

# Bay Geological Services Ltd

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ref: BGS201-10

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Policy and Regulation Group  
Hawkes Bay Regional Council  
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Dear Paul,

## **TRANCHE 2 WATER PERMIT APPLICATIONS PAPAWAI PARTNERSHIP: APP-123565 AND APP-124498**

In August 2021, eight Applicants lodged a resource consent for the Tranche 2 groundwater allocation. On 1 October 2021, the Hawkes Bay Regional Council (HBRC) provided a technical review by PDP along with a Request for Further information under S92 and S91 of the RMA (1991).

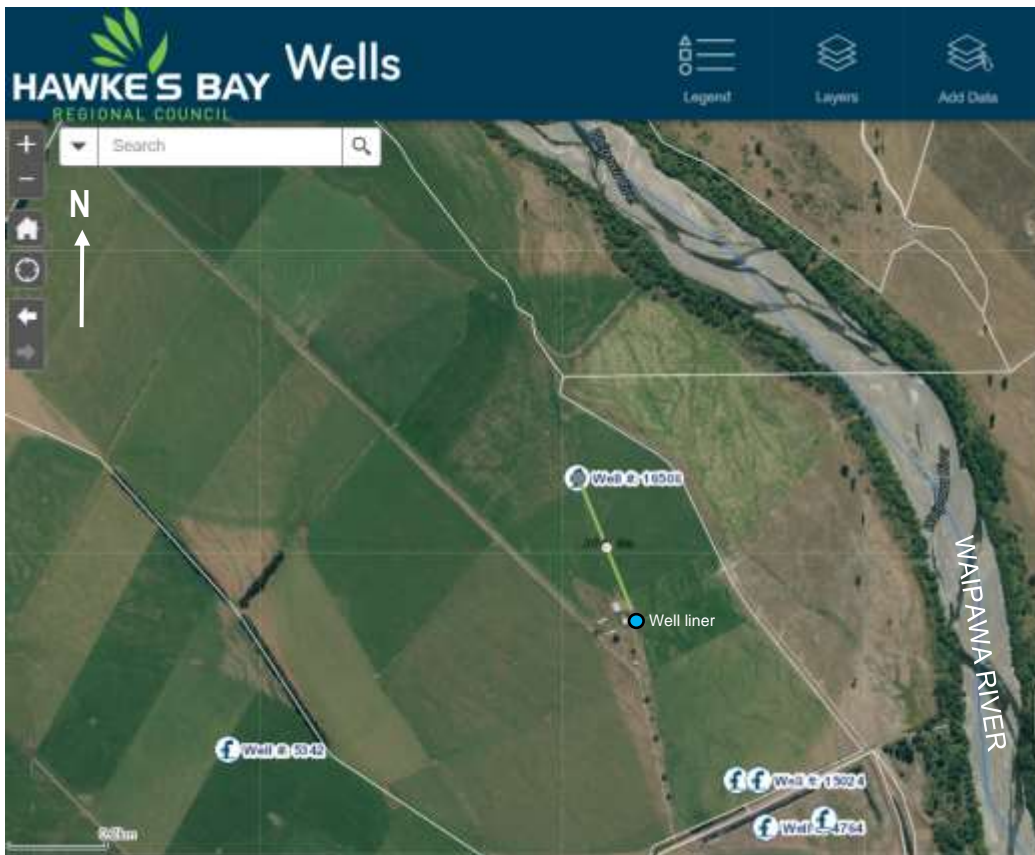
With respect to one of the Applicants, Papawai Partnership Ltd., (Applications APP-123565 and APP-124498), the following information is sought by HBRC:

- 1. Augmentation through a shallow bore 600 m from the river may not be feasible or may cause mounding effects. Consider and assess how effectively the discharge will augment flows in the Waipawa River\*.*

## **RESPONSE**

As indicated in the initial application, the Applicant has proposed pumping the augmentation volume into a shallow well liner located approximately 560 m west of the Waipawa River. The Applicant proposes to split the irrigation and augmentation take at Production Well No.16508 wellhead, and install a 150 mm pipeline to pump the augmentation volume about 300 m southeast to the well liner. The daily average augmentation rate as modelled by Aqualinc is 24 l/s to pump a volume of 464,700 m<sup>3</sup>/year when the proposed minimum flows are triggered.

The 1200 mm diameter well liner was inspected on 7 November, 2021 which measured 3.60 m depth below ground level (bgl) with a static water level (SWL) of approximately 3.00 m bgl. The well liner is located on a relatively wide former floodplain, slightly elevated above the Waipawa River channel, which is now bound by a stop bank along the western side as shown on the HBRC wells map in Figure 1 and the photograph presented in Appendix A. The existing Production Well No. 16508 is drilled on a higher alluvial terrace that extends across much of the Ruataniwha Basin.



**Figure 1. HBRC wells map illustrating Production Well No.16508, well liner and Waipawa River**

The bore log for Applicant's deep Production Well No. 16508, is included in Appendix B, which records the upper section of the bore as encountering blue/brown gravel from 0 to 12 m depth bgl. The HBRC website reveals another deep Well No. 4764 nearby, which logged water-bearing brown gravel in the upper section from 1 to 16 m bgl. A shallow 1200 mm diam. well No. 5532 located adjacent to the eastern side of the Waipawa River approximately 1.9 km north of the well liner logged grey gravels from the surface to at least the base of the 5 m deep bore hole.

In order to estimate the degree of mounding that may occur as a result of the proposed augmentation water reaching the groundwater table, the Theis (1935) drawdown solution has been used along with adopted aquifer parameters and measured distances.

A PDP (2018) report reviewed aquifer parameters across the Ruataniwha Basin, which concluded that transmissivity (T) values are higher north of the Tukituki River, with measured transmissivity values at least 1,000 m<sup>2</sup>/day occurring in an arc between the Tukituki River and the Mangaonuku Stream that crosses the Waipawa River. The report provides transmissivities (T) for the Applicant's and nearby wells screened over the deep confined gravel aquifer (> 75 m bgl) as follows:

- Well No. 2933: T = 1,250 m<sup>2</sup>/day
- Well No. 4764: T = 1,300 m<sup>2</sup>/day
- Well No. 16508: T = 1,160 m<sup>2</sup>/day

In the absence of available aquifer parameters associated with the shallow, unconfined gravel aquifer, for which the transmissivity value is likely to be higher, using the T values as listed above is considered a conservative approximation. The parameters used in the solution are detailed in Table 1.

**Table 1. Estimated and measured parameters used in mounding estimation**

Parameter	Parameters used for Mounding Estimate Calculations		
	Value	Unit	Detail
<b>T</b>	1,200	m <sup>2</sup> /day	Conservative estimate of shallow unconfined aquifer transmissivity
<b>s</b>	0.2		shallow unconfined gravel aquifer
<b>Q</b>	24	l/s (2073.6 m <sup>3</sup> /day)	Augmentation flow rate
<b>t</b>	224	days	Time to pump augmentation volume
<b>r</b>	440	m	Distance to nearest neighbouring property

Using the Theis (1935) solution, mounding is estimated as 0.38 m at a distance of 440 m as a result of pumping the augmentation groundwater into the well liner at a rate of 24 l/s over 224 days. This is plotted on the Aqtesolv (Duffield) graph using Theis (1935) as shown in Figure 2. The full Aqtesolv data sheet is included in Appendix C.

A search of the HBRC website revealed several shallow, unconfined gravel aquifer wells at similar elevations within 1.2 km of the well liner that record SWL's ranging from 4 and 5 m bgl. Therefore, the estimated mounding effect of 0.38 m is not predicted to result in adverse flooding effects at the boundary with the closest neighbour.

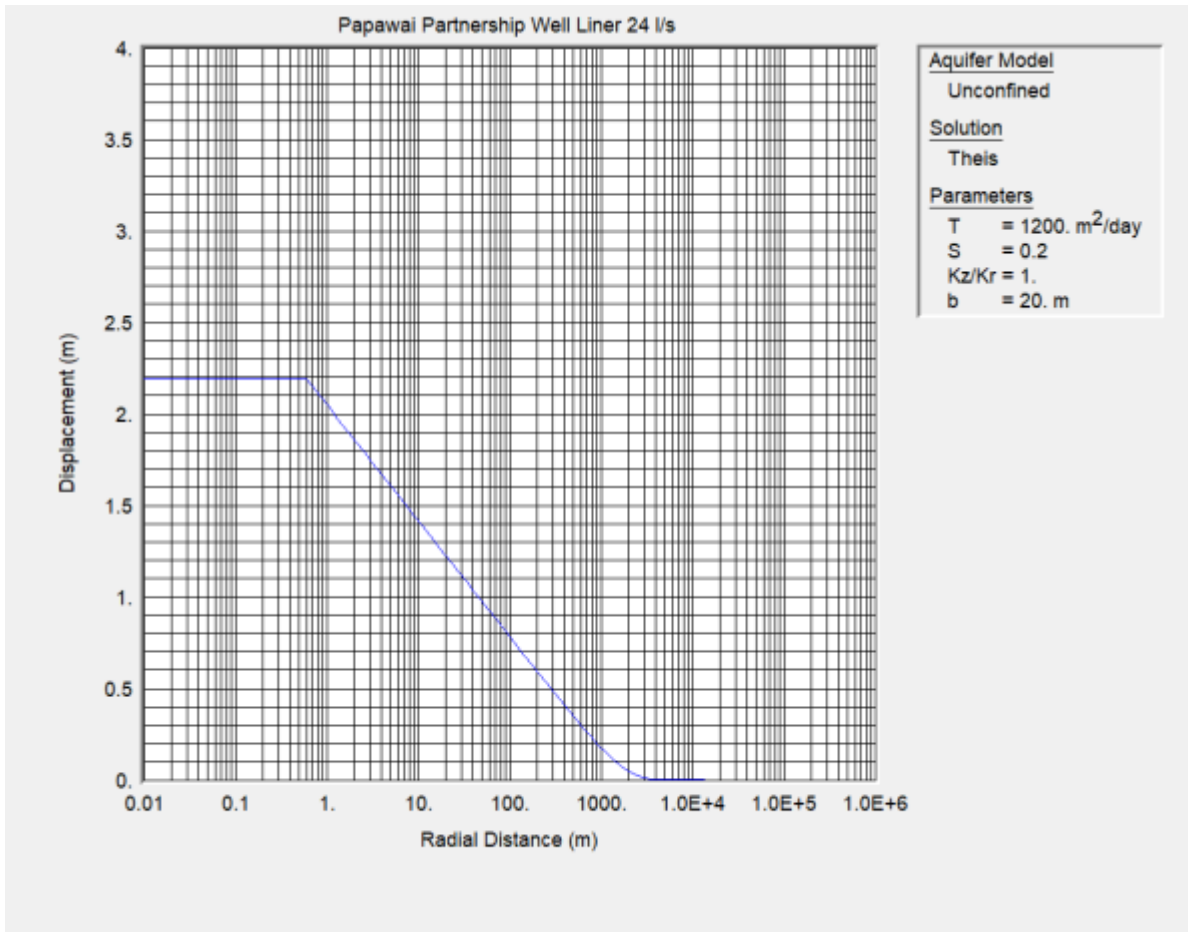


Figure 2. Aqtesolv drawdown v radial distance plot using Theis (1935) at a rate of 24 l/s for 224 days

## REFERENCES

Duffield, G.M., AQTESOLV 1996 – 2007 HydroSOLV Inc. [www.aqtesolv.com](http://www.aqtesolv.com)

Hawkes Bay Regional Council website ([www.hbrc.govt.nz](http://www.hbrc.govt.nz)).

Hawkes Bay Regional Council, 2021: Letter to Sage Planning re: Tranche 2 Water Permit Applications, 1/10/2021.

PDP, 2018: Ruataniwha Aquifer Properties Analysis and Mapping. Client Report No. C02591543 PDP, Christchurch, New Zealand.

Theis, C. V., 1935: The relation between the lowering of the piezometric surface and the rate of duration of discharge of a well using ground-water storage. American Geophysical Union Transactions v16, 519-524.

### **Report Limitations**

*This letter report is written based on conditions as they existed at the time of the assessment, and there is no interpretation made on potential changes that may occur across the site. Subsurface conditions may exist across the project area that are not able to be detected or revealed by the investigation within the scope of the project, and are therefore not taken into account.*

## **APPENDICES**

## **APPENDIX A**

### **Site Photographs**



**A1: Papawai Partnership well liner (view eastward) with the Waipawa River indicated by the blue arrow.**



**APPENDIX B**

**Applicant's Bore Logs (HBRC)**

## B1: Well No. 16508



# Well 16508

### IDENTIFICATION

**WQ Site:**  
**Easting:** 1895969.186  
**Northing:** 5579781.224  
**Method:** Hand-held GPS  
**Address:** 519 Plantation Road, Ongaonga

### WELL INFORMATION

**Drill date:** 03/08/2016  
**Driller:** Honnor Drilling Limited  
**Casing Diameter (mm):** 300  
**Bore Depth (m):** 119.55  
**Well Depth (m):** 87.6  
**Screen top (m):** 85.62  
**Screen bottom (m):** 119.55  
**Open hole top (m):**  
**Open hole bottom (m):**  
**Water level access:** Unknown

### Bore Consents

**Consent Id** LU160126B  
**Consent Type** Bore consent  
**Use One** Pastoral Farming  
**Use Two** Irrigation

**Consent Id** WP140555Tf  
**Consent Type** Ground-water consent  
**Use One** Pastoral Farming  
**Use Two** Irrigation & other use

### Aquifer Information

**Initial Water Level** -4  
**Aquifer Condition**  
**Aquifer Lithology**

### Aquifer Test

**Test Reliability** Unreliable  
**Specific Capacity** 3  
**Hydraulic Conductivity**  
**Storativity** 0  
**Transmissivity** 1237  
**Aquifer Thickness**  
**Number Of Pumping Steps**  
**Duration** 24  
**Maximum Draw Down** 34  
**Maximum Pumping Rate** 100  
**Report Number** 317  
**Bore No** 16508

## B2: Well No. 16508 (cont.)

### Bore Log (m)

Lithology	TOPSOIL
From Depth	0
To Depth	0
Lithology	blue/brown GRAVEL
From Depth	0
To Depth	12
Lithology	brown CLAY
From Depth	12
To Depth	15
Lithology	brown GRAVEL (Water Bearig)
From Depth	15
To Depth	20
Lithology	GRAVEL with clay (Clay bound gravel)
From Depth	20
To Depth	30
Lithology	blue GRAVEL
From Depth	30
To Depth	38
Lithology	brown GRAVEL (Water Bearig)
From Depth	38
To Depth	50
Lithology	GRAVEL with clay (Clay bound gravel)
From Depth	50
To Depth	52
Lithology	brown GRAVEL (Water Bearig 20 lps)
From Depth	52
To Depth	63
Lithology	brown GRAVEL with clay
From Depth	63
To Depth	65
Lithology	brown GRAVEL (Water Bearig 15 lps)
From Depth	65
To Depth	68
Lithology	brown GRAVEL (Water Bearig 10lps)
From Depth	68
To Depth	72

**B3: Well No. 16508 (cont.)**

<b>Lithology</b>	brown GRAVEL (Water Bearig 20 lps)
<b>From Depth</b>	72
<b>To Depth</b>	74

<b>Lithology</b>	brown GRAVEL (Water dropping off)
<b>From Depth</b>	74
<b>To Depth</b>	79

<b>Lithology</b>	CLAY with gravel (Mix)
<b>From Depth</b>	79
<b>To Depth</b>	88

<b>Lithology</b>	brown GRAVEL
<b>From Depth</b>	88
<b>To Depth</b>	90

<b>Lithology</b>	brown GRAVEL (Water Bearig 10 lps)
<b>From Depth</b>	90
<b>To Depth</b>	96

<b>Lithology</b>	brown GRAVEL (Water Bearig)
<b>From Depth</b>	96
<b>To Depth</b>	101

<b>Lithology</b>	brown GRAVEL
<b>From Depth</b>	101
<b>To Depth</b>	107

<b>Lithology</b>	brown GRAVEL
<b>From Depth</b>	107
<b>To Depth</b>	116

<b>Lithology</b>	brown GRAVEL with sand (More sand)
<b>From Depth</b>	116
<b>To Depth</b>	118

<b>Lithology</b>	brown GRAVEL with sand (Less sand)
<b>From Depth</b>	118
<b>To Depth</b>	119

<b>Lithology</b>	brown GRAVEL (Tight)
<b>From Depth</b>	119
<b>To Depth</b>	120

B4: Well No. 1859



## Well 1859

### IDENTIFICATION

**WQ Site:**  
**Easting:** 1894282.81  
**Northing:** 5580732.528  
**Method:** Differential GPS  
  
**Address:** S.H. 50, ONGA ONGA. (L/C)

### WELL INFORMATION

**Drill date:** 29/03/1985  
**Driller:** Hill Well Drillers Ltd  
**Casing Diameter (mm):** 250  
**Bore Depth (m)**  
**Well Depth (m):** 87.5  
**Screen top (m):** 77.5  
**Screen bottom (m):** 87.5  
**Open hole top (m):**  
**Open hole bottom (m):**  
  
**Water level access:** Yes

### Bore Consents

**Consent Id** WP140555Tf  
**Consent Type** Ground-water consent  
**Use One** Pastoral Farming  
**Use Two** Irrigation & other use

### Aquifer Information

**Initial Water Level** -10  
**Aquifer Condition** Unconfined  
**Aquifer Lithology** Gravels

### Aquifer Test

**Test Reliability** Unreliable  
**Specific Capacity**  
**Hydraulic Conductivity**  
**Storativity**  
**Transmissivity**  
**Aquifer Thickness**  
**Number Of Pumping Steps**  
**Duration**  
**Maximum Draw Down**  
**Maximum Pumping Rate** 6  
**Report Number**  
**Bore No** 1859

**Test Reliability** Unreliable  
**Specific Capacity** 6  
**Hydraulic Conductivity**  
**Storativity**  
**Transmissivity**

## B5: Well No. 1859 (cont.)

<b>Aquifer Thickness</b>	
<b>Number Of Pumping Steps</b>	4
<b>Duration</b>	8
<b>Maximum Draw Down</b>	5
<b>Maximum Pumping Rate</b>	32
<b>Report Number</b>	93
<b>Bore No</b>	1859

### Bore Log (m)

<b>Lithology</b>	brown/red GRAVEL
<b>From Depth</b>	0
<b>To Depth</b>	39

<b>Lithology</b>	GRAVEL with clay (cemented, brown clay)
<b>From Depth</b>	39
<b>To Depth</b>	40

<b>Lithology</b>	GRAVEL with clay (free, SWL -23m.)
<b>From Depth</b>	40
<b>To Depth</b>	48

<b>Lithology</b>	GRAVEL (Tough driving)
<b>From Depth</b>	48
<b>To Depth</b>	50

<b>Lithology</b>	GRAVEL (free)
<b>From Depth</b>	50
<b>To Depth</b>	53

<b>Lithology</b>	GRAVEL with clay (Very tight, claybound, (gravel?))
<b>From Depth</b>	53
<b>To Depth</b>	70

<b>Lithology</b>	GRAVEL with clay (Very tight, claybound, (gravel?))
<b>From Depth</b>	70
<b>To Depth</b>	72

<b>Lithology</b>	GRAVEL with sand
<b>From Depth</b>	72
<b>To Depth</b>	76

<b>Lithology</b>	GRAVEL with sand
<b>From Depth</b>	76
<b>To Depth</b>	76

<b>Lithology</b>	GRAVEL with clay (very tight, claybound, (gravel?))
<b>From Depth</b>	76
<b>To Depth</b>	84

**B6: Well No. 1859 (cont.)**

<b>Lithology</b>	GRAVEL (clean, tight)
<b>From Depth</b>	84
<b>To Depth</b>	86

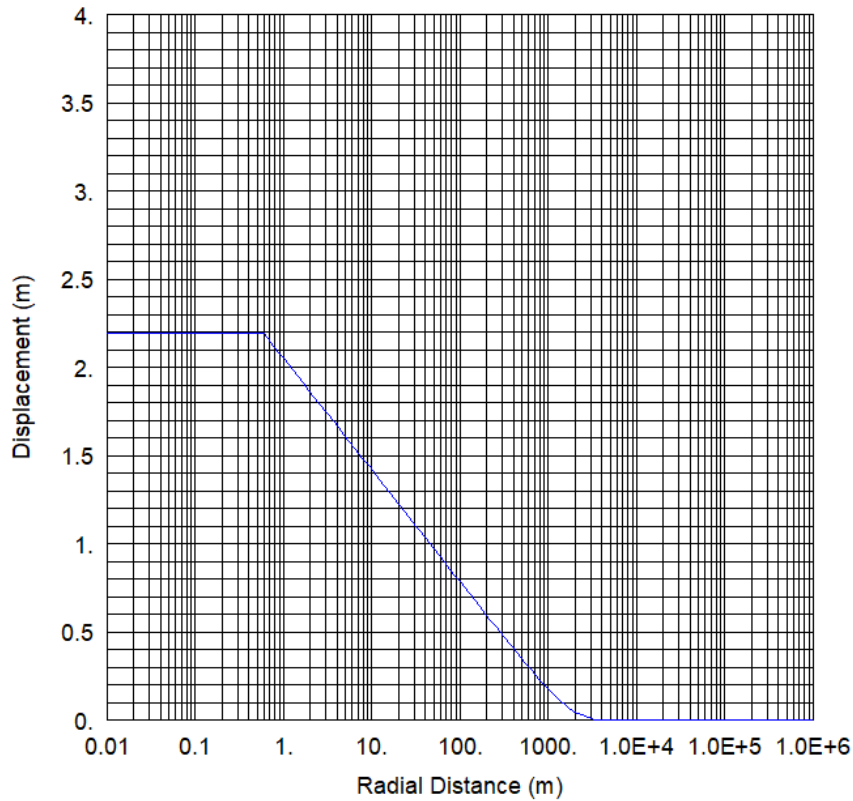
<b>Lithology</b>	GRAVEL with clay (tight, claybound, (gravel?))
<b>From Depth</b>	86
<b>To Depth</b>	88

## **APPENDIX C**

**AQTESOLV (Duffield, 2007) Distance-Drawdown plot  
using Theis (1935) Solution**



C1: Aqtesolv distance – drawdown plot (using Theis, 1935) pumping 24 l/s into the well liner at an average flow rate of 24 l/s ( $T = 1,200 \text{ m}^2/\text{day}$ ,  $s = 0.2$ ).



PAPAWAI PARTNERSHIP WELL LINER 24 L/S					
Data Set: C:\...\Papawai Proposed Mounding 24 lps 244 days.aqt					
Date: 11/11/21			Time: 11:03:08		
PROJECT INFORMATION					
Company: Bay Geological Services Ltd					
Client: Papawai Partnership					
Project: BGS201					
Location: SH50, Ongaonga					
Test Well: 1200 mm diam. Well Liner					
Test Date: N/a					
WELL DATA					
Pumping Wells			Observation Wells		
Well Name	X (m)	Y (m)	Well Name	X (m)	Y (m)
Well Liner	1895969	5579781	Well Liner	1895969	5579781
SOLUTION					
Aquifer Model: Unconfined			Solution Method: Theis		
T = 1200. m <sup>2</sup> /day			S = 0.2		
Kz/Kr = 1.			b = 20. m		