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Technical Report to assist with the Processing of the Groundwater Take Application for Whakatane District Council at Paul Road

Whakatane District Council

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Prepared for

Whakatane District Council

March 2015

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Quality Control Sheet

TITLE	Technical Report to assist with the Processing of the Groundwater Take Application for Whakatane District Council at Paul Road
CLIENT	Whakatane District Council
VERSION	Final
ISSUE DATE	3 March 2015
JOB REFERENCE	T01559402R001 Consent Report i1
SOURCE FILE(S)	T01559401R001

DOCUMENT CONTRIBUTORS

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Limitations:

This report has been prepared on the basis of information provided by Whakatane District Council and others (not directly contracted by PDP for the work), including the Bay of Plenty Regional Council. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the report. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

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Executive Summary

The purpose of this report is to support the resource consent application to take groundwater at 124 Paul Road, Te Teko submitted by Whakatane District Council (the Applicant). Pattle Delamore Partners (PDP) has been engaged by the Applicant to provide technical support to the consent application.

The Applicant proposes to take up to 10,368 m^3/d for 365 days a year at a maximum rate of 120 l/s. The water would be taken from the site at 124 Paul Road and would be used to supply WDCs municipal reticulation system to provide potable water to residents in Edgecumbe, Awakeri, and the Rangitāiki Plains.

The proposed take consent would supersede the Applicant's current consent to take groundwater (ID 66359). The existing consent allows up to 5,280 m^3/day to be taken from Bore 1 (11962) for municipal supply 365 days a year at a maximum rate of 61 l/s.

The Applicant requests a 35 year duration for the new consent. The 35 year duration is required to give the Applicant certainty in the long term water supply, given the considerable financial cost of the new infrastructure required to deliver and treat the water.

To date, one bore (Bore 1) has been drilled at the site (ID 11962). The Applicant intends to drill a second bore (Bore 2), approximately 90 m west of Bore 1 in order to provide the required water supply of 120 l/s. Bore 2 would be drilled to a similar or slightly greater depth than Bore 1 and would target the same aquifer.

An assessment of the potential cumulative effects from both bores, and net effects from Bore 2 have been undertaken. No significant adverse effects are anticipated.

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1.0 Description of the Proposal

1.1 Introduction

The purpose of this report is to support the resource consent application to take groundwater at 124 Paul Road, Te Teko submitted by Whakatane District Council (WDC) (the Applicant). Pattle Delamore Partners (PDP) was engaged by the Applicant in February 2015 to provide technical support to the consent application.

The Applicant's property at 124 Paul Road is located approximately 8 km south of Edgecumbe. The property is currently a greenfield site.

The Applicant proposes to take up to 10,368 m^3/day (120 L/s) for 365 days a year. The water would be taken from the site at 124 Paul Road and would be used to supply WDC's municipal reticulation system to supply potable water to residents in Edgecumbe, Awakeri, and the Rangitāiki Plains.

The proposed take consent will replace the Applicant's current consent to take groundwater (ID 66359). Once the new consent is granted the existing consent will be surrendered. The existing consent allows up to 5,280 m^3/day to be taken from Bore 1 (11962) for municipal supply 365 days a year at a maximum rate of 61 l/s. Consent (ID 66359) has not yet been used as a new pipeline and a water treatment system needs to be constructed.

A Hearing was held in 2010 for the current resource consent to extend the duration of the consent to 35 years. The Applicant also seeks a 35 year duration for this proposed consent. The 35 year duration is required to give the Applicant certainty in the long term water supply, given the considerable financial cost of the new infrastructure required to deliver and treat the water. A new, 7.2 km pipeline and water treatment system are required. However, the scope of this construction work is contingent on obtaining consent to abstract groundwater at a rate of 120 L/s. WDC is currently reviewing the detailed design of this pipeline and treatment system with the intention of tendering it for construction within the next few months.

To date, only (Bore 1) has been drilled at the site (ID 66359). The Applicant intends to drill a second bore (Bore 2) approximately 90 m west-north-west of Bore 1 in order to provide the required water supply of 120 l/s. Bore 2 would be drilled to a similar or slightly greater depth than the Bore 1 and would target the same aquifer. A site plan showing the locations of Bore 1 and 2, together with the proposed treatment plant is attached in Appendix A (D301).

The Applicant has received tenders from drilling companies for construction of Bore 2 and a preferred contractor has been selected. It is proposed that WDC will likely engage this contractor to drill Bore 2 in the near future.

1.2 Water Supply Scheme

The Applicant has a statutory obligation to provide potable water to the community. Communities benefit from the provision of a safe and reliable water supply for their social, economic and cultural well-being.

The Rangitaiki Plains Water Supply Scheme currently has four sources:

- Artesian spring off Braemar Road
- Two bores off Johnson Road
- One bore off Tahuna Road at Te Teko

Braemar spring is the primary source of water supplying the scheme with up to 6,000 m^3/day. The Johnson Road and Tahuna Road bores augment this supply when the pressures in the Onepū area of the Rangitāiki Plains are low, and in periods of high demand during summer.

Although the water from these sources is chlorinated and continuously monitored, it does not meet New Zealand Drinking Water Standards (NZDWS) (2005) due to the following:

- The Braemar Spring and Johnson Road bores have elevated levels of arsenic and antimony (exceeding the NZDWS 2005 Maximum Acceptable Value)
- Braemar Spring and Tahuna Road Bore are not secure water sources and do not meet the NZDWS protozoa removal requirements

Several studies have been carried out to investigate options to address the issues relating to water quality, non-secure groundwater sources, levels of service and storage capacity for the Rangitāiki Plains Water Supply Scheme. Following the investigations carried out, the option chosen by WDC is the development of a bore field in Paul Road to supply Edgecumbe, Awakeri, and the Rangitāiki Plains area. Selection of the Paul Road bore field as the main source of water for the Rangitāiki Plains for the next 50 years was based on the "Plains 50 Year Strategy Study" document (Opus, 2011) which is provided in Appendix B.

Modelling has been undertaken by Opus which shows that the peak demand is 120 l/s. This is based on the "Plains 50 Year Strategy Study" (Opus, 2011).

The Applicant has prepared a Demand Management Strategy to ensure efficient use of water which includes:

- Water restrictions and rationing
- Public education and water conservation
- Water metering and pricing
- Water leakage control, protection and repairs. Bulk zoning is used to monitor leakage

- Water entitlement and excess water usage charge

The plains are fully metered except for Edgecumbe township which has bulk metering.

1.3 Bore 1 and Proposed Bore 2

WDC drilled Bore 1 in 2010 at 124 Paul Road. The water from this bore complies with NZDWS guidelines. Groundwater from Bore 1 also meets the residence time criterion (Section 4.5.21) of the NZDWS, and therefore can obtain a secure source status (supporting report by GNS provided in Appendix D).

Bore 1 is screened from 106 to 166 m with a stainless steel 203 mm diameter screen, and is cased to 104 m depth with 250 mm diameter steel casing.

The exact dimensions of the proposed Bore 2 are yet to be decided, but it will also target the same aquifer (Matahina ignimbrite), and be 300 mm diameter with steel casing. It is envisaged that Bore 2 will be a similar or slightly greater depth than Bore 1.

2.0 Background Information

2.1 Local Setting

Bore 1 (11692) and the proposed location of Bore 2 lie in an area of predominantly low lying land, with a range of hills approximately 500 m to the east. The Rangitaiki River is located around 1.9 km to the north-west. The Bay of Plenty Regional Council (BoP RC) has advised that two main aquifers exist in the area; a gravel aquifer and the Matahina ignimbrite, located at approximately 50 to 70 m bgl (below ground level), and 130 to 180 m bgl respectively.

The geological log for the Bore 1 (11692), drilled in 2009, shows volcanic lithology including rhyolite, ignimbrite, and pumice, interbedded with alluvium, including gravel, sand, boulders, peat, and clay. The bore is screened within the Matahina ignimbrite aquifer, and this unit is overlain by a confining brown silt and purple rhyolite aquitard. At this location, the Matahina aquifer is semi-confined, and consists of fractured ignimbrite. Static water levels are around 2.1 m bgl in Bore 1.

2.2 Other Existing Neighbouring Bores and Takes

Details of surrounding bores and groundwater take consents within a 5 km radius of the Paul Road bore field have been obtained from BoP RC (data provided on the 24/10/14). Bores and takes near to the site are shown in Figure 1 (Appendix A).

According to the BoP RC database, 129 bores lie within 5 km of the bore field excluding those that have been abandoned, capped or removed. Of these bores, 105 are shallower then Bore 1 (< 125 m deep), 11 are of similar depth to Bore 1

(125 to 190 m depth), and 7 are deeper (> 190 m depth). The remaining 6 are of unknown depth.

There are 43 cold groundwater bore takes within 5 km of the bore field. All of these utilise groundwater for irrigation and frost protection purposes.

3.0 Pumping Tests

Two pumping tests were undertaken in January 2010 on Bore 1. Appendix C contains a report entitled the "Analysis of the Pumping Test Data and Assessment of Potential Effects", Voss Infrastructure Consulting Ltd, January 2010. This report was used to successfully support the application to take groundwater for the take consent for Bore 1 at the site. The results from this report are summarised below.

A step test consisting of six steps was undertaken on Bore 1. Each step was of 1 hour duration, at flows of 110, 130, 150, 170, 190 and 210 m^3/hr. A drawdown of 49.6 m was reached after the final step, with a residual drawdown of 0.5 m after a 2 hour recovery period.

Analysis of the step test data yielded the following Eden-Hazel well equation:

$$s = [5.595x10^{-3} + 1.301x10^{-3}\log(t)]Q + 2.263x10^{-7}Q^2$$

Where s is drawdown (m), Q is the pumping rate (m^3/day), and t the time (minutes).

The results from the step test gave transmissivities of 141 m^2/day and 436 m^2/day from Eden-Hazel, and Theis Recovery analyses respectively.

A 12 day constant rate test was undertaken after the step test, pumping at a rate of 5280 m^3/day (61 l/s). Water levels were monitored throughout the test in nine observation wells at distances of 85 to 2288 m away, and depths of 58.5 to 175 m. Six of these bores were monitored with loggers and three were manually monitored. After 12 days, drawdown in the pumping bore reached a maximum of 60.6 m. Residual drawdown was 0.1 m following two days of recovery.

Of the nine bores monitored during the constant rate test, six did not show any effect of the test pumping. A maximum drawdown of 2.8 m was observed in the Groot bore (ID 10762, 419 m away, 175 m deep). As expected for a semi-confined aquifer, less drawdown was observed in shallower bores. Drawdown versus time curves from the test show some curve flattening also indicative of a semi-confined aquifer.

Pumping test analysis was completed by Voss (2010), using the Theis, Theis recovery, and Hantush-Jacob (leaky aquifer) solutions to analyse the results. Transmissivities and storativities of 279 to 991 m^2/day, and 3.7 x 10^{-4} to 3.0 x 10^{-2} respectively were estimated, with mean values of 533 m^2/day for the transmissivity and 4.6 x 10^{-3} for storativity.

Results from this pumping test were used to predict the effects to support the consent application to take groundwater from Bore 1 at a rate of 61 l/s.

4.0 Description of Environmental Effects

4.1 Approach

An initial assessment of the predicted drawdown in the pumping bores and neighbouring wells has been undertaken. The mean values of the hydraulic parameters calculated above have been used in the assessment, assuming both Bore 1 and Bore 2 will be operating at a combined rate of 10,368 m^3/day (120 L/s). Whilst PDP has not independently verified these mean values, they are believed to be satisfactorily conservative to estimate drawdown interference.

4.2 Drawdown in Pumping Bores

Using the Eden-Hazel well equation, and accounting for drawdown interference using Theis, cumulative drawdown in both pumping bores is predicted to be around 81 m after pumping at a combined rate of 10,368 m^3/day (120 L/s) from both bores for 365 days. The predicted drawdown is significantly less than the total available drawdown, assuming the new bore will be constructed to a similar or greater depth.

4.3 Drawdown in Surrounding Bores

Cumulative (pumping both bores), and net (pumping from Bore 2 alone) drawdown interference effects on eight of the twelve closest surrounding bores from the BoP RC database have been predicted using the Theis solution. These assessments are deemed to be conservative, as they assume no leakage will occur from overlying strata which, will act to decrease the magnitude of observed drawdown. Four of the twelve closest bores have been excluded owing to their shallow depths.

These analyses utilise the mean hydraulic parameters calculated above, except in the case of shallow bores (< 100 m deep). Since the target aquifer is semi-confined, a storage coefficient of 0.1 was used for shallower bores. This greater storage coefficient models the multi-layered system as an unconfined aquifer, and acts as a simplification of the Boulton solution for calculating drawdown at the water table. This method will likely still produce an overestimate in drawdown, as the intervening low permeability layers are ignored.

Table 1 shows the results of the cumulative and net drawdown predictions for the eight closest bores after 365 days of continuous pumping from both Bores 1 and 2, and from Bore 2 alone respectively.

Table 1: Drawdown Interference on Surrounding Bores after 365 days pumping from both Bore 1 and Bore 2, and Bore 2 alone.

Bore ID	Corresponding Bore in Voss Report (assumed)	Distance from Bore 2 (m)	Distance from Bore 1 (m)	Bore depth (m)	Static water Level (m bgl)	Predicted net Drawdown (m) pumping from Bore 2 only	Predicted cumulative Drawdown (m) pumping from both Bore 1 and Bore 2
939	N/A	155	65	200	Unknown	6.4	14.2
1000035	Water supply bore	163	65	96	1.4	4[1]	9.3[1]
1000034	Community bore	169	79	200	2.7	6.3	13.7
3672	N/A	171	106	77.7	3.9	3.9[1]	8.5[1]
10909	N/A	244	311	146	Unknown	5.8	11.2
10762	Groot	347	428	175	0.65	5.7	10
2017	N/A	214	288	57	0	3.5 [1]	6.6[1]
1113	N/A	328	272	51.8	0	2.9[1]	6[1]

Notes:

Defined as shallow bore, storage coefficient of 0.1 used.

Static water levels in all of the deeper bores are within 5 m of ground level, and all of the predicted cumulative and net drawdowns represent a relatively small proportion of the total available drawdown. Through examination of drawdown curves from the pumping test conducted on the Bore 1, this analysis is deemed to be sufficiently conservative. Indeed, due to the semi-confined nature of the aquifer, drawdown in all bores is likely to be less than predicted here.

Effects on surrounding bores are likely to be less than minor given the conservative approach used to predict drawdown interference. However, there may still be sufficient drawdown interference to require the pump position to be lowered in some of these bores depending upon its current depth.

4.4 Effects on Surface Water Bodies

The nearest major surface water bodies to the site are Lake Otumahi, and the Rangitaiki River which lie around 0.97 km and 1.9 km to the north-east and north-west respectively. As mentioned above, Bore 1 and Bore 2 target a semi-confined aquifer. It is considered that due to the depth of the targeted aquifer

plus the distance to the nearest waterways and the intervening low permeability strata, stream depletion effects are unlikely to be significant.

4.5 Cumulative Effects on the Groundwater Resource

The Paul Road area is within the Ngakauroa Stream groundwater catchment. Janine Barber from the BOP RC has advised that groundwater is available for allocation from this aquifer (email of 24/9/14). This is based on GNS Science report 2010/113, NES guideline for groundwater allocation, and the calculated estimated actual use of groundwater from this aquifer.

Therefore, it is considered that the cumulative effects on the groundwater resource will be less than minor.

4.6 Other Effects

This well is located sufficiently distant from the coast for saline intrusion to not be an issue. Subsidence is also not expected to be an issue due to the relatively low magnitude of the proposed take.

4.7 Summary of Potential Effects

Effects as a result of the proposed take are likely to be less than minor.

5.0 Description of Alternatives to Avoid, Remedy or Mitigate any Significant Environmental Effects

As described in Section 2, the Applicant has undertaken several studies to investigate options to address the issues relating to water quality, non-secure groundwater sources, levels of service and storage capacity issues for the Rangitāiki Plains Water Supply Scheme. Development of a bore field at Paul Road is the preferred option.

6.0 Assessment of Risks to the Environment that may arise from Hazardous Substances and / or the Discharge of Contaminants

No risks are anticipated from the proposed consent to take groundwater.

7.0 Consultation

A meeting was held on the 3rd February 2015 at the Bay of Plenty Regional Council offices in Whakatane to discuss the proposed resource consent. The following people attended:

- Janine Barber and Jo Cranswick from the Bay of Plenty Regional Council
- Leilani Salanguit and Santha Agas from Whakatane District Council
- Clare Maginness and Warren McKenzie from PDP

8.0 Conclusion

The proposed take will have a positive effect on the people and communities of the Rangitaiki Plains area. The take would supply WDCs municipal reticulation system to supply potable water to residents in Edgecumbe, Awakeri, and the Rangitāiki Plains area.

Appendix A: Site Plan – Pump Station and Bore Field Layout

Original size mm

300 200 150 100 50 30 10 0

SERVICES LEGEND

EXISTING SURVICES

- POWER OVERHEAD (HV)
- POWER UNDERGROUND (HV)
- POWER CABLE OVERHEAD (LV)
- POWER CABLE UNDERGROUND (LV)
- TELECOM
- EXISTING FENCE LINE
- PROPOSED FENCE LINE
- WATER (DESIGN)

ISSUE	AMENDMENTS	SIGNED	DATE
A	ISSUED FOR REVIEW		JAN 15

WHAKATĀNE District Council

			NAME	SIGNED	DATE
DATUM	N/A				
BENCH MK.	N/A	DESIGNED	Warren McKenzie		JAN 15
RL	N/A	DES. REVIEW	Eoghan O'Neill		JAN 15
SURVEY	N/A	DRAWN	Eman Aziz		JAN 15
SURVEY LB	N/A	DRW. CHECK	Robert Docherty		JAN 15
		FILE LOCATION			
DRAIN. REF.	N/A	T01559400D001_RevA.dwg			
SAP WBS	N/A	PRINTED ON	January 9, 2015	BY	Eman Aziz

APPROVED

FOR TENDER	
DATE	SIGNED

FOR CONSTRUCTION	
DATE	SIGNED

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CONSULTANT PROJECT REF. T01559400

CONSULTANT FILE REF. T01559400D301

PROJECT TITLE

PAUL ROAD WATER SUPPLY

DRAWING TITLE

PUMP STATION AND BOREFIELD GENERAL LAYOUT

CONTRACT NUMBER 15-038

CAD DRAWING FILE REF. ---

ORIGINAL SHEET SIZE A1

SCALES 1:500 (A1) 1:1000 (A3)

PROJECT FILE NUMBER T01559400

SHEET D301

Figure 1: Locations of neighbouring bores and takes around the Whakatane District Council site at 124 Paul Road

Values in light blue are the take quantities in m^3/d (for bores with a take consent), values in yellow correspond to the bore depth in metres and white labels show the borehole ID.

Appendix B: Plains 50 Year Strategy Study, Opus, 2011

Appendix C: Paul Road Bore Results and Recommendations Report, Opus, 2010

Appendix D: Groundwater Residence Time Determination for the Paul Road Bore, GNS, 2010