since 1988 at the rate of 50 m<sup>3</sup> to 210 m<sup>3</sup> per day. In 1992 this volume was increased to 340 m<sup>3</sup> per day at a rate of 21.3 m<sup>3</sup>.

It is considered that the proposal to abstract groundwater as described in this proposal is not inconsistent with the relevant assessment criteria in the WRFPP as detailed below.

### **7.1 Adverse Effects of Take on Surrounding Groundwater Users**

The abstraction of groundwater generally creates a drawdown cone that extends laterally from the pumping bore, and may result in a lowering of groundwater levels in surrounding bores. Such lowering may have consequences for existing users by preventing them from taking their authorised amount, and may also result in increased costs for these users through having to change their pump from a surface to submersible pump or by using more electricity to abstract water.

Effects on surrounding users were examined by Mark Utting (Senior Hydrogeologist, Beca) using data gained from a pump test of R27/6978 conducted from the 2<sup>nd</sup> to the 5<sup>th</sup> of November 2010, followed by the collection of water level recovery data for an additional 40 minutes on the 5<sup>th</sup> of November 2010. Additional data was used to supplement the pump test such as bore logs and the detail of other groundwater studies (Sustainable Yield Study, Upper Hutt Aquifer- Stage Two, MWH, February 2008).

The Hydrogeology Report is attached as Appendix B and contains detailed analysis of data, including the parameters used for determining potential effects.

A summary of the findings is included below:

- Storativity used = 0.02
- Transmissivity calculated from the test = 1,500 m<sup>2</sup>/day
- Pumping rate of 10 l/s, 16 hrs/day, 6 days per week for a 150 day period, effectively equivalent to an average continuous pumping rate of 5.17 l/s for 150 days.



Consented groundwater users in the vicinity were determined using GWRC's online database (<http://www.gw.govt.nz/water-take-consents/>), which identified five existing users in the aquifer: Upper Hutt Bowling & Tennis Club, Urban Fairways Silverstream, Trentham Camp Golf Club Inc, Upper Hutt City Council and Wellington Racing Club (Inc). Two additional bores were included in this assessment as they were included in the original request from GWRC, however one consent is assumed to have expired (South Pacific Tyres), and one is a monitoring bore (Blockhouse Lane). Table 3 from The Hydrogeology Report is included below and summarises predicted drawdown in these bores.

**Table 3 – Results of Well Interference Analysis**

Well No.	Name	Consent No.	Distance from R27/6978 (m)	150 Day Drawdown T=1500 m <sup>2</sup> /d (mm)	150 Day Drawdown T=28000 m <sup>2</sup> /d (mm)
R27/7020	Wellington Racing Club	WGN110413	1035	185	120
R27/1137	South Pacific Tyres	-	1330	180	115
?	Trentham Camp Golf Club	WGN080420	1760	175	110
R27/7335	Upper Hutt City Council	WGN090067	1890	>170	100
R27/7023	Upper Hutt Bowling Club	WGN020153	2380	>150	>100
R27/7094	Urban Fairway Silverstream	WGN060121	4290	>100	>75

The Hydrogeology report states that *"The results of the distance-drawdown forward analysis generated by Aqtesolv showed that the drawdown in the Upper Hutt Aquifer 1 (0 to 50m in depth) after 150 days of continuous pumping at 5.17 l/s is small, less than 185 mm in all of the assessed wells using the lower end range for transmissivity and less than 120 mm using the upper end value. These drawdown interferences are unlikely to be noticed by any of the consented groundwater users"*.

#### 7.1.1 Potential effects on permitted groundwater users

The Hydrogeology Report summarises that by assuming that the permitted wells (e.g. those that do not require consent as they comply with the permitted activity rules in the WRFPP) are in direct hydraulic continuity with the Refreshment Place well, the distance drawdown graphs presented in Appendix D of the report can be used to indicate "worst-case" interference effects as a function of distance from the Refreshment Place well. Examples are then provided which analyse two nearby wells (R27/7148 located about 300m and R27/7146 located about 500m from the Refreshment Place well (R27/6978). Drawdown interference for these wells is estimated at 240 mm for R27/7148 and about 210 mm for R27/7146. More distant wells would experience correspondingly smaller drawdowns that can be calculated using the distance drawdown graph. The report summarises that as the drawdowns are small they are unlikely to be noticed by the operators of these wells.

Based on The Hydrogeology Report findings and taking into account the proposed conditions in Section 9 of this report it is considered the adverse effects on surrounding consented groundwater users from the proposed take will be less than minor.

## 7.2 Cumulative Effects

The WRFP states, in Table 6.4, (see below) that the Upper Hutt Aquifer has a safe yield of 48,500m<sup>3</sup>/day. According to the GWRC's online database (<http://www.gw.govt.nz/water-take-consents/>) and the Hydrogeology Report, current consented takes from this aquifer equate to 2,174.6 m<sup>3</sup>/day including the proposed 10l/s Heretaunga Water Limited take. Even with the Refreshment Place well pumping at the 10 l/s sought, the amount of groundwater available for additional development up to the safe yield cap from the Upper Hutt Aquifer (above 50 m in depth) is still about 95 %.

Further, The Hydrogeology Report states that any cumulative effects appear likely to be small based on the small number of consented wells, the relatively small consented pumping rates in these wells (3.4 to 22 l/s), and the small interference drawdowns that are likely to occur based on the results of the Refreshment Place test.

Taking this analysis into account and given the proposed conditions it is considered that the proposed take will not significantly affect groundwater levels in the area, either alone or cumulatively with other takes.

**Table 6.4 Aquifer Allocation Limits - the Hutt Valley**

Groundwater Zone	Aquifer Depth (metres)	Safe Yield (m <sup>3</sup> /day)
Lower Hutt (Taita Alluvium/Waiwhetu) Aquifer	5-80	90,000
Moera Aquifer	100-120	4,000
Upper Hutt	0-50	48,500
	65-90	25,100
Mangaroa (Whitemans Valley)	0-15	9,400
Mangaroa (Lower Mangaroa)	0-30	41,200
Akatarawa	5-20	9,800
Pakuratahi	0-20	16,300

## 7.3 Adverse Effect of Take on Other Users from Seawater Intrusion

Saltwater contamination can occur if potentiometric levels in coastal aquifers fall below that of sea level, reversing the hydraulic gradient and resulting in movement of saltwater into the aquifer. This contamination may arise because of excessive pumping of groundwater within the aquifer, but can also occur because of a seasonal decline in water levels relative to sea level.

The Hydrogeology Report states that as the Upper Hutt aquifer is located within a closed bedrock basin, there is no direct discharge of groundwater nor direct hydraulic connection to the sea from the basin. The report summarises that there will be no direct seawater intrusion induced by this well.

Based on this advice the adverse effects from the proposed take on other users from seawater intrusion will be *de minimis*.



#### **7.4 Adverse Effect of Take on Aquifer Stability**

Documented cases of land subsidence from overseas commonly occur in thick unconsolidated sequences of aquifers and aquitards. Land subsidence has occurred when there is an over-pumping of aquifers resulting in a lowering of water pressures and drainage of water from the overlying aquitards. Aquitards with a high proportion of silt or clay are particularly susceptible to compression, which leads to subsidence. Aquifer drainage can also result in subsidence but to a much lesser amount than the aquitard because of the nature of the aquifer materials.

As the proposed take is from a well that has been pumping for years under previous consents, any subsidence that would have been induced by pumping has likely already occurred, therefore additional subsidence caused by the resumption of pumping is expected to be small to un-measurable.

#### **7.5 Adverse Effect from Cross-Connection on Groundwater Quality**

Multiple screening of a bore in different aquifers can result in backflow contamination however, given the Upper Hutt Groundwater Zone above 50m in depth is considered as one aquifer, and the applicant's well is 30m deep, cross-contamination of other aquifers cannot occur.

#### **7.6 Adverse Effect of Take on Surface Water Flows**

There are numerous adverse effects that may arise from the taking of groundwater with hydraulic connection to surface water. In summary, these include effects on springs, existing authorised users of surface water, aquatic ecosystems, amenity and recreational values, and spiritual and cultural values.

The Hydrogeology report states that the proposed take may cause a small amount of increased seepage from the Hutt River in the areas identified as losing to groundwater (above Maoribank) and may also reduce by a small amount the groundwater returning to the Hutt River in the areas identified as gaining reaches (below Moonshine Bridge). It goes on to summarise that comparison of low flows in the river ( $1.2 \text{ m}^3/\text{s}$  – one day, 1 in 100 years event) with the proposed peak pumping rate suggests that effects would not be measurable.

Based on this advice the adverse effects from the proposed take on surface water flows is considered no more than minor.

### **8 Consultation**

No consultation has been undertaken for this application as, based on the hydrogeological assessment, it is considered there will not be any adversely affected parties. Further, GWRC staff advised (12/03/2012) that the Council has its own established processes for notifying parties such as Iwi on consent applications and it would be more appropriate to do this as opposed to contacting the Iwi directly given the scale and nature of this proposal.

## 9 Public Notification

Section 95A of the RMA is relevant when a consent authority is considering whether a consent application should be considered with or without public notification. In summary, a consent authority may at its discretion publicly notify an application, and must publicly notify it if:

- a) it decides (under Section 95D) that the activity will have or is likely to have adverse effects on the environment that are more than minor; or
- b) the applicant requests public notification of the application; or
- c) a rule or national environmental standard requires public notification of the application.

In addition, a consent authority may publicly notify an application if it decides that special circumstances exist in relation to the application.

Having regards to these tests, the following points are noted:

- An assessment of effects on the environment is provided in section 7 of this report. This assessment concludes that the adverse effects on the environment are likely to be no more than minor.
- The applicant does not request public notification of the application;
- There is no rule or national environmental standard that requires public notification of this application; and
- No special circumstances are considered to exist in relation to the application.

Based on the assessment provided in Sections 5, 6 and 7 of this report, we consider that this proposal meets the tests of the RMA to be processed without public notification.

### Potentially affected parties

Section 95B of the RMA requires that if a consent authority does not publicly notify an application for a resource consent, it must decide if there are any affected persons (95E) or affected order holders (95F) in relation to the activity.

Under section 95B, the consent authority must give limited notification of the application to any affected person or affected order holder, unless (in the case of affected persons) a rule or national environmental standard precludes limited notification of the application.

Section 95E states that a consent authority must consider a person to be an affected person if the activity's adverse effects on the person are minor or more than minor (but not less than minor). A consent authority must not consider a person affected if they have provided written approval to the proposal.

Having regard to these requirements and based on the hydrogeological report it is not considered there will be any adversely affected parties.

## 10 Conditions of Consent

In order to ensure that any potential adverse environmental effects are avoided, remedied or mitigated, the Applicant proposes that the following conditions of consent (or similar) be imposed on any consent granted:



- i. The location, design, implementation and operation of the works shall be in accordance with the consent application and its associated plans and documents lodged with the Wellington Regional Council in October 2012.
- ii. The rate of take shall not exceed 10 litres/second, 576 m<sup>3</sup>/day, 6 days/week, 52 weeks/year.
- iii. The system shall be designed, operated and maintained so that water does not run to waste.
- iv. If any modifications are made to the pump or intake, the permit holder shall notify the Manager, Consents Management, Wellington Regional Council, within one month of the modifications occurring.
- v. The permit holder shall meter all abstraction and the meter shall be accurate to +/- 2%.
- vi. The permit holder shall record the daily abstraction volumes and forward a copy of those records to the Wellington Regional Council monthly.
- vii. If requested by the Manager, Consents Management, Wellington Regional Council, the consent holder shall make the bore available for monitoring of water levels and water quality.
- viii. The Wellington Regional Council may review conditions of this permit by giving notice of its intention to do so under section 128 of the Resource Management Act 1991, at any time within 6 months of the fifth, tenth, fifteenth, twentieth and twenty fifth anniversaries of the commencement of this consent for the following purpose:
  - (a) To deal with any adverse effect on the environment, which may arise from the exercise of this consent and which it is appropriate to deal with at a later stage.
  - (b) To review the adequacy of any monitoring programme requirements and if necessary to amend those requirements

## 11 Conclusion

This is an assessment of effects on the environment in support of an application for resource consent for the abstraction of groundwater at 1-5 Refreshment Place, Upper Hutt.

The proposed activity is described as a discretionary activity in terms of Rule 16 of the WRFP with regards to the taking and use of water.

This proposal is not considered inconsistent with the relevant objectives and policies of the WRFP and follows guidance from Policies 6.23 and 6.27 regarding managing the aquifer within the safe yield and preferentially abstracting groundwater over surface water. Further, the proposal is not inconsistent with purpose and principles of RMA.

The environmental effects of this proposal, including effects on other groundwater users, are considered no more than minor and able to be sufficiently managed and mitigated by conditions of consent. Therefore, we request that Greater Wellington Regional Council grant consent on a non-notified basis.

Appendix A

Lapsed Water Permit WGN  
040019



**Consent No. WGN040019 [22914]**

**Category: Water permit**

Pursuant to sections 105<sup>1</sup> and 108, and subject to all the relevant provisions of the Resource Management Act 1991 and any regulations made thereunder, a consent in respect of a natural resource is hereby granted to:

<b>Name</b>	Piccadily Investments Limited	
<b>Address</b>	PO Box 8631, Auckland.	
<b>Term of consent</b>	Effective: 14 August 2003	Expires: 14 August 2013
<b>Purpose for which right is granted</b>	To take and use groundwater from an existing bore for bottling and retail purposes.	
<b>Location</b>	1-5 Refreshment Place, Upper Hutt, at or about map reference NZMS 260:R27;820.065.	
<b>Legal description of land</b>	Lot 4 DP31196	
<b>Volume/quantity/rate</b>	5.9 litres/second, 21.3 m3/hour, 340 m3/day, 5 days/week, 52 weeks/year.	
<b>Conditions</b>	1-8 as attached	

For and on behalf of  
WELLINGTON REGIONAL COUNCIL

Manager, Consents Management

Date: .....

<sup>1</sup> This consent application was processed and determined in accordance with section 112 of the Resource Management Act 2003.

# Conditions to Resource Consent

## WGN040019 [22914]

- (1) The location, design, implementation and operation of the works shall be in accordance with the consent application and its associated plans and documents lodged with the Wellington Regional Council on 31 July 2003.
- (2) The rate of take shall not exceed 5.9 litres/second, 21.3 m<sup>3</sup>/hour, 340 m<sup>3</sup>/day, 5 days/week, 52 weeks/year.
- (3) The system shall be designed, operated and maintained so that water does not run to waste.
- (4) If any modifications are made to the pump or intake, the permit holder shall notify the Manager, Consents Management, Wellington Regional Council, within one month of the modifications occurring.
- (5) The permit holder shall meter all abstraction and the meter shall be accurate to +/- 2%.
- (6) The permit holder shall record the daily abstraction volumes and forward a copy of those records to the Wellington Regional Council monthly.
- (7) If requested by the Manager, Consents Management, Wellington Regional Council, the consent holder shall make the bore available for monitoring of water levels and water quality.
- (8) The Wellington Regional Council may review condition 2 of this permit by giving notice of its intention to do so under section 128 of the Resource Management Act 1991, at any time within 6 months of the second, fourth, sixth and eighth anniversaries of the commencement of this consent for the following purpose:
  - (a) To deal with any adverse effect on the environment, which may arise from the exercise of this consent and which it is appropriate to deal with at a later stage.
  - (b) To review the adequacy of any monitoring programme requirements and if necessary to amend those requirements.



Appendix B

**Analyses and Assessments  
of Hydraulic Impacts - 72  
Hour Constant Rate  
Pumping Test Refreshment  
Place Well R27/6978**

Piccadilly Investments, Ltd  
41 Edgecumbe Road  
Tauranga

15 March 2012

**Attention: John Cronin**

Dear Britt

**Analyses and Assessments of Hydraulic Effects - 72 Hour Constant Rate Pumping Test  
Refreshment Place Well R27/6978**

## **1 Introduction**

Piccadilly Investments, Limited (Piccadilly) contracted Griffiths Drilling Ltd to conduct a constant rate aquifer test in well R27/6978, as required by Greater Wellington Regional Council in an email dated 30 October 2009. The well originally had consent WGN040019 which has now lapsed. This letter report presents an analysis of the test, which was conducted with pumping from 2 to 5 November 2010, followed by the collection of water level recovery data for an additional 40 minutes on 5 November 2010. This letter report also includes an assessment of drawdown interference at five consented water wells in the area, also as requested by GWRC. This well, known as the "Refreshment Place well" previously had consent to supply water for beverage manufacturing and was formerly called the "Unibag well" and the "Coca Cola well."

## **2 Pumping Test Details**

### **2.1 Scope/Purpose of the Test**

The constant rate aquifer test of well R27/6978 consisted of 72 hours of pumping followed by recovery to quantify aquifer parameters and to assess well interference effects on neighbouring users of groundwater in the Upper Hutt Groundwater Zone. GWRC asked that effects to the following currently consented water users/wells are addressed (consent number in parentheses):

- Upper Hutt City Council (WGN090067)
- Trentham Camp Golf Club Inc (WGN080420)
- Upper Hutt Bowling Club (WGN020153)
- JK's Driving Range and Golf Club – now Urban Fairways Silverstream (WGN060121) and
- Wellington Racing Club (WGN020016).

A search of the GWRC consent records indicates that these five users are the only approved groundwater takes in the Upper Hutt Regional Freshwater Plan groundwater zone. Bore logs available for these wells are included in Appendix A.



GWRC also asked for impact assessments to South Pacific Tyres (WGN020011), however, this consent is no longer valid. We have evaluated the effects on the original supply well for this lapsed consent, nonetheless.

Other permitted wells are present in the area in addition to the five consented supplies. Because we do not have the construction details for each of these wells, we have made only a general assessment of drawdown effects. The distance drawdown graphs presented in Appendix D indicate interference effects as a function of distance from the Refreshment Place well and can be used to assess interference effects on specific wells.

We have also made a general assessment of potential effects on the Hutt River from pumping the Refreshment Place well at the full requested rate of 10 l/s.

## 2.2 Location

Well R27/6978 is located at 1 - 5 Refreshment Place, owned by Piccadilly Investments in Upper Hutt, New Zealand. The "Blockhouse Well" also monitored during the test is located 157 m from the pumped well. Well locations are shown in Figure 1. These locations were provided by Griffiths Drilling (who measured the water levels during the test and constructed the Blockhouse well for a GWRC groundwater investigation in 2007) via marked Google Earth photos.<sup>1</sup>

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<sup>1</sup> The Griffiths Drilling bore log (Appendix A) indicates a well number of R27/7149 for the Blockhouse Well. However, a GWRC well location photo provide to Beca indicates a well with this number located on the Refreshment Place property. In addition, the same photo indicates a location for the Refreshment Place well (calculated by the GWRC GIS system) which is slightly different from that supplied by Griffiths. We have assumed that the locations provided by Griffiths who were on site during this recent test and who installed the Blockhouse well are correct and the GWRC locations are not.





Figure 1: Location Plan for Wells Monitored During the 72 Hour Test

### 3 Hydrogeology

Well R27/6978 screens the unconfined/semi-confined aquifer of the Upper Hutt Groundwater Zone. While no bore log is known to exist in GWRC files or in the files of the new owner, the bore is reportedly 30 m deep. GWRC (Jones and Baker, 2005) indicates that the Upper Hutt groundwater zone is productive above depths of 55 m and is of low-permeability below this depth. A Stage 2 analysis of the groundwater system in the Upper Hutt Valley contracted by GWRC (MWH, 2008) indicates that the aquifer is generally productive only above depths of 35 m. The two GWRC studies and the available bore logs for the consented wells (Appendix A), describe the Upper Hutt aquifer at this location as consisting of sand, gravels and boulders with varying silt and clay content interlayered with zones of silt and fine sand. Below 35 m the deposits are generally fine grained and of much lower permeability than the overlying sand and gravel zones. These deposits are typical of an alluvial valley fill aquifer system. Based on these studies and the reported well depth of 30 m, we have assumed that well R27/6879 draws water from permeable zones throughout the aquifer section, at depths between 10 to 35 m.

The bore log for the Blockhouse well monitored during the test is included in Appendix A. Although this log does not indicate the screen depth, the log indicates that most of the section between depths of 10 and 36 m is permeable and water bearing. Therefore the aquifer at this location is at least 27 m thick and probably more as the bore log for the Blockhouse Lane well does not indicate that the bottom of the aquifer had been penetrated. We have used 25 m as the representative aquifer thickness in our analysis.

The Upper Hutt Groundwater Zone consists of a highly permeable alluvial aquifer bounded on four sides by bedrock with permeability many orders of magnitude less than that of the alluvial aquifer (greywacke). Geological maps indicate that the aquifer is about 1½ to 3 km wide and about 9 to 10 km long. The bedrock sides to the valley generally act as 'no-flow' boundaries which cause



drawdowns from pumping wells to increase in the long term. The effects of these boundaries have been incorporated into our pumping test and well interference analyses (below). The Hutt River also interacts hydraulically with the aquifer system. It loses water to the aquifer (aquifer recharge) and regains it (aquifer discharge) at various locations. The MWH study indicates that surface water recharges the groundwater system above Maoribank with groundwater discharging back to the river below Moonshine Bridge. Pumping from the aquifer could induce more recharge from the river and reduce discharge back to the river, thereby allowing a larger total yield from the aquifer (at the expense of river flow). In addition the MWH study indicates that direct rainfall recharges the Upper Hutt aquifer. Our drawdown analyses have excluded these effects, an assumption that is conservative as it causes the predicted drawdowns to be larger than they would be were rainfall recharge and the hydraulic interaction between the river and the underlying aquifer to be incorporated into the analysis.

Based on our understanding of the hydrogeology of the Upper Hutt groundwater zone, we have assumed that all wells considered in our analyses are completed in the unconfined to semi-confined aquifer and in direct hydraulic continuity with the Refreshment Place well.

## 4 Constant Rate Aquifer Test

### 4.1 Well Details

A constant rate aquifer test was conducted using R27/6978 (Refreshment Place) as the pumping well and R27/7149 (Blockhouse well) as a monitoring well. Table 1 summarises the known well construction details.

Table 1 – Well Details

Parameter	R27/6978 (Refreshment Place Well)	R27/7149 (Blockhouse Well)
Well Purpose	Pumping	Obs.
Aquifer	Unconfined/semi-confined	Unconfined/semi-confined
Depth [m]	~30	36.5
Distance from Pumping Well [m]	0	157
Change in Water Level at end of Pumping (m)	0.420	0.125
Max Trend-Corrected Pumping-Induced DD at end of Test [m]	0.351	0.060
Owner	Piccadilly Place Investments, Ltd	Greater Wellington Regional Council
Easting (from GWRC)	?	2682185
Northing (from GWRC)	?	6006556
Diameter [mm]	150	150
Casing Material	Steel	Steel
Primary use(s)	Water supply	Monitoring



Non-pumping water level [mBGL] on 2/11/10	7.07	7.06
Screen Type	?	?
Screen Top [mBGL]	?	?
Screen Bottom [mBGL]	?	?

#### 4.2 Test Pumping Rate and Water Levels

R27/6978 was pumped at a rate between 4.23 l/s and 4.0 L/s for three days. The initial flow rate was 4.23 L/s as noted in the water level data sheets supplied by Griffiths but dropped back to an indicated 4.0 l/s as noted at 2.5 hours into the test. Data sheet supplied by Griffiths (Appendix B) indicate that a pumping rate of 4.0 l/s was recorded at six other occasions through the duration of the test. The decline in pumping rate near the beginning of the test appears to have been gradual as a sharp change in water level (typically associated with a sharp adjustment of pumping rate) does not appear in the water level data.

Recovery in the pumped well was also recorded at the end of the pumping period for 40 minutes. At this time the recorded water level in the pumped well returned to the level reported at the beginning of the test. Water levels were measured with an electric well sounder (a "dipper") and recorded to the nearest 5 mm. The discharge from the well was measured using a flow meter and manually recorded.

The water levels recorded in the Refreshment Place well dropped from 6.76 m below the top of the casing (btoc) to 7.06 m (a drawdown of 0.30 m) 1 minute into the test. The pumping water level then rose slowly by 0.28 m over the next 4 hours. Typically the pumping water level falls over the initial portion of a constant rate test. The rise could suggest either: a) a decline in the pumping rate, b) development of the well, or c) interference from some other hydrologic source (such as nearby pumping well ceasing to pump or a hydraulically connected river rising). We believe it unlikely that the well developed during the test as it had been pumped for some years in the past. Similarly, we believe that cessation of pumping in a nearby high capacity well is unlikely based on our review of consented well yields in the area. Therefore we believe it likely that the pumping rate slowly drifted down from 4.3 to 4.0 l/s during the initial 2½ hours of the test. After five hours the trend reversed with water levels dropping over the remainder of the test. Plots of the water level drawdowns recorded during the test are included in Appendix C.

#### 4.3 Corrections to the Data

The water level data obtained from the aquifer test have been corrected for a linear water level declining trend of 24.06 mm/day by adding this correction (time in days into the test times 24.06 mm/day) to each water level measured during the test. This trend correction rate was derived based on water levels in two GWRC monitoring wells in the area that were also declining before, during and after the test. MWH, 2008, established that levels in these wells correlate with levels in the Hutt River. We have taken the water level data from monitoring well R27/7004, calculated a declining trend of 24.06 mm/day to correct the water levels in both the pumping well (R27/6879) and the observation well (R27/7149). The hydrographs from GWRC monitoring wells R27/7004 and R26/1137 are also included in Appendix C.



No barometric data were collected during the test and therefore no corrections were made for barometric efficiency. However, as the aquifer is unconfined, any water level changes caused by changes in atmospheric pressure would have been relatively insignificant.

#### 4.4 Analysis and Results

The corrected data collected from the pumping and observation well were analysed using AQTESOLV Pro v4.5. We used the Cooper-Jacob method to calculate transmissivity using data obtained after 150 minutes (after the pumping rate had stabilized at 4 l/s) for both the pumping and observation well. These analyses for both wells (Appendix C) indicate:

- Transmissivity (T) of 1,500 m<sup>2</sup>/day
- Storativity (S) of 0.02 (dimensionless)

The Theis method applied to the observation well data indicated identical results (Appendix C). The Theis method cannot be used to *accurately* analyse the pumping well data because a) the effective well radius cannot be exactly known for a pumped well and b) the early time data, critical to proper alignment of a Theis curve over the data points, were affected by the declining pumping rate. Nonetheless, a Theis analysis composite plot of the observation and pumping well data indicates that the later time pumping well data do generally fit the Theis curve fitted to the observation well data, supporting the transmissivity values calculated using the observation well data.

Boundary effects are not observed in the drawdown plots of the corrected data. The relative proximity of bedrock boundaries surrounding the entire alluvial aquifer will cause a steepening of the drawdown curve with extended periods of pumping. The Theis analyses discussed above were set up to include the effects of four boundaries through the use of "image wells" to generate the Theis curve for the aquifer system. However, because the aquifer is unconfined and has a relatively large storativity, such effects require a longer period of pumping to become significant, as is discussed below in the assessments of interference effects to consented wells in the aquifer.

#### 4.5 Comparison with Other Test Values

The transmissivity value indicated from this test is lower than some reported values from other tests in the Upper Hutt groundwater zone. MWH (2008) indicates a range of test values from 1,200 to 33,400 m<sup>2</sup>/day. They indicate that channelization of the aquifer (varying aquifer thickness and amount of clays and silts) causes the variation in transmissivity. This interpretation appears reasonable to us and helps to explain the range of values. Therefore, it is likely that the Refreshment Place well is completed in a zone of relatively lower transmissivity within an aquifer that has localized high values.

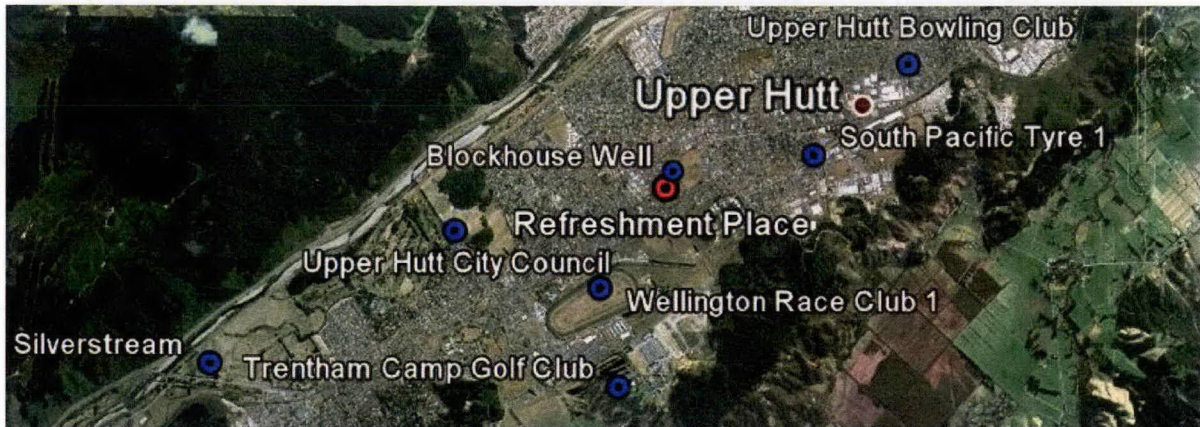
The calculated storativity value of 0.02 from this test lies with the range of values reported by MWH (0.001 - 0.04) and is typical of an unconfined/semi-confined aquifer.

#### 4.6 Interference to Consented Groundwater Takes

We have analysed the drawdown effects on other wells in the Upper Hutt aquifer using Aqtesolv, the Theis method and the incorporation of four boundaries to the aquifer. These boundaries were set up to replicate an aquifer 3 km across and 10 km long. We have assumed that the wells with



consents (listed below) are all in direct hydraulic continuity with R27/6978. Details of these wells are shown in Table 2 and their locations as supplied by GWRC are shown in Figure 2.



**Figure 2: Locations of Wells in Interference Analyses**

We have used a storativity of 0.02 along with the transmissivity calculated from the test (1,500 m<sup>2</sup>/day) and the upper end "representative" value from the MWH study (28,000 m<sup>2</sup>/day) to bracket the range of assessed effects. Our analysis used a pumping rate of 10 l/s, 16 hrs/day, 6 days per week for a 150 day period, effectively equivalent to an average continuous pumping rate of 5.17 l/s for 150 days.

**Table 2 – Consented Well Details for Interference Analysis**

Well No.	Name	Consent No.	Log Available	Screen Depth (m)	Distance from R27/6978 (m)
R27/6978	Refreshment Place	-	No	Unknown	0
R27/7149	Blockhouse Lane	-	Yes	Unknown	157
R27/7020	Wellington Racing Club	WGN110413	Yes	Unknown	1035
R27/1137	South Pacific Tyres	-	Yes	10.7 – 15.2	1330
?	Trentham Camp Golf Club	WGN080420	No	Unknown	1760
R27/7335	Upper Hutt City Council	WGN090067	Yes	15.2 – 18.2	1890
R27/7023	Upper Hutt Bowling Club	WGN020153	Yes	Unknown	2380
R27/7094	Urban Fairway Silverstream	WGN060121	No	Unknown	4290

The results of the interference analyses are shown in Table 3. The drawdown as a function of distance plots generated by Aqtesolv are included in Appendix D.



**Table 3 – Results of Consented Well Interference Analysis**

Well No.	Name	Consent No.	Distance from R27/6978 (m)	150 Day Drawdown T=1500 m <sup>2</sup> /d (mm)	150 Day Drawdown T=28000 m <sup>2</sup> /d (mm)
R27/7020	Wellington Racing Club	WGN110413	1035	185	120
R27/1137	South Pacific Tyres	-	1330	180	115
?	Trentham Camp Golf Club	WGN080420	1760	175	110
R27/7335	Upper Hutt City Council	WGN090067	1890	>170	100
R27/7023	Upper Hutt Bowling Club	WGN020153	2380	>150	>100
R27/7094	Urban Fairway Silverstream	WGN060121	4290	>100	>75

The results of the distance-drawdown forward analysis generated by Aqtesolv (Appendix D) shows that the drawdown in the Upper Hutt Aquifer 1 (0 to 50m in depth) after 150 days of continuous pumping at 5.17 l/s (generally equivalent to pumping at 10 l/s for 16 hours per day, six days per week over 150 days) is small, less than 185 mm in all of the assessed wells using the lower end range for transmissivity and less than 120 mm using the upper end value. These drawdown interferences are unlikely to be noticed by any of the consented groundwater users.

The cumulative effects appear likely to be small based on: a) the small number of consented wells (5), b) the relatively small consented pumping rates in these wells (3.4 to 22 l/s), and c) the small interference drawdowns that are likely to occur based on the results of the Refreshment Place test. A small cumulative effect is supported by the "available aquifer yield" (Section 4.8).

#### **4.7 Interference with Permitted (Non-consented) Wells**

By assuming that the permitted wells are in direct hydraulic continuity with the Refreshment Place well, the distance drawdown graphs presented in Appendix D can be used to indicate "worst-case" interference effects as a function of distance from the Refreshment Place well. For example, the photo-map provided by GWRC (Figure 3) shows permitted well R27/7148 located about 300 m and R27/7146 located about 500 m from the refreshment Place well (R27/6978). Using the distance-drawdown graph in Appendix D (T = 1,500 m<sup>2</sup>/day), the 150-day drawdown interference for these wells would be about 240 mm for R27/7148 and about 210 mm for R27/7146. More distant wells would experience correspondingly smaller drawdowns that can be calculated using the distance-drawdown graph. These "worst-case" drawdowns are small and unlikely to be noticed by the operators of these wells.





Figure 3 – Wells Located near the Refreshment Place Well

#### 4.8 Assessment of Available Aquifer Yield

The total withdrawal of groundwater from the Upper Hutt Groundwater zone even with the additional 10 l/s requested by Piccadilly Investments from the Refreshment Place well would be far less (about 4.5 %) than the total take authorized by GWRC in the January 2012 update of the Regional Freshwater Plan for the Wellington Region, Publication No. WRC/RP-G-99/31, ISBN 0-909016-69-0.

A search of the approved consents within GWRC's database indicates only five approved consents as shown in Table 4.

Table 4 – Upper Hutt Groundwater Consents

Well No.	Name	Consent No.	Peak Rate – Qp (l/s)	Daily Total – Qd (m <sup>3</sup> )	Yearly Total – Qy (m <sup>3</sup> )
R27/6978	Refreshment Place	-	10.0	576	179,712
R27/7020	Wellington Racing Club	WGN110413	22.0	792	106,560
?	Trentham Camp Golf Club	WGN080420	15.0	400	22,500
R27/7335	Upper Hutt City Council	WGN090067	8.0	316.8	33,264
R27/7023	Upper Hutt Bowling Club	WGN020153	3.4	25	9,100
R27/7094	Urban Fairway Silverstream	WGN060121	8.0	64.8	6,480
<b>Total (w/ R27/6978)</b>			<b>66.4</b>	<b>2174.6</b>	<b>357,616</b>



Well No.	Name	Consent No.	Peak Rate - Qp (l/s)	Daily Total - Qd (m <sup>3</sup> )	Yearly Total - Qy (m <sup>3</sup> )
<b>Authorized Total</b>				<b>48,500</b>	
<b>Percentage of Total Allocation (Including R27/6978)</b>				<b>4.5%</b>	

The table shows that even with the Refreshment Place well pumping at the 10 l/s sought, the amount of groundwater available for additional development from the Upper Hutt Aquifer (above 50 m in depth) is still about 95 % of the total currently authorized by GWRC in Table 6.4 in their Freshwater management plan.

#### 4.9 Discussion of Pumping Rates: 4 vs 10 l/s

Our analysis indicates that the Refreshment Place well appears capable of producing at 10 l/s, even though it has not been tested at this rate. Because of the relatively high permeability of the aquifer, estimated low levels of frictional well loss and relatively low pumping rates, the drawdown in this well at 4 and 10 l/s is still small, compared to the overall available drawdown. Therefore, this well appears capable of abstraction at the higher rate.

Our assessment of the ability of well R27/6978 to be capable of pumping at 10 l/s is based on comparisons of actual and theoretical drawdowns in the well at pumping rates of 4 and 10 l/s. At the end of the 72-hour test, the corrected drawdown from pumping at 4 l/s was 0.35 m. Using the aquifer parameters calculated from the test data ( $T = 1,500 \text{ m}^2/\text{s}$  and  $S = 0.02$ ) Aqtesolv indicates a theoretical drawdown of about 0.35 m, suggesting no measurable well loss. Even assuming that a small amount of well loss would occur when pumping at 10 l/s, the theoretical drawdown after 3 days at 10 l/s would be about 0.9 m. After 150 days, the theoretical drawdown would be about 1.2 m (assuming no well loss). Allowing for 0.3 m of well loss, the total drawdown would be on the order of 1.5 m, a relatively small amount compared to the overall depth of the well and thickness of the aquifer (~25 m). Because we have no records of well construction we recommend that a down-hole video survey be conducted to verify well construction details and well condition before pump installation.

Based on the small amounts of drawdown observed in the well after pumping for 72 hours at 4 l/s, we see no real advantage in conducting a new aquifer test at 10 l/s for 24 hours. Drawdown effects in the aquifer at any given time are proportional to the pumping rate. Because the 72-hour test at 4 l/s generated measurable drawdowns in both the pumping and observation well, a new test would only generate drawdowns that were proportionally larger (10:4) but not significantly different in pattern. Had the drawdowns measured during the test been relatively large or had well loss been significant, then a test at the higher rate might be warranted. But with such small drawdowns indicating large "drawdown reserves" and small if any well loss, a new 24 hour test at 10 l/s appears likely to offer no new significant information.

#### 4.10 Seawater Intrusion

The Upper Hutt aquifer is located within a closed bedrock basin. There is no direct discharge of groundwater nor direct hydraulic connection to the sea from this basin. There will be no direct seawater intrusion induced by this well.

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#### 4.11 Effect of Take on Surface Water Flows

Pumping may cause a small amount of increased seepage from the Hutt River in the areas identified as losing to groundwater (above Maoribank) and may also reduce by a small amount the groundwater returning to the Hutt River in the areas identified as gaining reaches (below Moonshine Bridge). Comparison of low flows in the river ( $1.2 \text{ m}^3/\text{s}$  – one day, 1 in 100 years event) with the proposed peak pumping rate suggests that effects would not be measureable.

### 5 Summary and Conclusions

Griffiths Drilling Ltd (Griffiths) conducted a 72-hour, constant rate aquifer test in well R27/6978 over the period 2 - 5 November 2010. Well R27/6978 is owned by Piccadilly and is located at 1 - 5 Refreshment Place, Upper Hutt. This well previously had consent to supply water for beverage manufacturing and was formerly known as the "Unibag well" and the "Coca Cola well." The test included water level monitoring in the pumped well and a nearby observation well known as the "Blockhouse well" located on Blockhouse Lane, 157 m from the pumped well. On-line data were also reviewed from two Greater Wellington Regional Council (GWRC) monitoring wells R27/7004 and R27/1137 to establish water level trends before, during and after the test and to investigate whether pumping of the Refreshment Place well during the 72-hour test caused detectable changes in water level ("drawdown interference") in either of these wells (it did not).

The Refreshment Place well was tested to assess aquifer parameters and calculate drawdown interference effects in five consented water wells in the Upper Hutt Groundwater Zone (plus one well with a lapsed consent), required to support a new resource consent to authorise the taking of water from well R27/6978. The requirement to assess effects to these wells was outlined in an email from Amy Holden (GWRC) to Sarah Garty and Charlotte Crack (Beca) sent 30 October 2009. In this email, GWRC suggested that the well be tested at 5.9 l/s for 24 hours. Instead, the well was pumped at 4 l/s for 72 hours. The longer duration test (although at a lower rate) is better for defining boundary conditions that affect the longer-term interference to other wells in the area. Analysis of the pumping test data suggests that the Refreshment Place well can accommodate the higher planned pumping rate of 10 l/s.

During the test, water levels were measured manually in the pumping and observation wells. After pumping ceased, recovery water levels were measured in the pumped well for an additional 40 minutes. The data were analysed using AQTESOLV Pro v4.5. The following aquifer parameters were derived from the analysis:

- Transmissivity (T) =  $1,500 \text{ m}^2/\text{day}$
- Storativity (S) = 0.02 [dimensionless].

The analysis indicates that the pumped aquifer has moderate to high yields and that the Refreshment Place well can be pumped at a rate of 10 l/s, 16 hours per day, six days per week, as requested in the consent application, without causing adverse drawdown effects in the pumped aquifer or existing wells. Predicted drawdowns in the consented wells ranged from a high of 185 mm in the closest consented well using the tested value for transmissivity ( $1,500 \text{ m}^2/\text{day}$ ) in the analysis to a low of less than 75 mm in the furthest well using the larger value for transmissivity ( $28,000 \text{ m}^2/\text{day}$ ) indicated in a GWRC funded aquifer study.



The daily take of 576 m<sup>3</sup> from pumping continuously for 16 hours at 10 l/s is equivalent to slightly more than 1 percent of the total daily take of 48,500 m<sup>3</sup> authorized by Table 6.4 of the Wellington Regional Freshwater Plan. This rate of 10 l/s, 16 hours per day, six days per week is equivalent to an annual volume of 179,712 m<sup>3</sup>.

## 6 References

Jones, Andrew and Tim Baker, 2005. Groundwater Monitoring Technical Report. GWRC technical report .

MWH, 2008. Sustainable Yield Study, Upper Hutt Aquifer, Stage Two. Consultant's report prepared February 2008.

Yours sincerely

A handwritten signature in black ink, appearing to read "Mark Utting".

**Mark Utting**  
Senior Hydrogeologist

on behalf of

**Beca Carter Hollings & Ferner Ltd**

██████████  
██████████

Appendix A

## Bore Logs



# Borelog for well R27/1137 - South Pacific Tyres

Gridref: 2683427.6006672

Ground Level Altitude 60.73 +MSD

Driller : RICHARDSON DRILLING COMPANY LTD

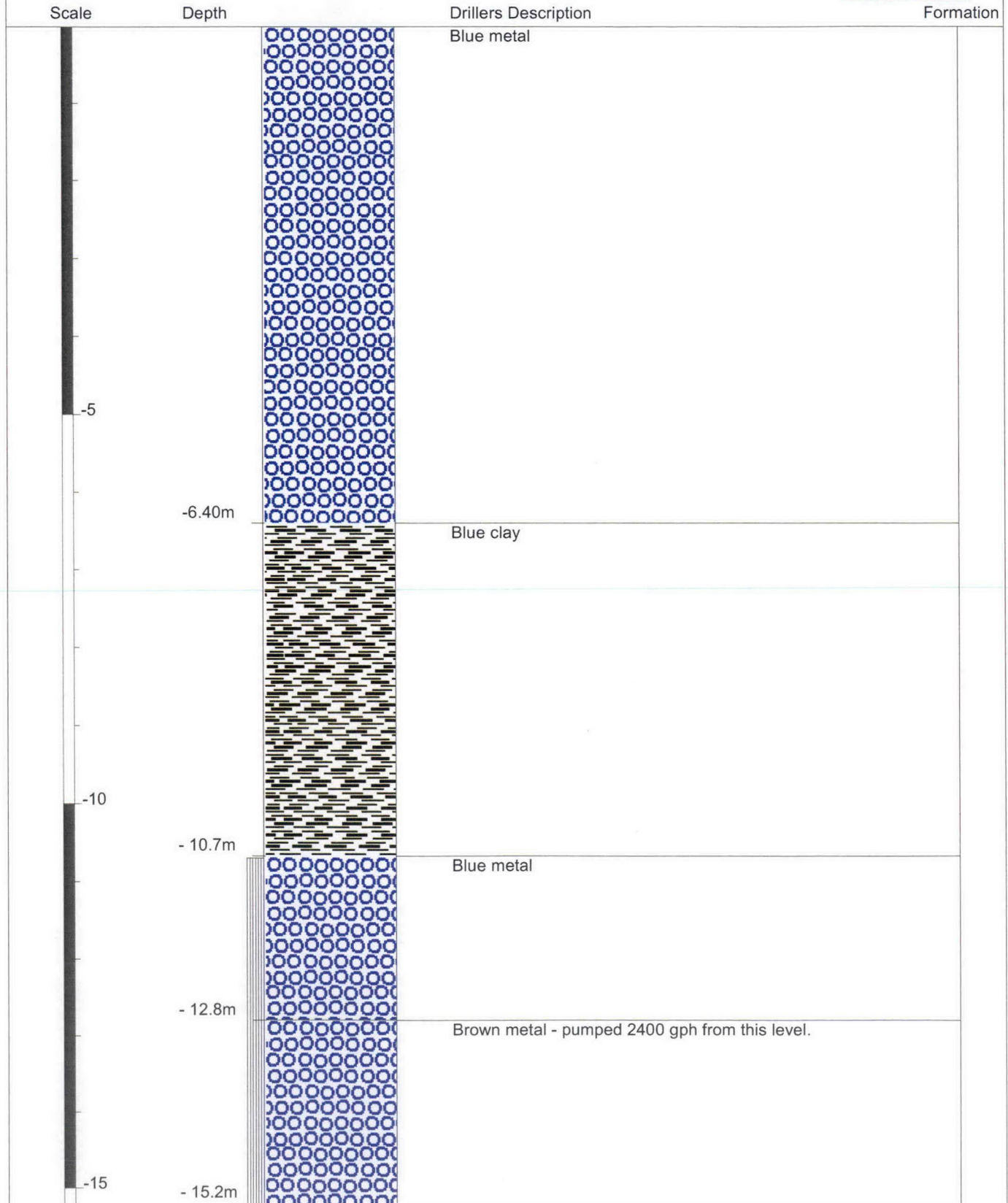
Drill Method:

Drill Depth : m Drill Date : 1/08/1946



greater WELLINGTON

REGIONAL COUNCIL



# Borelog for well R27/7020 -

Gridref: 2681523.6005561

Driller : RICHARDSON DRILLING COMPANY LTD

Drill Method:

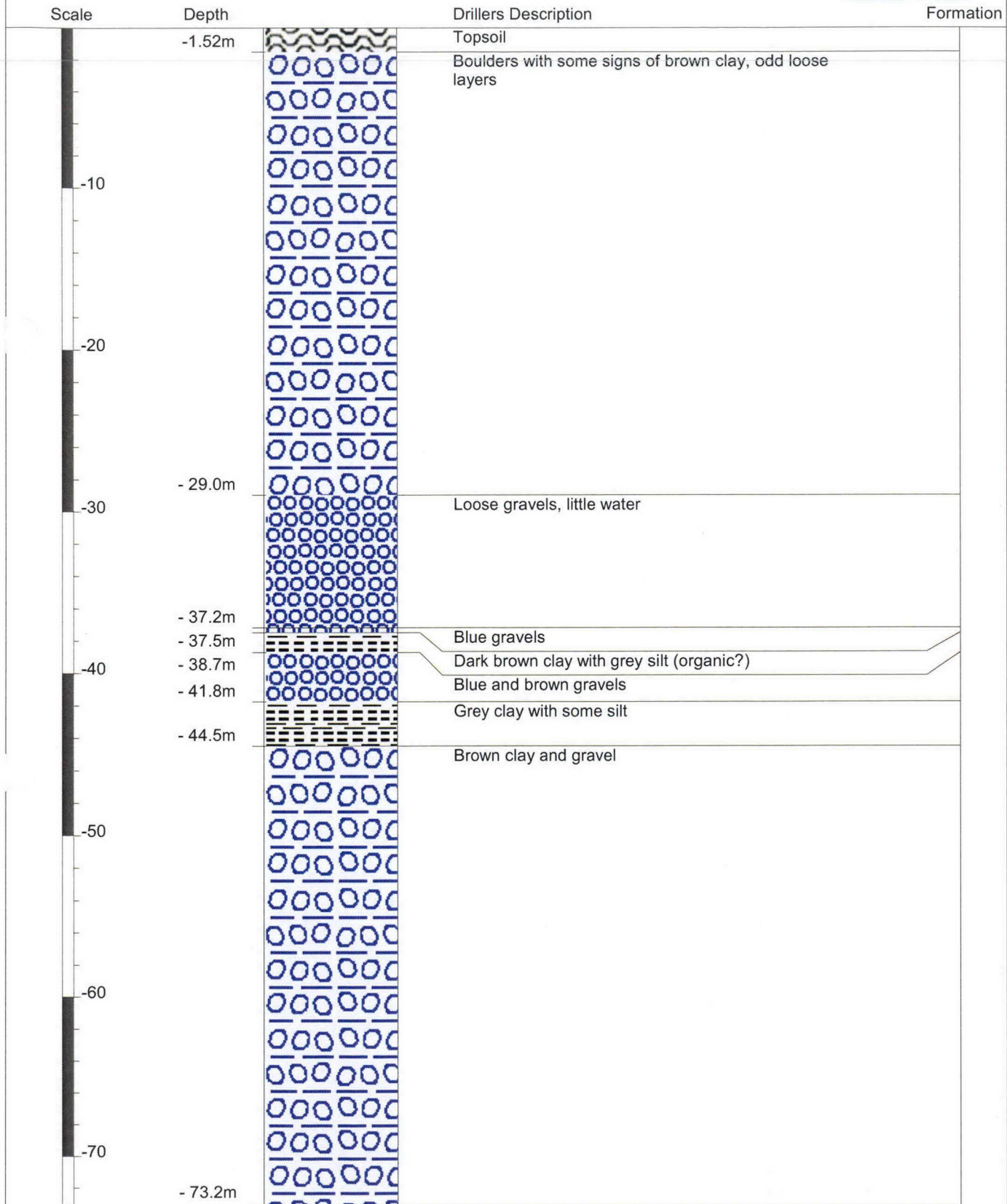
Drill Depth : 73.17m Drill Date :



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Formation





# Borelog for well R27/7023 - Upper Hutt Bowling Club

Gridref: 2684270.6007440

Driller : RICHARDSON DRILLING COMPANY LTD

Drill Method:

Drill Depth : 25.61m Drill Date :



greater WELLINGTON

REGIONAL COUNCIL

Scale	Depth	Drillers Description	Formation
		Filling, containing bricks, tars, concrete and boulders	
	-2.74m	Brown gravel with brown yellow silty clay and boulders (light)	
-5			
-10			
	-13.1m	Brown gravel and boulders with brown yellow silty clay, little water	
-15			
	-15.9m	Brown gravel	
	-18.8m	Brown gravel with brown yellow silty clay and boulders, little water	
-20			
	-21.8m	Brown gravel	
-25			
	-25.6m		

# Borelog for well R27/7041 - Wellington Racing Club

Gridref: 2681518.6005502

Driller :

Drill Method:

Drill Depth : m    Drill Date : 1/01/1942



greater WELLINGTON

REGIONAL COUNCIL

Scale	Depth	Drillers Description	Formation
	<p data-bbox="304 1973 373 2004">-9.76m</p>	Metal, sand and clay	



# Borelog for well R27/7335 - Upper Hutt City Council

Gridref: 2680260.6006089

Driller : GRIFFITHS DRILLING COMPANY LTD

Drill Method: Cable Tool

Drill Depth : 20.5m Drill Date : 27/01/2009



greater WELLINGTON

REGIONAL COUNCIL

Scale	Depth	Drillers Description	Formation
		Brown silt	
	-1.50m	Brown cobbles, med to large. Sand	
	-7.00m	Brown silty sand, cobb;es gravels, medium to large	
	-10.5m	Brown sand, gravels small to large, cobbles. Wet, static water level 2.6m bgl	
	-12.5m	Brown silty sand, gravels, small to large. Cobbles. Dry	
	-15.1m	Brown sandy gravels, small to large. Cobbles. Water bearing static water level 2.2m bgl	
	-20.5m		

## Water well record



### Well owner and site identification

Client	Greater Wellington Regional Council:
Address	
Telephone No.	
Location of bore	Block House Lane Upper Hutt
Map reference of bore	
Legal description of land	
GPS LOCATION	E2682185 N6006556
WRC consent number	

### Contractor

Drilling Contractor	Griffiths Drilling (NZ) Ltd PO Box 40 422 Upper Hutt
Drilling method	
Driller	Vaughan ROBSON/ Stuart CLARIDGE:
Date drilled	Finished 2-6-2007

### Well details

Casing size & type	150mm ID Line pipe
Casing length	36.15m
Screen type	N/A
Screen set from/to (m)	N/A
Overlap of casing to screen	N/A
Total depth of bore from G/L	N/A
Height of casing above G/L	0.500m
Static Water Level	7.50m Approx GL
Development method	N/A
Pump test results	N/A
Draw down level	N/A
Pump installed by	N/A
Type	N/A
Depth pump set	N/A

### Attachments

1. Water well bore log
2. Well schematic





Appendix B

## Pumping Test Raw Data



**Constant rate pump test**

Well Site	Refreshment Places	Date	2/11/10
Client	Piccadilly Investments	Bore ref No.	6978
Bore size	6"	SWL at start	6.76m
Tested by	M Griffiths	Pump	existing

Pumping rate	Time on clock am/pm	Recording interval	Time elapsed hrs - min	Depth to Water (Metres)
4.23L/sec	12.30.5pm	30 sec	30 sec	6.76
	12.31	1min	1min	7.060
	12.32	1min	2 min	7.060
	12.33	1min	3 min	7.050
	12.34	1min	4 min	7.060
	12.35	1min	5 min	7.060
	12.36	1min	6min	7.060
	12.37	1min	7 min	7.060
	12.38	1min	8 min	7.060
	12.39	1min	9 min	7.050
	12.40	1min	10 min	7.050
	12.45	5 min	15 min	7.045
	12.50	5 min	20 min	7.050
	12.55	5 min	25 min	7.045
	1.00	5 min	30 min	7.045
	1.05	5 min	35 min	7.045
	1.10	5 min	40 min	7.040
	1.15	5 min	45 min	7.040
	1.20	5 min	50 min	7.040
	1.25	5 min	55 min	7.050
	1.30	5 min	60 min (1hr)	7.045
	2.00	30 min	1hr 30 min	7.040
	2.30	30 min	2 hours	7.040
4L /sec	3.00	30 min	2hr 30 min	7.040
	3.30	30 min	3 hours	7.040
	4.00	30 min	3hr 30 min	7.040
	4.30	30 min	4 hours	7.040
	5.00	30 min	4hr 30min	7.045
	5.30	30 min	5 hours	7.040
	6.30	60 min	6 hr	7.055
	7.30	60 min	7 hr	7.065
	8.30	60 min	8 hr	7.070
	9.30	60 min	9 hr	7.065
	10.30	60 min	10 hr	7.065
	11.30	60 min	11	7.070
4L/sec	12.30am	60 min	12	7.070

Water levels taken from the top of the casing 310mm above ground level.

Pumping rate	Time on clock am/pm	Recording interval	Time elapsed (hrs)	Depth to Water (Metres)
4L/sec	1.30	60 min	13	7.070
	2.30	60 min	14	7.075
	3.30	60 min	15	7.075
	4.30	60 min	16	7.080
	5.30	60 min	17	7.085
	6.30	60 min	18	7.085
	7.30	60 min	19	7.085
	8.30	60 min	20	7.085
	9.30	60 min	21	7.090
	10.30	60 min	22	7.090
	11.30	60 min	23	7.090
	12.30pm	60 min	24	7.095
	1.30	60 min	25	7.100
	2.30	60 min	26	7.100
	3.30	60 min	27	7.110
	4.30	60 min	28	7.110
	5.30	60 min	29	7.110
	6.30	60 min	30	7.110
	7.30	60 min	31	7.110
	8.30	60 min	32	7.110
	9.30	60 min	33	7.120
	10.30	60 min	34	7.120
	11.30	60 min	35	7.120
	12.30am	60 min	36	7.125
	1.30	60 min	37	7.125
	2.30	60 min	38	7.125
	3.30	60 min	39	7.125
	4.30	60 min	40	7.125
	5.30	60 min	41	7.130
	6.30	60 min	42	7.130
	7.30	60 min	43	7.130
	8.30	60 min	44	7.130
	9.30	60 min	45	7.135
	10.30	60 min	46	7.140
	11.30	60 min	47	7.140
4L /sec	12.30pm	60 min	48	7.145

Water levels taken from the top of the casing 310 mm above ground level





Pumping rate	Time on clock am/pm	Recording interval	Time elapsed (hrs)	Depth to Water (Metres)
4L/sec	1.30	60 min	49	7.145
	2.30	60 min	50	7.145
	3.30	60 min	51	7.150
	4.30	60 min	52	7.150
	5.30	60 min	53	7.150
	6.30	60 min	54	7.150
	7.30	60 min	55	7.155
	8.30	60 min	56	7.155
	9.30	60 min	57	7.160
	10.30	60 min	58	7.160
	11.30	60 min	59	7.160
	12.30	60 min	60	7.160
	1.30	60 min	61	7.165
	2.30	60 min	62	7.165
	3.30	60 min	63	7.165
	4.30	60 min	64	7.170
	5.30	60 min	65	7.170
	6.30	60 min	66	7.170
	7.30	60 min	67	7.170
	8.30	60 min	68	7.170
	9.30	60 min	69	7.180
	10.30	60 min	70	7.180
	11.30	60 min	71	7.180
4L/sec	12.30	60 min	72	7.180

Water levels taken from the top of the casing 310 mm above ground level

**Recovery test at completion of pump test**

Time on clock	Time elapsed	Water level
12.30.5pm	30 sec	6.89
12.31	1 min	6.88
12.32	2 min	6.88
12.33	3 min	6.88
12.34	4 min	6.88
12.35	5 min	6.88
12.36	6 min	6.88
12.37	7 min	6.87
12.38	8 min	6.86
12.39	9 min	6.86
12.40	10 min	6.85
12.45	15min	6.83
12.50	20min	6.81
12.55	25min	6.79
1.00	30min	6.78
1.05	35min	6.77
1.10	40min	6.76 (SWL of bore)

## Monitor bore Static Water levels

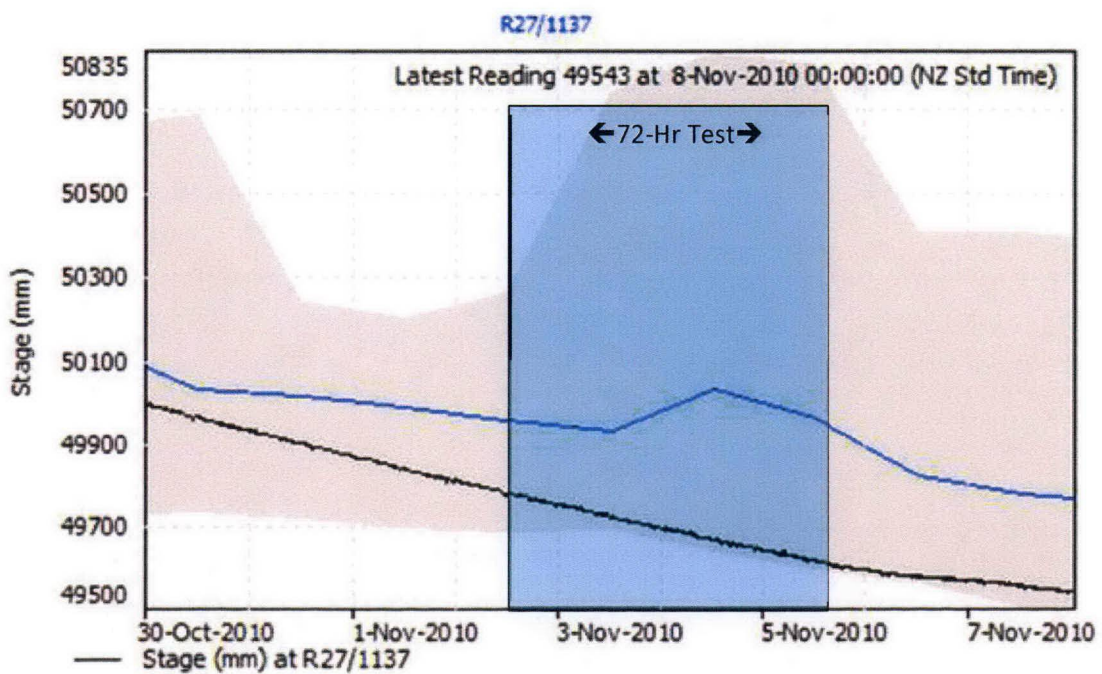
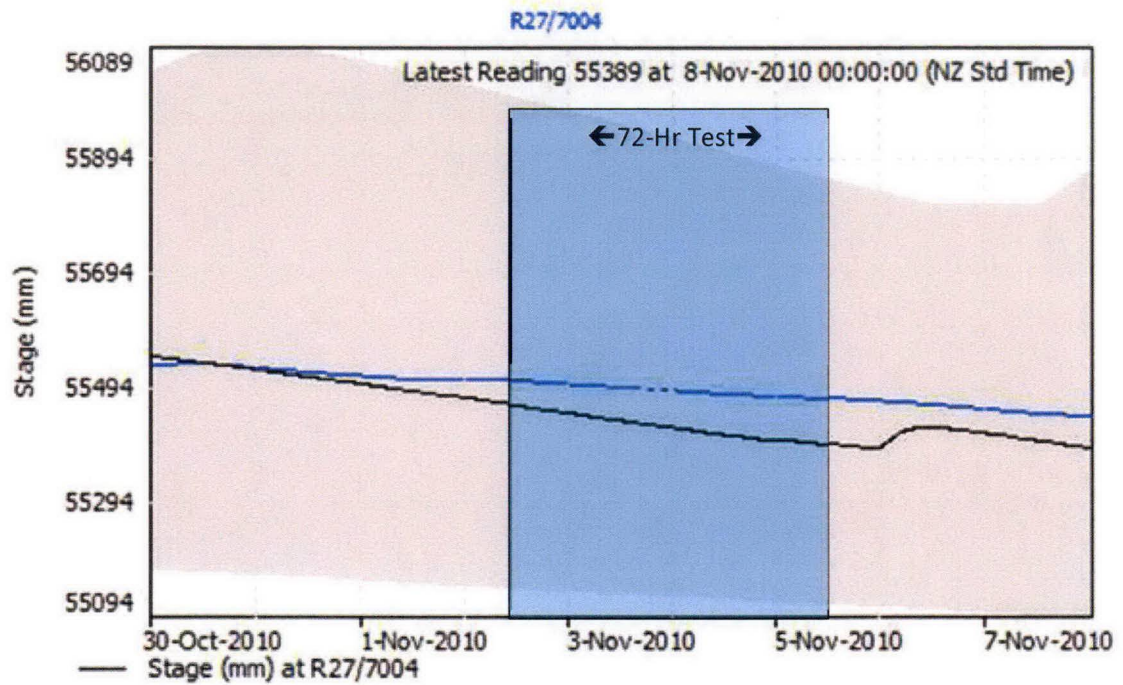
Borehole location: **Blockhouse Lane (7149)**

Date: **2 November 2010**

Time	Elapsed Time	Water level (m)	Comments
12.05pm	0	7.060	Level before stating test
1.05pm	30 min	7.065	
1.35pm	1 hour	7.065	
3.05pm	2hr 30 min	7.070	
4.35pm	4 hours	7.080	
8.35pm	8 hr	7.085	
10.35pm	10 hr	7.090	
4.35am	16	7.095	
7.35am	19	7.100	
10.35am	22	7.110	
2.35pm	26	7.115	
6.35pm	30	7.120	
9.35pm	35	7.130	
2.35am	38	7.140	
6.35am	42	7.155	
10.35am	46	7.160	
4.35pm	50	7.170	
8.35pm	56	7.175	
2.35am	62	7.180	
6.35am	66	7.180	
10.35am	70	7.185	
12.55pm	72	7.180	Test ended at 12.30pm



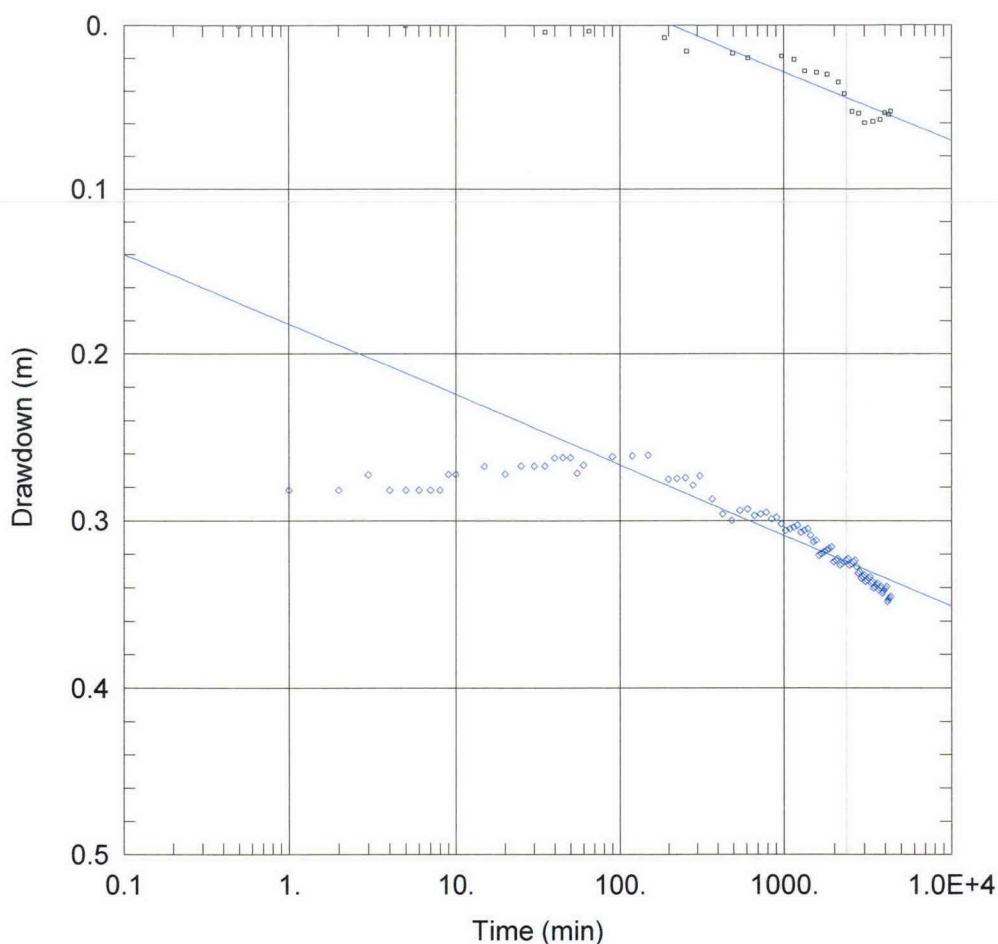
Water Levels Recorded by GWRC in Monitoring Wells R27/7004 and R27/1137 Before, During and After 72-Hour Pumping Test of R27/6978



Appendix C

## Aqtesov Pumping Test Analyses





### 72-HR CONSTANT RATE TEST - TREND CORRECTED DATA

Data Set: P:\...\Refreshment Place CJ both wells Trend corrected.aqt  
 Date: 03/14/12 Time: 10:48:48

### PROJECT INFORMATION

Company: Beca Carter Hollings & Ferner  
 Client: Picadilly Investments  
 Project: 4260716  
 Location: Upper Hutt, New Zealand  
 Test Well: Refreshment Place  
 Test Date: 2/11/10

### AQUIFER DATA

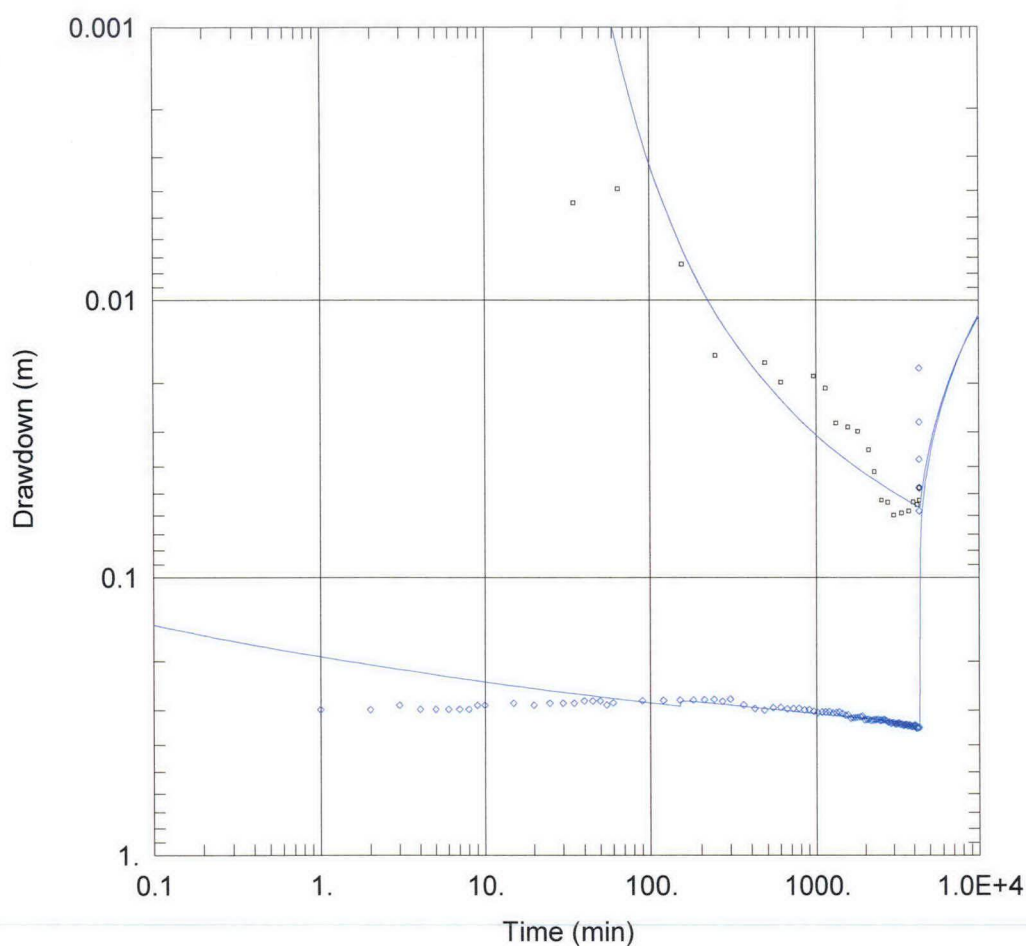
Saturated Thickness: 25. m Anisotropy Ratio (Kz/Kr): 1.

### WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (m)	Y (m)	Well Name	X (m)	Y (m)
Refreshment Place	0	0	◊ Refreshment Place	0	0
			◻ Blockhouse	157	0

### SOLUTION

Aquifer Model: Unconfined Solution Method: Cooper-Jacob  
 T = 1500. m<sup>2</sup>/day S = 0.02



**72-HR CONSTANT RATE TEST - TREND CORRECTED DATA**

Data Set: P:\...\Refreshment Place This Trend corrected Pumped well data.aqt  
 Date: 03/14/12 Time: 10:52:03

**PROJECT INFORMATION**

Company: Beca Carter Hollings & Ferner  
 Client: Picadilly Investments  
 Project: 4260716  
 Location: Upper Hutt, New Zealand  
 Test Well: Refreshment Place  
 Test Date: 2/11/10

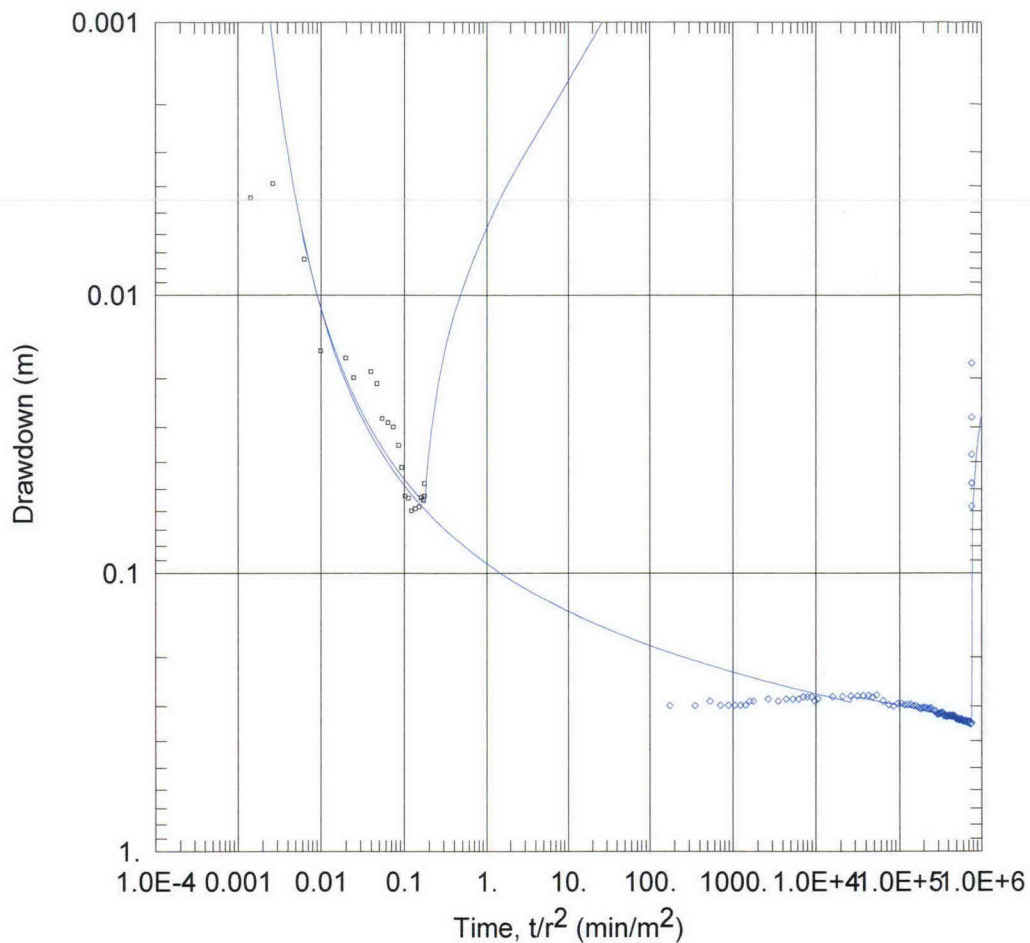
**WELL DATA**

Pumping Wells			Observation Wells		
Well Name	X (m)	Y (m)	Well Name	X (m)	Y (m)
Refreshment Place	0	0	◊ Refreshment Place	0	0
			◻ Blockhouse	157	0

**SOLUTION**

Aquifer Model: Unconfined Solution Method: Thisis  
 T = 1500. m<sup>2</sup>/day S = 0.02  
 Kz/Kr = 1. b = 25. m





72-HR CONSTANT RATE TEST - TREND CORRECTED DATA

Data Set: P:\...\Refreshment Place This Composite Trend corrected data.aqt  
 Date: 03/14/12 Time: 10:54:04

PROJECT INFORMATION

Company: Beca Carter Hollings & Ferner  
 Client: Picadilly Investments  
 Project: 4260716  
 Location: Upper Hutt, New Zealand  
 Test Well: Refreshment Place  
 Test Date: 2/11/10

WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (m)	Y (m)	Well Name	X (m)	Y (m)
Refreshment Place	0	0	◊ Refreshment Place	0	0
			◻ Blockhouse	157	0

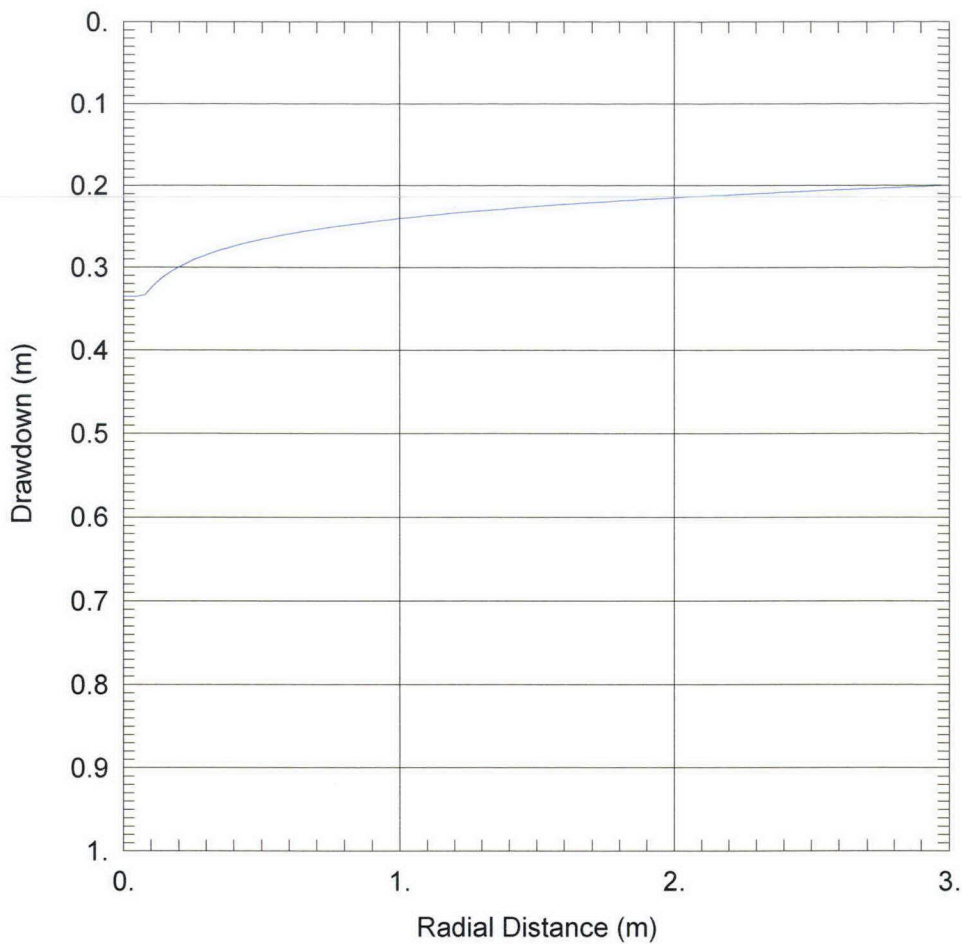
SOLUTION

Aquifer Model: Unconfined Solution Method: Thisis  
 T = 1500. m<sup>2</sup>/day S = 0.02  
 Kz/Kr = 1. b = 25. m

Appendix D

## Drawdown Interference Analyses





**THREE-DAY DRAWDOWN PREDICTIONS FOR PUMPING THE REFRESHMENT PLACE WELL AT 4 L/S**

Data Set: P:\...\Refreshment Place t 1500 q4 at well Near Well This Forward Predictor 3 Day.aqt  
 Date: 03/14/12 Time: 11:03:16

**PROJECT INFORMATION**

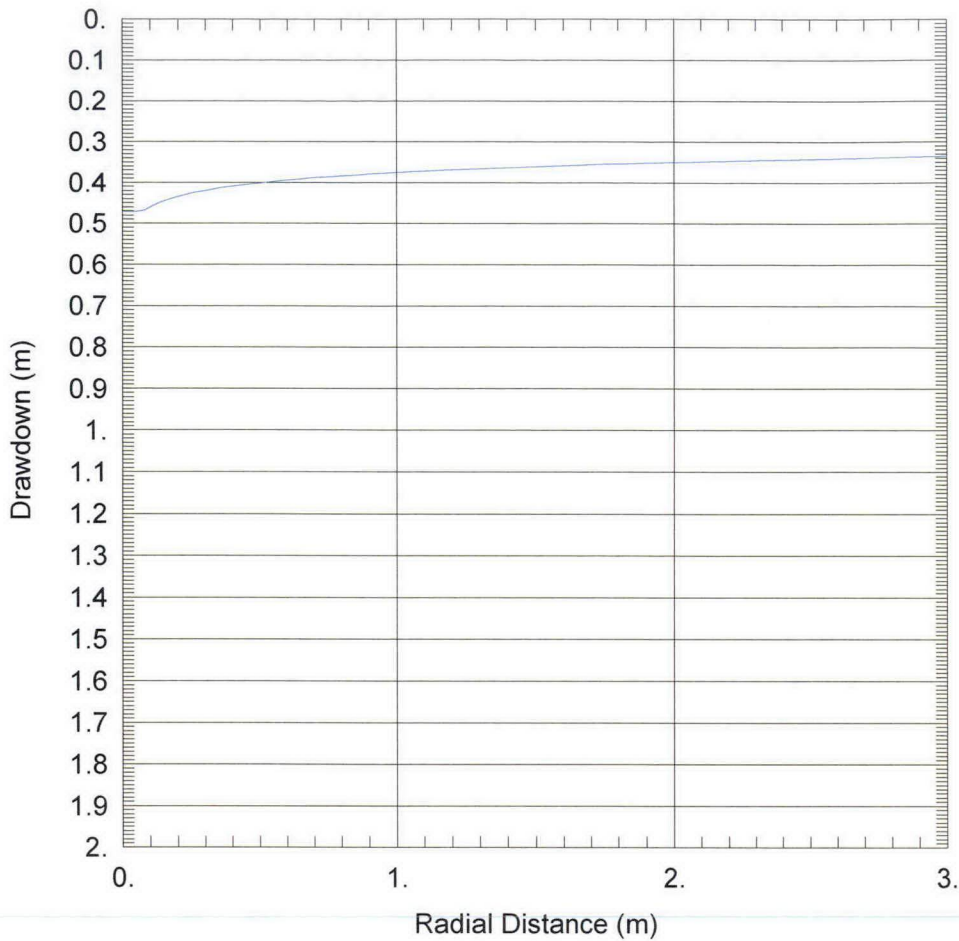
Company: Beca Carter Hollings & Ferner  
 Client: Picadilly Investments  
 Project: 4260716  
 Location: Upper Hutt, New Zealand  
 Test Well: Refreshment Place  
 Test Date: 2/11/10

**WELL DATA**

Pumping Wells			Observation Wells		
Well Name	X (m)	Y (m)	Well Name	X (m)	Y (m)
Refreshment Place	0	0	Refreshment Place	0	0

**SOLUTION**

Aquifer Model: Unconfined Solution Method: Theis  
 T = 1500 m<sup>2</sup>/day S = 0.02  
 Kz/Kr = 1 b = 25 m



150-DAY DRAWDOWN PREDICTIONS FOR PUMPING THE REFRESHMENT PLACE WELL AT 4 L/S

Data Set: P:\...\Refreshment Place t 1500 q4 at well Near Well Theis Forward Predictor 150 Day.aqt  
 Date: 03/14/12 Time: 11:04:53

PROJECT INFORMATION

Company: Beca Carter Hollings & Ferner  
 Client: Picadilly Investments  
 Project: 4260716  
 Location: Upper Hutt, New Zealand  
 Test Well: Refreshment Place  
 Test Date: 2/11/10

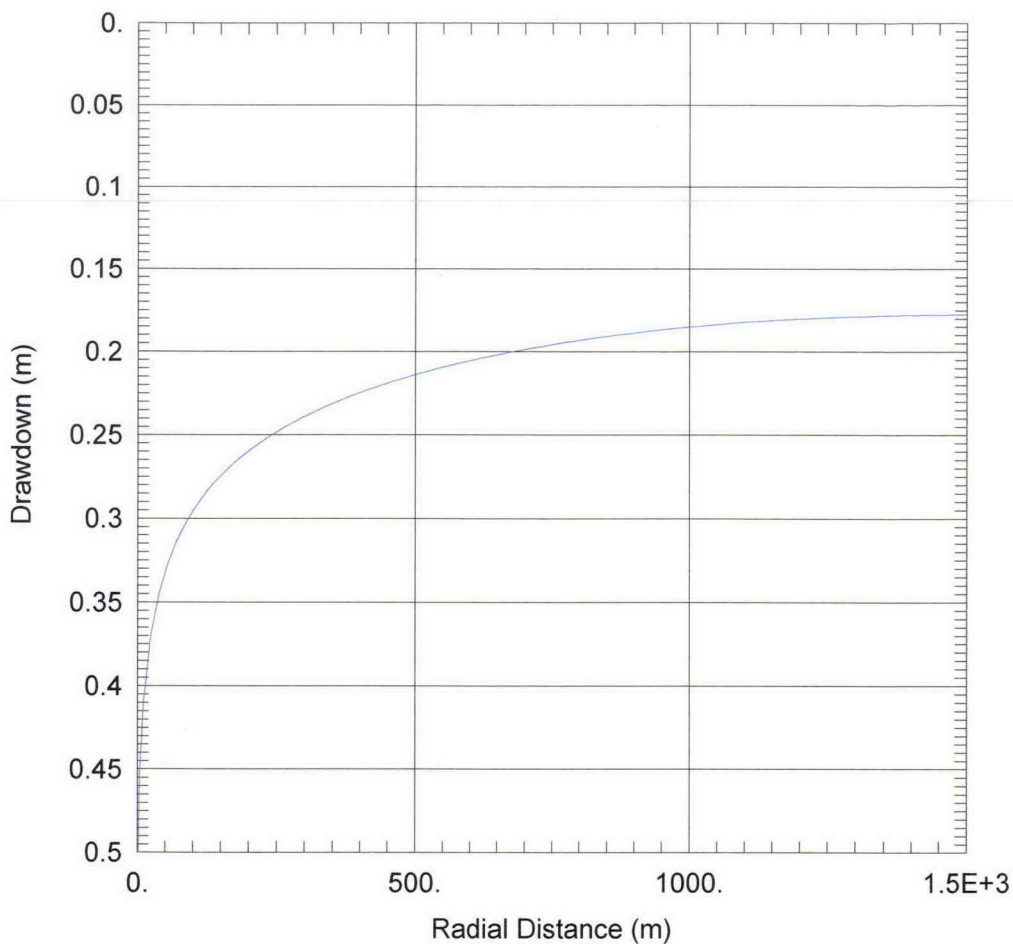
WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (m)	Y (m)	Well Name	X (m)	Y (m)
Refreshment Place	0	0	◊ Refreshment Place	0	0

SOLUTION

Aquifer Model: Unconfined Solution Method: Theis  
 T = 1500 m<sup>2</sup>/day S = 0.02  
 Kz/Kr = 1 b = 25 m





REFRESHMENT PLACE WELL: CONTINUOUS PUMPING AT 5.17 L/S FOR 150-DAYS

Data Set: P:\...\Refreshment Place t 1500 q5.17 out 1500m Theis Forward Predictor 150 Day.aqt  
 Date: 03/14/12 Time: 12:07:29

PROJECT INFORMATION

Company: Beca Carter Hollings & Ferner  
 Client: Picadilly Investments  
 Project: 4260716  
 Location: Upper Hutt, New Zealand  
 Test Well: Refreshment Place  
 Test Date: 2/11/10

WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (m)	Y (m)	Well Name	X (m)	Y (m)
Refreshment Place	0	0	Refreshment Place	0	0

SOLUTION

Aquifer Model: Unconfined

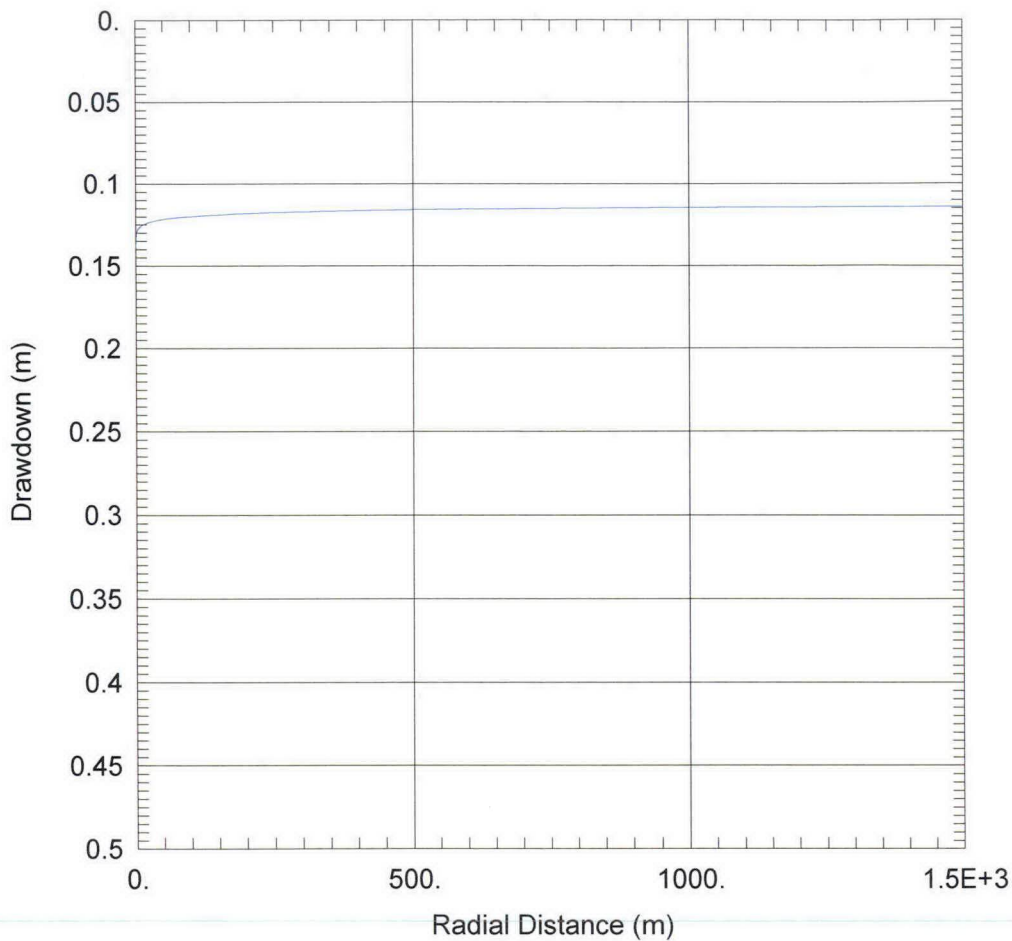
Solution Method: Theis

T = 1500. m<sup>2</sup>/day

S = 0.02

Kz/Kr = 1.

b = 25. m



REFRESHMENT PLACE WELL: LARGER T AQUIFER, PUMPING AT 5.17 L/S FOR 150 DAYS

Data Set: P:\...\Refreshment Place t 28000 q5.17 out 1500m This Forward Predictor 150 Day.aqt  
 Date: 03/14/12 Time: 11:17:56

PROJECT INFORMATION

Company: Beca Carter Hollings & Ferner  
 Client: Picadilly Investments  
 Project: 4260716  
 Location: Upper Hutt, New Zealand  
 Test Well: Refreshment Place  
 Test Date: 2/11/10

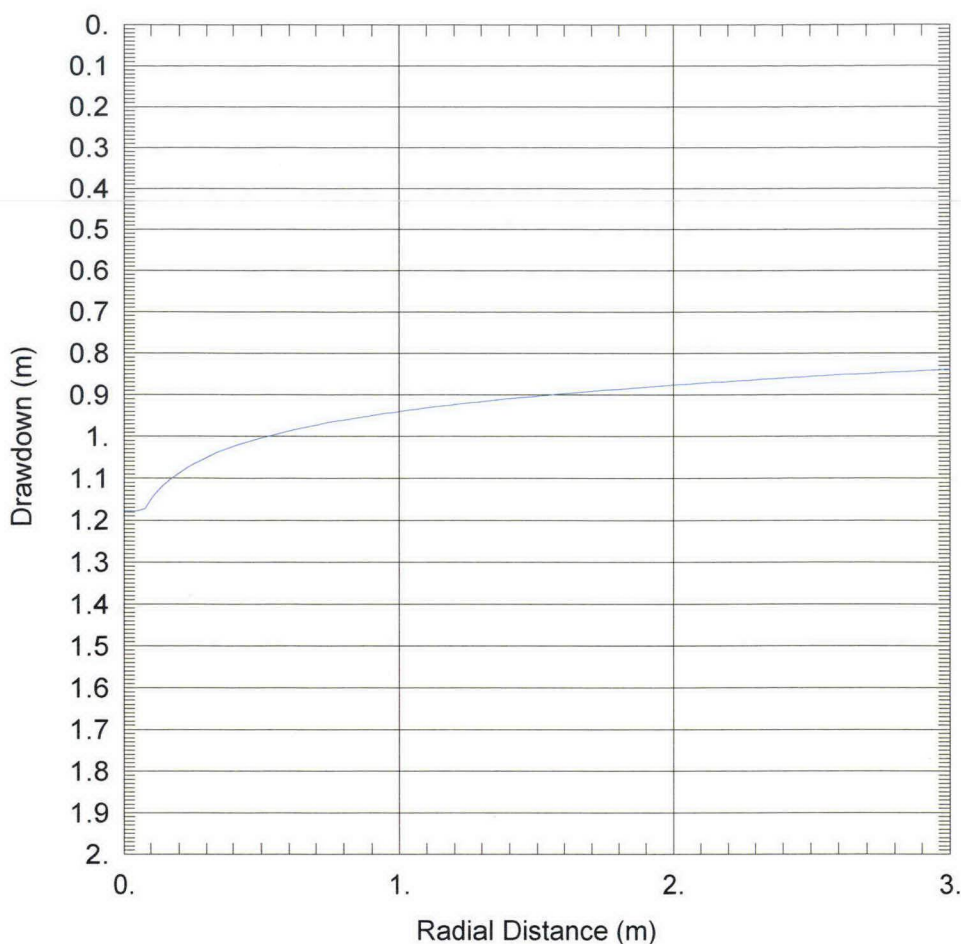
WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (m)	Y (m)	Well Name	X (m)	Y (m)
Refreshment Place	0	0	Refreshment Place	0	0

SOLUTION

Aquifer Model: Unconfined Solution Method: Thisis  
 T = 2.8E+4 m<sup>2</sup>/day S = 0.02  
 Kz/Kr = 1. b = 25. m





**150-DAY DRAWDOWN PREDICTIONS FOR PUMPING THE REFRESHMENT PLACE WELL AT 10 L/S**

Data Set: P:\...\Refreshment Place t 1500 q10 at well Theis Forward Predictor 150 Day.aqt  
 Date: 03/14/12 Time: 11:06:25

**PROJECT INFORMATION**

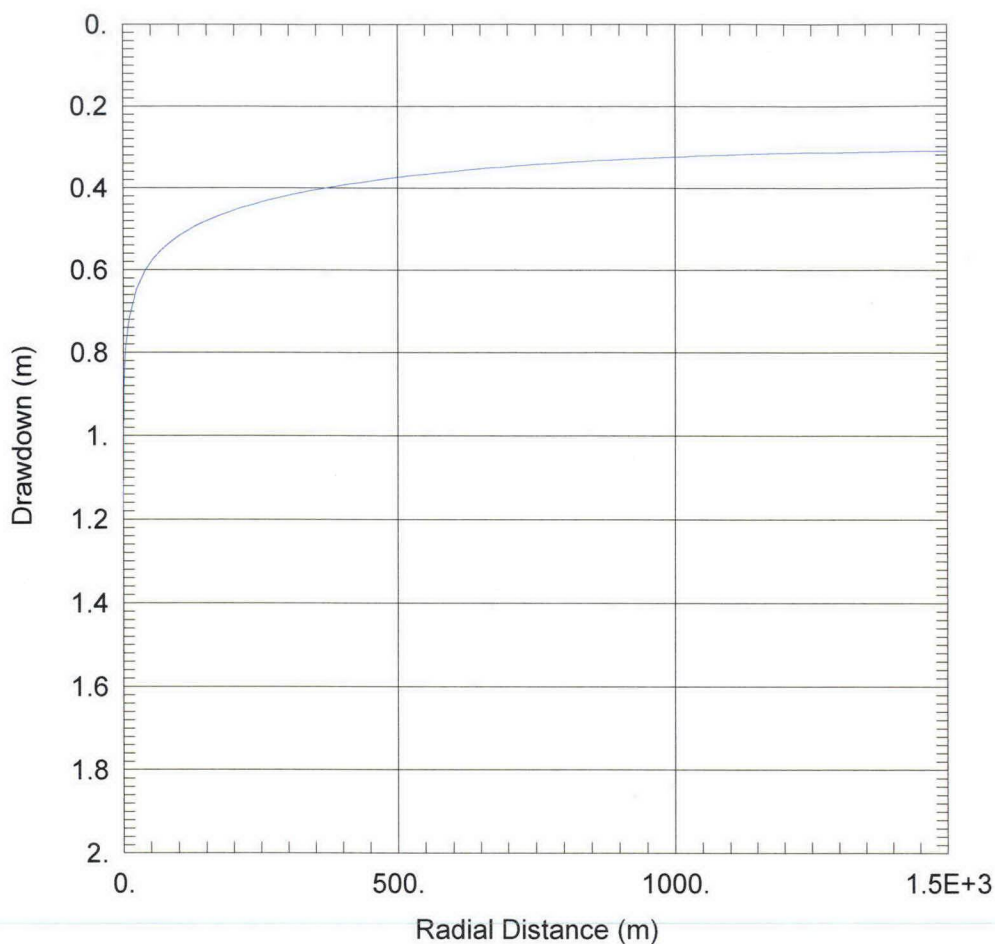
Company: Beca Carter Hollings & Ferner  
 Client: Picadilly Investments  
 Project: 4260716  
 Location: Upper Hutt, New Zealand  
 Test Well: Refreshment Place  
 Test Date: 2/11/10

**WELL DATA**

Pumping Wells			Observation Wells		
Well Name	X (m)	Y (m)	Well Name	X (m)	Y (m)
Refreshment Place	0	0	Refreshment Place	0	0

**SOLUTION**

Aquifer Model: Unconfined Solution Method: Theis  
 T = 1500 m<sup>2</sup>/day S = 0.02  
 Kz/Kr = 1 b = 25 m



150-DAY DRAWDOWN PREDICTIONS FOR PUMPING THE REFRESHMENT PLACE WELL AT 10 L/S

Data Set: P:\...\Refreshment Place t 1500 q10 out 1500m Theis Forward Predictor 150 Day.aqt  
 Date: 03/14/12 Time: 11:07:54

PROJECT INFORMATION

Company: Beca Carter Hollings & Ferner  
 Client: Picadilly Investments  
 Project: 4260716  
 Location: Upper Hutt, New Zealand  
 Test Well: Refreshment Place  
 Test Date: 2/11/10

WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (m)	Y (m)	Well Name	X (m)	Y (m)
Refreshment Place	0	0	◊ Refreshment Place	0	0

SOLUTION

Aquifer Model: Unconfined Solution Method: Theis  
 T = 1500. m<sup>2</sup>/day S = 0.02  
 Kz/Kr = 1. b = 25. m