PROFESSIONAL GROUND WATER AND ENVIRONMENTAL SERVICES

. RESOURCE CONSENTS
. ASSESSMENT OF EFFECTS
. WATER RESOURCE EVALUATIONS
. HYDROGEOLOGIC STUDIES

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2/12/08

Wellington Regional Council
P O Box 41
Masterton

Attention: Darryl Squires

Re. Water Permit application WAR080367 JV and LA Petrie

Dear Darryl

Additional work has been completed in relation to this application. This has involved comparing water quality from the Petrie irrigation bore with existing data for the Pukio and Tawaha Ground Water Zones.

A water sample was collected from the Petrie bore on 3/9/08 and submitted to Wairarapa Laboratory Services for chemical analysis. Results are attached to this letter. Available ground water quality data for the Tawaha and Pukio Aquifers was requested from Greater Wellington.

All this information is attached to this letter.

The chemical quality of the water from the Petrie bore is very similar to that recorded from Brian Bosch's irrigation bore (Pukio Aquifer) and is dissimilar to the various results available for the Tawaha Aquifer. The attached map shows the locations of the various bores in this area where water quality data is available. Also plotted on this map are chloride levels measured in these bores. Chloride tends to be a very stable ion and is a good indicator of chemical type and process. We also know that the Pukio Aquifer is located at the top end of the Lower Valley ground water system where the presence of marine or lacustrine sediments often results in elevated levels of sodium and chloride in the ground water. The attached map shows a distinct boundary between chloride levels of 28 - 44 g/m^3 cl (Tawaha Aquifer) and higher levels of 133 - 150 g/m^3 cl (Pukio Aquifer). These results support our assessment that the Petrie bore is situated in the top part of the Pukio Aquifer.

We still have the issue relating to the degree of connection between the Pukio and

Tawaha Aquifers. Reasonably rigorous pump testing of the Petrie bore showed no obvious connection over the period of pumping. In 2005 a comprehensive pump test was completed on Brian Bosch's second irrigation bore which is screened in the Pukio Aquifer (91 l/s for 3 days) again with no obvious effect on the Tawaha Aquifer. These results suggest that if there is a connection between the aquifers it is not that significant.

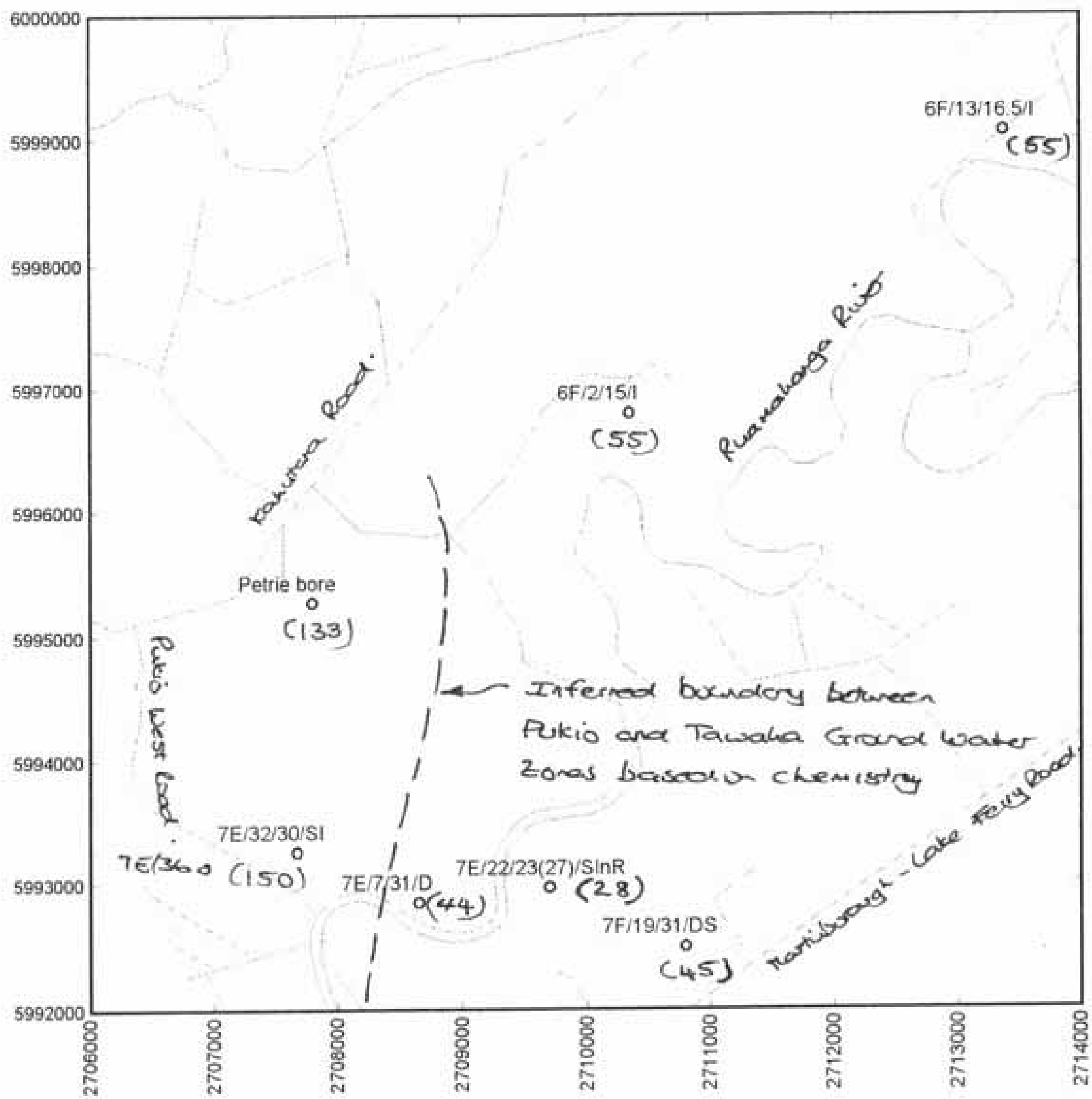
We believe that the level of assessment provided is rigorous given the relatively small size of the take for this area. On that basis we request that the consent application is taken off hold and processed accordingly.

If you have any queries please let me know.

Yours faithfully

Greg Butcher

G M Butcher



(50) ← Ground Water chloride (if more than one sample mean result listed)

Figure: Ground Water Chloride

WAIRARAPA LABORATORY SERVICES

POSTAL: FN 1768 PAIERAU ROAD, MASTERTON, RD 1. PHONE/FAX 06 378 9565.
LABORATORY AT: 1768 PAIERAU ROAD, MASTERTON.

2 October 2008

Ref: WLS 15/9/08

Mr J Petrie
Kahutara Road
FEATHERSTON

Dear Sir

The following are the chemical results for the Bore water sample as sampled and received for analysis from yourself on the 3 September 2008.

RESULTS Sample No: 080939.
Sample Date: 3 September 2008.
Date of Analysis: 3 - 29 September 2008.
Date Reported: 2 October 2008.

<u>Chemical Analysis</u>

Sample Determinant	Test Results	New Zealand Drinking Water Guidelines
pH	6.45	6.5 - 8.5
Conductivity at 25°C	725 uS/cm	
Turbidity	NTU	LT 2.5 NTU
Alkalinity as $CaCO_3$ To pH 4.5	12[illegible].0 g/m^3	
Est. Free Carbon Dioxide	87.3 g/m^3	
Total Hardness as $CaCO_3$	130.4 g/m^3	LT 200 g/m^3
Calcium as Ca^{++}	[illegible].3 g/m^3	
Magnesium as Mg^{++}	15.1 g/m^3	
Total Dissolved Solids	471 g/m^3	LT 1000 g/m^3
Chloride	133.[illegible] g/m^3	LT 250 g/m^3
Iron	5.64 g/m^3	LT 0.20 g/m^3
Manganese	0.6[illegible] g/m^3	LT 0.05 g/m^3

RESULTS Continued

Sample Determinant	Test Results	New Zealand Drinking Water Guidelines
Ammonia Nitrogen	0.612 g/m^3	LT 1.5 g/m^3
Nitrite Nitrogen	0.004 g/m3	LT 0.9 g/m^3
Nitrate Nitrogen	LT [illegible]02 g/m^3	LT 11.4 g/m^3
Potassium	[illegible].5 g/m^3	
Sodium	8[illegible]0 g/m^3	LT 200 g/m^3
Saturation Index at 16°C	8.14	
Langeliers Index at 16°C	-1.69	LSI >0
Correctness of Analysis Acceptable Difference	-3.25%	LT 10%

COMMENTS

A water supply with a negative Langeliers Index at 16°C is an indication that the water is not in balance with respect to Calcium Carbonate. In this scenario, the water will want to dissolve more ions into solution until it becomes stable where upon it will no longer want to dissolve or precipitate ions in solution, as in this situation. In most cases, waters that have a Langeliers Index of between -1.0 to +1.0 are generally considered to be reasonably stable.

When the free Carbon Dioxide content is above 10 g/m^3, and the pH of the water is below pH 7.00 together with a low Hardness or calcium content, the familiar sign of blue/green discolouration of the water is most often noticed when soap is used. In these cases, copper is being dissolved from copper or brass pipes, tap fittings, and hot water cylinders and is reacting with the alkaline soap to produce a blue precipitate. It is most noticeable on white surfaces, i.e., the bath, toilet pan and shower furniture. Those with blonde hair tend to find that the hair is tinted green. This water may exhibit this type of reaction considering the level of hardness and pH.

COMMENTS Continued

With the pH at 6.45 (slightly acidic), the alkalinity is good giving this water an acceptable buffering capacity. Buffering capacity is the waters ability to withstand minor changes (acid or alkaline impacts) without any significant change in pH. The Hardness level is reasonable, rating this water as slightly hard. A hard water is one that will precipitate Calcium (scale deposits) in kettles, hot water cylinders and in water reticulation systems over time where they will eventually fail or block up.

The Iron and Manganese levels were above their respective guideline values and further treatment will be necessary to produce a good quality potable water supply. When the Iron is in excess of 1.0 g/m^3, this generally leads to staining, taste and odour become evident, Iron bacteria may begin to establish within the water supply or the precipitated Iron begins to clog up the reticulation system. Manganese generally co-exists with Iron and can be troublesome when it comes to its removal. Manganese tends to be precipitated as black deposits in the water supply but the guideline value has been set at 0.05 g/m^3 purely on aesthetic grounds of taste, odour and appearance.

The Ammonia, Nitrite and Nitrate Nitrogen values were all recorded at less than their guideline values indicating that low nitrogen impacts are being experienced on this supply. As Ammonia and Nitrite Nitrogen are products of organic degradation, ie, from septic tanks, effluent applications, etc., these Nitrogen species are eventually oxidised through to Nitrate Nitrogen, the end product of the Nitrogen cycle. Nitrate Nitrogen tends to peak in the underground aquifers in late winter/early spring when the water table is usually at its maximum. At this time, the Nitrate Nitrogen is usually draining from the soil profiles unsaturated zone, which is the area between the grounds surface and the water table.

The Turbidity in this sample was poor indicating that particulate material was present in solution, due probably to the precipitated Iron that is visually apparent. However, it is recommended that all water supplies should be fitted with a filter to remove any gross material that may end up in the reticulation system that may pose problems later on. A simple Amiad type filter is usually sufficient.

The chloride level was fair as most ground waters in the Wairarapa typically have a Chloride value in the range of 25 to 35 g/m^3. Excessive Chloride can lead to corrosion problems.

COMMENTS Continued

All other parameters not discussed are satisfactory.

In summary, to improve this water supplies potability, this water will need treating for the removal of the Iron and Manganese.

The Analytical Laboratory Methods of Analysis used are:

pH	APHA Standard Methods 1998 (20th Edition) 4500-H, B, Electrometric Method.
Conductivity at 25°C	APHA Standard Methods 1998 (20th Edition) 2510 B, Conductivity Meter.
Turbidity	APHA Standard Methods 1998 (20th Edition) 2130-B, Nephelometric Method.
Alkalinity as $CaCO_3$ To pH 4.5	APHA Standard Methods 1998 (20th Edition) 2320 B, Titration Method.
Hardness as $CaCO_3$	APHA Standard Methods 1998 (20th Edition) 2340 B, EDTA Titrimetric Method.
Calcium	APHA Standard Methods 1998 (20th Edition) 3500-Ca B, EDTA Titrimetric Method.
Magnesium	APHA Standard Methods 1998 (20th Edition) 3500-Mg B, Calculation Method.
Estimated Free Carbon Dioxide	APHA Standard Methods 1998 (20th Edition) 4500-CO_2 C. Titrimetric Method for Free Carbon Dioxide.
Total Dissolved Solids	APHA Standard Methods 1998 (20th Edition) 2450 C, Total Dissolved Solids Dried at 105°C
Chloride	APHA Standard Methods 1998 (20th Edition) 4500-Cl^- C, Mercuric Nitrate Method.
Iron	APHA Standard Methods 1998 (20th Edition) 3500-Fe B, Phenantroline Method.
Manganese	APHA Standard Methods 1998 (20th Edition) 3500-Mn B, Persulphate Method.

The Analytical Laboratory Methods of Analysis used are continued;

Ammonia Nitrogen	APHA Standard Methods 1998 (20th Edition) 4500-NH_3, F, Phenate Method.
Nitrite Nitrogen	APHA Standard Methods 1998 (20th Edition) 4500-NO_2, B, Azo Dye Colourimetry.
Nitrate Nitrogen	Pearson, Cadmium Reduction Method Nitrite Finish.
Potassium	APHA Standard Methods 1998 (20th Edition) 3500-K B, Flame Photometric Method.
Sodium	APHA Standard Methods 1998 (20th Edition) 3500-Na B, Flame Photometric Method.

Notes:

1.0 APHA refers to the APHA publication 'Standard Methods for the Examination of Water and Wastewater' 20th Edition, 1998, unless specified.

2.0 The chemistry sample was collected in a Laboratory acid washed/distilled water rinsed sample bottle.

3.0 LT refers to 'Less Than'

Yours faithfully
for: **WAIRARAPA LABORATORY SERVICES**

M.G. Butcher
Analyst

Water Quality Data for Bore 7E/36/38/I (S27/0495) Pukeo Aquifer 2
Data supplied by Greater Wellington Regional Council

Date	Conductivity (Lab)	Alkalinity	Chloride	Magnesium (Total)	pH (Lab)	Total Dissolved Solids	Nitrite Nitrogen	Nitrate Nitrogen	Calcium (Total)	Sodium (Total)	Iron (Total)	Iron (Dissolved)
10/03/1998		163	161	17.8			<0.002	<0.002	39	97	6.54	
31/08/1998		160	170	21.1			0.015	<0.002	42.4	99	6.63	
17/02/1999		160	162	16.0			0.02	<0.002	39.2	94	5.1	
18/08/1999		159	165	16.9			0.014	<0.002	37.8	100	5.89	
16/02/2000		161	161	13.6			0.007	<0.002	42.1	100	5.1	
21/08/2000		160	163	15.4			0.005	<0.002	43	100	4.59	
14/03/2001		157	160	13.5			0.006	<0.010	39.3	95	5.87	
12/09/2001		168	170	14.1			0.005	<0.010	44.3	98	6.46	
23/04/2002		155	163	14.0			<0.002	<0.010	41.1	98	6.08	
5/09/2002		163	189	15.1			<0.002	<0.010	47.6	102	7.02	
14/04/2003		153	150	12.1			0.004	<0.010	42.8	96	5.73	
17/10/2003	768	145	172		7.3	419	<0.002	<0.002				6.08
30/03/2004	693	143	136		7.1	389	<0.002	0.004				5.44
6/07/2004	745	145	153		7.4	398	0.002	0.111				5.52
6/10/2004	755	148	165		7	429	<0.002	<0.002				6
20/01/2005	773	145	149		7	448	<0.002	0.003				6
8/04/2005	694	147	150		7.1	404	<0.002	0.003				5.18
28/07/2005	748	145	122		7	408	0.003	<0.002				6.2
19/10/2005	780	146	145		7	421	0.014	<0.002				7.21
15/12/2005	751	147	140		6.9	404	0.002	0.004				6.03
12/04/2006	727	147	125		6.9	394	<0.002	0.007				5.97
28/06/2006	744	146	130		7	376	<0.002	<0.002				6.18
19/09/2006	759	157	138		7.1	417	0.004	0.004				6.5
13/12/2006	798	160	143		7	445	<0.002	0.004				6.87
22/03/2007	803	160	154		7	452	0.01	0.08				6.44
4/10/2007	709	159	148		7.2	396	0.009	<0.002				5.88
20/12/2007	730	160	130		7	380	<0.002	0.004				5.7
11/03/2008	680	160	120		7	370	<0.002	<0.002				4.7
10/06/2008	660	150	120		6.9	360	0.016	0.028				4.6
Minimum	660	143	120	12.1	6.9	360	<0.002	<0.002	37.8	94	4.59	4.6
Mean	740	154	150	15.4	7.1	406	0.005	0.009	41.7	98	5.91	5.92
Maximum	803	168	189	21.1	7.4	452	0.016	0.111	47.6	102	7.02	7.21

Water Quality Data for Petrie irrigation bore

3/09/2008	725	123	133	15.1	6.5	471	0.004	<0.002	27.3	85	5.64	

Manganese (Total)	Manganese (Dissolved)	Potassium (Total)	Total Hardness	Ammoniacal Nitrogen	pH (Field)	Conductivity (Field)	Free CO2	Calcium (Dissolved)	Magnesium (Dissolved)	Potassium (Dissolved)	Sodium (Dissolved)
0.78		2.8	171	2.35	6.99	860	35				
0.81		3.2	192	2.403	7.04	821	35				
0.75		2.9	164	2.286	7.03	842	44				
0.77		3.2	164	2.35	6.96	833	35				
0.75		3.3	161	2.357	6.67	817	36				
0.76		3	171	2.491	7.05	589	48				
0.75		2.8	153	2.271	6.82	812	51				
1.26		3	169	2.126	6.76	843	40				
0.75		3.3	160	2.314	6.84	815	42				
0.75		3.1	181	2.374	6.75	879	62				
0.76		3.2	157	2.007	6.7	740	32				
	0.959		156	2.14	6.84	777	13	38.6	14.6	3.3	97.5
	0.811		142	2.1	6.91	708	22	35.2	13.1	2.94	81.9
	0.87		142	2.16		802	12	34.5	13.5	2.86	85.5
	0.908		146	2.11	6.91	751	29	35.4	13.9	2.97	91.5
	0.924		156	2.14	6.93	752	32	39.3	14	3.03	91.4
	0.851		135	2.3	7.06	682	21	33.6	12.5	2.87	84.7
	0.94		151	1.99		753	26	37.8	13.7	2.92	91
	1.08		177	2.04	6.5	659	27	43.5	16.6	3.73	101
	0.956		146	2.14	6.69	647	37	36.7	13.2	2.87	85.4
	0.952		155	2.04	6.99	632	38	37.5	14.9	2.91	90.3
	1.03		160	2.34	6.8	779	30	39.2	15	2.99	88.2
	1		153	2.12	6.55	763	27	37.7	14.2	2.74	80.8
	1.12		173	2.09	6.02	813	33	41.3	17	3.19	102
	1.07		163	2.09	6.22	810	29	39.1	15.8	3.03	91.3
	0.868		150	1.75		716	20	36.9	14.1	2.88	90.6
	0.95		150	1.9		740	30	38	15	3	91
	0.76		120	1.9		697	32	30	11	2.5	76
	0.78		130	1.9	7.19	508	43	30	12	2.2	76
0.75	0.76	2.8	120	1.75	6.02	508	12	30	11	2.2	76
0.81	0.93	3.1	157	2.158	6.80	753	33	36.9	14.1	2.94	88.7
1.26	1.12	3.3	192	2.491	7.19	879	62	43.5	17	3.73	102

0.65		2.5	130	0.612			87				

Water Quality Data for Bore 6F/13/16.5/I (S27/0344) Tawaha Aquifer 1
Data supplied by Greater Wellington Regional Council

Date	Conductivity (Lab)	Alkalinity	Chloride	Magnesium (Total)	pH (Lab)	Total Dissolved Solids	Nitrite Nitrogen	Nitrate Nitrogen	Calcium (Total)	Sodium (Total)	Iron (Total)	Iron (Dissolved)
11/03/1998		57	67.5	9			0.002	<0.002	20.5	36	0.53	
10/09/1998		56	48.4	7.5			0.003	0.004	14.6	30.5	0.78	
17/02/1999		57	73.9	9.3			0.002	<0.002	21.4	38.5	0.7	
20/08/1999		57	50.6	7.2			0.003	<0.002	17.4	33.5	1.05	
16/02/2000		56	44.6	5.6			<0.002	<0.002	16.9	30	5.56	
23/08/2000		57	46.7	7.9			<0.002	0.02	15.6	30	0.92	
14/03/2001		58	71.8	8.8			<0.002	<0.010	21	39	0.73	
12/09/2001		57	47.9	5.4			<0.002	<0.010	18.3	31	0.83	
12/09/2001		57	46.8	6.1			<0.002	<0.010	17.2	31	0.97	
23/04/2002		57	57	6.4			<0.002	<0.010	19.3	33	0.88	
5/09/2002		57	57.5	7.9			<0.002	<0.010	18.5	33	1.07	
14/04/2003		58	55.8	7			0.002	0.05	18.6	36	0.85	
15/10/2003	319	57	56.6		6.4	189	<0.002	<0.002				0.95
31/03/2004	291	57	48.2		6.7	169	<0.002	0.031				0.86
17/06/2004	302	57	49.1		6.6	173	<0.002	0.009				0.87
20/09/2004	327	57	59.1		6.5	183	<0.002	0.324				0.97
7/12/2004	313	57	54.9		6.4	185	<0.002	0.023				0.82
16/03/2005	323	56	50.9		6.8	194	<0.002	<0.002				0.74
13/07/2005	285	57	48.9		6.5	248	<0.002	0.003				0.8
18/10/2005	306	54	53		6.5	182	<0.002	0.009				0.93
19/12/2005	300	55	50		6.5	167	<0.002	0.008				0.86
16/03/2006	299	56	54.3		6.6	180	0.002	0.003				0.75
26/06/2006	302	56	51.3		6.7	181	<0.002	0.004				0.92
20/09/2006	334	58	63		6.7	203	<0.002	0.003				0.96
7/12/2006	353	59	64.7		6.5	209	<0.002	0.002				1.1
26/03/2007	291	58	47.8		6.8	171	<0.002	0.003				0.87
28/06/2007	312	59	57.6		6.5	191	<0.002	<0.002				0.98
17/10/2007	339	60	65.7		6.6	212	<0.002	0.003				1.1
19/12/2007	320	60	58		6.7	200	0.002	<0.002				0.81
10/03/2008	350	61	64		6.5	220	<0.002	<0.002				0.85
3/06/2008	290	59	49		6.8	170	<0.010	<0.010				0.85
Minimum	285	54	44.6	5.4	6.4	167	<0.002	<0.002	14.6	30	0.53	
Mean	313	57	55.3	7.3	6.6	191	<0.002	0.016	18.3	33.5	1.24	
Maximum	353	61	73.9	9.3	6.8	248	0.003	0.324	21.4	39	5.56	

Water Quality Data for Petrie irrigation bore

3/09/2008	725	123	133	15.1	6.5	471	0.004	<0.002	27.3	85	5.64	

Manganese (Total)	Manganese (Dissolved)	Potassium (Total)	Total Hardness	Ammoniacal Nitrogen	pH (Field)	Conductivity (Field)	Free CO2	Calcium (Dissolved)	Magnesium (Dissolved)	Potassium (Dissolved)	Sodium (Dissolved)
0.44		1.5	88	0.086	6.48	374	37.1				
0.29		1.5	67.4	0.082	6.51	274	36.6				
0.44		1.7	91.6	0.094	6.35	391	37.7				
0.3		1.7	73.1	0.085	6.58	300	52.2				
0.34		1.7	65.4	0.073	6.15	279	32				
0.33		1.6	71.3	0.084	6.44	291	43.4				
0.44		1.7	88.5	0.119	6.23	383	38				
0.06		1.5	68	0.075	6.11	289	35.6				
0.06		1.6	68	0.076	6.11	289	38.4				
0.36		1.8	74.5	0.083	6.24	315	41.3				
0.37		1.6	78.4	0.084	6.05	315	40				
0.35		1.8	75	0.074	6.12	304	27.3				
	0.415		69	0.09	6.39	315	43	16.4	6.76	1.67	32.9
	0.406		66	0.08	6.34	292	23	15.4	6.71	1.7	34.9
	0.438		67	0.09		297	32	15.4	6.87	1.64	31.3
	0.488		71	0.09	6.09	299	36	15.9	7.52	1.72	32.9
	0.46		72	0.1	6.31	291	46	16.9	7.19	1.73	33
	0.44		68	0.08	6.28		20	15.7	7.01	1.61	32.6
	0.397		61	0.08		283	34	14.6	5.94	1.68	28.8
	0.463		71	0.09	6.3	256	33	16.8	7.08	1.97	31.9
	0.474		65	0.09	6.25	252	36	15.9	6.23	1.74	30.5
	0.477		72	0.09	6.17	305	9	17	7.07	1.68	30.3
	0.44		69	0.15	6.2	309	24	16.2	6.84	1.66	30
	0.553		77	0.08	6.19	341	26	17.9	7.81	1.7	29.5
	0.516		80	0.08	6.24	358	37	19.1	7.89	1.82	33.7
	0.443		68	0.08	6.13	290	17	15.9	6.93	1.7	30.2
	0.488		73	0.08	6.02	304	42	17.2	7.3	1.76	31.6
	0.524		78	0.09	5.41	340	32	18	7.95	1.7	33
	0.51		74	0.084		320	26	18	7.5	1.7	32
	0.49		78	0.11		352	41	18	7.8	1.7	35
	0.43		65	0.081	6.79	221	19	15	6.8	1.6	33
0.06	0.397	1.5	61	0.073	5.41		9	14.6	5.94	1.6	28.8
0.32	0.466	1.6	72.7	0.088	6.24		33.4	16.6	7.12	1.71	32.0
0.44	0.553	1.8	91.6	0.15	6.79		52.2	19.1	7.95	1.97	35

0.65		2.5	130	0.612			87				

Water Quality Data for Bore 6F/2/15/I (S27/0351) Tawaha Aquifer 1
Data supplied by Greater Wellington Regional Council*

Date	Conductivity (Lab)	Alkalinity	Chloride	Magnesium (Total)	pH (Lab)	Total Dissolved Solids	Nitrite Nitrogen	Nitrate Nitrogen	Calcium (Total)	Sodium (Total)	Iron (Total)	Iron (Dissolved)
27/04/1982		86.885	55	10					16	36	9.2	

Water Quality Data for Bore 7E/22/23/SInR (S27/0481) Tawaha Aquifer 1
Data supplied by Greater Wellington Regional Council*

Date	Conductivity (Lab)	Alkalinity	Chloride	Magnesium (Total)	pH (Lab)	Total Dissolved Solids	Nitrite Nitrogen	Nitrate Nitrogen	Calcium (Total)	Sodium (Total)	Iron (Total)	Iron (Dissolved)
1/09/1989		97	30	8			<0.003	0.05	23	27	0.08	
1/09/1989		86	25	6			<0.003	0.05	19	26	0.02	

Water Quality Data for Bore 7F/19/31/DS (S27/0541) Tawaha Aquifer 1 (or Martinborough Western Terraces)
Data supplied by Greater Wellington Regional Council*

Date	Conductivity (Lab)	Alkalinity	Chloride	Magnesium (Total)	pH (Lab)	Total Dissolved Solids	Nitrite Nitrogen	Nitrate Nitrogen	Calcium (Total)	Sodium (Total)	Iron (Total)	Iron (Dissolved)
13/02/1987		67	45	7			<0.003	2.2	32	23	0.06	

Water Quality Data for Bore 7E/7/31/D (S27/0502) Tawaha Aquifer 1
Data supplied by Greater Wellington Regional Council*

Date	Conductivity (Lab)	Alkalinity	Chloride	Magnesium (Total)	pH (Lab)	Total Dissolved Solids	Nitrite Nitrogen	Nitrate Nitrogen	Calcium (Total)	Sodium (Total)	Iron (Total)	Iron (Dissolved)
27/04/1982		64	32	7			<0.005	0.25	14	26	2.3	
24/11/1982		100	56	8					23	43	1.28	

Water Quality Data for Petrie irrigation bore

3/09/2008	725	123	133	15.1	6.5	471	0.004	<0.002	27.3	85	5.64	

* water sample would not have been collected according to current Regional Council/National sampling protocols

Manganese (Total)	Manganese (Dissolved)	Potassium (Total)	Total Hardness	Ammoniacal Nitrogen	pH (Field)	Conductivity (Field)	Free CO2	Calcium (Dissolved)	Magnesium (Dissolved)	Potassium (Dissolved)	Sodium (Dissolved)
1		1.9				339					

Manganese (Total)	Manganese (Dissolved)	Potassium (Total)	Total Hardness	Ammoniacal Nitrogen	pH (Field)	Conductivity (Field)	Free CO2	Calcium (Dissolved)	Magnesium (Dissolved)	Potassium (Dissolved)	Sodium (Dissolved)
0.7		2.1	90	0.16	6.8	212	34				
0.41		1.6	74	0.08	7.2	152	13				

Manganese (Total)	Manganese (Dissolved)	Potassium (Total)	Total Hardness	Ammoniacal Nitrogen	pH (Field)	Conductivity (Field)	Free CO2	Calcium (Dissolved)	Magnesium (Dissolved)	Potassium (Dissolved)	Sodium (Dissolved)
<0.05		2.4	107	0.02	7	304	14				

Manganese (Total)	Manganese (Dissolved)	Potassium (Total)	Total Hardness	Ammoniacal Nitrogen	pH (Field)	Conductivity (Field)	Free CO2	Calcium (Dissolved)	Magnesium (Dissolved)	Potassium (Dissolved)	Sodium (Dissolved)
0.2		1.2	65			250					
0.3		1.7			7.1	379					

0.65		2.5	130	0.612			87				

PROFESSIONAL GROUND WATER AND ENVIRONMENTAL SERVICES

. RESOURCE CONSENTS
. ASSESSMENT OF EFFECTS
. WATER RESOURCE EVALUATIONS
. HYDROGEOLOGIC STUDIES

GREG BUTCHER (B.Sc)

CONNOLLYS LINE CARTERTON
PH/FAX (06)3797441 MOBILE (027)2833722 EMAIL gregbutcher@xtra.co.nz

29/7/08

Greater Wellington
P O Box 41
Masterton

Attention: Darryl Squires

Re. Water Permit application WAR080367 - JV and LA Petrie

Dear Darryl

In response to your letter to John Petrie dated 20/6/08, I wish to make the following comments.

Clearly there are differences in interpretation between myself and Council officers in relation to some matters associated with this application. I do not intend to further debate these issues at this stage as I don't believe that will advance matters. I simply wish to reiterate the underlying philosophy in making this consent application and request clarification from Council of one matter.

Prior to drilling John's irrigation bore we completed some background monitoring of the shallow aquifer at this site. Our belief was that this aquifer was Pukio Aquifer 1. A major difference between the Pukio and Tawaha Aquifers is that the Tawaha Aquifer exhibits a clear response to the Ruamahanga River. The Pukio Aquifers do not appear to, but they do exhibit a clear response to atmospheric pressure variation. Therefore, an automatic water level recorder was installed on an existing shallow stock water bore adjacent to the proposed drill site. This information has already been supplied to you. The resultant hydrograph from this bore shows no obvious response to river stage. You are correct in stating in your letter to John that this bore is a reasonable distance from the river and may exhibit a more subdued response to river stage variation. Nevertheless, due to the high aquifer transmissivity you would expect some response, albeit probably subdued, as you state. Greater Wellington operates three automatic sites monitoring Tawaha Aquifer water levels. These sites are varying distances from the river and the aquifer has slightly different properties at each site. All three sites show a clear correlation with Ruamahanga River stage. Hydrographs from these sites are attached to this letter for your information. The hydrographs are for the period of monitoring completed on John's stock water bore in 2007.

John's irrigation bore is screened at a relatively shallow depth (16 metres). An option is to drill a deeper bore at this site or deepen the existing bore. If a deeper bore was screened in a confined aquifer separate from the aquifer currently screened then the deeper aquifer must be either Tawaha Aquifer 2 or Pukio Aquifer 2 (or >2 depending on depth)? No safe yield has been established for Tawaha Aquifer 2 as very little is known about this aquifer. Pukio Aquifer 2 is situated in the Lower Valley ground water zone, of which Aquifer 2 is near full allocation. Total allocation from Pukio Aquifer 2 currently exceeds the throughflow estimate for this aquifer. Can you please advise Council's position regarding future allocation from these deeper aquifers?

As this relates to a Water Permit application that Council has placed on hold under Section 88c of the Resource Management Act 1991 and given that John wants to advance this matter expeditiously can you please supply a response to the above query by 8 August 2008.

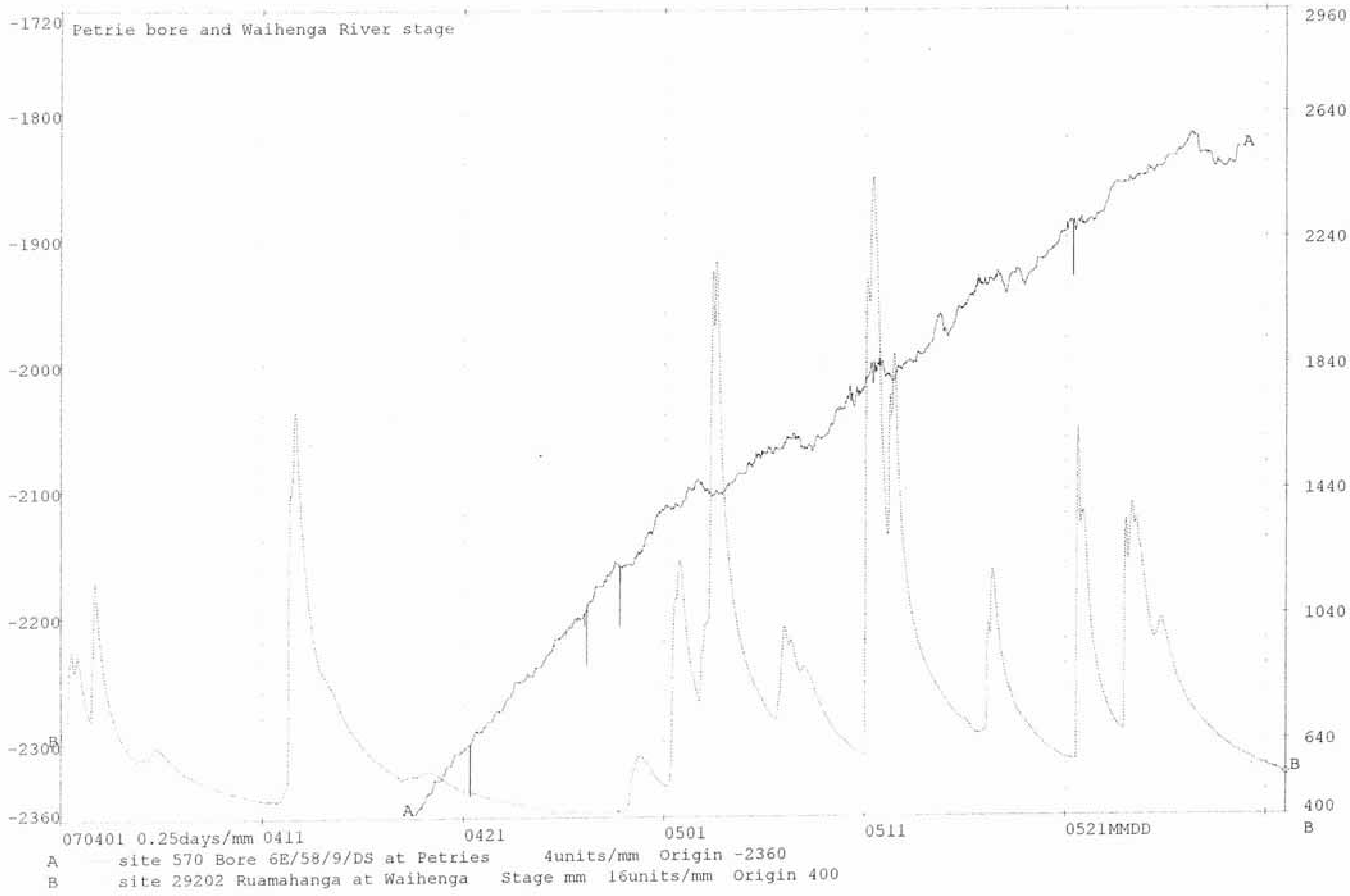
Thank you.

Yours faithfully

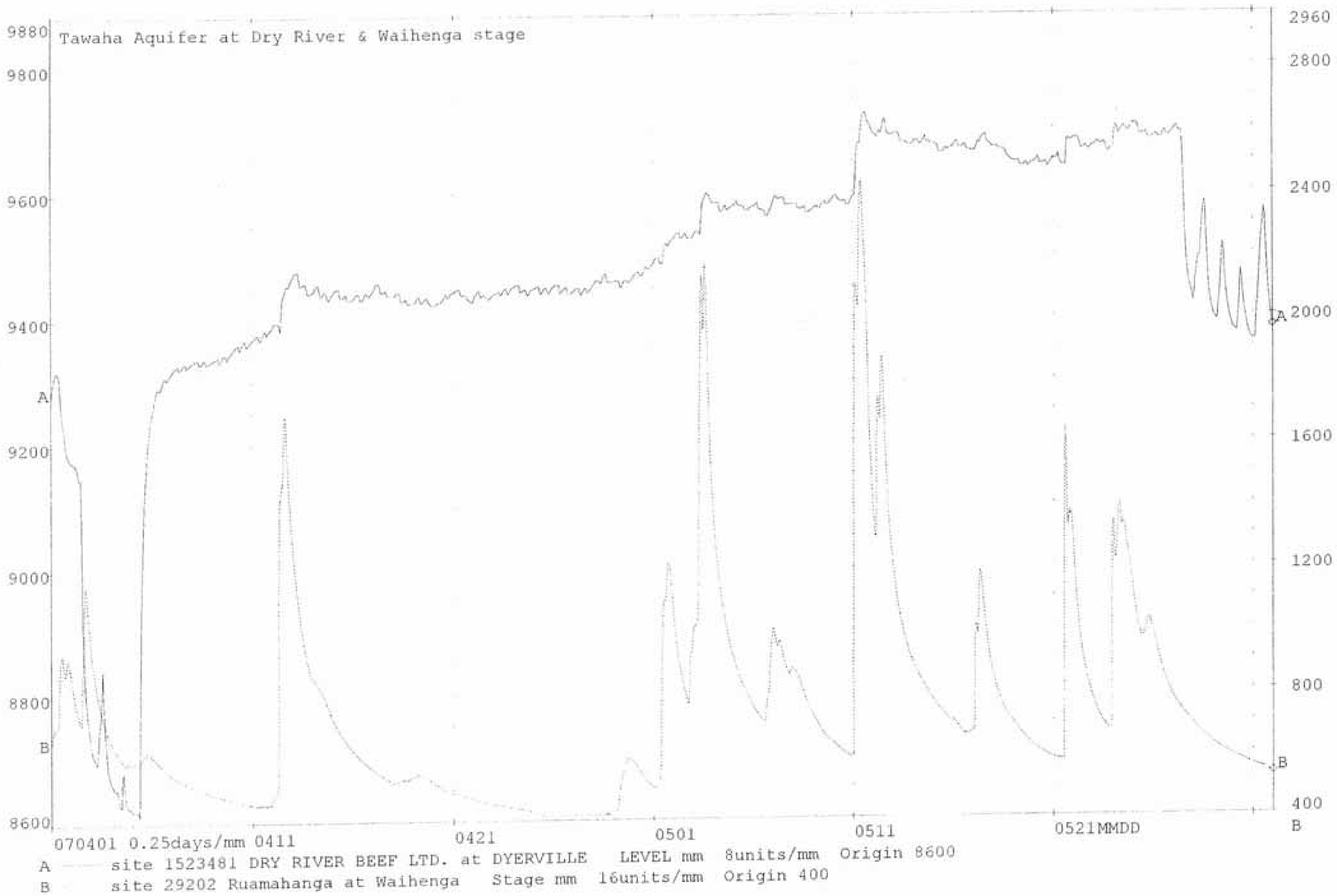
G M Butcher

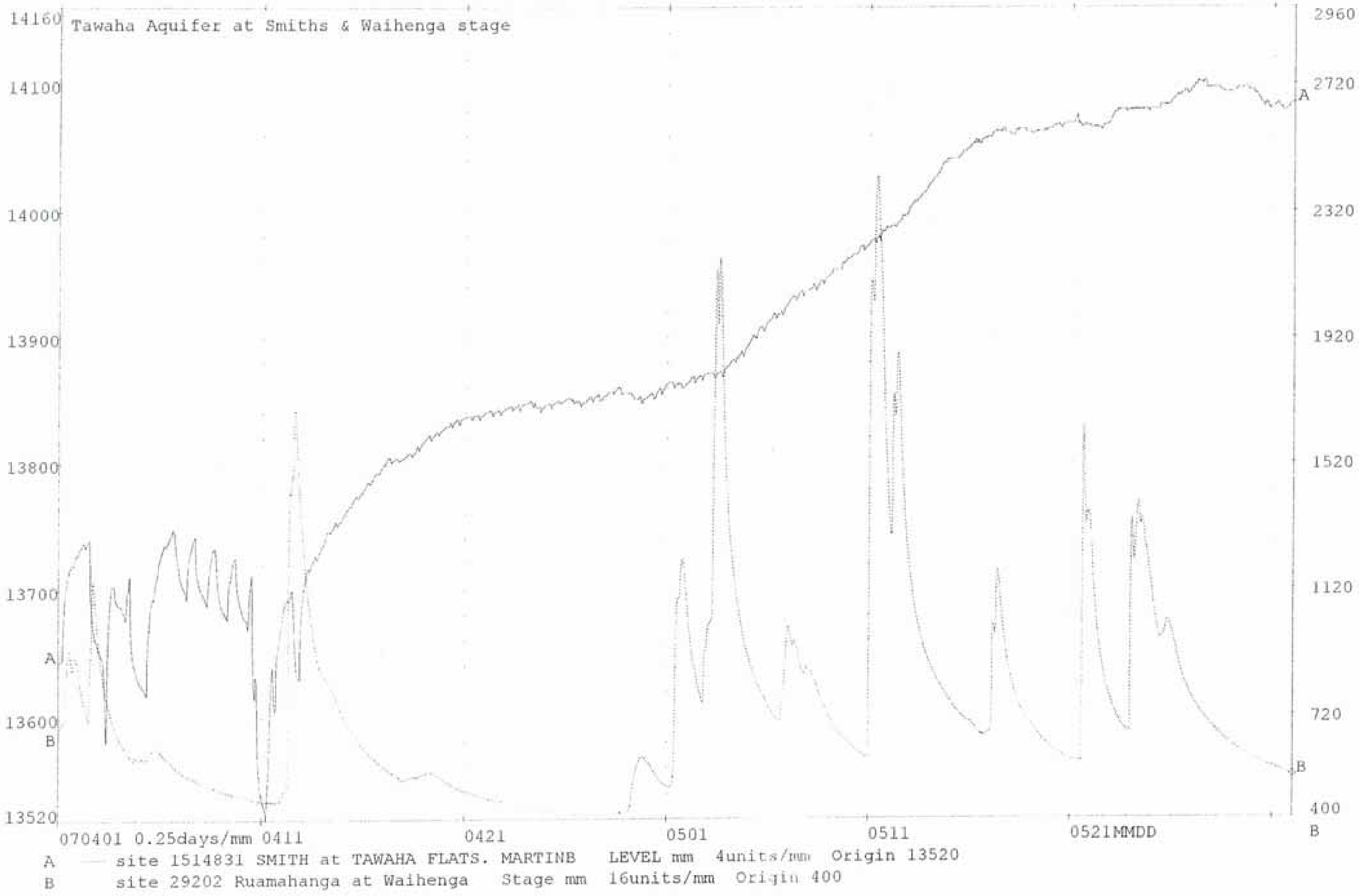
copy to: John Petrie
Te Kopura
RD 1
Featherston

copy to: Hugh Rennie QC
Harbour Chambers
P O Box 10-242
The Terrace
Wellington 6143

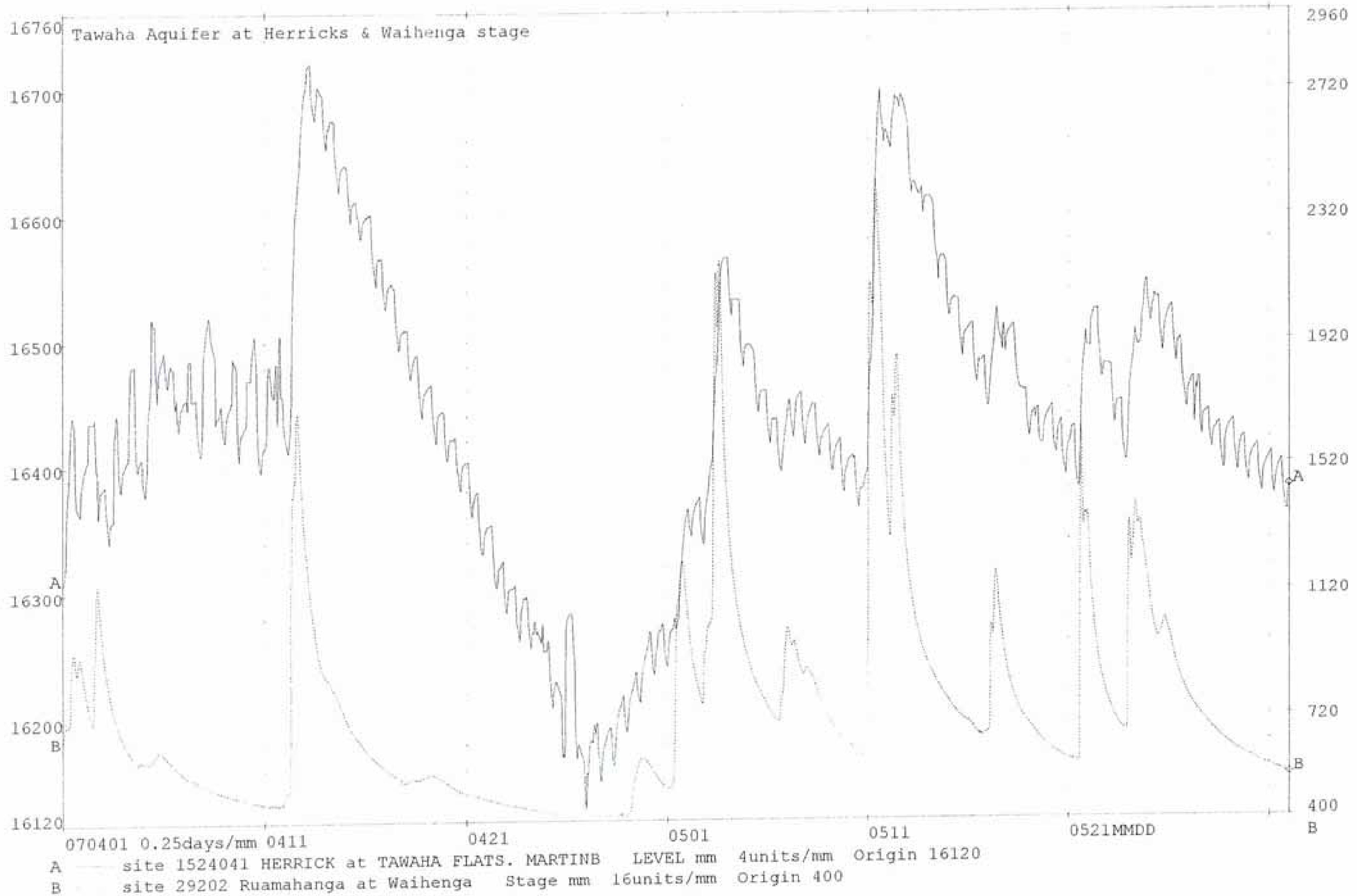


Petrie bore and Waihenga River stage
-1720
-1800
-1900
-2000
-2100
-2200
-2300
-2360
2960
2640
2240
1840
1440
1040
640
400
A
B
070401 0.25days/mm 0411
0421
0501
0511
0521MMDD
A site 570 Bore 6E/58/9/DS at Petries 4units/mm Origin -2360
B site 29202 Ruamahanga at Waihenga Stage mm 16units/mm Origin 400


Tawaha Aquifer at Dry River & Waihenga stage
9880
9800
9600
9400
9200
9000
8800
8600
2960
2800
2400
2000
1600
1200
800
400
A
B
070401 0.25days/mm 0411
0421
0501
0511
0521MMDD
A site 1523481 DRY RIVER BEEF LTD. at DYERVILLE LEVEL mm 8units/mm Origin 8600
B site 29202 Ruamahanga at Waihenga Stage mm 16units/mm Origin 400



Tawaha Aquifer at Smiths & Waihenga stage
14160
14100
14000
13900
13800
13700
13600
13520
2960
2720
2320
1920
1520
1120
720
400
A
B
070401 0.25days/mm 0411
0421
0501
0511
0521MMDD
A — site 1514831 SMITH at TAWAHA FLATS. MARTINB LEVEL mm 4units/mm Origin 13520
B site 29202 Ruamahanga at Waihenga Stage mm 16units/mm Origin 400


Tawaha Aquifer at Herricks & Waihenga stage
16760
16700
16600
16500
16400
16300
16200
16120
A
B
2960
2720
2320
1920
1520
1120
720
400
A
B
B
070401 0.25days/mm 0411
0421
0501
0511
0521MMDD
A site 1524041 HERRICK at TAWAHA FLATS. MARTINB LEVEL mm 4units/mm Origin 16120
B site 29202 Ruamahanga at Waihenga Stage mm 16units/mm Origin 400

COPY

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GREG BUTCHER (B.Sc)

CONNOLLYS LINE CARTERTON
PH/FAX (06)3797441 MOBILE (027)2833722 EMAIL gregbutcher@xtra.co.nz

6/6/08

Greater Wellington
P O Box 41
Masterton

Attention: Darryl Squires

Re. Water Permit application - JV & LA Petrie, Te Kopura, Featherston

Dear Darryl

In response to your request for further information I supply the following (your letter dated 2/5/08 refers).

The applicant's bore is located in the Tawaha Ground Water Zone, as defined in the Regional Freshwater Plan. The bore is however close to the boundary of the Tawaha zone and the Pukio area of the Lower Valley zone. Prior to drilling the applicant's bore a review of available borelog information in this area was completed. Borelog details for an existing 9-metre deep stock-water bore on the applicant's property (6E/58/9/DS) described sandy fine gravels between depths of 2.5 to 9.0+ metres. These sediments are typical of those described in Pukio Aquifer 1. In comparison the Tawaha Aquifer in this area tends to comprise larger gravels with less sand. The confining layer above Tawaha Aquifer 1 also tends to much deeper/thicker in this area, as shown in Figure 5 of the Assessment of Effects (AEE) Report. The same hydrogeology is shown in Figures 8 and 9 of my report dated May 1996 'Ground Water Resources of the Ruamahanga River Floodplain Martinborough to Pukio'. Bore 6E/58/9/DS was drilled after the 1996 Report was completed. If this borelog information had have been available at the time of producing the report the derived boundary between the Pukio and Tawaha Aquifers may have been different.

It is also known that water level trends in the Tawaha and Pukio Aquifers tend to differ. For example, the Tawaha Aquifer is known to be at least partly recharged from the Ruamahanga River. Consequently hydrographs for bores screened in this aquifer shown a response to river level variation. The Pukio Aquifers, by comparison, appear to exhibit little or no correlation with river level. The Pukio Aquifers exhibit a response to atmospheric pressure changes, whilst the Tawaha aquifer doesn't appear to. These characteristics are also described in my 1996 report. Given these differences, an automatic water level recorder was installed on the Petrie stock water bore for a period of 41 days prior to the drilling the new irrigation bore to track water level trend to assist with aquifer definition. The resultant hydrograph is presented in Figure 6 of the AEE Report. Over-plotted in Figure 6 is the corresponding hydrograph for the Tawaha Aquifer as recorded at the Council's 'Dry River Beef' monitoring site. The Tawaha Aquifer hydrograph shows clear differences to the hydrograph from the Petrie stock water bore e.g. the Tawaha hydrograph exhibits a clear correlation with Ruamahanga River stage whilst the Petrie bore hydrograph doesn't. The hydrograph from the Petrie stock water bore shows a clear correlation to atmospheric pressure variation, as shown in attached Figure 1. Figure 1 also shows that the small drop in water level in the Petrie stock water bore on the 27& 28/5/07 is associated with a rapid change in atmospheric pressure commencing 27/5/07. If there was any response to pumping of the Pukio and/or Tawaha Aquifers that occurred at this time the effect was very small, perhaps a few mm, if at all.

Based on the balance of evidence it appears that the applicant's bore is screened in Pukio Aquifer 1. Extensive pump testing of both Pukio Aquifer 2 and Tawaha Aquifer 1 in the past has never shown any obvious connection between these two aquifer systems, over the period of the pump testing anyway. Extensive pump tests have been completed in the past on bores 7E/36/38/I, 7E/32/30/SI, 7E/35/29/I (Pukio Aquifer 2) and bores 7E/20/23/I, 7E/16/21/I, 7E/21/27/I and 7E/22/23(27)/I (Tawaha Aquifer 1).

With respect to the observation bores monitored during the pump test of the applicant's irrigation bore, the closest Tawaha aquifer bore that we could obtain ready access to for monitoring purposes was bore 7E/20/23/I. Bore 7E/16/21/I is slightly closer however is also used for stock water purposes via a pump operating under vacuum from the top of the bore. This would have made monitoring of this bore very difficult. Bore 6E/70/17/I is closer but has similar access problems. Also at the time of completing the pump test on the Petrie irrigation bore I could not recall any pump test having been completed on bore 6E/70/17/I to confirm which aquifer this bore is screened in i.e. this bore could be screened in the Pukio system? You confirmed to me on 3/6/08 that Council has no record of a pump test being completed on bore 6E/70/17/I. Also I am not aware of this bore being utilised as an observation bore during pump tests of other bores in the area, the results of which may have confirmed which aquifer this bore is screened in.

Determining interference drawdowns in other existing irrigation bores in this instance is difficult due to:
- The large separation distance between the Petrie irrigation bore and other bores.
- The high transmissivity of the aquifers means interference drawdowns are small.
- Interference drawdown effects tend to be masked by background changes in ground water level due to such factors as river stage response or atmospheric pressure effects

To highlight the above point a pump test was completed between 7 - 9/5/08. This involved pumping bore 7E/32/30/SI (Pukio Aquifer 2) at a constant rate of 70 l/s for 2 days and measuring the response in the Petrie irrigation bore. The hydrograph for the Petrie bore is presented in Figure 2. Over-plotted in Figure 2 is atmospheric pressure.

Atmospheric pressure variation had a measurable effect on the hydrograph and may mask a small drawdown effect. It is possible that a small subdued drawdown effect occurred on the second day of the pump test, but this is inconclusive.

Attached Figure 3 shows the proposed irrigation area.

I trust that provision of the enclosed additional information will enable you to complete the processing of this consent application.

Yours faithfully

G M Butcher

copy to: John Petrie
Te Kopura
Kahutara Road
RD 1
Featherston

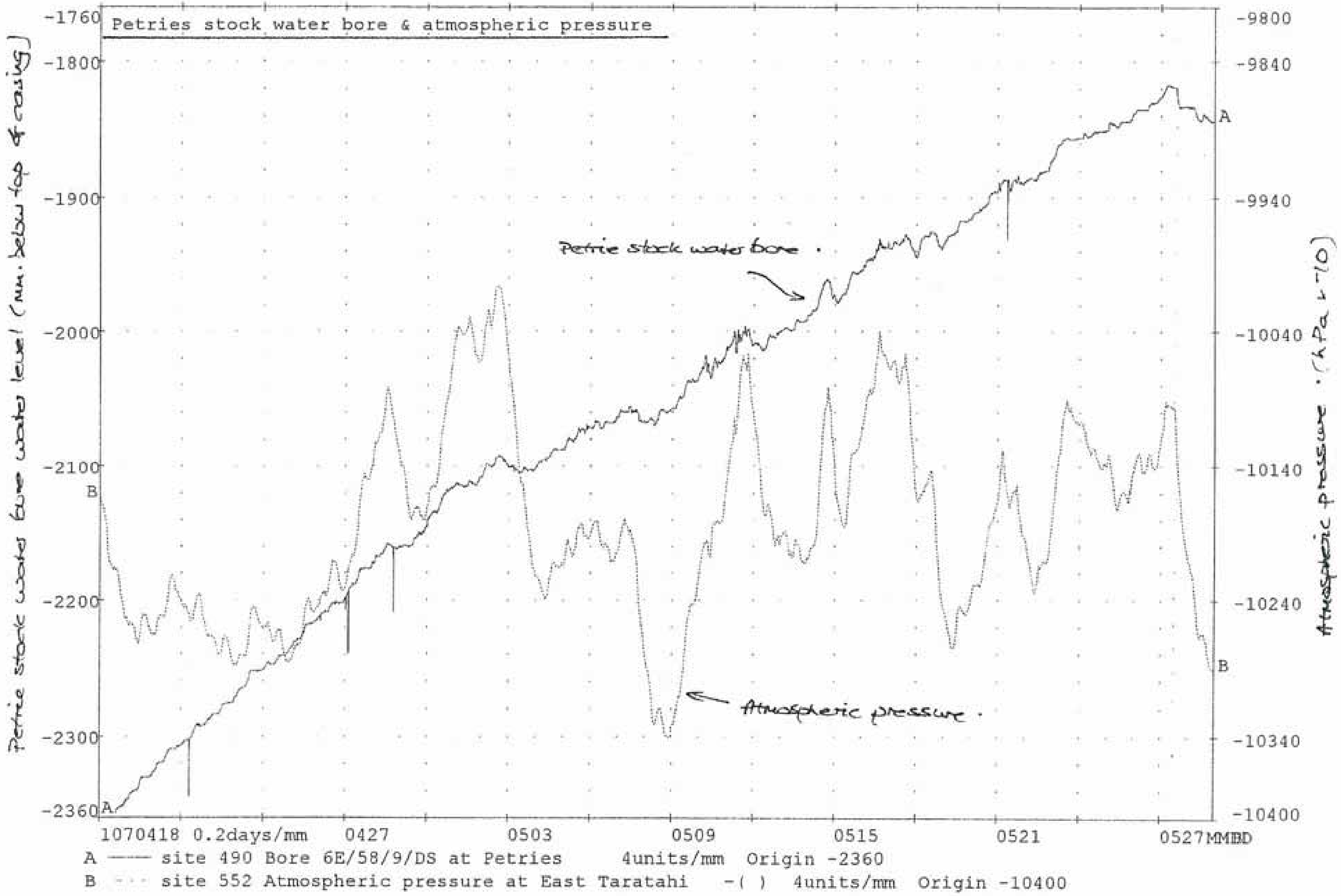
Petries stock water bore & atmospheric pressure
-1760
-1800
-1900
-2000
-2100
-2200
-2300
-2360
-9800
-9840
-9940
-10040
-10140
-10240
-10340
-10400
Petrie stock water bore water level (mm. below top of casing)
Atmospheric pressure. (hPa x -10)
Petrie stock water bore.
Atmospheric pressure.
A
B
1070418 0.2days/mm
0427
0503
0509
0515
0521
0527MMDD
A —— site 490 Bore 6E/58/9/DS at Petries 4units/mm Origin -2360
B ··· site 552 Atmospheric pressure at East Taratahi -( ) 4units/mm Origin -10400

Figure 1

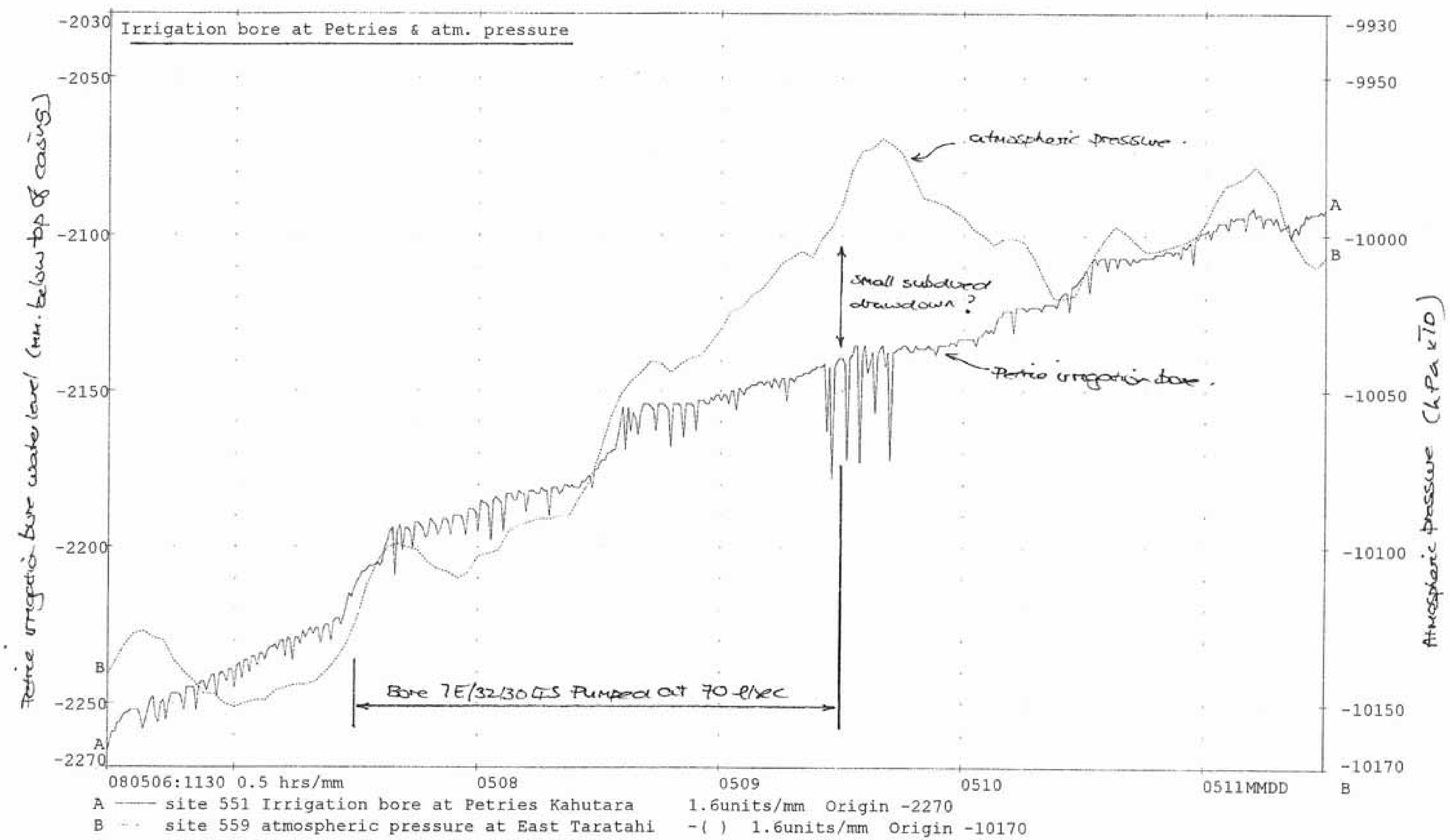
Irrigation bore at Petries & atm. pressure
-2030
-2050
-2100
-2150
-2200
-2250
-2270
-9930
-9950
-10000
-10050
-10100
-10150
-10170
A
B
Petrie irrigation bore water level (mm. below top of casing)
Atmospheric pressure (hPa x10)
atmospheric pressure.
Petrie irrigation bore.
Small subdued drawdown?
Bore 7E/32/30 GS Pumped at 70 l/sec
080506:1130 0.5 hrs/mm
0508
0509
0510
0511MMDD
A —— site 551 Irrigation bore at Petries Kahutara 1.6units/mm Origin -2270
B - - site 559 atmospheric pressure at East Taratahi -( ) 1.6units/mm Origin -10170

Figure 2

Figure 3. Proposed Irrigation Area