Auckland
Regional Council
TE RAUHITANGA TAIAO

Auckland Water Quantity Statement June 2004–May 2005

April 2006 TP300

Surface water and groundwater resource information, availability, allocation and use.

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Executive Summary

The Auckland Regional Council reviews water resource monitoring data and resource consent data on an annual basis. The Auckland region's principal planning document, Proposed Auckland Regional Plan: Air, Land and Water (PARP: ALW) (2001), identifies 13 high use aquifer management areas and 8 high use management stream areas. These areas are under pressure from demands of water abstraction and need careful management to ensure their values are maintained or enhanced. ARC collects rainfall, stream and groundwater monitoring data in most of these areas. This data is reviewed to ensure these high use management areas are not being adversely affected by water abstraction.

The hydrological year ending May 2005 was 20% drier than average. This had the effect of reducing stream flows and groundwater recharge. Drier than average conditions also resulted in higher than average water demand in some parts of the region, particularly demand for municipal supply and irrigation.

Stream flows in three High Use management area streams ran below mean annual low flows during the 2004/2005 year. This was due to the effects of the lower than average rainfall, especially in late summer and autumn and the increased demand for water abstraction. Enforcement action has been taken against consent holders in these high use management areas that exceeded their consent allocations; thereby exacerbating the low stream flows.

Most High Use aquifers have groundwater availability limits set in the PARP: ALW (2001). These figures are the maximum amount of water that can be allocated to users, to ensure that the aquifer is not over pumped. Groundwater levels are monitored in the aquifers to ensure water levels are not dropping in the long term. Currently Omaha, Waiwera and Parakai high use aquifers are fully allocated. Groundwater allocation to consent holders remains within groundwater availabilities. Groundwater levels at Waiwera Geothermal aquifer fell below the management target. Applications for consent are currently being processed and allocations reviewed. Groundwater levels in Volcanic and Waitemata Aquifer management areas came close to site minima in autumn 2005 as a result of increased water abstraction and/or reduced rainfall at this time.

The greatest demand for water in the Auckland Region is for Municipal supply. Water Care Services Ltd have consent from ARC to take surface water from dams in the Waitakere and Hunua Ranges and groundwater from the Onehunga aquifer for bulk water supply. They also have consent from Environment Waikato to water from the Waikato River to meet Auckland's water demand. Excluding municipal supplies, industry, then irrigation are the next greatest water users by volume.

1 Introduction

In the Auckland Region, policy governing water management is included in the Auckland Regional Policy Statement (ARC, 1999) (RPS) and the Proposed Auckland Regional Plan: Air, Land and Water (ARC, 2004a) (PARP:ALW). The RPS and the PARP: ALW both include a series of anticipated environmental outcomes encompassing maintenance of sufficient water for present and future generations and protecting the ecosystems, natural character and intrinsic values of water bodies. This report addresses these outcomes in respect of stream and aquifer levels and the quantity of water abstracted in the Auckland Region for the period June 2004 through May 2005. Most reporting is on high use management areas defined in the PARP: ALW.

The 2004-2005 hydrological year was a much drier than average year in the Auckland Region. Monthly rainfall totals were lower than average for seven individual months, close to average for 3 months and above average for just 2 months of the year. The reduced rainfall had the consequence of reducing runoff to streams and recharge to aquifers. Whilst this is quickly seen in stream flow hydrographs, the impact on aquifers is variable depending on aquifer characteristics. Five of the 10 high use streams with long term monitoring sites had periods during the year where flows dropped below the Mean Annual Low Flow (MALF)[1]. Four of these sites are in the north of the region. Hydrographs of groundwater levels in the volcanic aquifers in the Auckland Isthmus and South Auckland also show the impact of reduced recharge with minimum groundwater levels dipping close to site minima in autumn 2005. Groundwater monitoring in Waitemata Aquifers did not show the same trend, as these aquifers take a lot longer to show impacts of reduced recharge or increased discharge (including abstraction).

Both streams and aquifers are impacted in the same period by water abstraction. Not surprisingly water abstraction during dry periods tends to be higher than during wetter periods, particularly in irrigated areas. Water use figures for the 2004-2005 year show an increase in use from the previous year in most high use management areas. Groundwater use totals remained within groundwater allocation totals for all areas, except for the Pukekohe management area.

This report includes assessment of rainfall, stream flow, groundwater level data & resource consent data for the twelve months June 2004 to May 2005 and compares it against methods in the PARP: ALW and baseline information. For further information on the region's water resources refer to the Auckland Water Resource Quantity Statement: *Auckland Water Resource Quantity Statement 2002, Technical Publication 171* (Crowcroft & Bowden, 2002)[2].

For the purposes of reporting the region is split into 8 water resource reporting areas (Fig. 1). Chapters 3-10 contain rainfall, surface water and groundwater resource information, together with water allocation and use figures for each area for the year June 2004 – May 2005.

[1] The MALF is determined from frequency analysis as being the lowest 1 day flow in every 2.33 years.
[2] All ARC reports are available on the ARC Internet site at http://www.arc.govt.nz or by contacting the ARC, email publications@arc.govt.nz or phone (09) 366 2000.

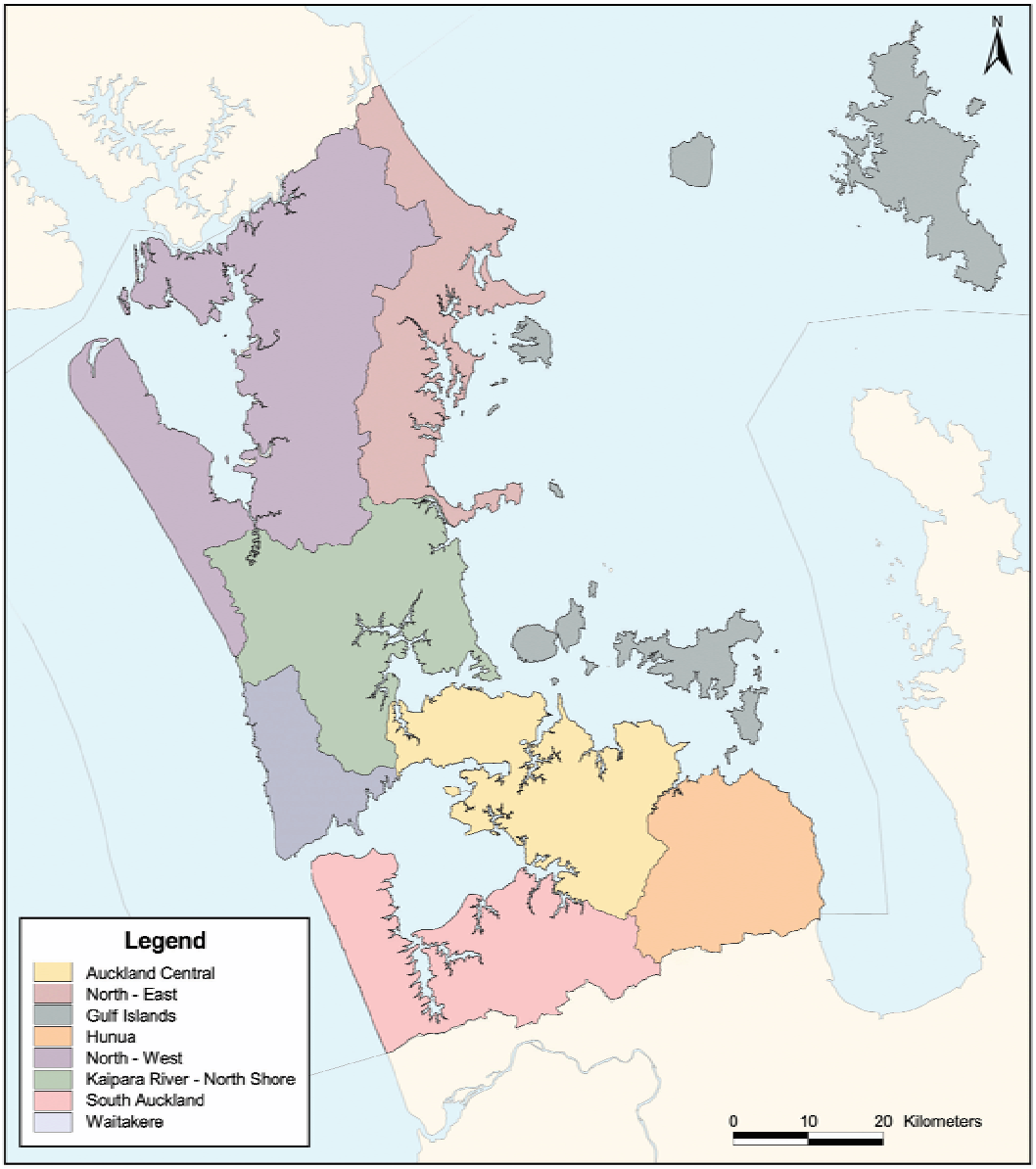

Figure 1: Location of Water resource reporting areas

1.1 Regional Rainfall

Winter 2004 was dominated by more frequent north-westerlies in June, anticyclones ("highs") in July, and extended periods of very cold southerlies in August, producing an overall pattern of stronger westerly airflow (NIWA, 2005). Winter rainfall in Auckland was below average (Fig.2 & 3). Spring began with cold south-westerlies, was followed by average temperatures in October and concluded with a mild, although windy November. Spring rainfall was below average in much of Auckland. December was much colder and wetter right across the region as a result of frequent southerlies. January temperatures were close to average but rainfall was less than 60% of average. By comparison February 2005 was much warmer, with more frequent north-easterlies. Severe or significant soil moisture deficits occurred throughout much of the North Island during January and February (NIWA, 2006). Autumn monthly rainfall totals continued to be below average (18-78% below) until May, when rainfall was slightly above average. Severe soil moisture deficits occurred during March and April.

Annual rainfall totals were closest to average in the southern part of the Auckland Region. Departure from average rainfall was slightly greater in Central Auckland, while the northern part of the region had much lower than average rainfall (Figs. 2, 3).

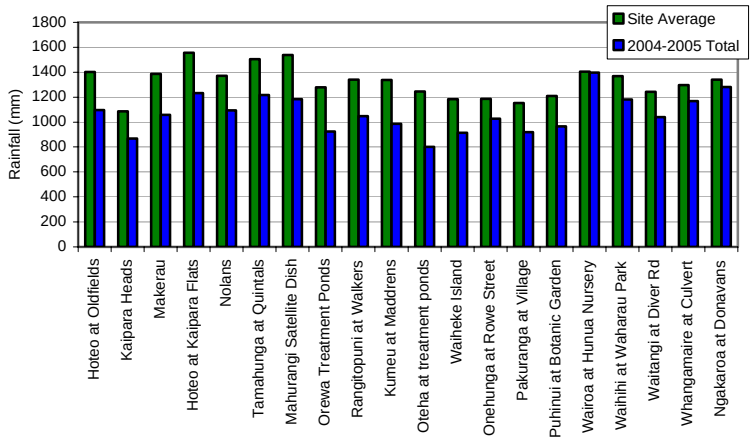

Figure 2: Comparison of long term average annual rainfall totals with 2004-2005 rainfall totals at selected monitoring sites across the Auckland Region.

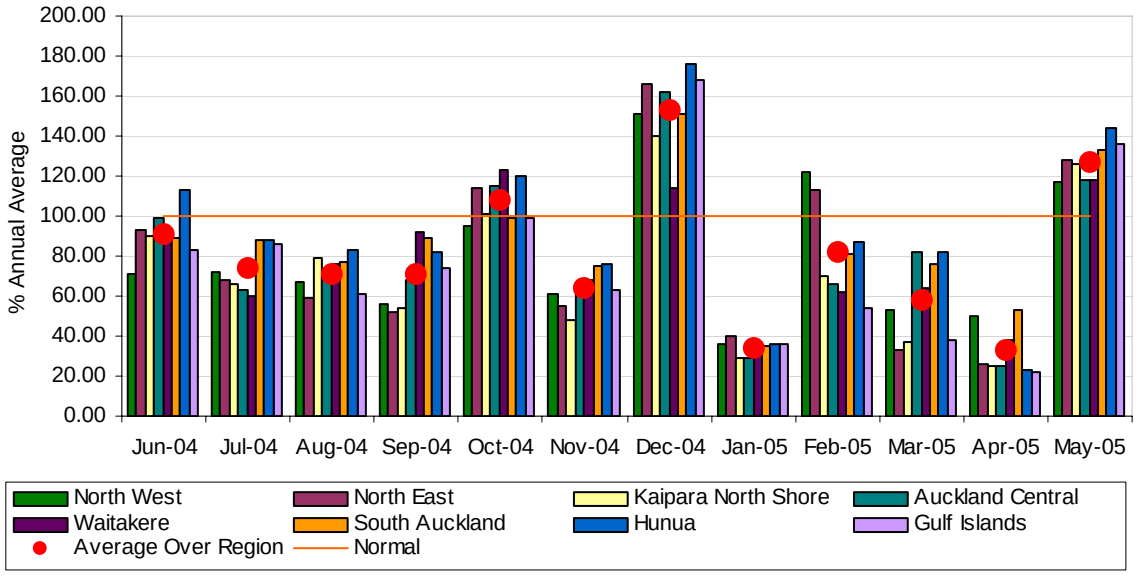

Figure 3: Regional monthly rainfall percentage compared with long term mean, June 2004 to May 2005

1.2 Surface Water Management

The surface water of Auckland Region is composed of rivers, small streams, small lakes, dammed water and wetlands (Crowcroft & Bowden, 2002). Small streams are sensitive to abstraction and so need to be closely monitored to ensure that flows are maintained at levels that do not adversely impact their resident flora and fauna. This is particularly important during summer when flows are at their lowest and demand for water is at its highest.

Surface water is mainly abstracted from run-of-stream flow, dams, and lakes. In some streams the demand for water already equals or exceeds the amount determined available for allocation. The ARC has defined in the PARP: ALW (2001) eight stream catchments that are under pressure from high water use as "high use stream management areas" (Table 1). During 2004/2005 flows at 3 monitoring sites dropped below the calculated MALF (Table 1).

Table 1: High use stream management areas & number of days flow fell below the site MALF during 2004-2005.

High use stream name	Water resource reporting area	Monitoring site	No. days below MALF
Whangaripo	North West		
Mahurangi River	North East	6806 Mahurangi	19
Waitoki, Waikahikatea Waipapakura	North West	45415 Kaukapakapa	0
Waimauku and Kumeu	Kaipara River – North Shore	45315 Kumeu River 45311 Kaipara River	7 0
Puhinui	Auckland Central	43807 Puhinui	
Taitaia	Auckland Central		
Hays Creek	Auckland Central		
Ngakoroa, Mauku and Waitangi	South Auckland	742914 Ngakaroa at Donovans 742736 Waitangi at Glenbrook Rd	4 0

1.3 Groundwater Management

Most groundwater use in the Auckland Region is abstracted from high use aquifer management areas (Table 2). These aquifers are considered at risk from over-pumping or water abstraction. Demand is high compared with total groundwater available for allocation. The maximum volume of water that can be allocated from high use aquifers is tabled in the PARP: ALW (schedule 2). Table 2 sets out the groundwater availabilities and allocations as at June 2005 for each groundwater management area.

Groundwater levels are monitored to ensure that groundwater abstraction does not cause long-term groundwater depletion and management objectives for that aquifer are met. In this report minimum monthly groundwater levels are presented within groundwater envelope plots. The envelopes are based long term monitoring data. Minimum, maximum and mean monthly groundwater levels are used, together with 1 standard deviation from the mean groundwater level.

The Region's basaltic aquifers respond quickly to changes in rainfall and abstraction. Large rainfall events show as rapid rises in groundwater levels. Similarly periods of large abstraction show as dropping water levels. Groundwater levels in the basaltic monitoring bores in high use groundwater management areas show slowly declining water level over the latter part of the 2004-2005 year. This will be a consequence principally of decreased recharge, as well as groundwater abstraction.

1.4 Water Allocation and Use

Water allocation in high use aquifers in the 2004-2005 hydrological year was similar to the previous year (Table 2). Omaha, Parakai Geothermal, Waiwera Geothermal, and Kumeu-Hobsonville area 1 are fully allocated "aquifers".

Table 2: High use aquifer management areas, annual availability, allocation and use figures for 2004 – 2005. Note that groundwater availabilities are not set for 5 high use aquifers.

High Use Aquifer Management area	Aquifer	Availability m^3 (000)	2003-2004		2004-2005	
			Allocation m^3 (000)	Use m^3 (000)	Allocation m^3 (000)	Use m^3 (000)
Clevedon	Clevedon Waitemata - East	379	157	67	157	97
	Clevedon Waitemata - West	964	877	462	877	534
Manukau City Waitemata	Manukau – Waitemata	660	304	163	357	125
Franklin Kaawa	Bombay – Drury Kaawa	718	327	183	341	239
	Glenbrook/Waiau Pa Kaawa	1,560	1,645	679	1,249	939
	Karaka Kaawa	617	530	176	520	171
	Pukekohe Kaawa	1,860	1,247	1,203	1,247	1,425
	Pukekohe West Kaawa	1,780	476	109	466	203
	Waiuku Kaawa	2,450	162	79	1,002	331
Franklin Volcanics	Pukekohe Central Volcanic	856	535	183	535	245
	Pukekohe North Volcanic	420	140	143	116	92
	Pukekohe South Volcanic	650	128	10	129	73
	Pukekohe West Volcanic	420	276	151	276	219
Kumeu – Hobsonville	Kumeu – Hobsonville 1	211	229	153	229	158
	Kumeu – Hobsonville 2	586	535	218	532	264
	Kumeu – Hobsonville 3	762	81	22	73	19
Omaha – Waitemata	Omaha – Waitemata	105	70	39	69	50
North East	Tomarata Waitemata	638	135	48	135	64
Onehunga – Mt. Wellington Volcanic	Onehunga-Mt Wellington Volcanic[3]	15,038	9,092	5,936	9,354	5,683
Parakai	Parakai geothermal	-			249	168
Waiwera	Waiwera geothermal	-			492	456
Manukau City Kaawa	Manukau Kaawa	-			167	60
Waiheke		-			155	80
Drury Sand-Volcanic		-			144	97

Allocation numbers in some areas have changed due to updating of the ARC consent database. The significant differences are

- *Waiuku Kaawa: allocation and use has increased due to the inclusion of two Franklin District Council consents for municipal supply that did not previously have an allocation assigned to them. The combined annual allocation is now 850,000 m^3.*
- *Omaha – Waitemata: the allocation, in common with figures for all high use aquifers, is based on consented abstractions. At Omaha, ARC has undertaken two surveys that have assessed the volume of water required for other purposes such as permitted activities and stock and domestic use at 50,000 m^3.*

[3] In this report the Onehunga and Mt Wellington aquifers have been lumped together.

Under Section 14 of the Resource Management Act 1991 (RMA) surface water and groundwater is allowed to be taken "as of right" for individual domestic use and stock drinking water. Water that is taken for other purposes requires resource consent unless it is allowed as a permitted activity in a Regional Plan. The amount of water taken for "as of right" purposes is not measured although the effects on major streams and aquifers are monitored.

Water use was higher than the previous year, which is not surprising considering the much lower than average rainfall. Currently there are approximately 1500 resource consents to take water in the region (Table 3). Consent holders are required to record at least their weekly water use and submit these records to the ARC on a quarterly basis. Return rates for these record sheets are high, with only 4% of consent holders exercising their consents failing to make any returns during the period.

Key statistics for water use by resource consent holders are shown in Table 3. Of particular note is that water allocation has increased by 16 million cubic metres from last years report. This is because several large municipal supply consents to take water from dams do not have explicit allocations. However for the purpose of reporting, "allocations" have been set equal to the volume used in the previous year.

Table 3: Key water use and allocation statistics for Auckland Region for 2004 – 2005. Previous year in ()

1,499	(1,533)	resource consents to take water. Of these
1,172	(1,189	consents are to take groundwater and
327	(344)	consents are to take surface water
152,345,498 m^3	(136Mm^3)	of water is allocated
118,925,849 m^3	(115Mm^3)	of water is used
22%	(23%)	of consents are inactive - representing 3% of total volume allocated
90%	(81%)	of active consents holders make returns every quarter
4%	(4%)	of active consent holders failed to make a return
12%	(10%)	of consents holders used more than allocated. This is equal to 0.8% of the total allocated water(1,294,082 m^3)

The total volume of water used across the region in 2004/2005 was about 77% of total allocation. However, a small number of consent holders (12%) used in excess of their allocations resulting in a net under use of 22%. Overusers' consent conditions are being reviewed and in some cases ARC has taken enforcement action.

The number of applications to take water and/or drill new bores can be used as an indirect measure of new water demand in the region. The total number of applications for new resource consents over the last five years has remained the same although there have been yearly variations (Fig. 5). The number of applications for irrigation and for industrial purposes has generally declined, which may reflect regulatory changes and the increase in lifestyle use of land in the region.

According to figures provided by Watercare Services Ltd., Rodney District Council and Franklin District Council, approximately 1.25 million people were supplied with reticulated water in the Auckland Region last year (Table 4). Total reticulated supply was 85 million m^3, or an average of 185 litres per capita. The six local network operators supplied by Watercare services Ltd. collectively serve a population of about 1.19 million people. Of the total volume supplied, 24% is for industrial and commercial purposes, 2% is for agricultural purposes and 62% is for domestic use (data from Watercare Services, pers. comm.). The majority of the water taken by Franklin District Council and Rodney District Council is delivered to domestic properties (77% and 82% respectively (data from Franklin District Council and Rodney District Council pers. comm.)).

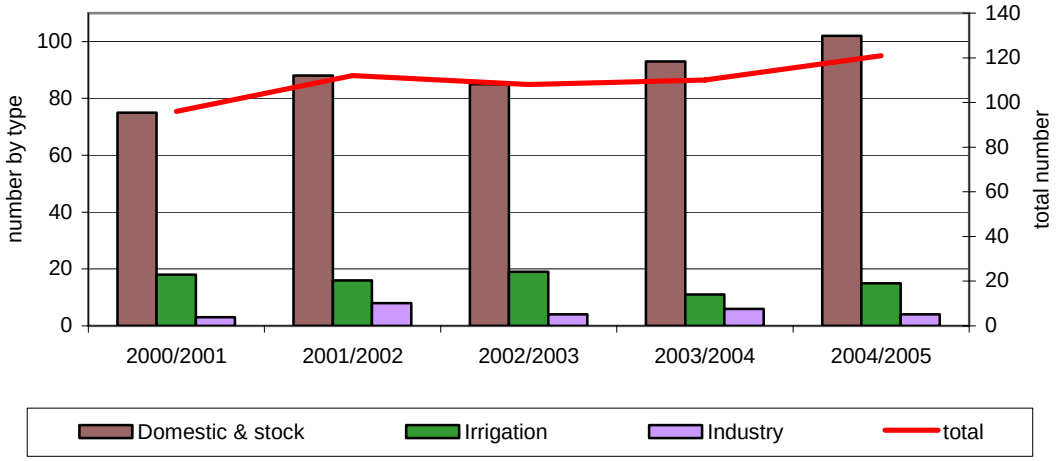

Figure 4: Numbers of applications to drill bores for domestic and stock supply, inductrial use and irrigation supply.

Table 4: Volumes of surface water, groundwater and total water in millions of cubic metres (Mm^3) and percentage of regional allocation for municipal supply in 2004 – 2005

	Allocated Surface water (Mm^3)	Allocated groundwater (Mm^3)	Total allocated (Mm^3)	Percent of total allocated water
Watercare Services Ltd.	108	7.4	115.4	76
Franklin District Council	1	2.3	3.3	2.2
Rodney District Council	1.2	0.5	1.7	1.1
Total municipal supply	110.2	10.2	120.4	79.3

The balance of the 31 Mm^3 or 21% of the regions' consented allocation is distributed between various agricultural and horticultural uses, industry and small community supplies.

A comparison of surface water and groundwater allocation is shown in Figure 5. High surface water allocation figures in the Hunua and Waitakere regions reflect the consented allocations to Watercare Services Ltd to take from 10 dams for municipal supply. If these allocations are excluded (Fig. 6), groundwater represents the larger percentage of allocated water in the region.

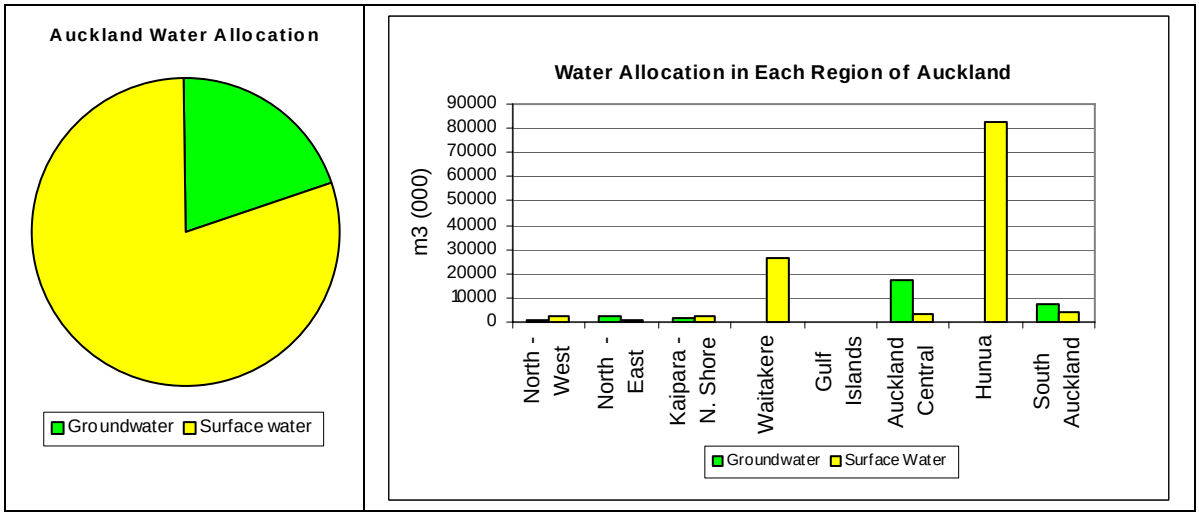

Figure 5: Comparison of surface water and groundwater allocation in each of the eight regions of Auckland.

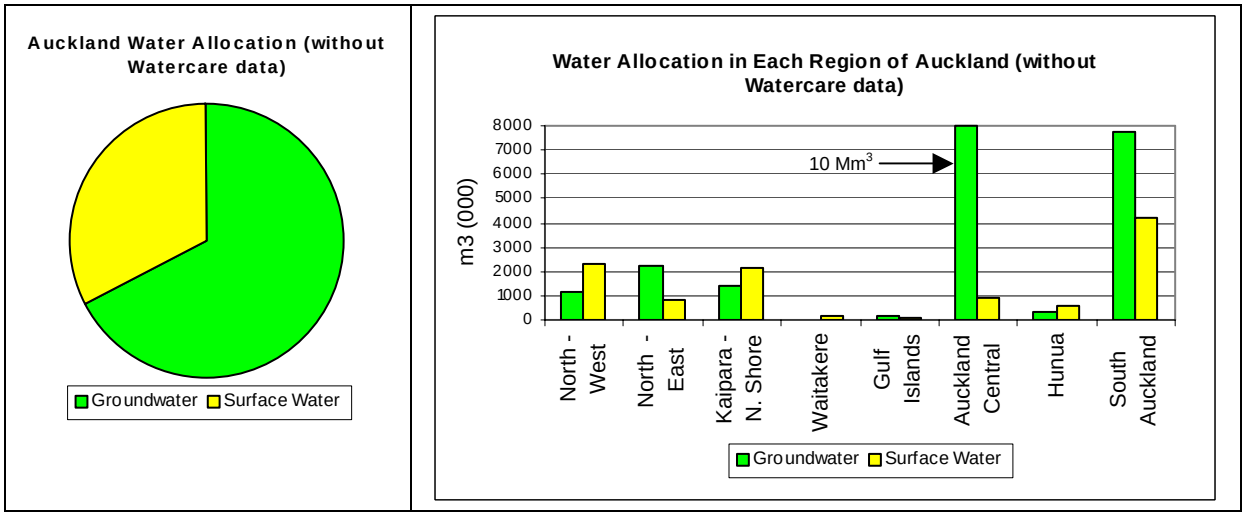

Figure 6: Regional water allocation and use excluding Watercare Services Ltd data

The volume of water used for irrigation, compared to that allocated, was low (~ 4.5 million of 12 Mm^3 allocated) (Fig. 7). This was similar to the allocation and use for industry (12 Mm^3 allocated and 6 Mm^3 used). The water allocated for municipal supply increased significantly from last year due to allocations being set equal to the volume used as discussed above.

Consent holders are grouped into three monitoring priorities based on the quantity of their allocation and the aquifer/stream they take water from. High Priority consents are generally in high use management areas and are allocated a large proportion of the allocation (Figure 8).

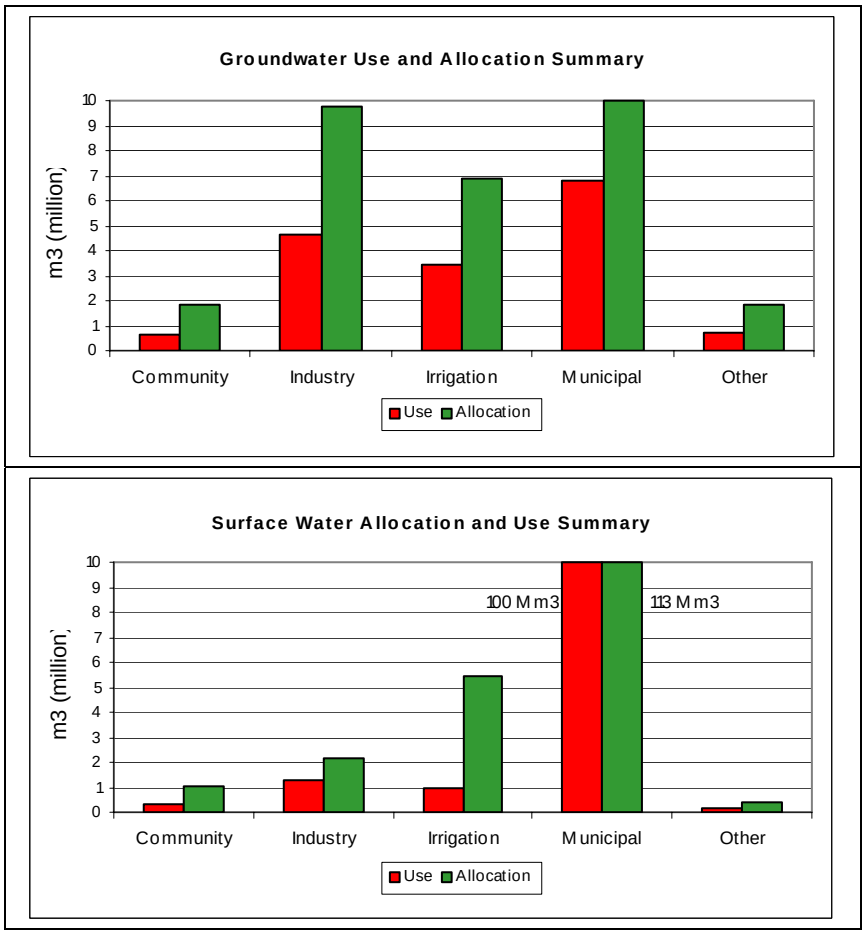

Figure 7: Groundwater and surface water allocation and use shown by use type.

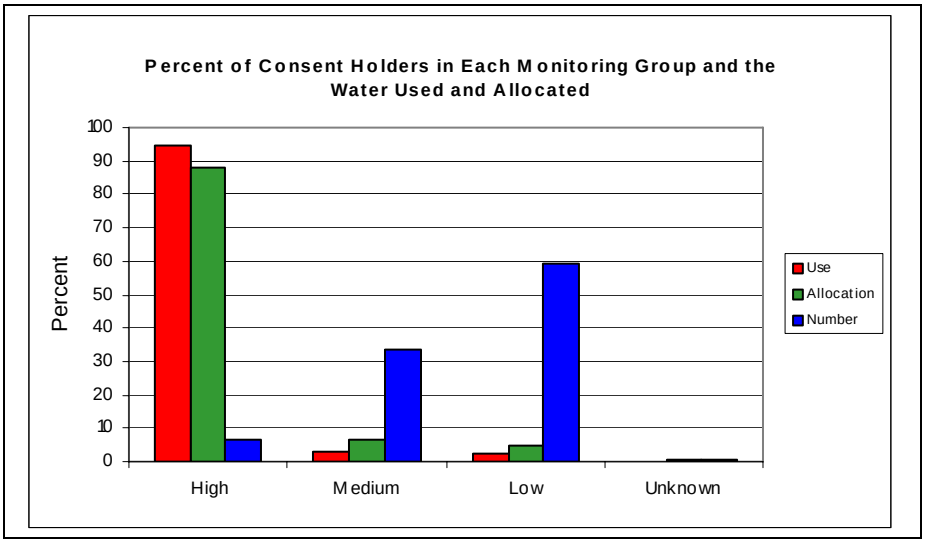

Figure 8: Percentage of consent holders in each monitoring category and the percentage of water allocated and used.

1.5 Irrigation

The Auckland Region consists of a small land area, only 2% of the national total, yet there are areas of intense agricultural productivity. The region has 44% of the national total area of "indoor" fruit, vegetable and flower production, 66% of the indoor capsicum growing area, 60% of the indoor tomato growing area, 26% of the national onion growing area and 7% of potatoes (Ministry of Agriculture and Forestry (MAF) Agricultural Production Survey, 2002). According to the MAF survey, about 2 percent of productive land in the Auckland Region is under irrigation (6,200ha).

For the year 1 June 2004 to 31 May 2005, 12 Mm^3 was allocated for irrigation and 4.5 Mm^3 was used. The average allocation for irrigation for the 2005 year, based on an irrigation area of 6196 ha., was 1982 m^3 per ha. However, actual irrigation of 4.5 Mm^3 equates to about 726m^3 per ha. Irrigation demand varies considerably with the distribution of rainfall through the irrigation season (November – April) i.e. irrigation rates are generally higher in months with below average rainfall than months with average or above average rainfall.

1.6 Industry

For 2004-5 there were 198 consents to take water for "industrial" purposes, 97% of the allocation by volume was for industrial type processes including manufacturing and processing plants and 2% by volume was for food processing mainly pig and poultry raising. There other consents are for dewatering of quarries and excavations and provision of cooling, circulation or wash-water for quarries.

The total volume of water allocated for these activities was 11.9Mm^3. 48% of the allocated volume was used. This excludes water provided by reticulated systems to industrial enterprises.

81% by volume of the allocation was for groundwater, 15% by volume was from dams and 4% from rivers-streams. All the food industry consents were for groundwater.

2 North West

2.1 Rainfall

Rainfall in the Northwest was around 20% drier than average (Table 5). Winter and spring months were drier than average. While October rainfall was close to average, June-September and November 2004 were around 30% drier than normal and December 2004 was 50% wetter. During January less than half the average monthly rainfall fell in the northwest (Fig. 9). Average rainfall in February was followed by another dry period in March and April.

Table 5: Comparison of 2004 – 2005 rainfall with long term mean at 4 sites

Site Number	Site name	Mean Annual rainfall (June - May) (mm)	Total rainfall June 2004 - May 2005 (mm)	Deviation from average rainfall
643510	Hoteo at Oldfields	1402	1096	-22%
644211	Kaipara Heads	1087	869	-20%
645519	Makerau	1387	1057	-24%
644511	Hoteo at Kaipara Flats	1557	1233	-21%

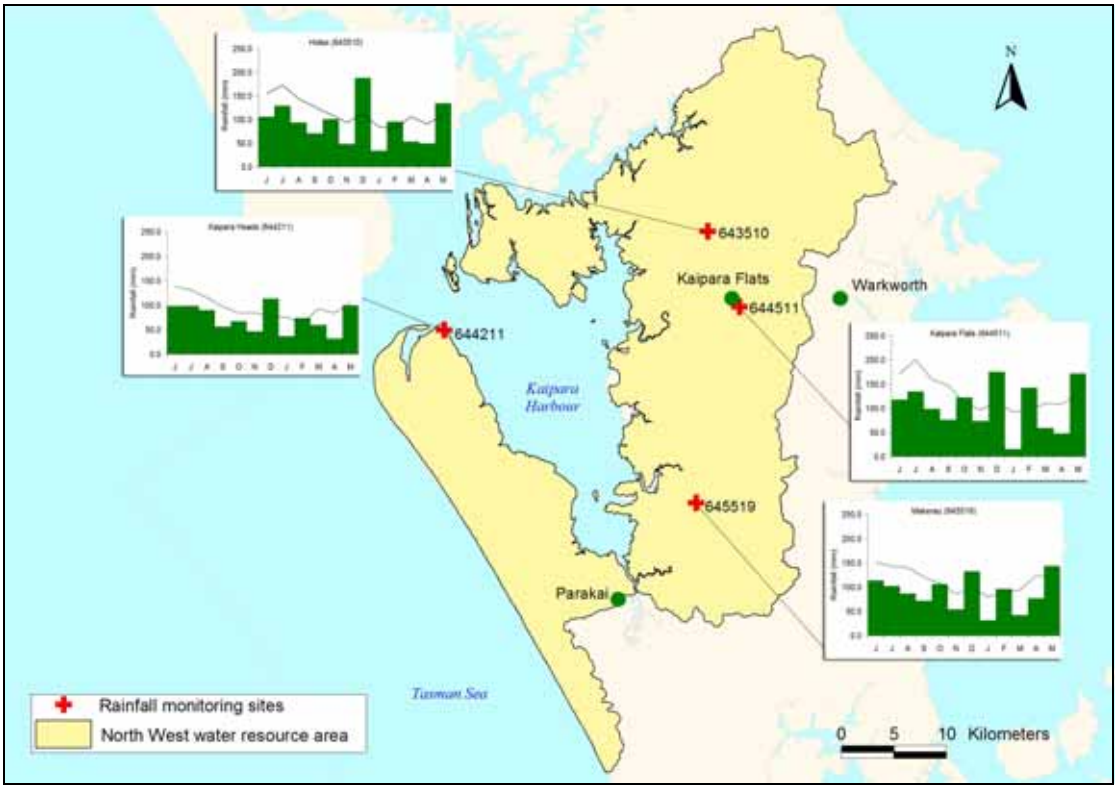

Figure 9: Total monthly rainfall (bars) and long term mean monthly rainfall (line) at 4 sites in the North West water resource area

2.2 Surface Water

There are four high use management streams in the North West water resource management area, Whangaripo, Waititoki, Waikahikatea and Waipapakura (Fig.10). The Whangaripo Stream is a tributary of the Hoteo River. There are currently no flow-monitoring sites for the stream. The water that has been currently allocated from the Whangaripo Stream represents 19**%** of the mean annual low flow. Flow gauging is undertaken manually on the stream from time to time.

The Waitoki, Waikahikatea and the Waipapakura Streams are sub-catchments of the Kaukapakapa River. There are currently no monitoring sites on these small streams but there is a flow-monitoring site at Taylors (45415) on the Kaukapakapa River into which they flow. The lowest flow was 22 l/s, higher than the MALF of 16.5 l/s.

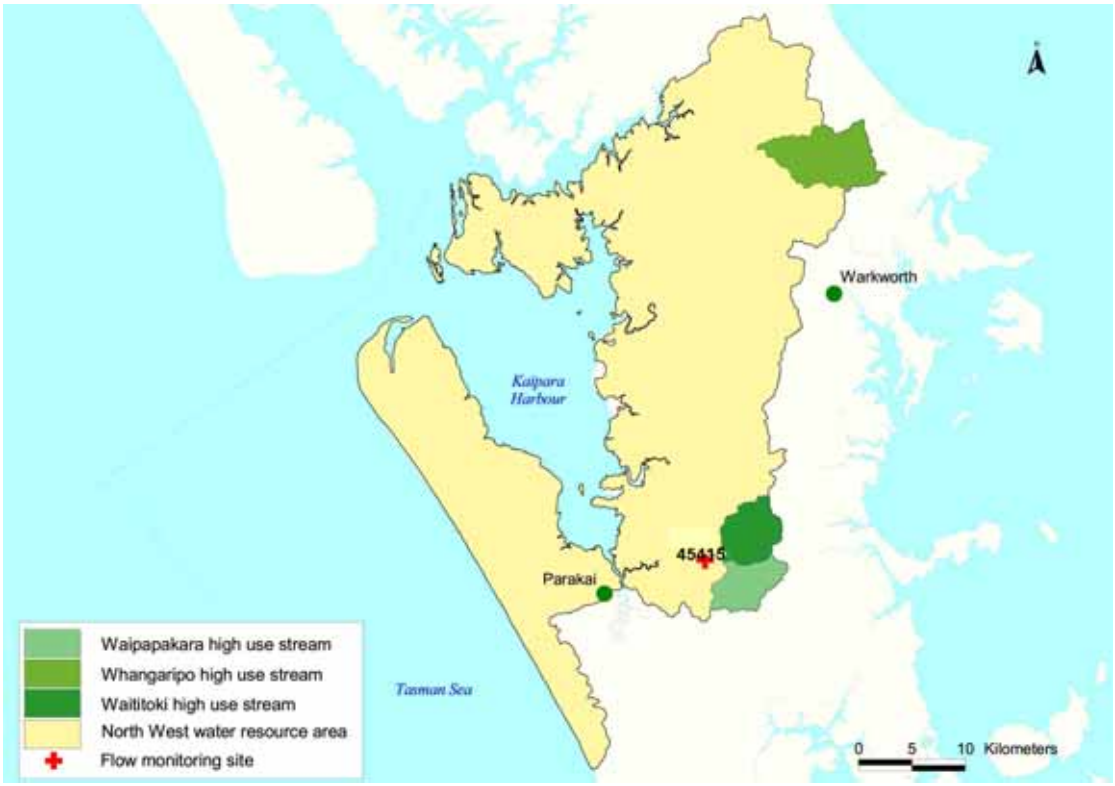

Figure 10: North West water resource area, high use stream management areas and flow-monitoring site

2.3 Groundwater

The Parakai geothermal aquifer is the only high use aquifer in the North West water resource area (Fig. 11). The PARP: ALW sets the groundwater management level in Parakai bore 86 (6464007) at 2.5m above mean sea level (amsl), averaged over a 12-month period. Groundwater pressures have increased since the late 1990's; this is thought to be due to reduced artesian flow losses from bores following remedial works on bores head works. The average groundwater level at Parakai between 1 June 2004 and 31 May 2005 was 2.7m amsl, which is above the management target (Fig. 12).

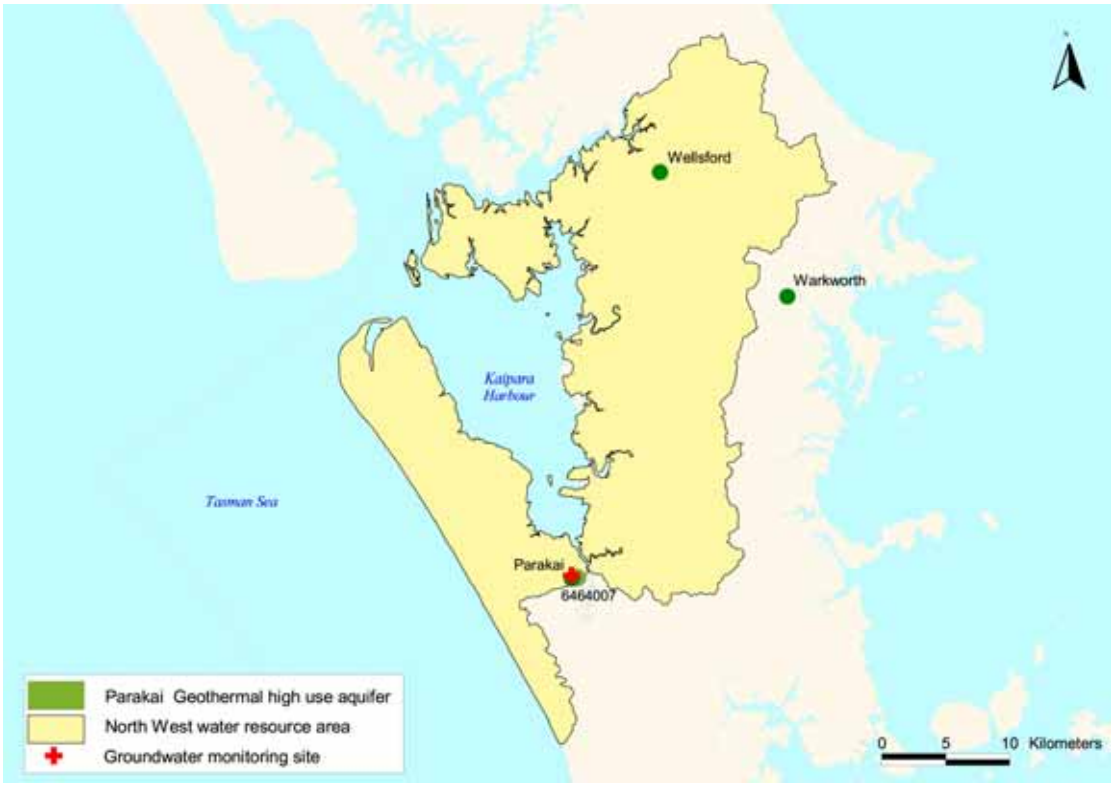

Figure 11: North West water resource area, high use aquifer management area and groundwater monitoring site

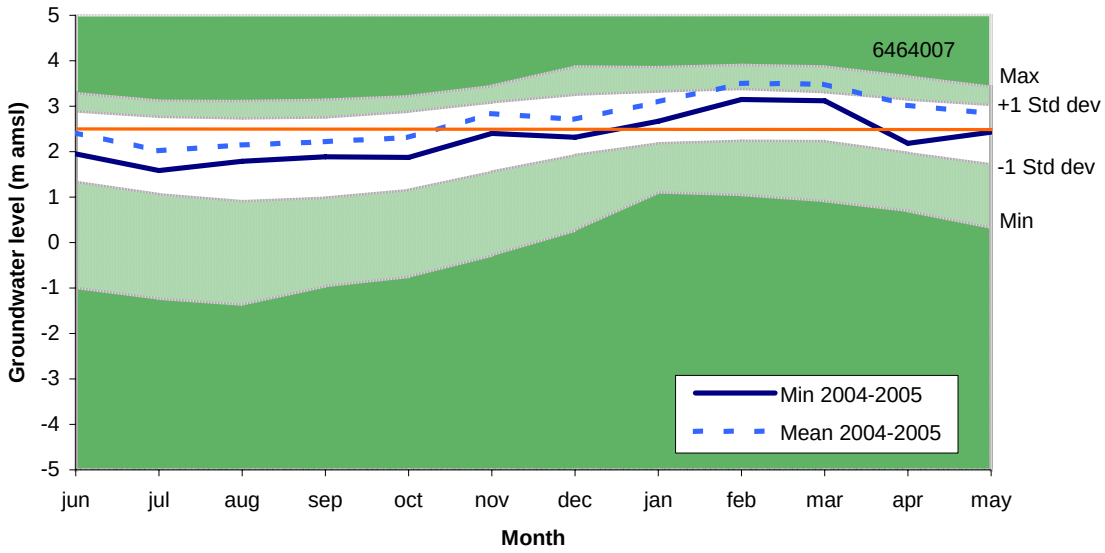

Figure 12: Groundwater envelope for Parakai bore 86 (6464007). The orange line indicates the target groundwater management level of 2.5m amsl

2.4 Allocation and Use

Much of the North West water resource area is rural farmland used for dairying and dry stock (Crowcroft and Bowden, 2002). The large allocations of surface water are generally for pasture irrigation. Most water is used from large farm storage dams. In the 2004/2005 year these consents were not fully exercised, despite the lower than average rainfall (Fig. 13). Similarly one large groundwater allocation for pasture irrigation and several consents for smaller allocations for market gardens and irrigation were not exercised. The large groundwater consent allocation to "other" use types includes geothermal abstraction at Parakai in this aquifer consent is required for all abstractions, including small domestic supplies for spa pool use.

The number of surface water consent holders has decreased from 47 in May 2002 to 30 in May 2005. The number of groundwater consent holders has stayed relatively similar (60 in May 2002, 59 in May 2005).

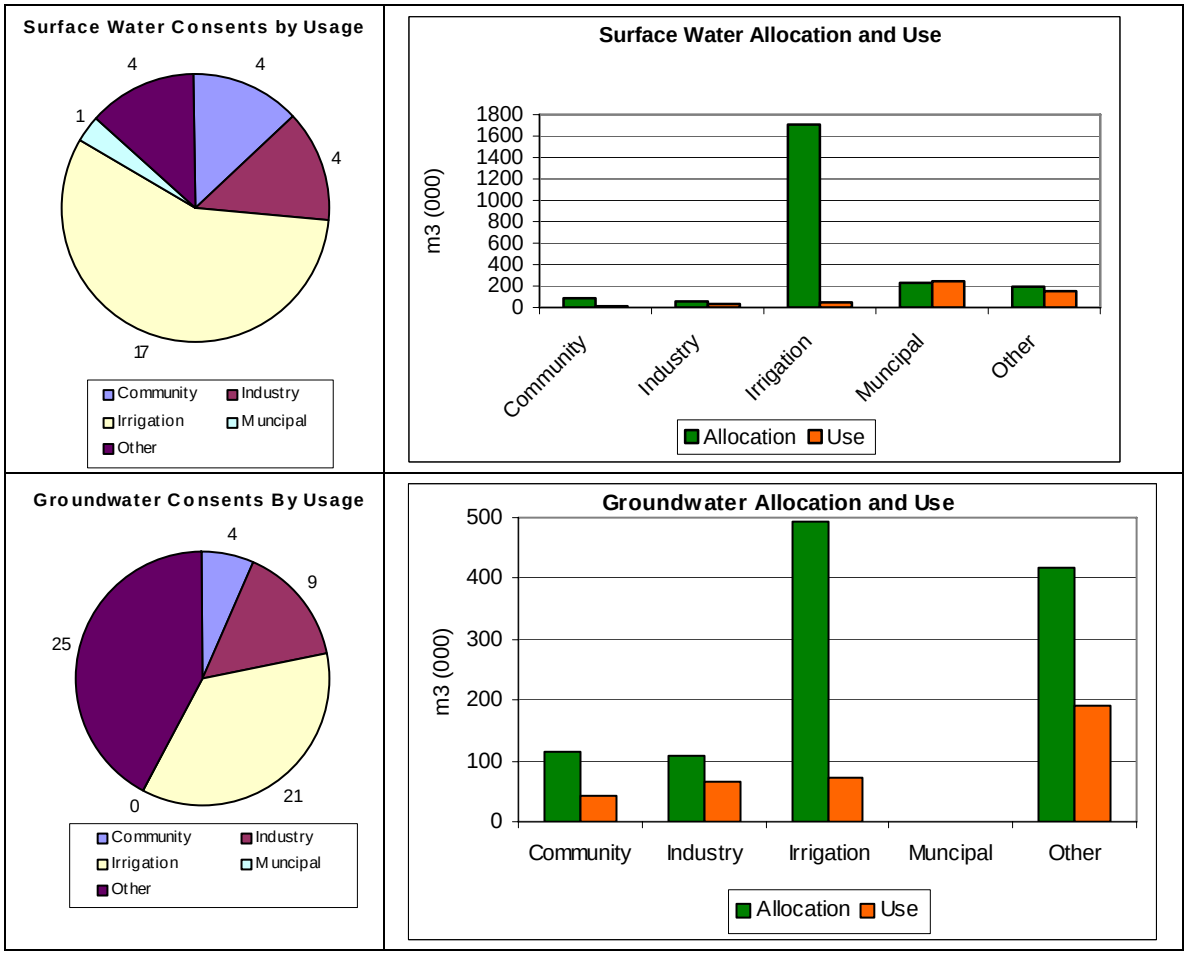

Figure 13: Surface water and groundwater allocation and use for the North West water resource area and the number of consents held for each purpose

3 North East

3.1 Rainfall

The North East experienced a year of different rainfall patterns to normal compared with other parts of the region. Deviations from average monthly rainfall were amongst the highest in the region (Fig. 14). Annual rainfall totals at sites in the north east of the Auckland Region were between 72-80% of the long-term average (Table 6). While December 2004 and May 2005 were much wetter than average most months were much drier.

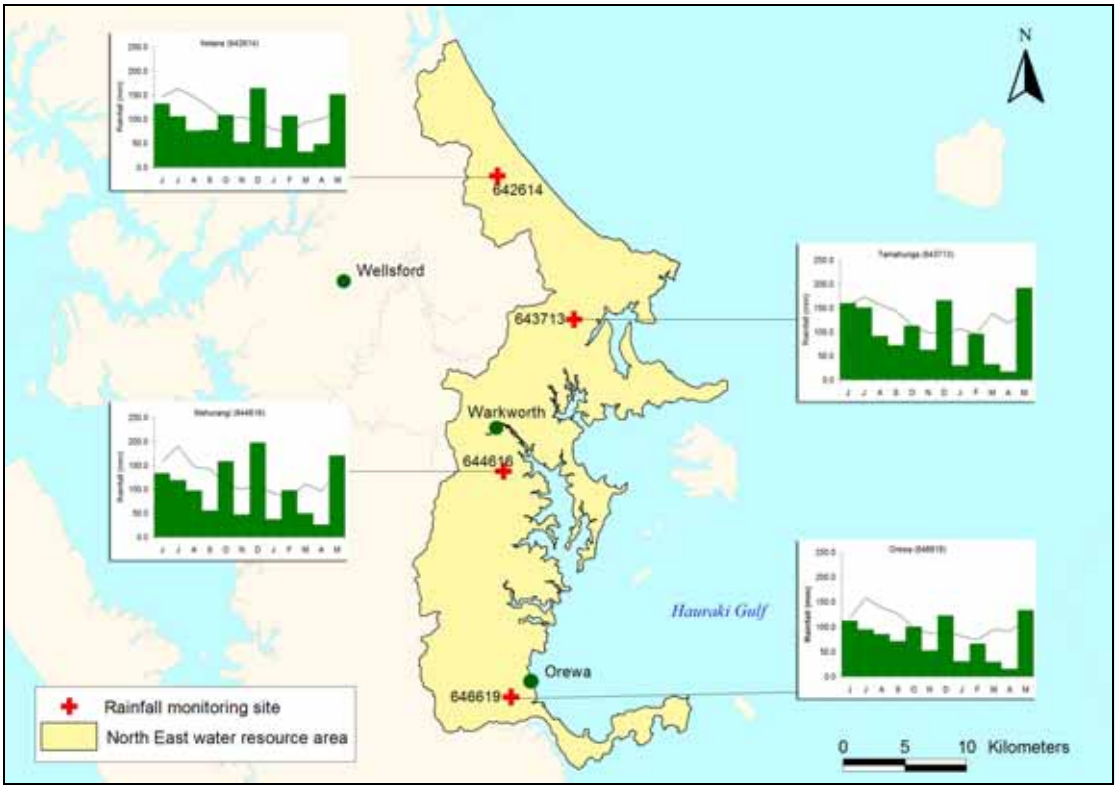

Figure 14: Rainfall monthly rainfall (bars) and long term mean monthly rainfall (line) at 4 sites in the North East water resource area

Table 6: Comparison of 2004 – 2005 rainfall with long term mean at 4 sites

Site number	Site name	Mean annual rainfall (June - May) (mm)	Rainfall June 2004 - May 2005 (mm)	Deviation from average rainfall
642614	Nolans	1370	1094	-20%
643713	Tamahunga at Quintals	1505	1218	-19%
644616	Mahurangi Satellite Dish	1537	1185	-23%
646619	Orewa Treatment Ponds	1279	925	-28%

3.2 Surface Water

The Mahurangi River is the only high use stream in the North East water resource area (Fig. 15). There is a flow-monitoring site (6806) on the river located behind Mahurangi College at Warkworth.

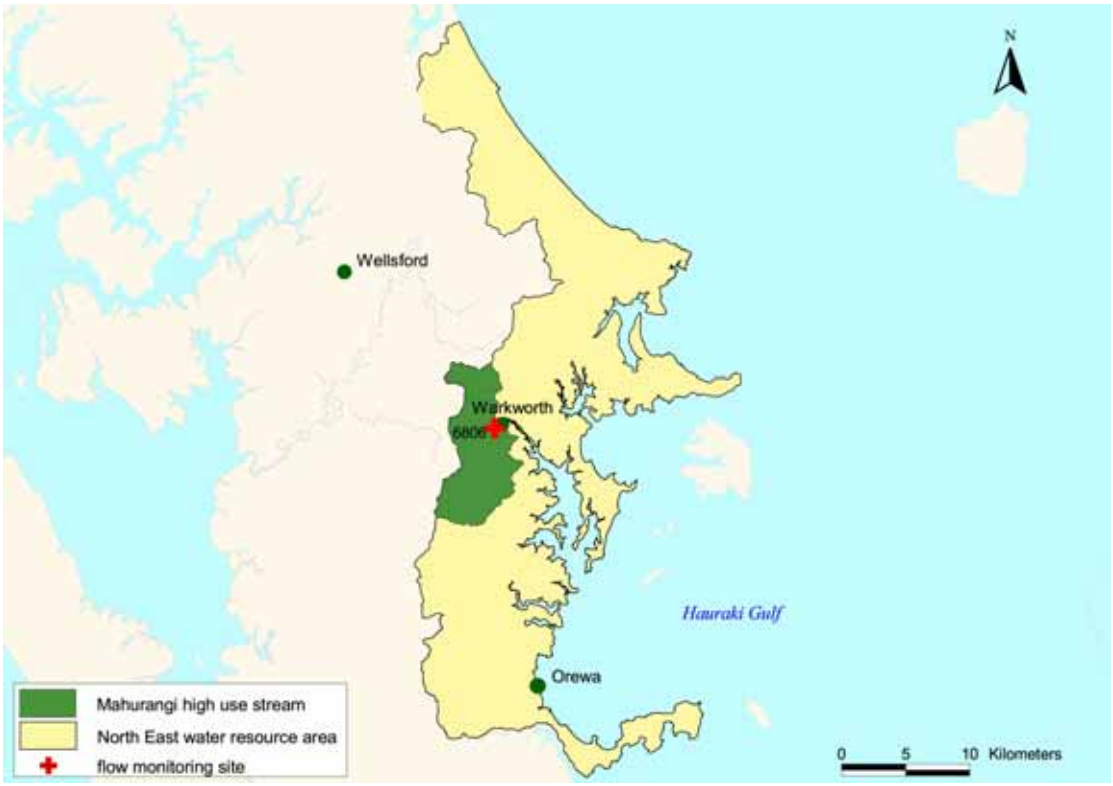

Figure 15: North East water resource area, high use stream management area and flow monitoring site.

During 2004-2005 stream flows at the monitoring site dropped below the mean annual low flow on four occasions; twice in April and twice in May 2005 (Table 7). The low flows are not surprising given the very low rainfall from January to May 2005. However, low flows are exacerbated by water abstraction. There is only one consented take in the catchment, the Rodney District Council take for municipal supply. That consent has a maximum daily allocation of 1600 m^3/day. Abstraction was within this rate for the period that the Mahurangi River fell below the MALF.

Table 7: North East area high use streams low flow statistics for 2004 – 2005

Stream Name	Site No.	MALF l/s	Date flow fell below MALF	Time below MALF (days)	Flow l/s
Mahurangi	6806	57.5	13/04/2005	7.5	53.3
			28/04/2005	3.6	57.1
			05/05/2005	3.0	55.9
			09/05/2005	5.80	53.7

3.3 Groundwater

The North East water resource area contains three high use aquifer management areas; Tomarata Waitemata, Omaha Waitemata and Waiwera Geothermal (Fig. 16). The ARC does not have a monitoring site on the Tomarata Waitemata aquifer. There is only one resource consent to take groundwater from the aquifer. This allocation represents about 20% of the aquifer's available resource. Therefore the aquifer is managed by ensuring that the consent holder's water abstraction remains within the consent conditions.

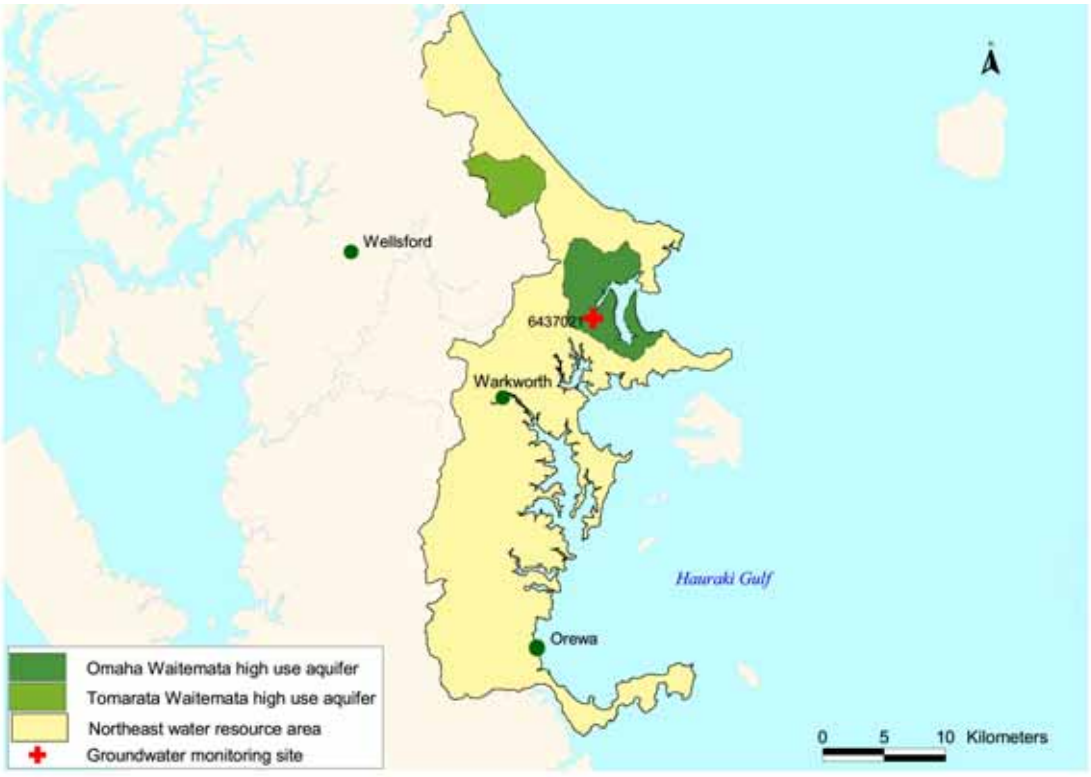

Figure 16: North East water resource area, high use aquifer management areas and groundwater monitoring site

There are several ARC groundwater monitoring bores in the Omaha Waitemata aquifer. Omaha 25 (6437021), located in the centre of the main horticultural area of Omaha Flats, has a management target water level of above 3.25m amsl for 11 months of the year (PARP: ALW). In 2004 – 2005, groundwater levels remained significantly above the management threshold for the entire period (Fig. 17). Groundwater use by the 27 resource consent holders was within aquifer availability and most allocations.

The groundwater management target for Waiwera geothermal aquifer at Waiwera beachfront bore is to maintain an annual mean of at least 0.5m amsl. Groundwater levels in the aquifer were lower than average for June 2004-May 2005 and the mean groundwater level during this period was 0.45m (Fig. 18). This is below the PARP: ALW management water level of 0.5m averaged over 12 months. Most geothermal groundwater taken from the geothermal field is allocated to several users for pool use. During 2004/2005 water use records show that water use was within allocation with the exception of one consent, where water use exceeded both daily and maximum annual allocations.

Groundwater levels have risen since May 2005 to above the management level.

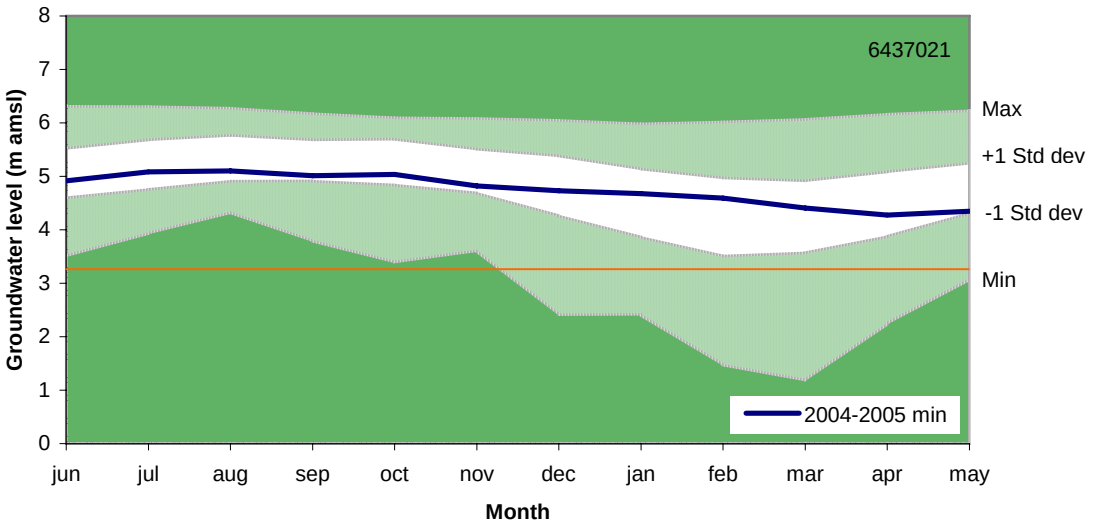

Figure 17: 2004 – 2005 Groundwater envelope for Omaha Waitemata bore 6437021. The orange line indicates the target groundwater management level of 3.25m amsl

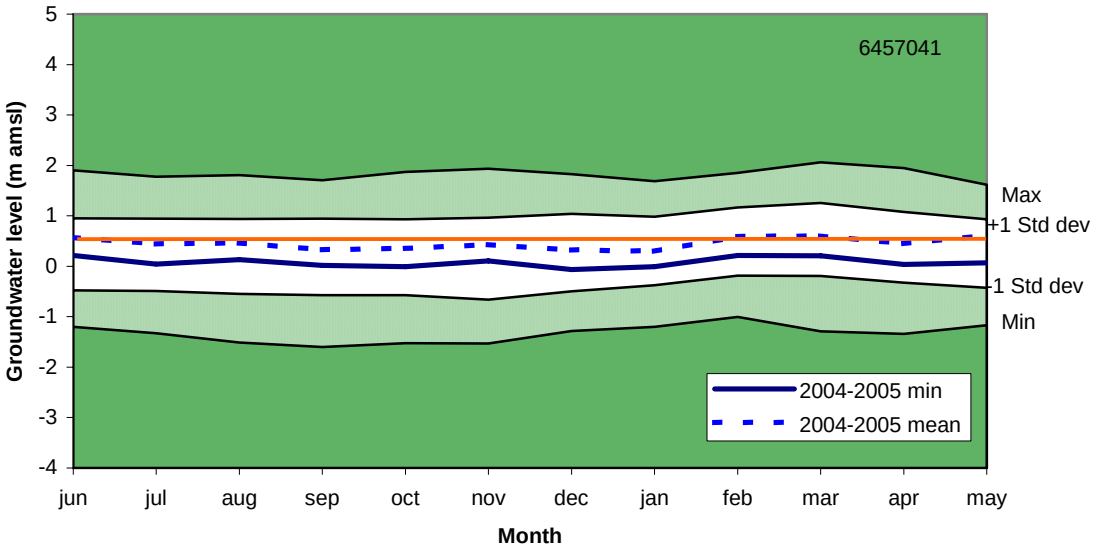

Figure 18: 2004 – 2005 Groundwater envelope for Waiwera geothermal bore 6457041. The orange line indicates the target groundwater management level of 0.5m amsl

3.4 Water Allocation and Use

Omaha High use aquifer has an availability of 105,000 m^3/year. The aquifer is fully allocated to 27 consent holders (69000m^3/year) and to non-consented users (including private domestic supplies). During 2004-2005 consented water use was within allocations.

Waiwera geothermal aquifer is also fully allocated, although a groundwater availability figure is not set in the PARP: ALW (2001). One of the main management issues for Waiwera is to avoid cold saline water intrusion hence the inclusion of a minimum water level in the ARC

beachfront monitoring bore. Water levels below this point are indicative of conditions that could see saltwater entering the geothermal aquifer. Unfortunately the monitoring bore is very sensitive to large abstractions from 2 nearby bores. Consent renewals for 6 consent holders at Waiwera are currently being processed and the current abstraction and overuse by one consent holder will be addressed though that process.

There was a large difference between allocation and use of surface water for community supply in 2004-2005, as was the case in 2003-2004 (Fig. 19). This is because 7 of the 8 consents are for irrigation of golf courses yet only 30% of the allocation is actually used. Similarly, a large consented allocation for pasture irrigation from surface water used only 27%. Groundwater allocated for 'Other' purpose is also much higher than usage. This is because several large consents to take water are no longer active.

The number of surface water consent holders has remained similar (13 in May 2002, 14 in May 2005). The number of groundwater consent holders has increased considerably, from 99 in May 2002 to 140 in May 2005.

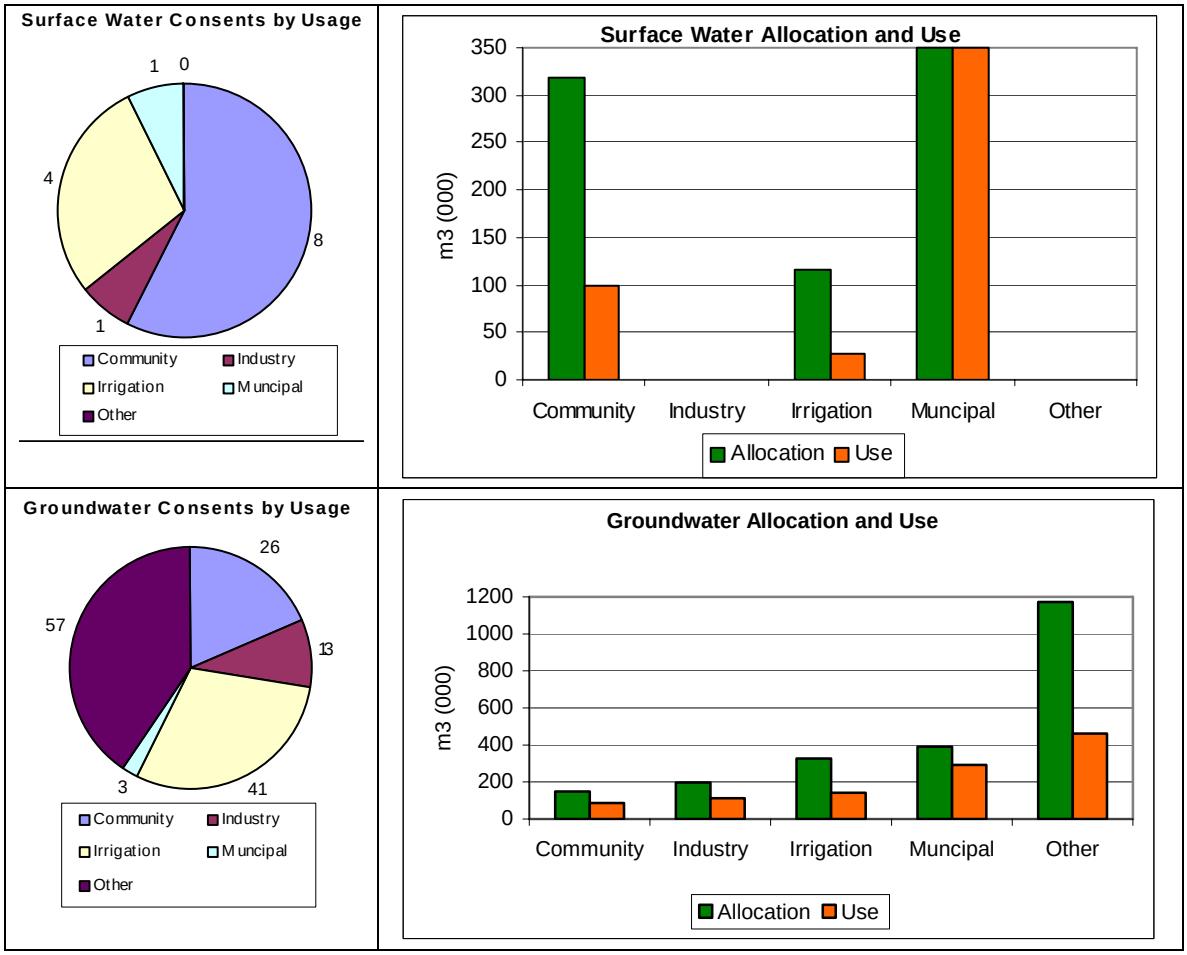

Figure 19: surface water and groundwater allocation and use for North East water resource area and the number of consents held for each purpose.

4 Kaipara River – North Shore

4.1 Rainfall

Rainfall totals in the Kaipara North Shore area for the 2004-2005 period were much lower than average (Fig. 20, Table 8). While December and May were wetter than average and October was near average, the other months were considerably drier. The driest months were January and April 2005, when monthly rainfall was approximately 30% and 25% of average.

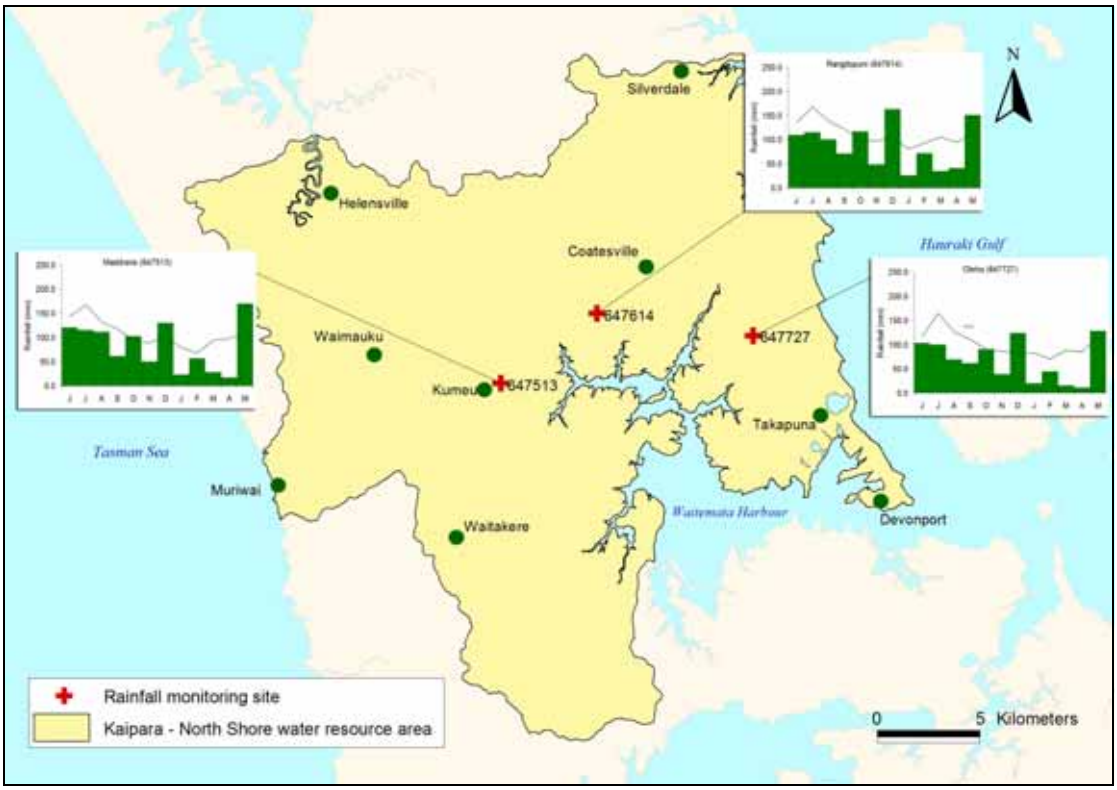

Figure 20: Total monthly rainfall (bars) and long term mean monthly rainfall (line) at 4 sites in the Kaipara River – North Shore water resource area

Table 8: Comparison of 2004-2005 rainfall with long term mean at 4 sites

Site number	Site name	Mean annual mean rainfall (mm)	Total rainfall (mm)	Deviation from average rainfall
647614	Rangitopuni at Walkers	1340	1048	-22%
647513	Kumeu at Maddrens	1339	985	-26%
647727	Oteha at treatment ponds	1246	800	-36%