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via email

Tenā koe Todd

Subject: RM20-0862:AFFCO RANGIURU CONSENT REVIEW

Following receipt of a recent letter from Pattle Delamore Partners Limited (PDP) dated 4 February 2021. I have drafted the following response.

A review of the Regional Council borehole data base indicates that most of the neighbouring bores are missing important data such as depth of bore, casing depth and pump install depth. Consequently, it is not possible to make an accurate assessment of possible impacts on neighbouring bores as it is not able to be determined whether these bores are located within the same section of aquifer as that of the applicants.

Notwithstanding this issue, please find attached a spreadsheet which includes consent details (daily maximum takes volume) for of the consented bores near the Applicants. To calculate the drawdown at different distances (i.e. bore locations around AFFCO bore) the GWFlow model has been used. A module (Well WT01) within the model allows the calculation of drawdown at specified distance and time. This represents the transient drawdown due to pumping of a fully penetrating well in a confined aquifer using the Theis¹ equation.

The model requires input such as transmissivity (determined from pump testing), storativity pumping rate, distance, and duration of pumping. The modelling is very conservative as it does not allow for any recharge during the calculated period. It also assumes that the value of drawdown calculated is only occurring in the same section of aquifer.

Examination of the attached spreadsheet shows that of the 12 bores within approximately 1,000 m only one is known to be to a similar depth to the applicants bore (BN-10931 at 121 m). Given that the ground elevation is uniform it is likely that even this bore is not actually in the same section of confined aquifer as the applicant. Most other bores in the area are described as cold-water bores when the applicants bore held a steady temperature of 27 to 28 °C, which is not cold water. This also confirms that most other bores in the area are tapping into shallower aquifers than the applicants bore.

Using Well WT01 and the input parameters (see Table 1) the storage value has been adjusted until the model calculated drawdown after 72-hours is the same as that measured during the pumping test (see AEE for further detail). The distances to the other bores were then inputted and the drawdown at that location calculated on the basis that that bore was in the same section of aquifer. This was then repeated for repeated that for 365 days of continuous 24-hour a day pumping (a very unlikely scenario in reality) and recalculated the drawdowns.

¹ Theis, C.V., 1935. The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage, Am. Geophys. Union Trans., vol. 16, pp. 519-524.

Examination of the two columns of drawdown caused by the pumping in AFFCO's bore shows that after 3 days of pumping the drawdown varies between 0.333 to 0.018 m over the range of 446 to 1,078 m. Similarly, for the 365 days of pumping the drawdowns calculated range between 2.62 to 1.508 m.

Since most bores in the immediate area are shallower than the AFFCO bore, the actual drawdown experienced by these shallower bores will be attenuated significantly by the various intervening low permeability layers that make this a sequence of confined aquifers.

Not knowing the depth that the adjacent pumps are installed at in each well makes this an exercise of limited value. Based upon information recently received from the Council concerning maximum daily take volumes and identifying which bores have consents, I have done further calculations (see attached spreadsheet) and confirm that the take will have no more than minor effects on any consented bore.

It is considered that this further assessment is sufficient to show that the AFFCO bore is not having any more than a minor effect on any neighbouring bores.

Nāku iti noa, nā
Terra Aqua Consultants Limited

David Whyte
Principal Hydrogeologist

BORE ID	CONSENT HOLDER	SITE DESCRIPTION	EASTING (NZMT)	NORTHING (NZTM)	CONSENT No	Consented Status	Pumping Rate m ³ /d	Pumping Rate L/s	Distance	GROUND ELEVATION	DEPTH (m)	STATIC WATER LEVEL (m)	GWL m RL - Moturiki	CASING DEPTH (m)	Pump Depth (m) or [Casing depth - 5 if not known]	Calculated Drawdown Effect after 72 hours (m)	Calculated In Well Drawdown after 365 days (m)	Submergence Remaining (m)
BN-4037	AFFCO	Freezing Works	1897913	5811621			1762.56		0.0	13	130 ^a	5.99		118 ^b	45.5	6.0	8.122	31.388
BN-1133			1898313	5811422	NK	Decomissioned			446.8	14	NK	14.48	14.51	72	67	0.333	2.262	50.258
BN-4017			1897513	5811420	NK				447.7	5	NK	2		107	102	0.331	2.260	97.74
BN-4422			1898112	5812122	21760.1.91-WU				539.1	11	20	6		17	12	0.228	2.100	3.900
BN-4074			1898613	5811522	RM20-0504-WT.02	Current		19 in total	707.0	13	55	27.43	-14.39	45	40	0.111	1.868	10.702
BN-10931	Blackburn Orchards Limited		1898622	5811565	RM20-0504-WT.01	Current			711.2	14	122	3.63	14.00	116	111	0.109	1.862	105.508
BN-11391	Blackburn Orchards Limited		1898580	5811899	RM16-0253-WT.02	Current	45.5	2	722.6	13	84	10.80	2.00	78	73	0.103	1.849	60.351
BN-4603	I Five Limited	Domestic Supply	1898713	5811723	20689.0.01-WU	Surrendered	20	0	806.5	13	31	6.10	6.87	25	20	0.071	1.755	12.145
BN-4166			1898714	5811422	21510.0.01-WU	Surrendered		0	825.3	15	91	11.00		85	80	0.065	1.736	67.264
BN-1532			1898712	5812123	21473.0.01-WU	Surrendered		0	943.6	12	104	7.90		72	67	0.036	1.621	57.479
BN-1531			1898767	5812105	21473.0.01-WU	Surrendered		0	981.6	10	104	7.90	2.49	72	67	0.030	1.588	57.512
BN-1533			1898913	5811823	21472.0.01-WU	Expired		0	1020.2	14	91	14.04	14.04	75	70	0.025	1.555	54.405
BN-10076			1898913	5812023	NK				1077.8	13	27	9.50	3.93	25	20	0.018	1.508	8.992

Notes: ¹ Denotes drawdown as measured after 72 hour of pumping
^a denotes assumed depth based on other bores in area that are at same temperature
^b denotes assumed depth based on other bores in area that are at same temperature
Red colour denotes estimated casing depth
Yellow Colour denotes estimated bore deep
Blue Colour Indicates new information from Council
NK denotes Not Known
NR Denotes Not Recorded