



**WINSTONE**  
AGGREGATES

4th May 2007

Auckland Regional Council  
Vodafone House  
Private Bag 92012  
Auckland.

**Attention: Naveen Kumar**

**RE: Three Kings Quarry Dewatering Permit - Annual Monitoring Report**

Dear Naveen

As required by Section 9 of the Monitoring and Contingency Plan for Dewatering Three Kings Quarry, please find attached the Annual Monitoring Report for the year ending 31 March 2007.

A copy of this report will be forwarded to South Epsom Planning, Three Kings United, Epsom Environmental Effects, the Mt Roskill Community Board, and the Eden-Albert Community Board.

Yours faithfully  
for **WINSTONE AGGREGATES**

  
Michael Harris  
Engineering Geologist.



**WINSTONE**  
AGGREGATES

**THREE KINGS QUARRY**  
**RESOURCE CONSENT 12977**  
**ANNUAL MONITORING REPORT**

**May 2007.**

# ANNUAL THREE KING QUARRY

## MONITORING REPORT

### **Introduction**

The following report is made with regard to Section 9 of the Monitoring and Contingency Plan for Dewatering Three Kings Quarry dated September 2005.

This report contains a compilation of all monitoring data and documents any settlement alarm level events, reviews and remedial action undertaken for the period of 1 April 2006 to 31 March 2007.

This report also contains the seasonal variation calculations for bores 37, 38, 39 and 40 (as required by Section 6.9 of the Monitoring and Contingency Plan).

### **Monitoring Summary**

The monitoring of groundwater levels has been undertaken monthly for the year ending March 31 2007. Groundwater levels within the quarry have been held above RL34m since the lowering of the groundwater table ceased in October 2002.

BH5B has been used as the quarry reference bore since March 2006. Access to BH2A has not been possible due to the quarry floor being flooded.

No new groundwater monitoring bores were installed in the 12 month period ending 31 March 2007.

The monitoring of precise level survey marks has continued with a survey of all survey benchmarks undertaken in March/April 2007. In September 2005, cessation of settlement (as defined in the permit to dewater Three Kings Quarry) was shown to have occurred. Precise level surveys are currently being undertaken at 12 month intervals.

### **Precise Level Survey Results**

Three differential settlement alarm values were recorded in the March/April 2007 survey of all precise level survey points. All three differential settlement alarms were recorded in the Hillsborough Road area and all involved differential settlements between 1 in 5000 and 1 in 2000.

1. A differential settlement alarm level was recorded between points AP110 and AP111 on Hillsborough Road. The adjusted differential between survey marks was calculated at 1 in 2827 after making allowances for settlement prior to the marks being installed. The measured difference in level change between these two points was 4.33mm. The adjusted difference in level change was 6.27mm. The spacing between the marks is 17.7metres.
2. A differential settlement alarm value was recorded between points OCP68 and AP114 on Budock Road. The adjusted differential between OCP68 and AP114 was calculated at 1

- in 3308. The measured difference in level change between OCP68 and AP114 was 0.33mm; the adjusted difference in level change was 6.95mm. The spacing between OCP68 and AP114 is 23.0metres.
3. A differential settlement alarm value was recorded between points AP92 and AP93 on Mt Albert Road. The adjusted differential between AP92 and AP93 was calculated at 1 in 4660. The measured difference in level change between AP92 and AP93 was 3.00mm; the adjusted difference in level change was 3.58mm. The spacing between AP92 and AP93 is 16.7metres.

Settlement alarm values were recorded between AP110 and AP111, and OCP68 and AP114 in the March 2006 survey. The adjusted differential settlements at that time were 1 in 4150 and 1 in 4645 respectively. An adjusted differential settlement of 1 in 3363 was recorded between AP110 and AP111 in the June 2005 survey.

The settlement alarm events were reported to the Quarry Manager and the Auckland Regional Council. No further action was required as the spacing between these marks is already less than 50 metres.

### Seasonal Variation Calculations

As required by Section 6.7 of the Monitoring and Contingency Plan, seasonal variation calculations have been undertaken for bores 37, 38, 39 and 40. The results of the seasonal variation calculations are attached.

In summary, the 95percent confidence limits for the data from the first 12 months overlapped with the 95percent confidence limits for the second 12 month period and, as such, the seasonal variation has been calculated using both sets of data.

The calculated seasonal variation for the deep and shallow piezometers respectively in bores 37, 38, 39 and 40 are as follows:

Table 1: Deep Piezometers

	BH37a	BH38a	BH39a	BH40a
99% Confidence Limits	RL54.17m RL53.60m	RL54.73m RL53.80m	RL55.31m RL54.82m	RL62.07m RL61.23m
99.9% Confidence Limits	RL54.25m RL53.53m	RL54.85m RL53.67m	RL55.37m RL54.76m	RL62.19m RL61.12m

Table 2: Shallow Piezometers

	BH37b	BH38b	BH39b	BH40b
99% Confidence Limits	RL54.03m RL53.56m	RL53.80m RL53.33m	RL57.42m RL56.50m	RL63.86m RL63.31m
99.9% Confidence Limits	RL54.09m RL53.50m	RL53.87m RL53.26m	RL57.55m RL56.38m	RL63.94m RL63.23m

## **REVIEWS**

### Groundwater

A review of the groundwater monitoring data was undertaken by Pattle Delamore Partners Ltd for the year ending June 30 2005 (Report entitled 2004/2005 Groundwater Monitoring Report dated October 2005).

The report concluded that monitoring over the 12 month period of July 2004 to July 2005 showed that groundwater levels generally recorded a flat or slightly falling trend. The falling trend was ascribed to be in response to reducing rainfall during the period.

An assessment of the calibration of the groundwater model in light of a further 24 months of monitoring data showed no need for a recalibration of the groundwater model.

No other reviews of groundwater levels were undertaken in the year ending March 31 2007.

### Surface Levels

The results of precise level surfaces are checked as the results are received. The results of each precise level survey are forwarded to the Auckland Regional Council within 10 working days of the completion of each precise level survey.

A review of precise level survey data was undertaken by Tonkin and Taylor in April 2005 (letter report entitled Three Kings Quarry Dewatering Settlement Review Data to April 2005 dated 16 June 2005). This report reviewed settlement data to the March 2005 survey and included the findings of the Pattle Delemore annual groundwater report dated January 2005.

The Tonkin and Taylor report concluded that while surface settlement monitoring indicates that surface settlement is typically on-going about the quarry, it was at a much reduced rate.

The on-going settlement close to the quarry was concluded to be the result of secondary consolidation induced by changes in groundwater pressure associated with past quarry dewatering. At increased distances from the quarry, Tonkin and Taylor concluded that it is possible that the ongoing surface settlement includes some delayed consolidation as a result primarily of consolidation of soil strata not currently monitored by piezometers. In addition Tonkin and Taylor concluded that any groundwater drawdown effects at distance from the quarry are small and surface settlement data at the fringe of drawdown are within expected settlement tolerances.

A further review of the precise level survey information was undertaken in August 2005 to determine if cessation of settlement had occurred (letter report dated 29 August 2005). It was found that cessation of settlement (as defined by the consent to dewater Three Kings Quarry) had occurred and this was reported more fully to the Auckland Regional Council in September 2005. As such, and because more than two years has elapsed since dewatering has been undertaken, precise level surveys are now required to be undertaken at 12 month intervals.

No further reviews of surface levels were undertaken in the year ending March 31 2007.

## **REMEDIAL ACTION**

No remedial action was required or undertaken for the 12 month period ending 31 March 2007.

THREE KINGS GROUNDWATER LEVEL RECORD SHEET

Date	BH 1B	BH 2B	BH 5B	BH 6A	BH 6B	BH 6C	BH 7	BH 10a	BH 10b	BH 11b	BH 12a	BH 12b	BH 13a	BH 13c	BH 16	BH 17	BH 18A	BH 18B	BH 19A	BH 19B
19-Apr-06	35.28		34.60	44.75	39.94	35.78	39.81	50.89	72.65	72.40	50.33	66.97	55.16	66.21	50.77	34.51	35.7	45.13	34.58	38.95
17-May-06	35.92			45.10	40.43	36.40	41.14	50.89	72.66	72.43	50.8	67.12	62.01	66.22	51.09	35.18	36.13	44.79	35.2	38.45
20-Jun-06	36.69			45.64	40.95	37.12	41.20	51.17	72.64	72.39	51.17	67.09	64.3	66.25	51.6	35.92	36.7	45.42	35.92	38.45
19-Jul-06	36.80			46.17	41.04	37.13	40.10	51.12	72.64	72.40	51.11	66.98	62.22	66.21	51.64	36.03	37.16	46.24	36.1	38.45
16-Aug-06	36.98			46.25	41.19	37.37	40.64	51.04	72.65	72.41	51.21	67.05	64.49	66.22	51.54	36.31	37.16	45.99	36.27	38.65
20-Sep-06	37.02			46.21	41.14	37.29	40.17	52.05	72.64	72.24	51.08	66.98	62.51	66.21	51.55	36.18	37.32	46.05	36.22	38.45
18-Oct-06	37.23			46.23	41.34	37.57	40.49	51.27	72.64	72.24	51.25	67.02	64.36	66.21	51.69	36.48	37.37	46.13	36.51	38.45
15-Nov-06	37.20			46.11	41.22	37.42	40.11	50.97	72.59	72.19	51.02	67	61.7	66.21	51.45	36.49	37.59	46.22	36.37	38.45
19-Dec-06	36.80			45.71	40.90	36.96	39.75	50.76	72.59	71.79	50.78	67.81	56.03	66.21	35.89	37.27	46.13	36.03	38.45	38.45
17-Jan-07	36.40			45.44	40.66	36.68	39.71	50.82	72.67	72.19	50.6	66.74	55.84	66.21	51.1	35.6	37.21	45.69	35.69	38.45
21-Feb-07	35.80			45.05	40.26	36.12	39.57	50.83	72.66	72.09	50.53	67.02	55.57	66.28	50.92	34.98	36.77	45.54	35.1	38.45
21-Mar-07	35.41			44.76	40.00	35.76	39.59	50.83	72.66	72.02	50.41	66.83	55.37	66.27	50.78	34.62	36.35	45.49	34.72	38.23

Date	BH 20	BH 20A	BH 21	BH 22	BH 22a	BH 23	BH 23a	BH 24	BH 24a	BH 25	BH 25a	BH 25b1	BH 25b2	BH 26	BH 26a	BH 27	BH 28a	BH 28b	BH 29	BH 30
19-Apr-06	54.53	50.17	35.67	41.20	64.42	51.29	51.03	55.64	62.22	37.21	48.46	47.99	50.73	58.96	54.04	49.36	50.62	52.18	57.39	54.75
17-May-06	54.86	51.07	36.05	41.20	65.08	51.35	51.06	55.77	62.26	37.61	49.05	48.62	51.53	58.97	54.36	49.6	50.84	52.92	57.57	55.03
20-Jun-06	55.19	51.86	36.74	41.19	65.47	51.51	51.13	56.03	62.31	37.98	49.64	49.35	52.3	58.96	54.35	49.6	51.14	53.34	57.78	55.3
19-Jul-06	55.30	51.74	36.94	41.19	65.27	51.54	51.14	56.06	62.37	38.18	49.79	49.42	52.12	59.02	53.49	49.6	51.16	53	57.85	55.19
16-Aug-06	55.40	51.75	37.08	41.20	65.38	51.62	51.17	56.09	62.54	38.29	49.67	49.43	52.27	59.05	54.3	49.6	51.23	53.36	57.97	55.28
20-Sep-06	55.43	51.58	37.15	41.22	65.18	51.60	51.18	56.07	62.44	38.39	49.70	49.59	52.48	59.07	54.21	49.6	51.36	53.48	58.02	55.28
18-Oct-06	55.49	51.91	37.41	41.22	65.39	51.59	51.19	56.10	62.47	38.48	49.91	49.47	52.02	59.11	54.22	49.6	51.4	52.95	57.98	55.17
15-Nov-06	55.52	51.55	37.33	41.10	64.34	51.62	51.17	56.09	62.46	38.49	49.67	49.47	51.66	58.97	54.11	49.6	51.31	52.66	57.92	55.07
19-Dec-06	55.52	51.13	37.13	41.08	64.82	51.55	51.16	56.05	62.76	38.38	48.37	48.18	51.66	58.97	54.11	49.6	51.34	52.68	57.96	55.05
17-Jan-07	55.13	50.78	36.96	41.14	64.68	51.56	51.22	55.99	62.76	37.54	49.00	48.16	51.69	59.1	54.2	49.6	51.34	52.68	57.81	55.01
21-Feb-07	54.70	50.40	36.49	41.16	64.45	51.44	51.19	55.80	62.76	38.00	45.47	47.87	51.5	59.08	54.25	49.6	50.68	52.55	57.81	55.01
21-Mar-07	54.51	50.17	36.38	41.16	64.28	51.41	51.16	55.71	62.76	37.66	48.39	47.26	50.7	59.04	54.24	49.5	50.86	52.18	57.74	54.8

Date	BH31a	BH31b	BH32	BH33	BH34	BH35a	BH35b	BH36a	BH36b	BH37a	BH37b	BH38a	BH38b	BH39a	BH39b	BH40a	BH40b
19-Apr-06	48.44	49.81	53.94	57.04	48.78	50.00	54.81	58.46	58.65	54.01	53.75	54.39	53.6	54.98	56.92	61.56	63.58
17-May-06	48.59	49.98	54.72	57.42	49.57	49.97	55.00	58.69	58.88	53.96	53.88	54.45	53.69	55.14	57.05	61.52	63.56
20-Jun-06	48.88	50.22	55.19	57.58	50.05	50.29	55.20	58.87	59.05	53.99	53.93	54.48	53.77	55.1	57.12	61.56	63.6
19-Jul-06	48.91	50.27	54.80	57.46	50.04	50.19	55.27	58.78	59.03	53.98	53.86	54.45	53.6	55.07	57.07	61.55	63.58
16-Aug-06	49.01	50.37	54.99	57.35	50.06	50.33	55.23	58.81	59.02	53.98	53.9	54.52	53.64	55.16	57.18	62.22	63.61
20-Sep-06	49.05	50.41	54.68	57.20	50.00	50.04	55.27	58.69	58.99	53.98	53.87	54.52	53.6	55.17	57.07	61.82	63.77
18-Oct-06	49.13	50.47	54.79	56.99	49.93	49.88	55.26	58.71	59.03	53.94	53.85	54.52	53.61	55.15	57.08	61.81	63.73
19-Dec-06	49.08	50.43	54.39	56.88	49.11	50.03	55.17	58.49	58.98	53.81	53.79	53.88	53.51	54.98	56.23	61.59	63.58
17-Jan-07	49.04	50.39	54.26	56.82	49.39	50.06	55.13	58.60	58.89	53.74	53.71	54.27	53.44	54.95	56.93	61.65	63.57
21-Feb-07	48.85	50.35	53.99	56.70	47.60	49.88	54.96	58.61	58.80	53.97	53.87	54.45	53.6	55.16	57.11	61.77	63.69
21-Mar-07	48.76	50.10	53.89	56.78	48.48	49.65	54.92	58.56	58.77	54.11	53.91	54.39	53.69	55.03	57.12	61.62	63.55





THREE KINGS SURVEY RECORD

Station ID	Location	Coordinates		Averaged Level	Surveyed Levels (metres)		Change from Averaged Level (mm)	
		mN	mE		Mar-06	Mar-07	Mar-06	Mar-07
SS 3136	Mt Eden Rd	697910.68	299385.73	63.047	63.033	63.030	-14	-17
SS 3137	Mt Eden Rd	698072.60	299427.08	63.343	63.341	63.338	-2	-5
M 212A	Mt Albert Rd	696504.39	299153.17	86.127	86.114	86.111	-13	-16
SM 4163	Mt Albert Rd	696843.03	298513.03	74.142	74.143	74.141	1	-1
SM 4164	Mt Albert Rd	696728.57	298688.37	75.851	75.846	75.844	-5	-7
SM 4165	Mt Albert Rd	696625.11	298783.31	83.632	83.625	83.623	-7	-9
SM 3882	Parau St	697063.26	298555.52	63.302	63.302	63.301	0	-1
RM 3898	McCullough Ave	697067.11	298760.28	76.078	76.066	76.065	-12	-13
RM 3899	McCullough Ave	696900.99	298813.23	77.811	77.803	77.801	-8	-10
RM 3900	McCullough Ave	696713.60	298916.53	76.657	76.644	76.642	-13	-15
RM 3901	Smallfield Ave	696669.58	298986.57	78.931	78.917	78.915	-14	-16
RM 3902	Smallfield Ave	696747.40	299014.21	80.177	80.165	80.165	-12	-12
RM 3903	Smallfield Ave	696834.73	298965.09	82.524	82.516	82.515	-8	-9
RM 3904	Smallfield Ave	696939.98	298912.45	82.708	82.699	82.699	-9	-9
RM 3907	Fyvie Ave	697063.27	299054.59	80.321	80.315	80.315	-6	-6
RM 3910	Scout Ave	696974.91	298672.88	83.414	83.405	83.404	-9	-10
RM 3925	Bremner Ave	696727.72	298541.52	65.423	65.426	65.426	3	3
RM 3926	Bremner Ave	696630.47	298448.99	59.088	59.093	59.092	5	4
RM 3933	Miliken Rd	696725.14	298412.65	71.049	71.055	71.054	6	5
RM 3934	Miliken Rd	696742.66	298472.30	66.303	66.308	66.307	5	4
RM 3935	Simmonds Ave	696876.97	298725.70	91.755	91.746	91.745	-9	-10
RM 3936	Simmonds Ave	696788.84	298756.78	90.869	90.858	90.856	-11	-13
RM 7440	Hayr Rd	696258.10	299279.70	84.033	84.026	84.025	-7	-8
RM 7457	Mt Albert Rd	696575.40	298967.90	85.707	85.694	85.691	-13	-16
AP 1	Plaza, Mt Albert Rd	696589.80	299127.20	81.269	81.254	81.250	-15	-19
AP 2	Plaza, Mt Albert Rd	696706.40	299158.20	76.290	76.279	76.274	-11	-16
AP 2A	Plaza, Mt Albert Rd	696679.30	299152.50	77.582	77.573	77.568	-9	-14
AP 3	Plaza, Mt Albert Rd	696693.00	299259.10	77.367	77.357	77.355	-10	-12
AP 4	Plaza, Mt Albert Rd	696564.80	299244.90	83.366	83.349	83.347	-17	-19
AP 13	Barrister Ave	696796.00	299064.30	79.867	79.860	79.861	-7	-6
AP 20	Grahame Breed Dr	696723.10	299358.50	76.792	76.785	76.784	-7	-8
SM 3123	Mt Eden Rd	697750.13	299344.75	75.676	75.659	75.658	-17	-18
SM 3124	Landscape Rd	697715.79	299327.99	77.724	77.706	77.705	-18	-19
SM 3125	Landscape Rd	697810.23	298959.44	69.440	69.432	69.429	-8	-11
AP 3125A	Discontinued 03/06	697810.13	298967.59					
SM 3126	Landscape Rd	697873.04	298716.42	63.015	63.013	63.009	-2	-6
SS 3127	Landscape Rd	697911.99	298565.74	59.724	59.725	59.722	1	-2
SS 3132	Waitomo St	697987.80	298590.90	61.689	61.690	61.687	1	-2
SM 3883	Parau St	697156.95	298581.04	64.371	64.368	64.368	-3	-3
RM 3884	Parau St	697301.96	298629.21	62.539	62.537	62.537	-2	-2
SM 3885	Duke St	697474.42	298680.34	61.857	61.851	61.850	-6	-7
RM 3886	Fearon Ave	697329.55	298529.49	55.236	55.237	55.237	1	1
RM 3887	Fearon Ave	697221.32	298498.22	51.548	51.543	51.545	-5	-3
OCP 3888	Parau St	697732.59	298744.43	62.513	62.508	62.505	-5	-8
RM 3889	Duke St	697452.34	298785.50	69.233	69.215	69.214	-18	-19
RM 3891	Duke St	697515.89	299039.80	77.575	77.562	77.560	-13	-15
RM 3892	Duke St	697529.22	299086.26	78.012	77.999	77.998	-13	-14
RM 3893	Duke St	697610.67	299248.07	79.146	79.126	79.125	-20	-21
RM 3894	Fulljames Ave	697586.82	298923.43	72.082	72.065	72.063	-17	-19
RM 3895	Hamon Ave	697620.41	298829.46	65.188	65.179	65.174	-9	-14
RM 3896	McCullough Ave	697345.49	298887.04	69.820	69.802	69.801	-18	-19
RM 3897	McCullough Ave	697170.56	298776.56	75.084	75.071	75.070	-13	-14
RM 3905	Fyvie Ave	697080.60	298923.97	75.813	75.807	75.806	-6	-7
RM 3906	Fyvie Ave	697134.57	298836.07	77.447	77.437	77.436	-10	-11
RM 3908	Fyvie Ave	697093.64	299129.18	82.069	82.065	82.065	-4	-4
RM 3909	Scout Ave	697136.38	298680.63	80.056	80.048	80.047	-8	-9
RM 3911	Dally Tce	697387.46	298991.05	88.894	88.880	88.881	-14	-13
RM 3912	Fearon Ave	697399.31	298512.83	51.652	51.655	51.655	3	3
RM 3913	Fearon Ave	697445.84	298362.01	49.238	49.244	49.246	6	8
RM 3921	Duncumb St	697530.84	298402.67	50.034	50.038	50.039	4	5
RM 3923	Connelly Ave	697465.89	299086.33	74.293	74.280	74.279	-13	-14
RM 3924	Connelly Ave	697424.55	299131.88	73.034	73.023	73.021	-11	-13
SM 4354	Mt Eden Rd	697606.00	299322.20	80.155	80.133	80.132	-22	-23
SM 6241	Duke St	697468.58	298893.36	70.012	69.990	69.989	-22	-23
OCP 90B	Duke St	697480.39	298934.30	71.805	71.789	71.787	-16	-18
AP 10	Roskill Way	697458.10	299308.70	82.673	82.661	82.661	-12	-12
AP 14	Churches Ave	697318.10	298969.20	91.334	91.322	91.322	-12	-12
AP 15	Dally Terrace	697357.20	299055.90	90.821	90.811	90.811	-10	-10
AP 17C	Hunters Park Dr	697293.89	299402.87	74.602	74.597	74.596	-5	-6
AP 24	Discontinued 03/06	697237.90	299127.40					
AP 29A	Duke St	697501.58	298517.84	49.542	49.541	49.543	-1	2
M 220	Mt Eden Rd	697232.61	299557.19	81.700	81.667	81.666	-33	-34

Station ID	Location	Coordinates		Averaged Level	Surveyed Levels (metres)		Change from Averaged Level (mm)	
		mN	mE		Mar-06	Mar-07	Mar-06	Mar-07
M 221	Mt Eden Rd	697359.09	299539.94	83.449	83.436	83.435	-13	-14
SS 1555	Selwyn Rd	697413.60	300062.90	99.584	99.581	99.582	-3	-2
SS 1556	Selwyn Rd	697425.87	300012.81	102.373	102.369	102.370	-4	-3
SS 1617	St Andrews Rd	697887.68	299983.32	81.442	81.443	81.443	1	1
SS 1618	St Leonards Rd	697906.03	299884.48	78.478	78.475	78.475	-3	-3
SS 1619	St Leonards Rd	697935.70	299724.63	66.617	66.614	66.614	-3	-3
SS 1623	St Andrews Rd	697461.10	299874.96	107.522	107.513	107.515	-9	-7
SS 3306	Mt Eden Rd	697993.20	299406.80	60.565	60.557	60.555	-8	-10
SS 3307	St Leonards Rd	697985.83	299454.69	59.661	59.655	59.653	-6	-8
SS 3308	St Leonards Rd	697952.15	299635.99	63.275	63.272	63.271	-3	-4
SS 3311	Rahiri Rd	697752.00	299610.94	95.306	95.297	95.292	-9	-14
SS 3312	Rahiri Rd	697733.64	299682.97	95.929	95.921	95.917	-8	-12
SS 3313	Landscape Rd	697648.30	299592.51	112.633	112.619	112.615	-14	-18
SS 3315	Rewa Rd	697613.41	299396.64	80.938	80.917	80.916	-21	-22
SS 3316	Rewa Rd	697579.48	299529.80	98.902	98.886	98.883	-16	-19
RM 6807	St Andrews Rd	697216.70	299808.10	102.487	102.472	102.473	-15	-14
RM 6812	St Andrews Rd	697370.60	299846.60	108.907	108.892	108.894	-15	-13
SM 6826	Buckley Rd	697157.90	300077.50	74.710	74.707	74.708	-3	-2
RM 6827	Buckley Rd	697345.96	300128.04	83.332	83.332	83.334	0	2
SM 6828	Buckley Rd	697383.80	300177.40	87.952	87.951	87.954	-1	2
SS 7701B	Landscape Rd	697619.71	299657.05	115.509	115.510	115.506	1	-3
SS 7702B	Landscape Rd	697602.26	299725.78	110.538	110.539	110.535	1	-3
RM 7703	Landscape Rd	697589.21	299808.37	100.149	100.136	100.135	-13	-14
SM 7704	St Andrews Rd	697556.90	299894.50	97.816	97.808	97.810	-8	-6
RM 7705	St Andrews Rd	697703.31	299921.80	88.086	88.083	88.085	-3	-1
AP 9	St Andrews Rd	697103.90	299782.20	92.802	92.782	92.784	-20	-18
AP 11	Mt Eden Rd	697168.40	299548.70	80.191	80.184	80.183	-7	-8
AP 16	Queens Way	697156.20	299676.20	83.646	83.630	83.631	-16	-15
AP 18B	Mt Eden Rd	697509.31	299384.27	81.642	81.642	81.641		-1
M 205	Mt Albert Rd	696471.16	300138.54	59.305	59.304	59.305	-1	0
AP 206	DESTROYED	696526.70	299919.50		59.969		-7	Refer AP206A
AP 206A	Mt Albert Rd	696527.29	299919.36	59.998		59.998		
M 210	Mt Albert Rd	696536.06	299441.55	83.050	83.034	83.032	-16	-18
OIT 219D	Discontinued 03/06	696902.20	299520.30					
IT 219C	Mt Eden Rd	696891.78	299519.11					
SM 1979	Hillsborough Rd	696308.02	299637.25	61.241	61.217	61.217	-24	-24
BP 1977B	Hillsborough Rd	696141.75	299609.93	71.993	71.985	71.988	-8	-5
SM 6809	St Andrews Rd	697001.27	299757.44	81.800	81.781	81.781	-19	-19
SM 6810	St Andrews Rd	696925.56	299720.86	76.956	76.939	76.940	-17	-16
RM 6811	St Andrews Rd	696849.02	299715.44	76.526	76.507	76.509	-19	-17
RM 6813	St Andrews Rd	696631.95	299652.97	80.905	80.883	80.882	-22	-23
RM 6816	Rowan Rd	696721.88	299845.69	78.908	78.889	78.889	-19	-19
SM 6817	Rowan Rd	696808.83	299876.79	80.995	80.980	80.981	-15	-14
RM 6818	Rowan Rd	696826.70	299791.25	81.966	81.948	81.949	-18	-17
RM 6819	Buckley Rd	696678.00	299942.25	65.620	65.610	65.610	-10	-10
SM 6820	Buckley Rd	696808.11	299988.79	71.955	71.948	71.949	-7	-6
SM 6821	Buckley Rd	696938.51	300004.30	71.114	71.108	71.110	-6	-4
SM 6822	Gorrie Ave	696973.90	299863.23	81.874	81.858	81.859	-16	-15
SM 6823	Buckley Rd	697012.43	300021.72	70.593	70.586	70.588	-7	-5
RM 6824	Buckley Rd	697044.38	300030.36	71.084	71.080	71.081	-4	-3
RM 6825	Quentin Ave	697092.90	299916.80	81.366	81.374	81.375	-12	-11
SM 6835	Torrance St	696969.98	300185.70	70.784	70.784	70.786	0	2
SM 6836	Torrance St	696930.33	300343.26	65.955	65.956	65.957	1	2
RM 6838	Fernleigh Ave	696773.28	300065.80	70.304	70.299	70.299	-5	-5
SM 6839	Fernleigh Ave	696748.10	300163.47	67.487	67.486	67.487	-1	0
SM 6840	Fernleigh Ave	696714.69	300296.02	63.278	63.279	63.279	1	1
SM 6841	Peel Ave	696626.68	300131.57	65.698	65.696	65.697	-2	-1
SM 6843	DESTROYED	696958.77	299640.57		75.149		-12	Refer AP6843A
AP 6843A	Kings Way	696958.42	299642.03	75.223		75.223		
RM 7647	Mt Albert Rd	696565.00	299755.10	67.601	67.579	67.579	-22	-22
ORM.I	Weaver Street	696836.50	300316.20	63.578	63.579	63.580	1	2
AP 5	Mt Eden Rd	696757.00	299500.90	75.746	75.737	75.736	-9	-10
AP 6	Queens Way	696746.90	299590.60	75.306	75.289	75.289	-17	-17
AP 7A	St Andrews Rd	696778.94	299702.10	76.821	76.821	76.821		0
AP 8B	Mt Albert Rd	696559.06	299633.48	75.740	75.730	75.728	-10	-12
AP 12	Warren Ave	696409.10	299402.20	94.357	94.343	94.341	-14	-16
OAP 19	St Andrews Rd	696725.00	299676.40	77.508	77.486	77.486	-22	-22
AP 21A	Mt Eden Rd	696997.90	299534.34	77.288	77.288	77.288		0
AP 22	Queens Way	697069.30	299667.60	78.352	78.340	78.342	-12	-10
AP 23	Queens Way	696858.57	299609.62	74.402	74.391	74.393	-11	-10
AP 30	Mt Eden Rd	696966.19	299525.13	77.329	77.321	77.320	-8	-9
AP 31	Mt Eden Rd	696934.22	299521.42	76.857	76.854	76.853	-3	-4
AP 32	Mt Eden Rd	696902.63	299517.81	76.203	76.195	76.194	-8	-9
AP 33	Mt Eden Rd	696855.06	299512.27	75.121	75.114	75.113	-7	-8

Station ID	Location	Coordinates		Averaged Level	Surveyed Levels (metres)		Change from Averaged Level (mm)	
		mN	mE		Mar-06	Mar-07	Mar-06	Mar-07
AP 34	Mt Eden Rd	696807.28	299506.75	74.937	74.926	74.926	-11	-11
SM 5387	Erson Ave	696146.21	300815.94	56.747	56.749	56.749	2	2
SM 5386	Symonds St	696104.12	300983.29	55.184	55.186	55.187	2	3
M 638	Manukau Rd	696081.51	301109.25	54.690	54.691	54.692	1	2
CA 55	Manukau Rd	696605.90	300894.30	65.141	65.141	65.141	0	0
CA 53	Akarana Ave	696935.90	298292.10	70.594	70.594	70.594	0	0
M 216	Mt Albert Rd	696903.54	298347.91	72.658	72.658	72.658	0	0
SS 1977	Hillsborough Rd	696020.20	299595.82	74.453	74.450	74.451	-3	-2
RM 3927	Bremner Ave	696633.32	298338.77	62.651	62.652	62.651	1	0
RM 3928	Bremner Ave	696727.76	298195.81	56.144	56.145	56.146	1	2
AP 139	Bremner Ave	696788.02	298157.42	56.225	56.225	56.225	0	0
RM 3931	Milliken Ave	696817.47	298257.51	62.500	62.501	62.501	1	1
RM 3932	Milliken Ave	696733.95	298363.24	71.719	71.720	71.718	1	-1
SS 3004	Dominion Rd	698058.80	298223.46	51.812	51.814	51.811	2	-1
SS 3131	Shackleton Rd	698110.53	298631.80	59.419	59.420	59.417	1	-2
SS 3133	Shackleton Rd	698071.30	298770.71	59.554	59.553	59.551	-1	-3
SS 3134	Shackleton Rd	698021.66	298946.50	61.479	61.475	61.473	-4	-6
SS 3135	Shackleton Rd	697966.25	299165.81	61.684	61.683	61.680	-1	-4
SS 3151	Mt Eden Rd	698285.87	299497.70	67.987	67.988	67.985	1	-2
SS 1905	St Andrews Rd	698147.73	300049.39	88.810	88.808	88.807	-2	-3
RM 7707	St Andrews Rd	697973.66	299990.96	81.206	81.204	81.204	-2	-2
SS 1558	Empire Rd	697813.79	300111.39	92.169	92.166	92.167	-3	-2
SS 1559	Empire Rd	697800.00	300165.50	96.024	96.021	96.022	-3	-2
SS 1549	The Drive	697753.34	300348.67	85.871	85.869	85.870	-2	-1
SS 1550	The Drive	697589.88	300306.71	84.432	84.431	84.433	-1	1
RM 6830	The Drive	697538.21	300294.84	81.638	81.636	81.638	-2	0
SS 1551	The Drive	697492.54	300281.71	77.481	77.478	77.480	-3	-1
RM 6829	Selwyn Rd	697363.05	300258.05	79.864	79.858	79.861	-6	-3
RM 6832	Selwyn Rd	697337.40	300403.57	80.190	80.187	80.189	-3	-1
SM 5912	Pah Rd	697278.09	300666.24	74.285	74.283	74.285	-2	0
AP 35	Mt Albert Rd	696402.12	300407.23	54.190	54.192	54.194	2	4
AP 37	Hillsborough Rd	696407.39	299705.88	59.335	59.327	59.327	-8	-8
AP 38	Budock Rd	696246.76	299834.65	69.274	69.272	69.269	-1	-4
AP 39	Hillsborough Bowling	696383.07	299856.28	56.297	56.293	56.295	-4	-2
AP 40	Hillsborough Bowling	696445.91	299895.62	55.757	55.753	55.754	-4	-3
IS 41	Hillsborough Bowling	696403.82	299804.75	56.336	56.332	56.333	-4	-3
AP 42	Dornwell Rd	696378.41	299015.87	76.373	76.366	76.365	-7	-8
AP 43	Dornwell Rd	696260.57	298956.76	66.002	65.996	65.995	-6	-7
AP 44	Dornwell Rd	696110.00	298858.85	58.493	58.487	58.487	-6	-6
AP 45	Frost Rd	696471.85	298726.92	64.920	64.914	64.912	-6	-8
AP 54	Frost Rd	696264.66	298577.84	57.855	57.847	57.845	-8	-10
AP 46	Dominion Rd	697995.61	298226.64	50.443	50.445	50.442	2	-1
AP 47	Landscape Rd	697950.56	298343.52	52.522	52.525	52.522	3	0
AP 48	Landscape Rd	697921.33	298458.57	56.819	56.820	56.817	1	-2
AP 49A	Landscape Rd	697784.60	299050.46	70.323	70.320	70.318	-3	-5
AP 50A	Landscape Rd	697765.09	299133.24	71.653	71.654	71.652	1	-1
AP 51A	Landscape Rd	697744.94	299214.66	74.053	74.050	74.048	-3	-5
AP 55	Mt Eden Rd	698209.04	299461.78	68.263	68.263	68.260	0	-3
AP 56	Mt Albert Rd	696314.42	300774.76	58.409	58.410	58.411	1	2
AP 60	Rowan Rd	696681.05	299826.31	76.276	76.268	76.268	-8	-8
AP 61	Rowan Rd	696616.53	299797.11	71.310	71.303	71.303	-7	-7
AP 62	Mt Albert Rd	696530.18	299814.00	63.068	63.062	63.063	-6	-5
AP 63	DESTROYED	696521.12	299876.43		61.247		-3	Refer AP 63A
AP 63A	Mt Albert Rd	696520.06	299875.15	61.371		61.371		
AP 64	Hillsborough Rd	696478.45	299774.30	60.579	60.575	60.575	-4	-4
AP 65	Hillsborough Rd	696446.58	299735.84	59.546	59.540	59.540	-6	-6
OAP 66	Hillsborough Rd	696359.44	299672.76	59.987	59.984	59.984	-3	-3
AP 67	Hillsborough Rd	696248.43	299622.21	63.871	63.868	63.867	-3	-4
OCP 68	Budock Rd	696235.97	299684.44	66.304	66.302	66.300	-2	-4
AP 69	Budock Rd	696249.57	299731.19	65.977	65.976	65.974	-1	-3
AP 70	Budock Rd	696244.13	299790.39	71.208	71.207	71.205	-1	-3
OAP 71	Hillsborough Rd	696195.17	299615.83	67.651	67.649	67.650	-2	-1
AP 72	Hillsborough Rd	696072.41	299594.01	74.077	74.075	74.076	-2	-1
AP 73	Marie Ave	696238.34	299544.47	70.874	70.869	70.869	-5	-5
AP 74	Marie Ave	696260.93	299489.18	80.330	80.325	80.325	-5	-5
AP 75	Marie Ave	696280.07	299452.86	86.876	86.872	86.871	-4	-5
AP 77	Mt Albert Rd	696539.58	299487.18	82.751	82.746	82.744	-5	-7
AP 78	Mt Albert Rd	696559.36	299551.48	81.022	81.017	81.015	-5	-7
AP 79	Mt Albert Rd	696558.48	299588.52	78.663	78.658	78.656	-5	-7
AP 80	Mt Albert Rd	696561.89	299691.52	71.414	71.408	71.407	-6	-7
AP 81	DESTROYED	696500.82	300015.14		58.433		-2	Refer AP 81A
AP 81A	Mt Albert Rd	696501.72	300015.21	58.552		58.552		
AP 82	DESTROYED	696507.00	299990.93		58.504		-1	Refer AP 82A
AP 82A	Mt Albert Rd	696507.72	299991.38	58.576		58.576		

Station ID	Location	Coordinates		Averaged Level	Surveyed Levels (metres)		Change from Averaged Level (mm)	
		mN	mE		Mar-06	Mar-07	Mar-06	Mar-07
AP 83	Mt Albert Rd	696514.36	299966.95	58.863	58.862	58.863	-1	0
AP 84	Mt Albert Rd	696520.40	299943.25	59.350	59.349	59.349	-1	-1
AP 85	Mt Albert Rd	696516.23	299894.40	60.619	60.618	60.617	-1	-2
AP 86	Mt Albert Rd	696524.80	299855.75	62.051	62.049	62.050	-2	-1
AP 87	Mt Albert Rd	696530.55	299833.50	62.733	62.731	62.731	-2	-2
AP 88	Mt Albert Rd	696541.65	299788.51	64.828	64.824	64.824	-4	-4
AP 89	Mt Albert Rd	696560.86	299777.80	65.939	65.935	65.935	-4	-4
AP 90	Mt Albert Rd	696562.93	299734.25	68.687	68.684	68.684	-3	-3
AP 91	Mt Albert Rd	696562.43	299712.45	70.075	70.072	70.072	-3	-3
AP 92	Mt Albert Rd	696560.50	299673.84	72.613	72.613	72.613	0	0
AP 93	Mt Albert Rd	696559.89	299657.17	73.864	73.862	73.861	-2	-3
AP 94	Mt Albert Rd	696558.57	299610.31	77.101	77.099	77.097	-2	-4
AP 95	Mt Albert Rd	696559.21	299569.96	79.957	79.954	79.952	-3	-5
AP 96	St Andrews Rd	696582.87	299641.10	77.897	77.895	77.893	-2	-4
AP 97	St Andrews Rd	696607.72	299646.90	80.321	80.318	80.317	-3	-4
AP 98	Rowan Rd	696588.07	299763.68	68.501	68.498	68.498	-3	-3
AP 99	Rowan Rd	696594.23	299786.13	69.478	69.475	69.475	-3	-3
AP 100	Hillsborough Rd	696521.99	299784.89	62.966	62.963	62.963	-3	-3
AP 101	Hillsborough Rd	696494.72	299786.95	61.359	61.355	61.356	-4	-3
AP 102	Hillsborough Rd	696457.24	299761.13	60.006	60.003	60.003	-3	-3
AP 103	Hillsborough Rd	696427.81	299719.78	59.404	59.400	59.400	-4	-4
AP 104A	Hillsborough Rd	696385.14	299690.23	59.554	59.553	59.553	-1	-1
AP 105	Hillsborough Rd	696373.80	299682.70	59.711	59.709	59.709	-2	-2
AP 106	Hillsborough Rd	696341.88	299660.52	60.458	60.457	60.457	-1	-1
AP 107	Hillsborough Rd	696324.59	299648.55	60.881	60.879	60.880	-2	-1
AP 108	Hillsborough Rd	696290.76	299628.82	62.060	62.059	62.059	-1	-1
AP 109	Hillsborough Rd	696270.02	299627.79	62.806	62.805	62.805	-1	-1
AP 110	Hillsborough Rd	696230.60	299619.62	64.997	64.994	64.992	-3	-5
AP 111	Hillsborough Rd	696213.05	299617.07	66.322	66.321	66.321	-1	-1
AP 112	Budock Rd	696247.78	299636.80	63.699	63.699	63.698	0	-1
AP 113	Budock Rd	696235.55	299662.37	65.546	65.547	65.546	1	0
AP 114	Budock Rd	696238.48	299707.28	65.879	65.883	65.883	4	4
AP 115	Budock Rd	696251.17	299753.13	67.579	67.580	67.577	1	-2
AP 116	Budock Rd	696251.91	299773.34	69.485	69.486	69.484	1	-1
AP 117	Budock Rd	696245.16	299811.84	70.833	70.835	70.834	2	1
OAP 118	Mt Albert Rd	696509.17	299918.39	59.895	59.892	59.891	-3	-4
AP 119	DESTROYED	696165.18	299223.38		72.945		-1	Refer AP 119A
AP 119A	Haughey Ave	696164.45	299223.61	72.897		72.897		
AP 120	Haughey Ave	696109.88	299304.27	67.450	67.449	67.449	-1	-1
AP 121	Haughey Ave	696056.80	299385.05	66.666	66.665	66.665	-1	-1
AP 122	Haughey Ave	696006.86	299462.68	66.032	66.030	66.031	-2	-1
AP 123	Haughey Ave	695958.87	299555.50	73.227	73.224	73.224	-3	-3
OAP 125	Hillsborough Rd	695847.40	299535.51	69.958	69.957	69.957	-1	-1
SS 1976	Hillsborough Rd	695759.40	299503.94	71.137	71.136	71.132	-1	-5
AP 126	Carr Rd	695885.73	299463.44	65.133	65.132	65.129	-1	-4
OAP 127	Carr Rd	695905.57	299370.85	61.441	61.440	61.441	-1	0
RM 7441	Carr Rd	695901.87	299261.38	58.499	58.498	58.498	-1	-1
AP 129	DESTROYED	695938.98	299189.30		58.142		-2	Refer AP 129A
AP 129A	Carr Rd	695938.31	299190.92	58.156		58.156		
OAP 130	Dornwell Rd	696185.75	298907.65	60.670	60.669	60.669	-1	-1
OAP 131	Hayr Rd	696067.40	299157.71	63.120	63.121	63.120	1	0
OCP 41B	Carr/Hayr Rds	695981.19	299080.36	58.362	58.362	58.360	0	-2
AP 132	Carr Rd	696043.81	298963.55	58.403	58.403	58.403	0	0
AP 133	Carr Rd	696128.84	298776.82	58.156	58.156	58.156	0	0
AP 134	Carr Rd	696177.86	298685.47	58.033	58.033	58.033	0	0
AP 135	Frost Rd	696157.94	298506.10	57.399	57.399	57.400	0	1
AP 136	Frost Rd	696363.44	298640.34	59.265	59.265	59.263	0	-2

Groundwater Levels to 31 March 2006

	BH37a	BH37b	BH38a	BH38b	BH39a	BH39b	BH40a	BH40b
19-Jan-05	53.83	53.77	54.06	53.52	55.16	56.98		
16-Feb-05	53.79	53.71	54.11	53.47	55.11	56.93	61.71	63.55
16-Mar-05	53.74	53.66	54.08	53.42	55.07	56.84	61.64	63.42
20-Apr-05	53.68	53.61	54.04	53.39	55.02	56.86	61.41	63.37
18-May-05	53.73	53.61	54.02	53.4	54.74	56.78	61.45	63.32
14-Jun-05	53.88	53.68	54.05	53.53	54.99	56.84	61.45	63.48
20-Jul-05	53.9	53.8	54.14	53.62	55.2	56.91	61.58	63.49
17-Aug-05	53.94	53.85	54.2	53.56	55.07	57.01	61.64	63.63
21-Sep-05	53.94	53.81	54.24	53.53	55.11	57.03	61.68	63.66
19-Oct-05	53.97	53.89	54.24	53.62	55.09	57.04	61.71	63.66
16-Nov-05	53.97	53.83	54.21	53.68	55.11	57.02	61.73	63.72
14-Dec-05	53.87	53.8	54.21	53.56	55.06	57.01	61.74	63.7
18-Jan-06	53.79	53.76	54.27	53.57	55.05	56.96	61.71	63.65
15-Feb-06	53.78	53.75	54.22	53.49	55.04	56.94	61.78	63.6
15-Mar-06	53.74	53.71	54.27	53.54	54.99	56.88	61.58	63.6
Mean	53.84	53.75	54.16	53.53	55.05	56.94	61.63	63.56
Standard Deviation	0.09	0.08	0.09	0.08	0.10	0.08	0.12	0.13
95% Confidence Limits	54.02	53.92	54.33	53.69	55.26	57.09	61.86	63.81
	53.65	53.58	53.98	53.36	54.85	56.78	61.40	63.31
99% Confidence Limits	54.08	53.97	54.39	53.74	55.32	57.15	61.94	63.89
	53.59	53.53	53.93	53.31	54.79	56.73	61.32	63.24
99.9% Confidence Limits	54.15	54.03	54.45	53.80	55.39	57.20	62.02	63.97
	53.53	53.47	53.86	53.26	54.71	56.67	61.24	63.15

Groundwater Levels April 2006 to April 2007

	BH37a	BH37b	BH38a	BH38b	BH39a	BH39b	BH40a	BH40b
19-Apr-06	54.01	53.75	54.39	53.6	54.98	56.92	61.56	63.58
17-May-06	53.96	53.88	54.45	53.69	55.14	57.05	61.52	63.56
20-Jun-06	53.99	53.93	54.48	53.77	55.1	57.12	61.56	63.6
19-Jul-06	53.98	53.86	54.45	53.6	55.07	57.07	61.55	63.58
16-Aug-06	53.98	53.9	54.52	53.64	55.16	57.18	62.22	63.61
20-Sep-06	53.98	53.87	54.52	53.6	55.17	57.07	61.82	63.77
18-Oct-06	53.94	53.85	54.52	53.61	55.15	57.08	61.81	63.73
15-Nov-06	53.81	53.79	53.88	53.51	54.98	56.23	61.59	63.58
19-Dec-06	53.74	53.71	54.27	53.44	54.95	56.93	61.65	63.57
17-Jan-07	53.97	53.87	54.45	53.6	55.16	57.11	61.77	63.69
21-Feb-07	53.96	53.86	54.45	53.57	55.03	57.1	61.62	63.55
21-Mar-07	54.11	53.91	54.39	53.69	55.03	57.12	61.47	63.51
Mean	53.95	53.85	54.40	53.61	55.08	57.00	61.68	63.61
Standard Deviation	0.09	0.07	0.18	0.09	0.08	0.25	0.21	0.08
95% Confidence Limits	54.14	53.98	54.75	53.78	55.23	57.49	62.08	63.76
	53.77	53.72	54.05	53.44	54.92	56.50	61.28	63.46
99% Confidence Limits	54.20	54.02	54.86	53.83	55.28	57.65	62.21	63.81
	53.71	53.68	53.94	53.39	54.87	56.34	61.15	63.41
99.9% Confidence Limits	54.26	54.06	54.98	53.89	55.34	57.83	62.35	63.87
	53.64	53.63	53.82	53.33	54.81	56.17	61.01	63.36