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TE RAUHĪTANGA TAIAO

State of the Environment Monitoring

Auckland Water Quantity Statement, 2006/07

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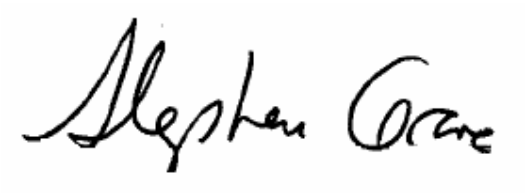

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Contents

1 Introduction

In the Auckland region, policy governing water management is included in the Auckland Regional Policy Statement (ARC, 1999) (ARPS) and the Proposed Auckland Regional Plan: Air, Land and Water (ARC, 2001) (PARP:ALW). The ARPS 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 2006 through May 2007. Most reporting is on high use management areas defined in the PARP: ALW (2001).

This report includes assessment of rainfall, stream flow, groundwater level & resource consent data for the twelve months June 2006 to May 2007 and compares it against methods in the PARP: ALW (2001) and baseline information. The stream flow is compared with the Mean Annual Low Flow (MALF)[1] as no minimum flows have been set in the PARP:ALWP. For further information on the region's water resources refer to the Auckland Water Resource Quantity Statement 2002, Technical Publication 171 (Crowcroft & Bowden, 2002). For the purposes of reporting the Auckland region is split into 8 water resource reporting areas (Figure 1). Chapters 3-10 contain rainfall, surface water, groundwater, water allocation and use figures. Information is for each water resource reporting area, for the hydrological reporting year 1st June 2006 – 31st May 2007.

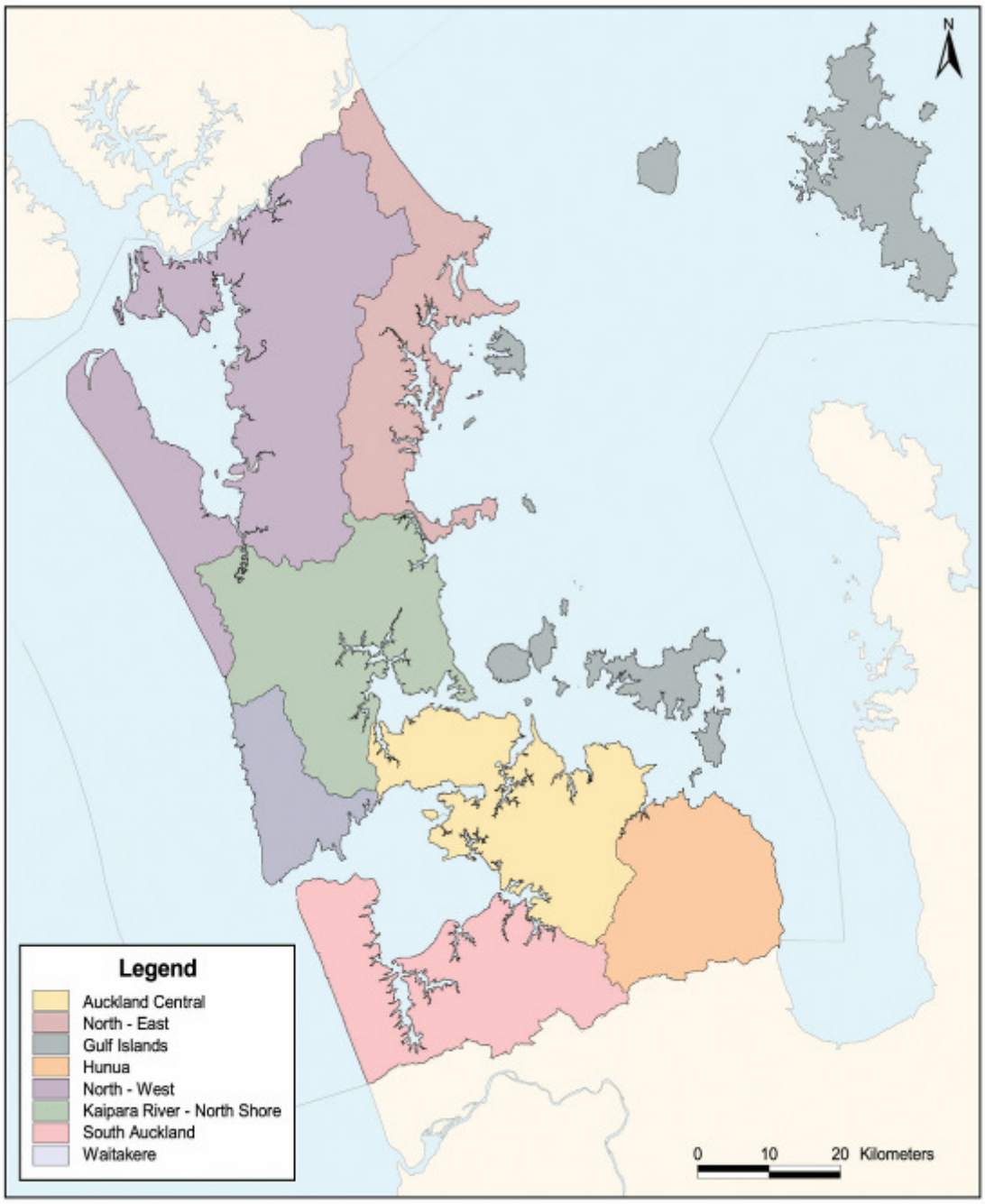
The 2006—2007 Hydrological year was dominated by weak–moderate El Niño conditions in the tropical Pacific, this caused a noticeable increase in windiness, and more frequent south westerly winds in the Auckland region. There was then a swing from an El Niño to a La Niña climate pattern in early 2007. (NIWA, 2007)

Over the period June 2006 – May 2007 the region experienced well below average rainfall causing effects on both stream flows and groundwater levels. 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 seven high use streams with long term monitoring sites had periods during the year where flows dropped below the Mean Annual Low Flow (MALF) Hydrographs of groundwater levels in the North West and South Auckland show groundwater levels dipping close to or greater than site minima in autumn 2007. The Parakai and Waiwera geothermal aquifers both had periods where the monthly mean was well below the management levels imposed on the water resource area.

Water use and allocation were both up on the previous year even though the total numbers of consents were down.

[1] The MALF is determined from frequency analysis as being the lowest 1 day flow in every 2.33 years. The MALF values in this report are not adjusted for pumping effects and thus can be expected to be lower than the MALF for natural flows.

Figure 1 Location of Water Resource Areas



1.1 Regional Rainfall

The Auckland region was on average 23.6% drier than the pervious hydrological year, with decreased rainfall recorded at all hydrological sites over the period (Figure 2). During the last half of 2006 the region experienced below average rainfall by up to 20%, this was associated with more anticyclones over the North Island. The 2007 year began with low rainfall and significant soil moisture deficits, especially in the east, which persisted in the east of the North Island until May. August, November, and January had average rainfall, yet months either side of these experienced extremes. The months of February and May were extremely dry for the region, with rainfall being 70% less than the monthly mean.

During the months of October 2006 and March 2007 there was very high rainfall across the region. Some sites received more than 200% of the monthly mean making these 2 months extremely wet (Figure 3).

Overall the hydrological year was much drier than average, and there was a lot of variance in the monthly totals at monitoring sites. These rainfall variances were attributed to the variable weather patterns, high rainfall brought by subtropical lows, and long fine periods in the winter from high pressure systems.

Within this report each rainfall site has been compared to the long term monthly mean.

Figure 2 Comparison of 2005-2006 rainfall totals with 2006-2007 rainfall at selected monitoring sites across the Auckland Region.

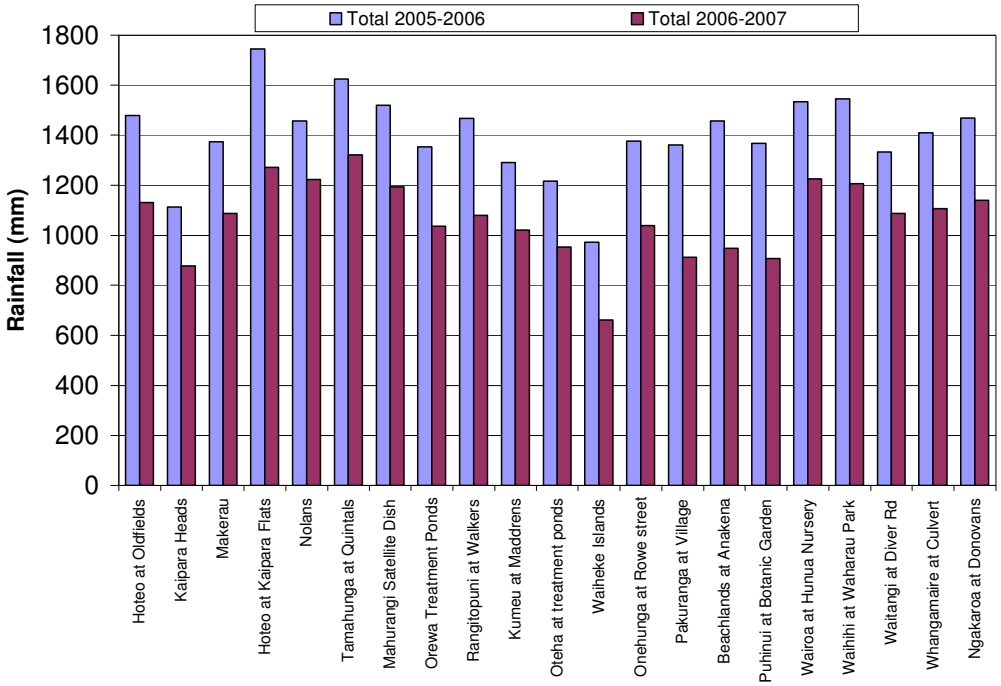
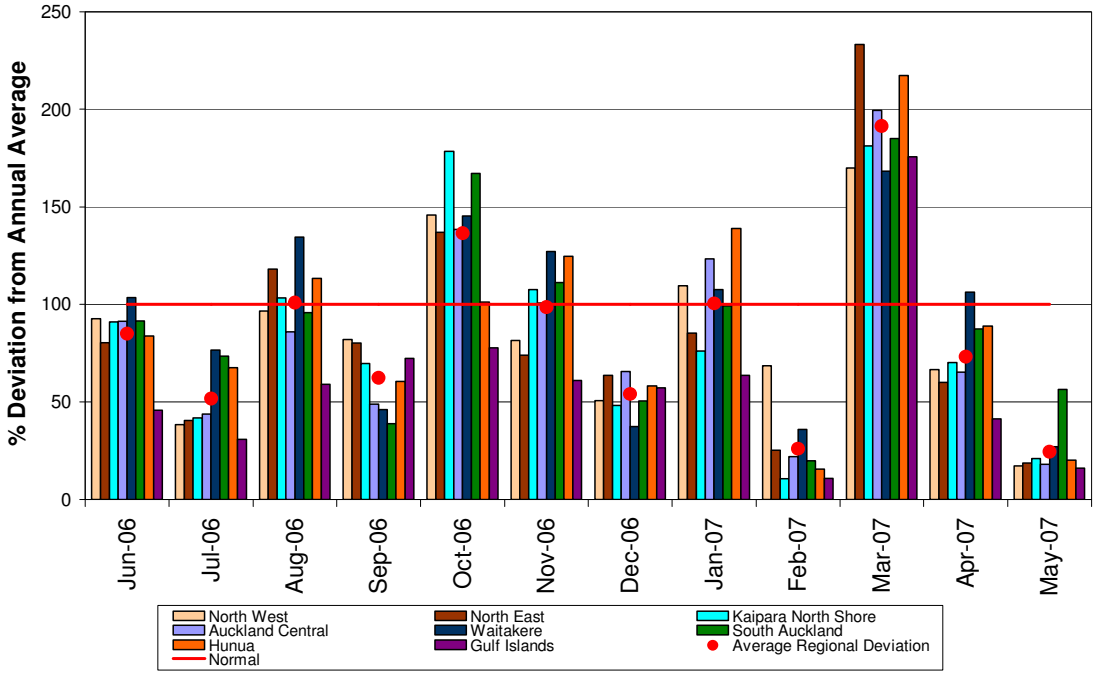


Figure 3 Regional monthly rainfall percentage compared with long term mean, June 2006 to May 2007



1.2 Surface Water Management

The surface water of the Auckland region is composed of rivers, small streams, small lakes, dammed water and wetlands (Crowcroft & Bowden, 2002). The monitoring of streams particularly at low flows is very important. Streams can be affected by water abstraction, but primarily prevailing weather conditions influence their flow. Monitoring stream flow, water allocation and use in catchments indicates whether flows are maintained at levels that do not adversely impact their resident flora and fauna. This is most important during summer and early autumn when flows are at their lowest and demand for water is at its highest.

Surface water is mainly abstracted from run-of-stream flow, lakes and dams (Crowcroft & Bowden, 2002). In some catchments there is a constant demand for water allocation and abstraction. 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 2006/2007 flows at 5 monitoring sites dropped below the calculated MALF (table 1).

These streams, and the reasons for the low flows, are explained in the water resource reporting areas in the following chapters.

Table 1 High use stream management areas, the current site MALF, number of days flow fell below the site MALF during 2006-2007 & the lowest flow for the reporting period.

Water resource reporting area	High use Stream name	Monitoring site	MALF m^3/s	No. of days below MALF	Lowest Flow for Year
North West	Whangaripo	-			
North East	Mahurangi River	6806 Mahurangi	0.069	39.2	0.035
North West	Waitoki Waikahikatea Waipapakura	45415 Kaukapakapa	0.0221	14.1	0.015
Kaipara River	Waimauku and	45315 Kumeu	0.0225	0	0.023
North Shore	Kumeu	45311 Kaipara	0.1399	38.7	0.069
Auckland Central	Puhinui	43807 Puhinui	0.0144	0	0.015
	Taitaia	-			
	Hays Creek	-			
South Auckland	Ngakoroa Waitangi	43829 Ngakoroa 43602 Waitangi	0.0078 0.033	18 3.3	0.002 0.030

1.3 Groundwater Management

Most of the groundwater abstraction in the Auckland Region is from high use aquifer management areas (Table 2). These water takes are primarily for municipal use and agricultural needs, and need to be monitored to ensure compliance with consented allocations. The PARP: ALW (2001) has set a maximum availability that can be extracted annually from most aquifers or a minimum groundwater level. Table 2 shows the availability, allocation and use for the years 2005 - 2006 and 2006 – 2007.

Groundwater level is closely monitored by fortnightly manual readings and water level recorders. This is to ensure that groundwater allocations are sustainable and that groundwater levels are not falling under the long term mean. Consent holders are required to return quarterly water meter figures so the total water use can be compared to the water allocated and the total groundwater availability. In this way pumped aquifer management can be monitored over the hydrological year.

This report uses envelope plots to show the groundwater levels for the current hydrological year. The envelopes are based on long term monitoring data. Minimum, maximum are long term extreme monthly values, the +/- 1 standard deviations from the mean level of the entire record. The plotted minimum monthly groundwater levels are for the reported period.

The Auckland Region's basaltic aquifers respond quickly to changes in rainfall and abstraction. Large rainfall events such as in March 2007 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 levels during the end of 2006 and early 2007. The aquifers responded quickly to the October 2006 and March 2007 high rainfall events causing levels to come back to the long term mean. But due to high water demand and low soil moisture levels the aquifers dropped back quickly to below average levels.

1.4 Water Use and Allocation

Water allocation in the high use aquifer management areas during the 2006-2007 hydrological year was similar to the previous year (Table 2).

Water use increased in many of the smaller aquifers and this is associated with the below average rainfall during the hydrological year. Where use was less than the previous year, this was generally associated with a decrease in allocation in the high use aquifer management area, and the high rainfall amounts in October and March which will have decreased demand for irrigation water.

Currently the only fully allocated aquifer is the Kumeu Waitemata zone 1. The Omaha Waitemata aquifer is also fully allocated, but 50,000m3 has been available for permitted activities. Onehunga and Mt-Wellington volcanic high use aquifer management areas have been grouped together for this reporting table.

Under Section 14 of the Resource Management Act 1991 (RMA) surface water and groundwater can be taken "as of right" for individual domestic use and stock drinking water provided that it does not have an adverse effect on the environment. Water that is taken for other purposes requires resource consent unless it is allowed as a permitted activity in the PARP: ALW

Total water allocated in the 2006-2007 hydrological year stayed relatively the same as the previous year, and total use was up by 3Mm^3 to 107Mm^3. The reason for the high water use was likely to be from the low rainfall throughout 2006-2007. This low rainfall caused an increase in water use even though the number of consents had reduced. The total water allocated in the year approximately 77% was used in 2006-2007 (Table 3).

Approximately 14% of consent holders used more than their consented allocations. These consent holders who have exceeded their allocation have been contacted by ARC for an explanation for their overuse. If the overuse cannot be resolved there may be need for enforcement action to prevent this occurring again. If water is available in the aquifers then the consent holders may need to apply for more water to be allocated. 430 of the consent holders where either inactive or used no water. These consents equated to 7.1Mm^3 of the total water that was allocated. As with last year 91% of consent holders returned their quarterly meter returns.

Table 2 High use aquifer management areas, annual availability, allocation and use figures for 2006-2007

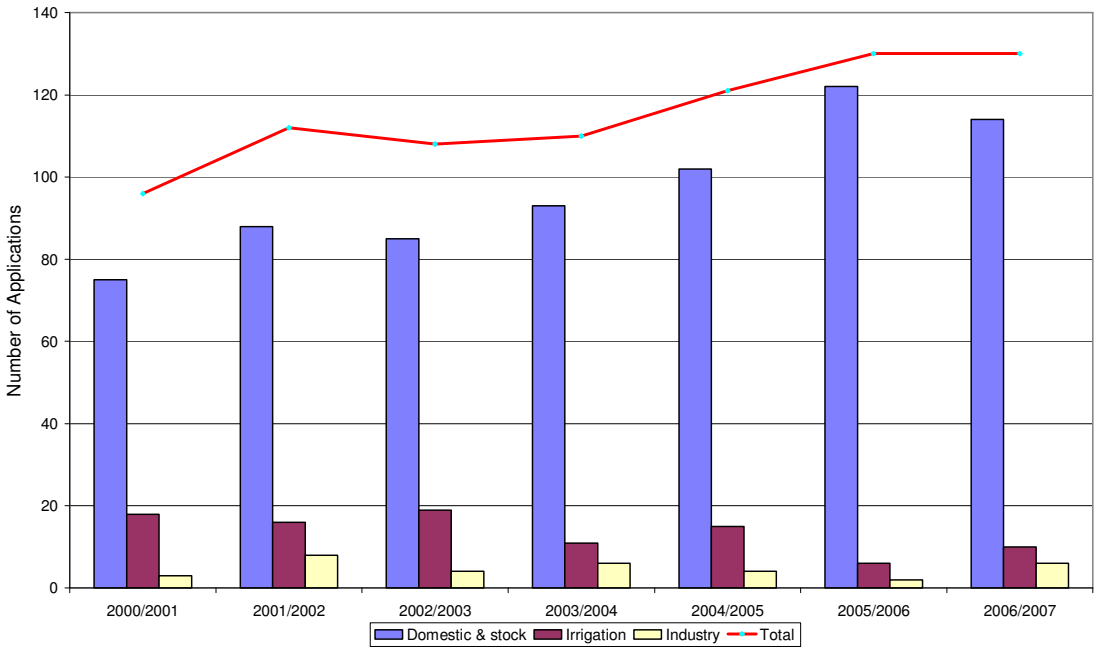
High Use Aquifer Management Area	Sub Aquifer		2005-2006 (TP 323)		2006-2007	
		Availability m^3 (000)	Allocation m^3 (000)	Use m^3 (000)	Allocation m^3 (000)	Use m^3 (000)
Clevedon East Waitemata		379	155	86	164	83
Clevedon West Waitemata		964	815	423	849	373
Manukau City Waitemata		660	359	148	276	124
Franklin Kaawa	Bombay - Drury Kaawa	718	296	234	339	141
	Waiau Pa Kaawa	1,560	1,207	991	1200	770
	Karaka Kaawa	617	484	168	469	169
	Pukekohe Kaawa	1,860	1,210	1,282	1,185	887
	Pukekohe West Kaawa	1,780	466	236	459	180
	Waiuku Kaawa	2,450	994	380	988	417
Franklin Volcanics	Pukekohe Central Volcanic	856	652	286	625	218
	Pukekohe North Volcanic	420	120	91	143	82
	Pukekohe South Volcanic	650	148	88	148	90
	Pukekohe West Volcanic	420	296	299	260	257
	Bombay volcanic	-	62	34	127	44
	Glenbrook volcanic	-	162	101	136	80
Kumeu Waitemata	Kumeu – Waitemata zone1	211	227	160	234	168
	Kumeu – Waitemata zone2	586	540	180	554	221
	Kumeu – Waitemata zone3	762	70	31	87	33
Omaha Waitemata	Omaha - Waitemata	105	70	39	66	54
Tomarata Waitemata	Tomarata Waitemata	638	135	0.3	174	22
Onehunga-Mt Wellington Volcanic	Onehunga-Mt Wellington Volcanic	15,038	8,959	5,200	8,722	5,268
Parakai	Parakai geothermal	-	249	172	248	183
Waiwera	Waiwera geothermal	-	492	422	492	464
Manukau City Kaawa		-	196	24	196	67
Waiheke		-	108	23	163	60
Drury Sand		-	159	104	144	60

Table 3 The key water statistics for the 2006-2007 hydrological year

Key Water Statistics	2004-2005	2005-2006	2006-2007
Number of consents	1,499	1,439	1,343
Groundwater take consents	1,172	1,132	1,059
Surface water take consents	327	307	284
Water allocated	152Mm^3	138Mm^3	139Mm^3
Water Used	118Mm^3	104Mm^3	107Mm^3
Surface water Allocated			105.6Mm^3
Surface water Used			90.5Mm^3
Groundwater Allocated			33.4Mm^3
Groundwater Used			15.7Mm^3
Inactive consents	22%	21%	21%
Quarterly meter returns	90%	91%	91%
Failed quarterly returns	4%	9%	9%
Consents with use exceeding water allocation	12%	14.50%	13.70%

An indirect measure of new water demand in the region is the application to take water or drill new bores. In the 2006-2007 hydrological year there were 315 new applications to take water. In the last 6 years the applications for new bores increased from 90 to 130. The major area in demand from these bores is for domestic and stock use. Demand for irrigation and industry over the past six years has remained relatively stable (Figure 4). The last two years show signs of demand stabilising, this will be a cycle and demand would be expected to increase in the future, due to intensifying agriculture and population growth.

Figure 4 Number of applications for new bores for domestic and stock supply, industry and irrigation



The three main providers of municipal water in the Auckland Region are Watercare Services, Franklin and Rodney district councils. Between these three they provide an estimated population of 1.28 million with reticulated water. Municipal water supply was 70% of the total water allocated in the Auckland region (Table 4).

Table 4 Volumes of surface water and groundwater (Mm3) allocated for Municipal supply in 2006-2007

Municipal Water Supplier	Allocated Surface water (Mm^3)	Allocated Groundwater (Mm^3)	Total Allocation(Mm^3)	Percent of total allocated water
Watercare Services Ltd	84	6.9	90.9	65.0
Franklin District Council	1	3	4	3.0
Rodney District Council	1.2	0.5	1.7	1.0
Total Supply for Municipal use	86.2	10.4	96.6	69.0

Most of the water allocated in the Auckland region comes from the surface water dams in the Hunua and Waitakare Ranges (Figure 5). Watercare Services Ltd operates the dams, and provides the majority of water to the Auckland metropolitan population. If the Watercare Services Ltd allocations were removed then the Auckland central (Mt Wellington – Onehunga Aquifer) and South Auckland (Kaawa and Waitemata Aquifers) water resource areas are the primary sources for abstraction and use (Figure 6).

Figure 5 Comparison of groundwater and surface water allocated in each of the water resource areas including Watercare's allocation

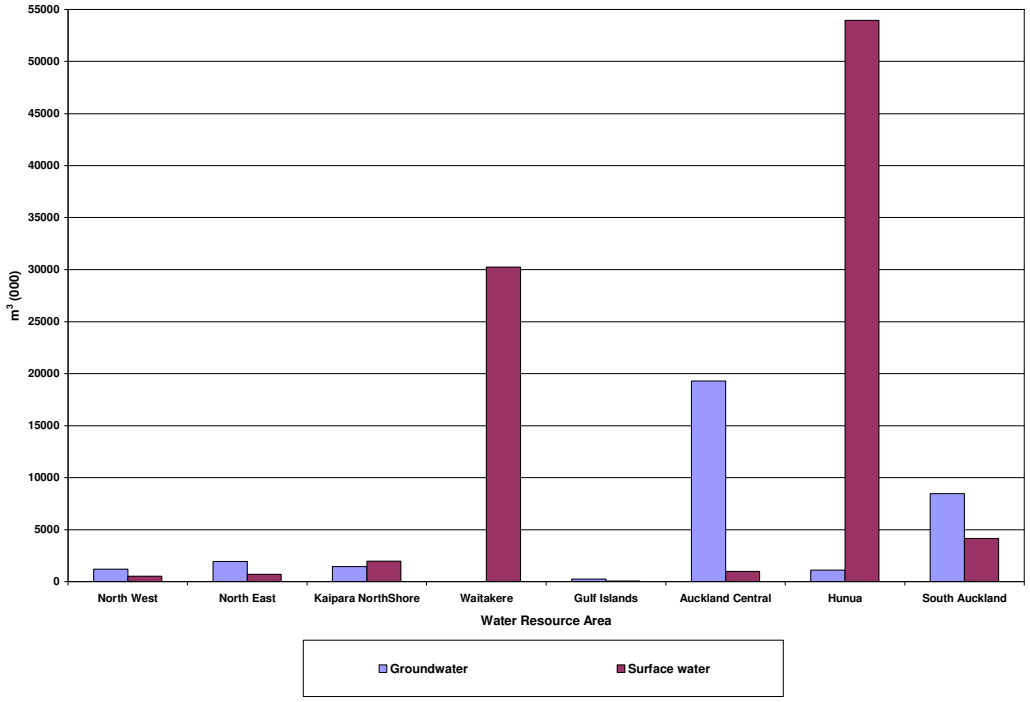
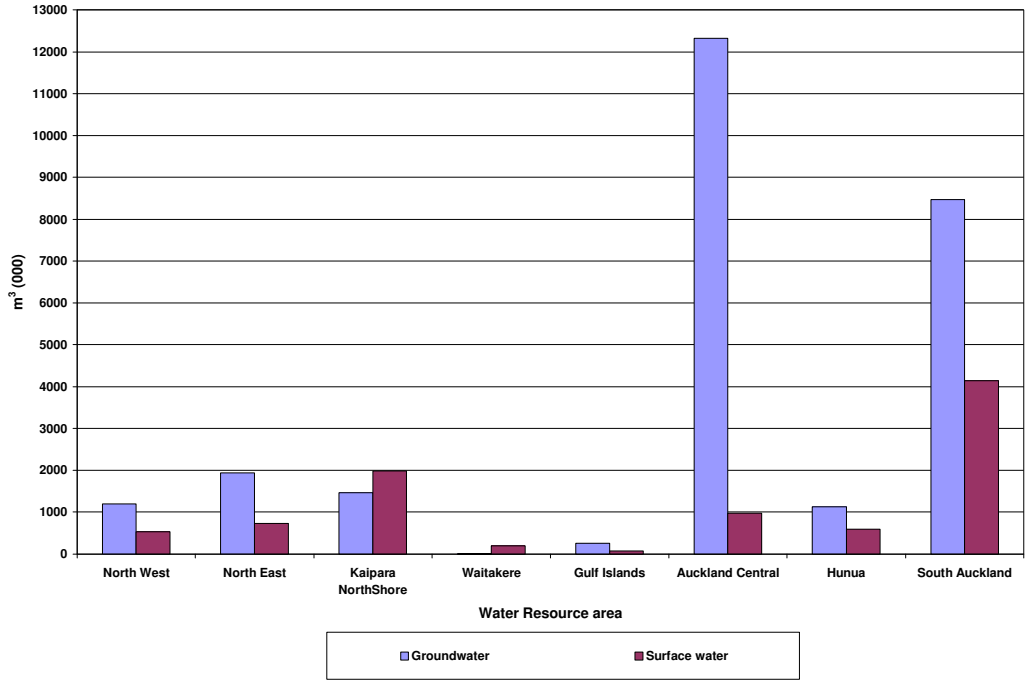


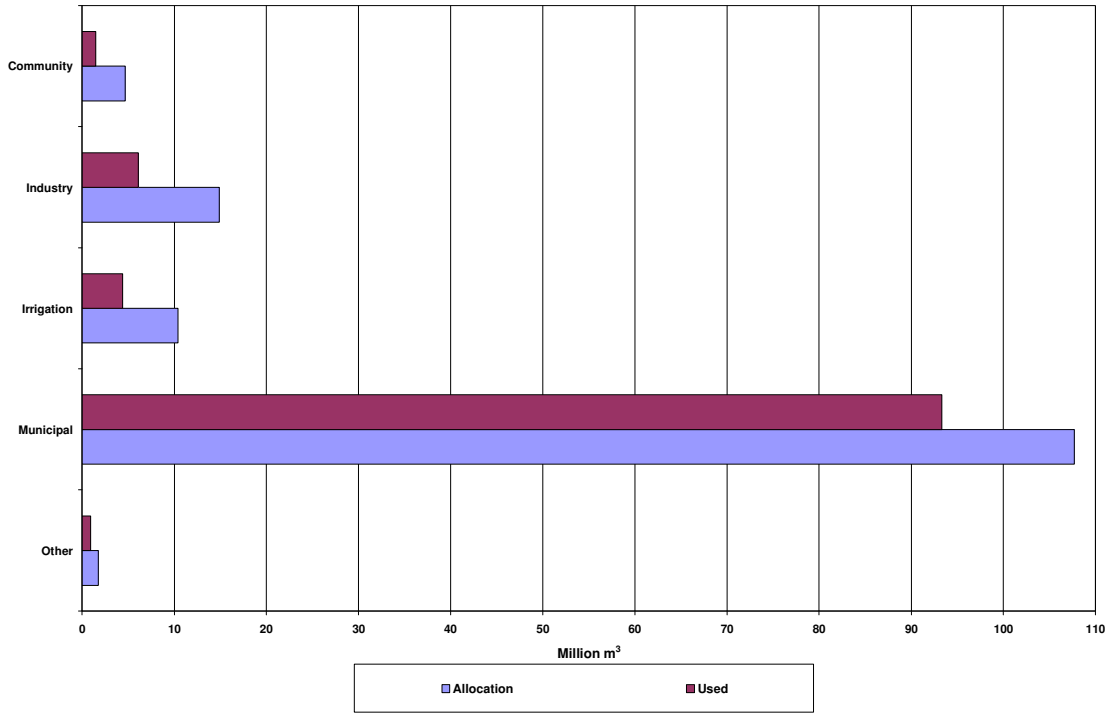
Figure 6 Comparison of groundwater and surface water allocated in each of the water resource areas excluding Watercare's allocation



The total volume of water used for Community, Industry, Irrigation and Other purposes is generally around half of what is allocated (Figure 7). The quantity of water allocated for the Municipal category is close to that which is used. This is due to Watercare Services Ltd consents not having designated allocations, so the annual allocation is set equal to the usage for this report.

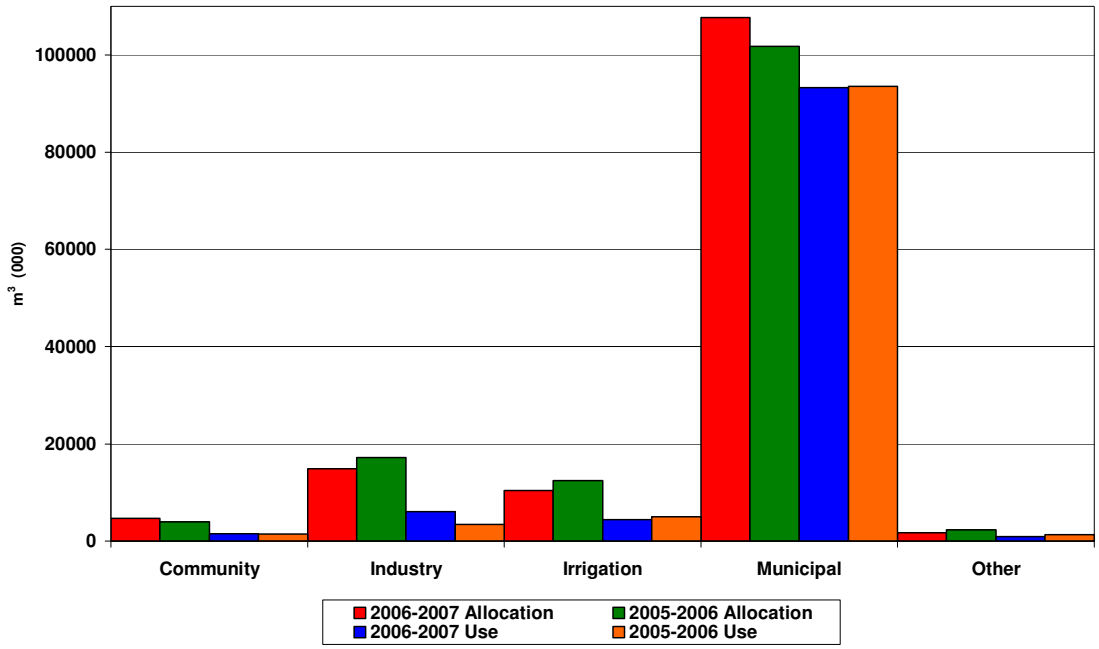
- The 5 water use categories are made up from a range of water use types.
- The Community category is made up from bowling green, sport field, golf course, and community supply.
- The Industry category is made up from pigs, vegetable washing, poultry, industrial use, cooling/circulation and ground dewatering.
- The Irrigation category is made up from hothouse/shadehouse/nursery, pastoral, orchards, market gardening, outdoor nursery.
- The Municipal category is made up from municipal type only.
- The Other category is made up from, domestic and stock, emergency standby use, geothermal water use, and other.

Figure 7 Total allocation and use for each purpose



Allocation and water use in 2006-2007 has been slightly different to the previous hydrological year. Municipal allocation has increased but total use has remained the same. The allocation for industry has decreased but total use has gone up. Allocation for irrigation has decreased as has the use. These decreases in allocation are associated with the fall in consent numbers over the 2006-2007 year (Figure 8).

Figure 8 Comparison of allocation and use for each purpose between the two hydrological year 2005-2006 and 2006-2007

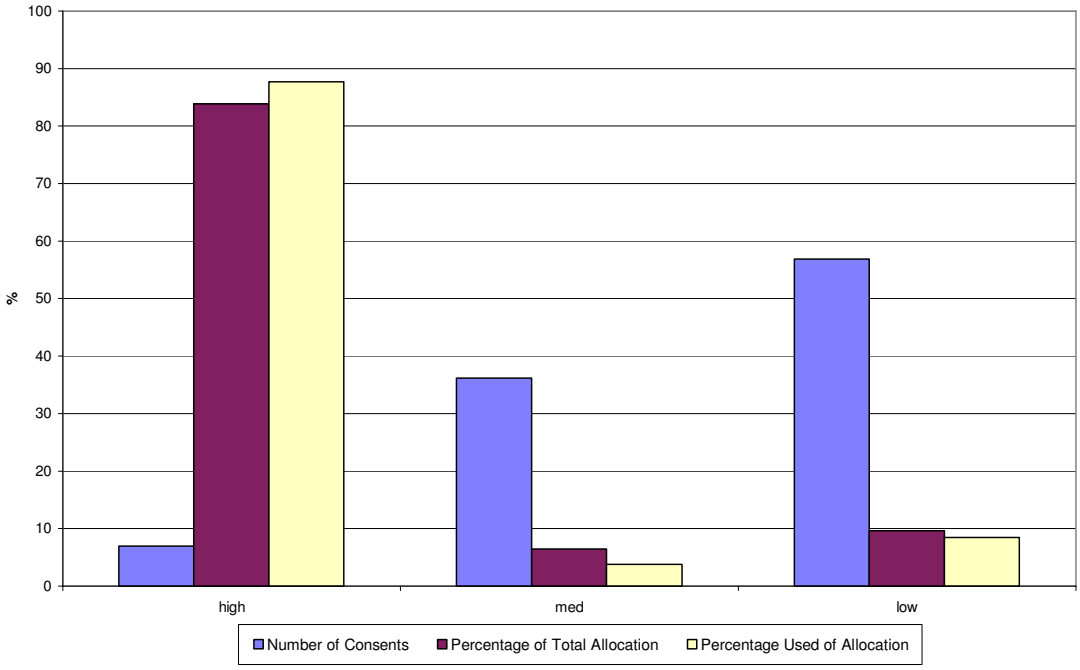


Consent holders are categorised into 3 different types of monitoring priority, high, medium and low. This priority is decided on the resource which the water is extracted, or the quantity extracted so a high use aquifer or a large consent will have high priority.

High priority monitoring consents have complex conditions where, if conditions are not fully complied with, it could potentially have a major adverse effect on the environment. Medium monitoring consents are those that take or divert larger quantities of water from highly allocated aquifers and catchments and there is the potential for significant adverse effects on the environment. Taking more than 50 m^3/day from a stream will fall into the medium category. Groundwater take consents from a high use aquifer that cumulatively make up about 80% of the total annual allocation will also fall into the medium category. Low impact monitoring consents are to take/divert smaller quantities of water or to take/divert water from aquifers and catchments that are not highly allocated. The level of monitoring required for these consents is lesser than that required for Medium monitoring consents.

7% of consents are high priority but they include 84% of all the water allocated in the Auckland region. In contrast 57% of consents are low priority and they are allocated only 9.6% of the water (Figure 9).

Figure 9 Percentage of consent holders in each monitoring category and the percentage of water allocated and used



1.5 Irrigation

The Auckland region produces 44% of the national total area of "indoor" fruit, vegetable and flower production, 66% of the indoor capsicum, 60% of the indoor tomato growing, 26% of the national onion and 7% of the national potatoes (Ministry of Agriculture Production Survey, 2002).

During the 2006-2007 hydrological year 10.4Mm^3 of water was allocated for irrigation and only 4.4Mm^3 of water was used. Irrigation, allocation and use were both down due to several consents becoming inactive from the previous year. The total land irrigated during the year by consent holders was 5091 Ha. This equates to approximately 2042m^3 of water being allocated per hectare and 864m^3 of water actually being used per hectare. This was slightly higher than the previous year and can be associated with the decreased rainfall throughout the hydrological year.

1.6 Industry

During the 2006-2007 hydrological year there were 167 active consents to take water for industrial purposes. Of this manufacturing and processing was 76.5%, the food sector was 18.5% and cooling/circulation/dewatering was 5.0% of the total consent numbers. There has been an increase in both manufacturing and the food sector while cooling/circulation and dewatering had decreased by 7%. Dewatering consents are often short term as the dewatering is during the construction phase of a project. The total volume allocated for these uses was 14.6Mm^3 and only 5.9Mm^3 was used. This

allocation excludes water being provided by municipal supply. Of the water allocated 13% was from surface water and 87% from groundwater, all of the water supplied for the food sector comes from a groundwater source.

2 North West

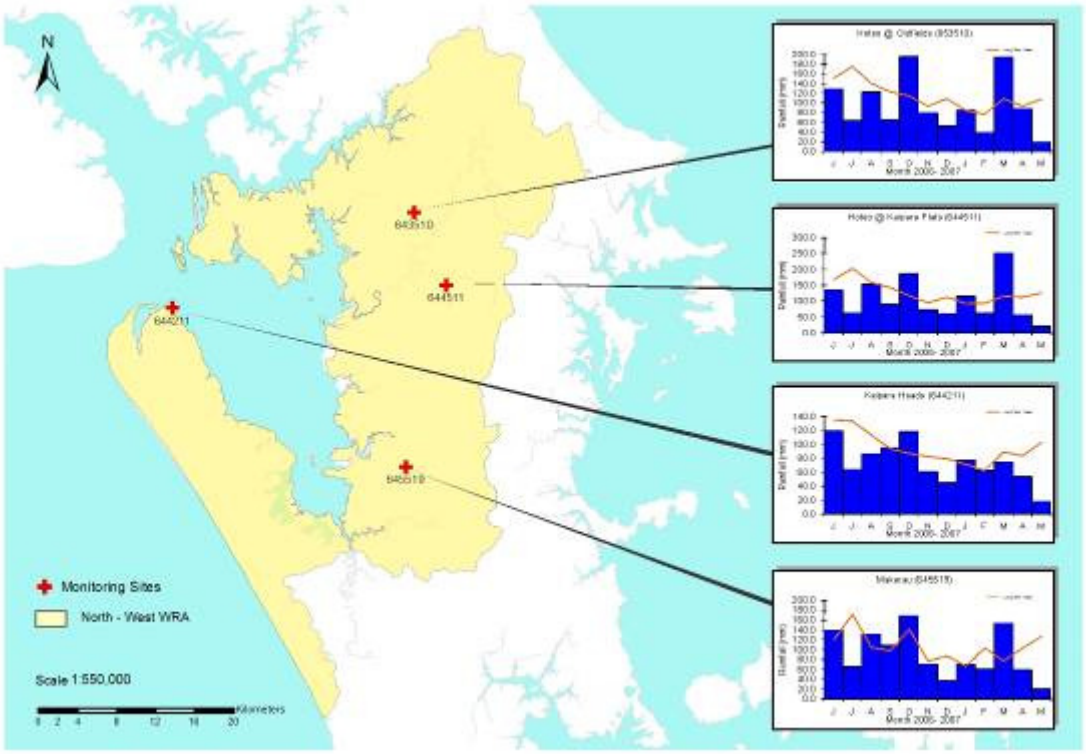
2.1 Rainfall

The total rainfall for the North West water resource area was between 15 and 18.5% below the long term average (Table 5). In August and January rainfall was close to the average. The months of October and March were 50-100 % above the average. In July, December and March there was a 50-70% reduction in rainfall making these three months very dry (Figure 10).

Table 5 Comparison of 2006 - 2007 rainfall with long term mean at 4 sites

Site Number	Site Name	Mean Annual Rainfall June - May (mm)	Total Rainfall June 2006 - May 2007 (mm)	% Deviation from Average
643510	Hoteo at Oldfields	1387	1131	-18.5
644211C	Kaipara Heads	1034	876.6	-15.2
644511	Hoteo at Kaipara Flats	1537	1271	-17.3
645519	Makerau	1279	1087	-15.0

Figure 10 Total Monthly rainfall (bars) and long term mean monthly rainfall (line) at 4 sites in the North West resource area



2.2 Surface Water

In the North West water resource area there are four high use management streams, Whangaripo, Waititoki, Waikahikatea and Waipapakura (Figure 11). The Whangaripo stream is a tributary of the Hoteo River and currently there are no flow-monitoring sites for this stream.

The Waitoki, Waikahikatea and Waipapakura currently have no monitoring sites but they are all sub-catchments of the Kaukapakapa River. There are spot measurements undertaken on the Waikahikatea stream (site # 45405) these are related back to the Kaukapakapa flow site. The flow-monitoring site on the Kaukapakapa River is located at Taylors (45415), catchment area 61.92km^2. The MALF of the site is 22.0 l/s, flows were below the MALF on 14 days and the lowest recorded flow was 15 l/s. This flow period below the MALF was due to a combination of pumping on the stream and a prolonged period of low rainfall from December February.

Figure 11 North West water resource, high use stream management areas and flow monitoring site

2.3 Groundwater

2.3.1 Parakai Geothermal Aquifer

The North West water resource area has only one high use management aquifer, the Parakai geothermal aquifer (Figure 12). The PARP: ALW sets the groundwater management level in Parakai bore (6464007) at 2.5m above mean sea level (amsl), averaged over a 12-month period. The average groundwater level recorded at Parakai between 1 June 2006 and 31 May 2007 was 2.90m amsl[2] (Figure 13).

The water levels in the aquifer stayed above the long term mean for the site over the period. Yet there were occasions where the minimum groundwater level dropped below management level of 2.5 amsl.

Figure 12 North West water resource area, high use aquifer management area and groundwater monitoring site

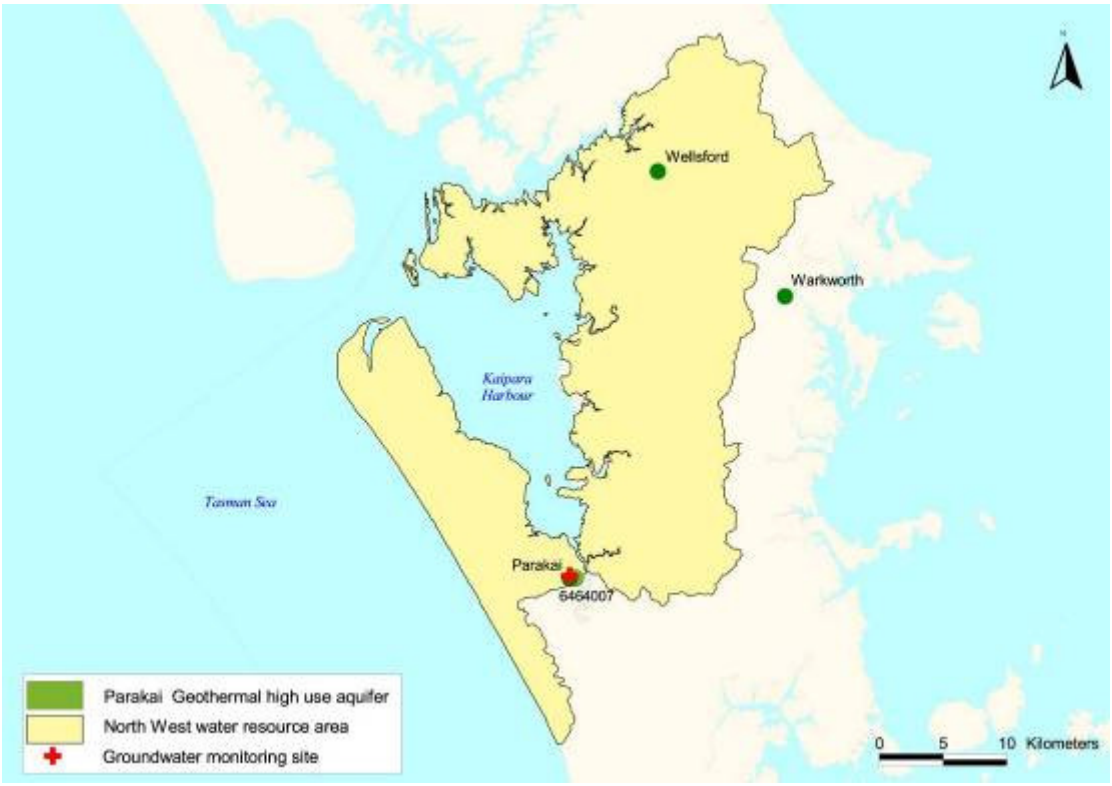
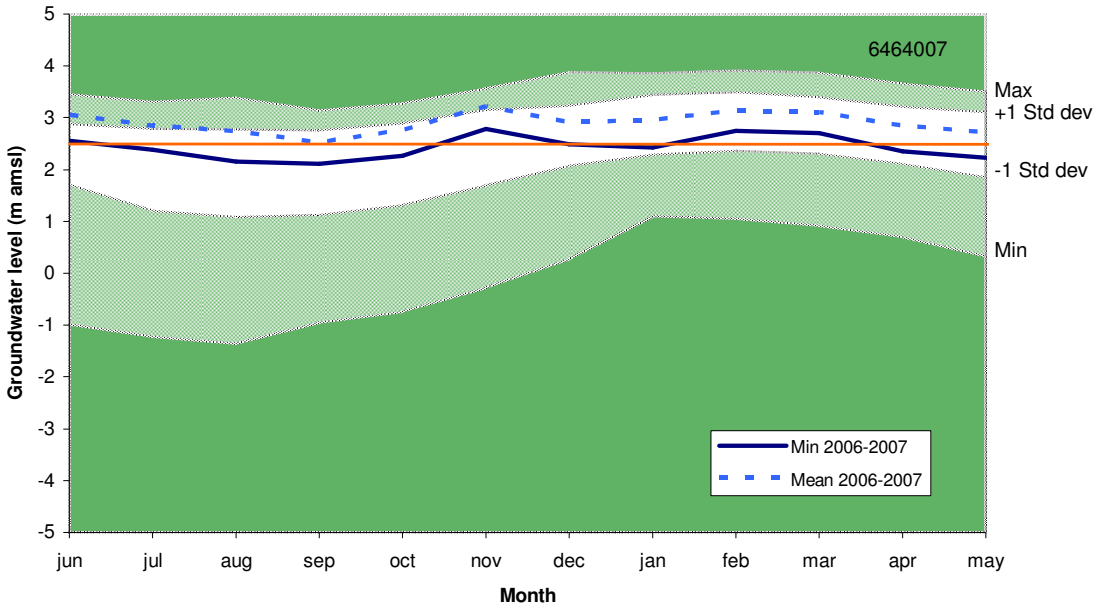


Figure 13 Groundwater envelope for Parakai geothermal bore (6464007). The orange line indicated the groundwater management level of 2.5m amsl (above mean sea level).

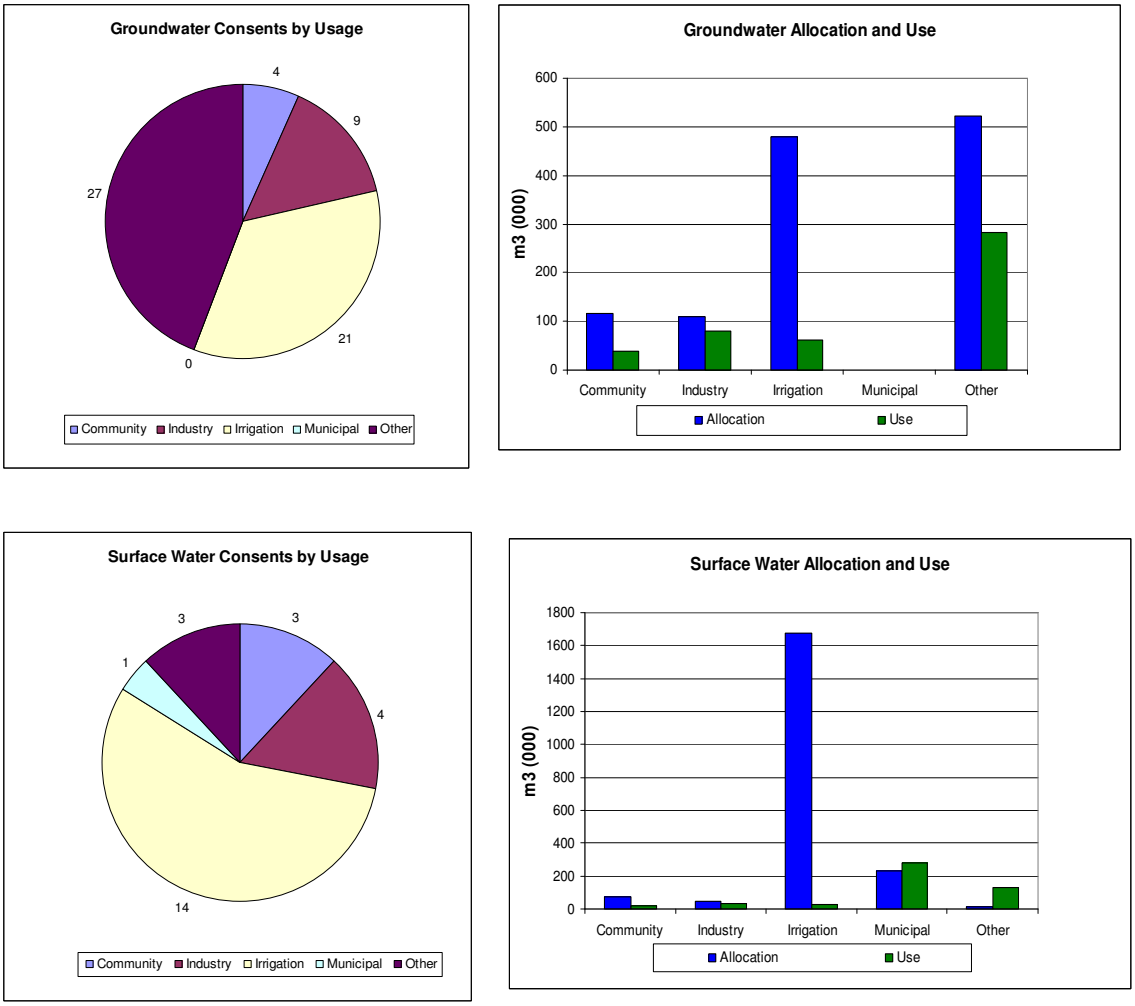


2.4 Water Use and Allocation

The majority of the North West water resource area is rural farmland, used for dairying and dry stock (Crowcroft and Bowden, 2002). The region has large surface water allocations for irrigation of dairy pasture land of which only 1.7% was used. There was also a high portion of groundwater allocated for irrigation for dairy pasture land of which 12% was used. The other major use in the region is from groundwater sources such as the Parakai geothermal aquifer most of this use is for private spa pools, and use was approximately 50% of allocation. Surface water municipal use exceeded that allocated as with the previous year (Figure 14).

The number of consents has increased for groundwater from 53 in May 2006 to 61 in May 2007. The surface water consent numbers have decreased from 28 in May 2006 to 25 in May 2007.

Figure 14 Surface water and Groundwater allocation and use for the North West water resource area and the number of consents for each purpose



3 North East

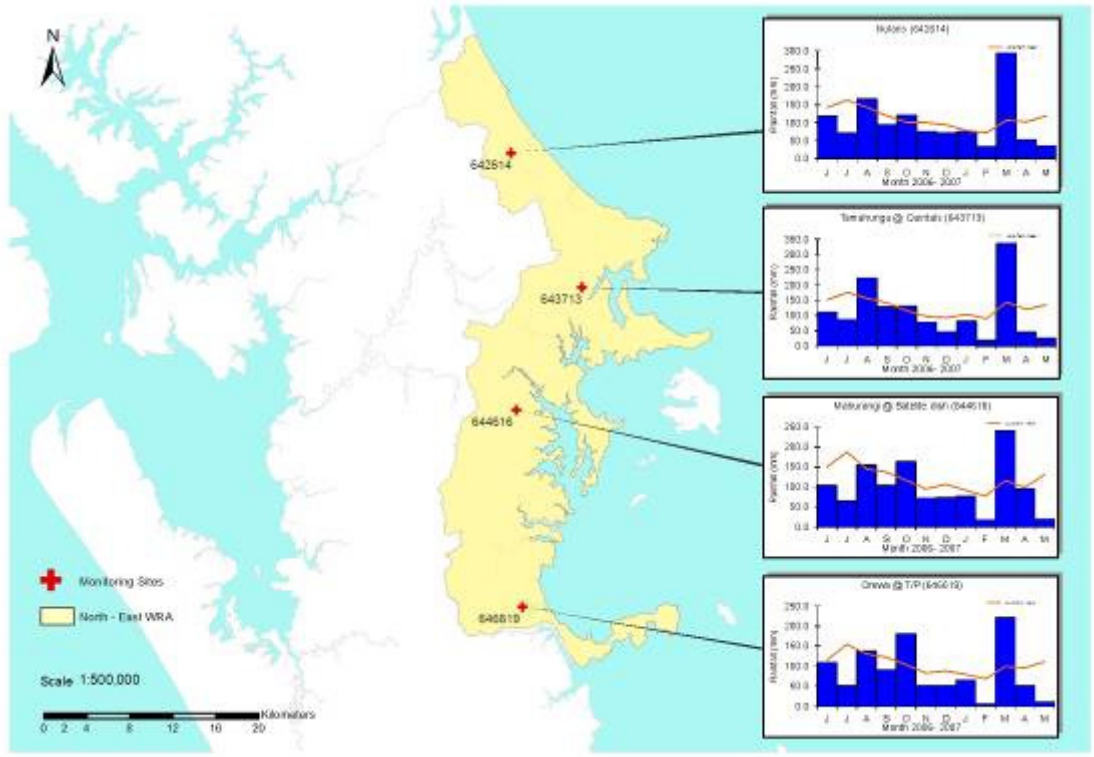
3.1 Rainfall

The North East water resource area was between 9.7 – 18.3% below the long term average (Table 6). Late winter was generally close to the average rainfall. The months of July, February and May were all 50-60% below average. March was 130% above the average making it an extremely wet month (Figure 15). This high rainfall in March was associated with north-easterly air flows bring heavy rains to this area of the region.

Table 6 Comparison of 2006 - 2007 rainfall with long term mean at 4 sites

Site Number	Site Name	Mean Annual Rainfall June - May (mm)	Monthly rainfall total (mm) (June 2006 - May 2007)	% Deviation from Average Rainfall
642614	Nolans	1353	1222	-9.7
643713	Tamahunga at Quintals	1530	1320	-13.7
644616	Mahurangi Satelite Dish	1461	1194	-18.3
646619	Orewa Treatment Ponds	1261	1036	-17.8

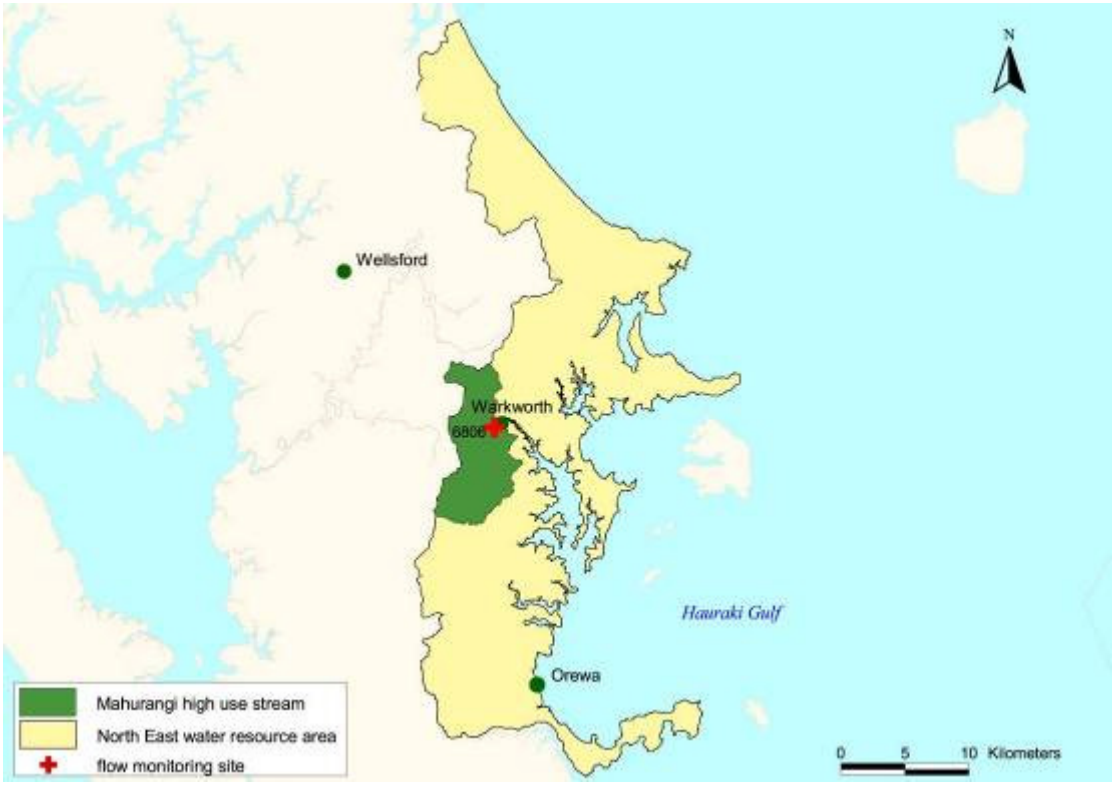
Figure 15 Total monthly rainfall (bars) and long term mean monthly rainfall (line) at 4 sites in the North East water resource area



3.2 Surface Water

The flow-monitoring site is located on the Mahurangi river at the rear of the Mahurangi College at Warkworth (6806), catchment area 46.80km^2 (Figure 16). The Mahurangi is the only high use management stream in the North East water resource area. In 2005-2006 records show the lowest flow was 95.0 l/s, with the MALF of 69.0 l/s. During 2006-2007 records the lowest flow recorded was 35.0 l/s, a decrease of 60.0l/s from the previous year. This was also well below the MALF for the site, with flows being less than the MALF for 39.2 days starting on the 13/02/2008. This was caused by a very dry summer from November to February with well below average rainfall, causing the natural flow recession in the catchment.

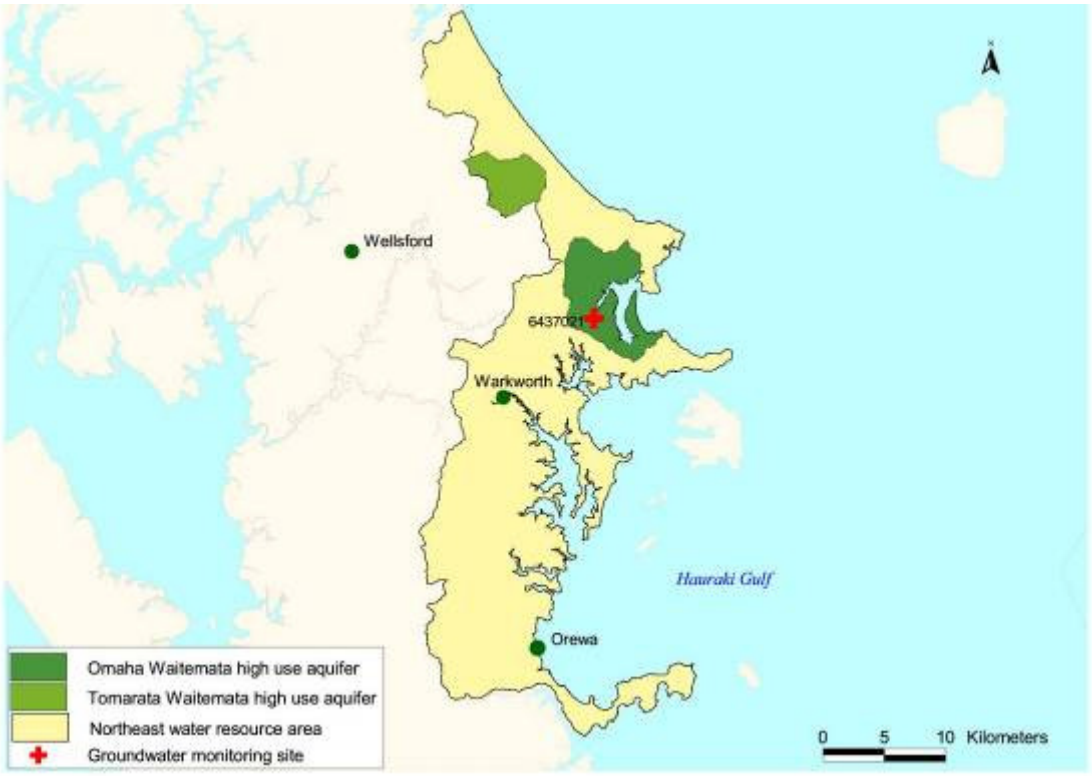
Figure 16 North East water resource area, high use stream and management area and flow monitoring site



3.3 Groundwater

The North East area contains three high use aquifer management areas, Tomarata Waitemata, Omaha Waitemata and the Waiwera Geothermal aquifer (Figure 17). There is currently no monitoring site on the Tomarata Waitemata aquifer. The aquifer is managed by ensuring that the consent holder's water abstraction remains within the consent conditions.

Figure 17 North East water resource area, high use aquifer management areas and groundwater monitoring site



3.3.1 Omaha Waitemata Aquifer

The Omaha Waitemata aquifer has several ARC groundwater monitoring sites. The Omaha (6437021) monitoring site, which is located in the main horticultural area of the Omaha Flats, has been set a management water level of 3.25m amsl by the PARP:ALW. During 2006-2007 the average groundwater level recorded was 4.481m amsl. The minimum level for the year came very close to the management level (Figure 18). The groundwater level during the June-October recharge period was slightly below the long term mean water level for the site. There are currently 30 consents for the Omaha Waitemata aquifer. The consented water allocation and usage is well within the water availability of 105,000 m^3/year.

3.3.2 Waiwera Geothermal Aquifer

The Waiwera geothermal aquifer has a bore (6457041) located above the Waiwera beachfront (Figure 19). The PARP: ALW has set an average management level of 0.5m amsl. The average groundwater level for June 2006 to May 2007 was 0.277m amsl. This is well below the management level for the aquifer. The total water allocation was the same as the previous year and use was up. This is some concern as the mean water level has been below the management point of 0.5 amsl. These points are indicative of conditions permitting saltwater and cold freshwater entering the geothermal aquifer.

Figure 18 2006 – 2007 Groundwater envelope for Omaha Waitemata aquifer bore 6437021. The orange line indicates the groundwater management level of 3.25m amsl.

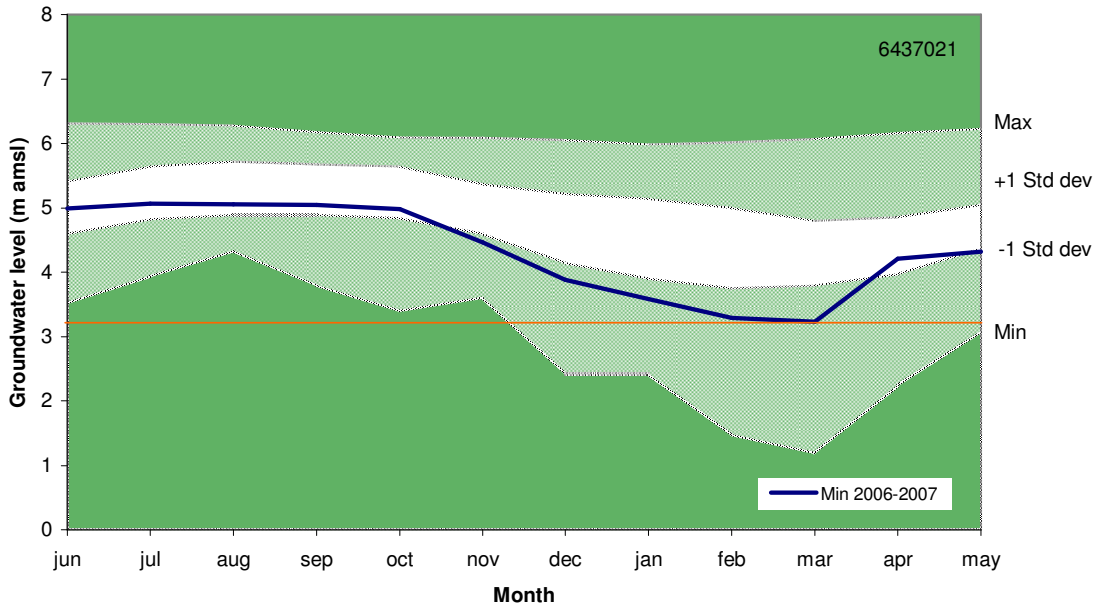
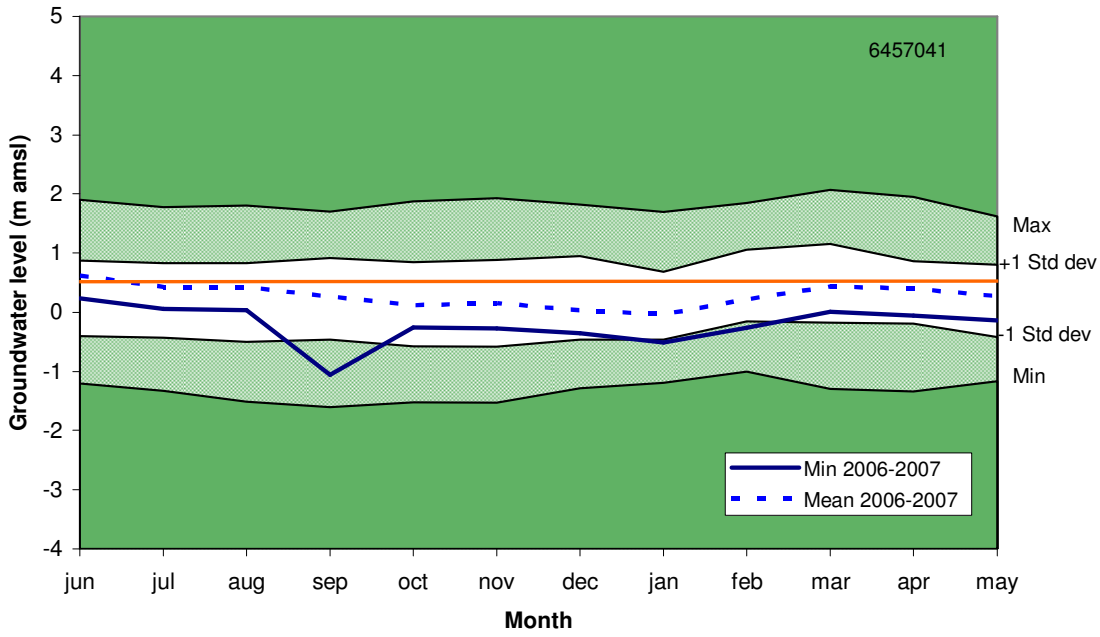


Figure 19 2006 – 2007 Groundwater envelope for Waiwera geothermal aquifer bore 6457041. The orange line indicates the groundwater management level of 0.5m amsl



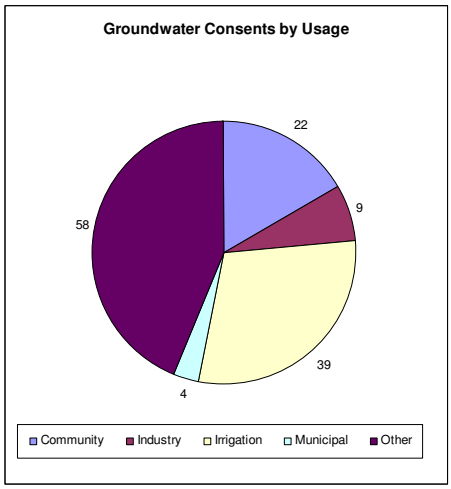
3.4 Water Allocation and Use

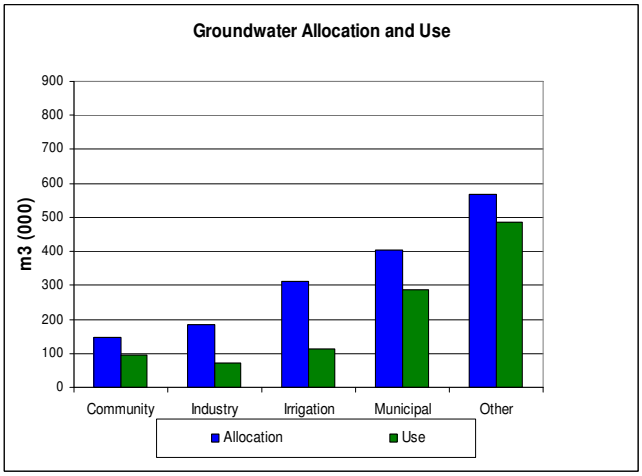
The Omaha high use aquifer management area has an availability of 105,000m^3/year. The aquifer is currently fully allocated with 30 consent holders allowed to take 66,000 m^3/year; the remaining 50,000m^3/year has been allocated for permitted activities, stock use, dairy shed use and domestic supply. In the year 2006-2007 water use was 54,000m^3, in the previous year the use was greater than that allocated.

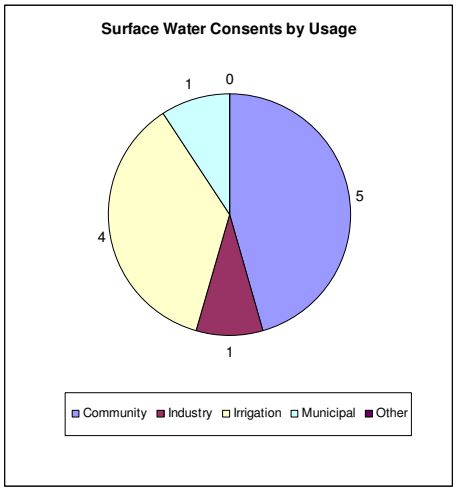
The Waiwera geothermal aquifer is fully allocated although availability has not been set in the PARP: ALW (2001). The main issue with this aquifer is that the groundwater level was below the management level for the majority of the year. The aquifer beach front monitoring bore has shown to be very sensitive to large abstractions from nearby bores.

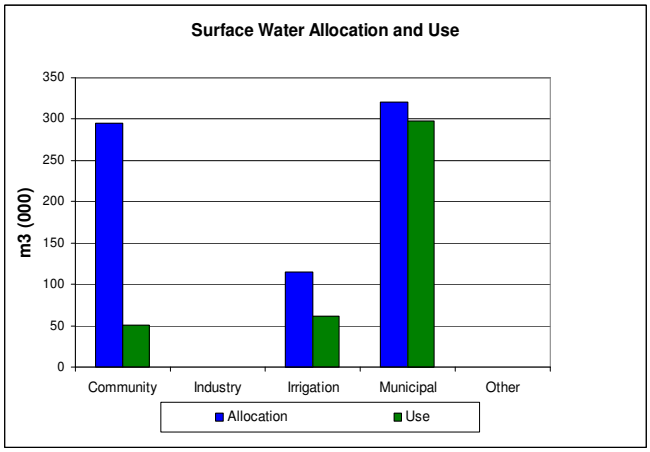
Surface water community supply use was only 17% of the allocation (Figure 20). During 2005 - 2006 water use exceeded allocation for municipal supply from surface water sources. But during this reporting hydrological year 2006 – 2007 the use was less than allocated. Groundwater allocation and usage from other sources has dropped from the previous year (Figure 20). Surface water consent numbers in May 2007 have dropped from 12 to 11 from the previous year. Groundwater consent numbers in May 2007 have also decreased from 138 to 132.

Figure 20 Surface water and groundwater allocation and use for the North East water resource area and the number of consents for each purpose









4 Kaipara River – North Shore

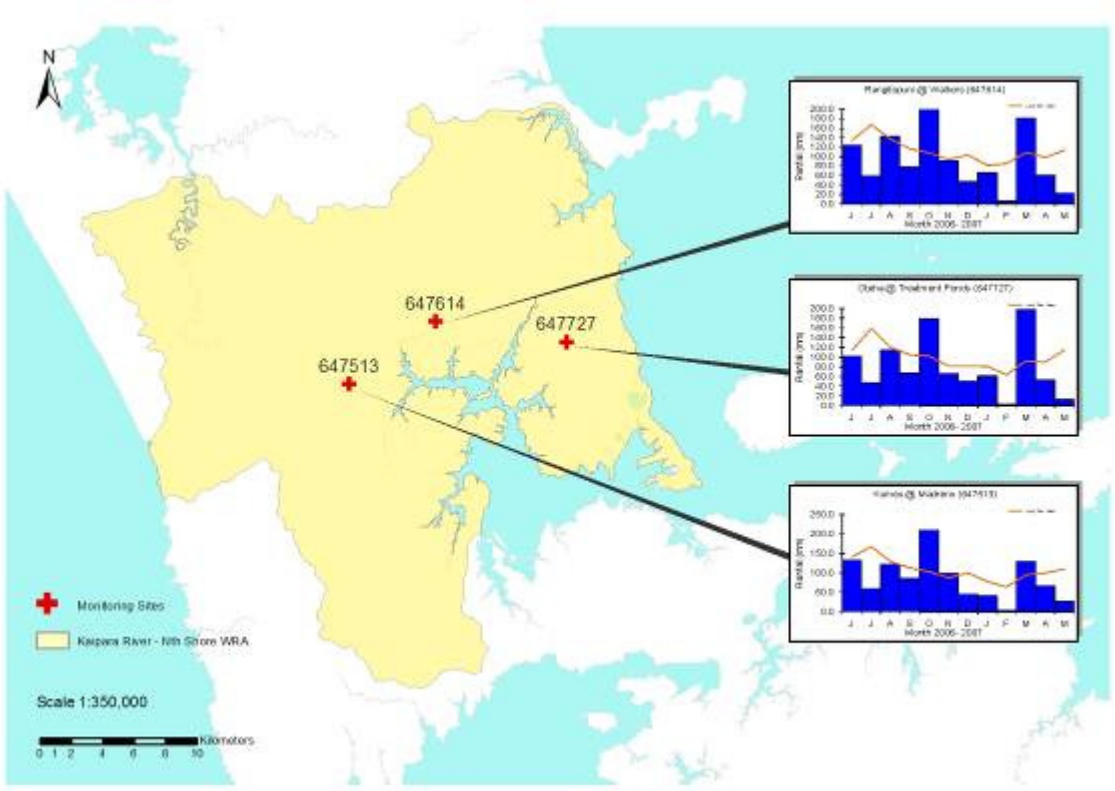
4.1 Rainfall

The Kaipara – North Shore water resource area received 20% less rainfall than the average during the 2006 - 2007 hydrological year (Table 7). This was a result from low rainfall in July, February and May, being 50-70% drier than the average. The months of October and March received approximately 50% above the long term monthly average (Figure 21).

Table 7 Comparison of 2006 - 2007 rainfall with long term mean at 3 sites

Site Number	Site Name	Rainfall Mean Total for Period June - May (mm)	Rainfall Total June 2006 - May 2007 (mm)	% Deviation from Average Rainfall
647614C	Rangitopuni at Walkers	1351	1079	-20.1
647513C	Kumeu at Maddrens	1288	1020	-20.8
647727C	Oteha at Treatment Ponds	1204	953.2	-20.8

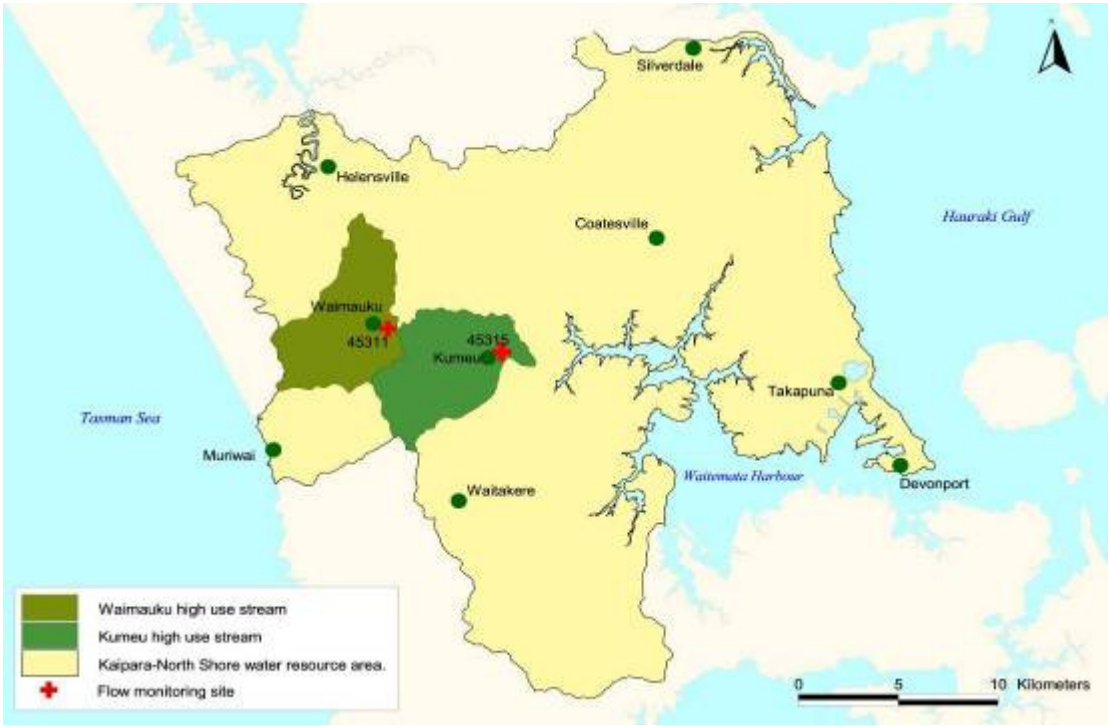
Figure 21 Total Monthly rainfall (bars) and long term mean monthly rainfall (line) at 3 sites in the Kaipara River - North Shore water resource area



4.2 Surface Water

The Kaipara River – North Shore water resource area has two high use management streams, the Waimauku Stream and Kumeu River. Both these are sub-catchments of the Kaipara River (Figure 22). The flow-monitoring site on the Kaipara River lies upstream of the Waimauku Stream and the Kaipara River confluence (site #45311, catchment area 155 km^2). For 2005-2006 the flows at this site fell below the MALF for 9 days. Contrasting results were recorded in 2007 where the flow fell below the MALF (139.9l/s) on 39 days commencing 12 February 2007, with 69.0 l/s being the lowest recorded flow for the period. The upstream flow-monitoring site on the Kumeu River (site #45315, catchment area 47.6 km^2), did not fall below the MALF (22.5 l/s), the lowest reading 23.0 l/s. The low flows measured at Kaipara are due to low rainfall received in the catchment from November to February.

Figure 22 Kaipara River – North Shore water resource area, high use stream management areas and flow-monitoring sites



4.3 Groundwater

The Kaipara River – North Shore water resource area has only one high use management aquifer, the Kumeu - Waitemata aquifer (Figure 23). The area is divided into three different zones due to the variation in density of demand for groundwater. Zone 1 is fully allocated (although use is less than availability), Zones 2 and 3 are not fully allocated and the aquifer as a whole is not fully allocated.

4.3.1 Kumeu - Waitemata Aquifer

The ARC representative groundwater monitoring site is located at Selaks in Kumeu (6475003). It is used to monitor long-term baseline groundwater levels (Figure 24). The groundwater levels from June to October 2006 were close to the long term mean level for the site, this represents winter aquifer recharge. December 2006 to May 2007 show a decrease in groundwater levels probably due to extraction and reduced rainfall especially in February. The heavy rains in late March started to raise the levels back towards the long term mean.

Figure 23 Kaipara River – North Shore water resource area, high use aquifer management area and groundwater monitoring site

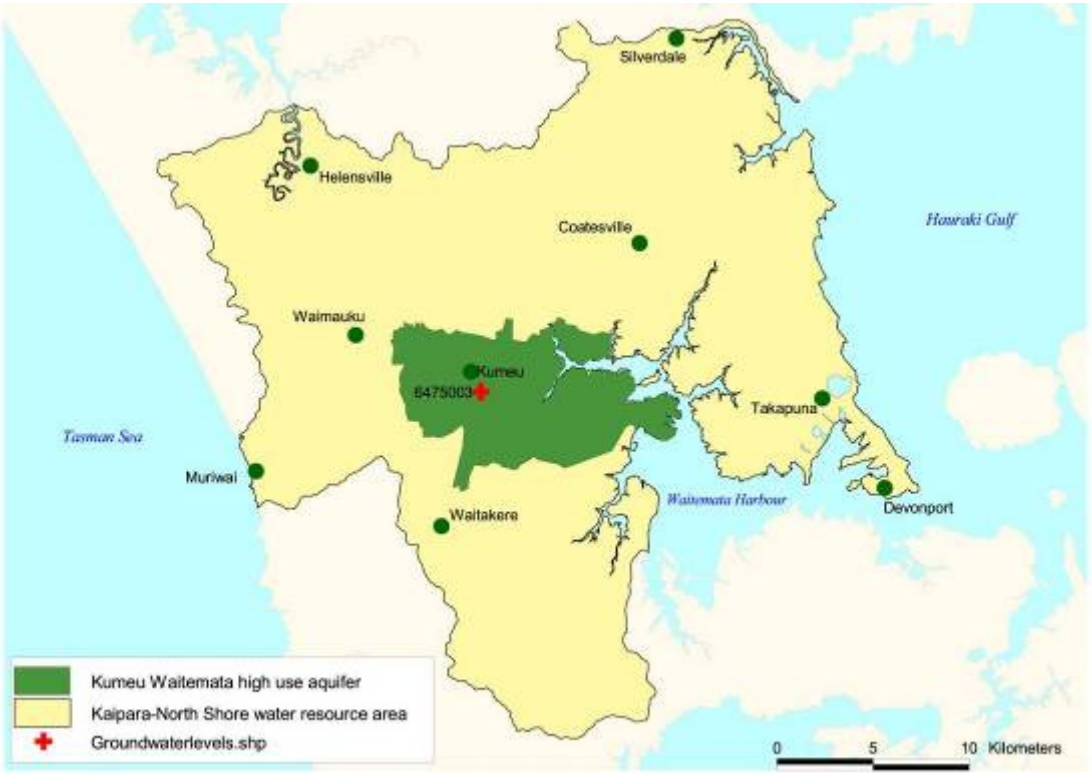
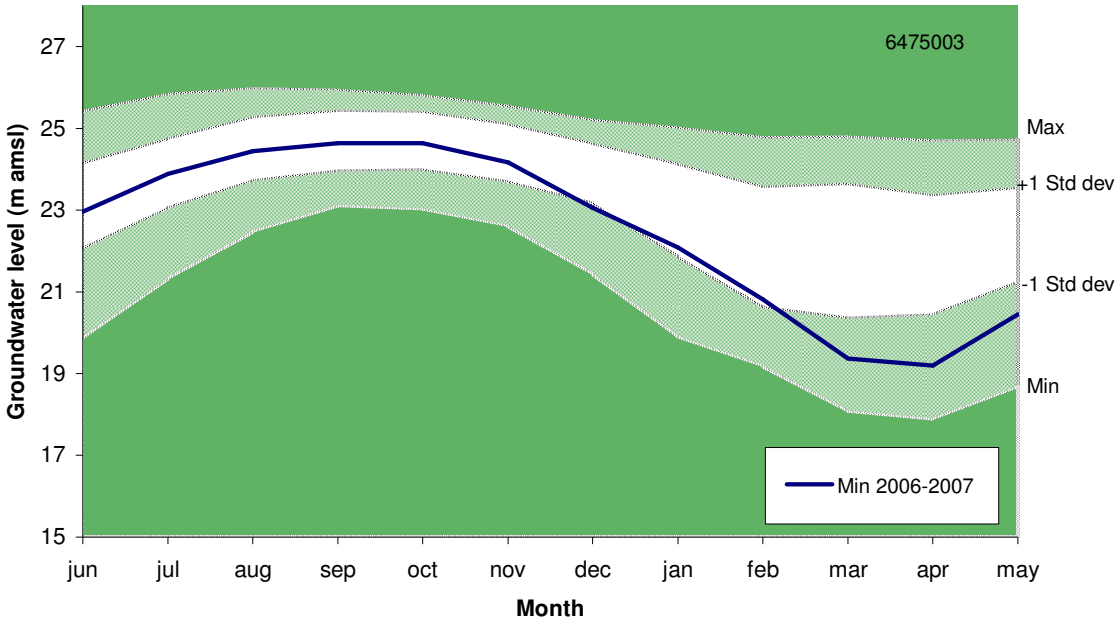


Figure 24 Groundwater envelope for Kumeu – Waitemata aquifer monitoring site at Selaks vineyard, Kumeu (6475003)



4.4 Water Allocation and Use

Kaipara River – North Shore is the second most urbanised of the water resource areas in the Auckland region, with major urban centers in North Shore and Waitakere. There are also significant levels of horticulture, farming and forestry beyond the urban boundary. (Crowcroft and Bowden, 2002)

The quantity of surface water and groundwater allocated for irrigation has remained the same while the usage is approximately 50% (Figure 25). Municipal surface water use has increased by 150,000 m^3 in the year 2006-2007.

The number of surface water consents has decreased from 71 in May 2006 to 65 in May 2007. Groundwater consent numbers has decreased from 268 in May 2006 to 250 in May 2007 (Figure 25).

The Kumeu- Hobsonville Waitemata aquifer has been divided into management areas of zones 1, 2 and 3. Zone 1 is further divided in zones 1a to 1f. The zones do not represent hydro-geological boundaries but have been created by large concentrations of consents in small areas. Currently zones 1a and 1f are over allocated, but for the whole aquifer the total use is only 27% of the total availability of 1,559,000 m^3/year.

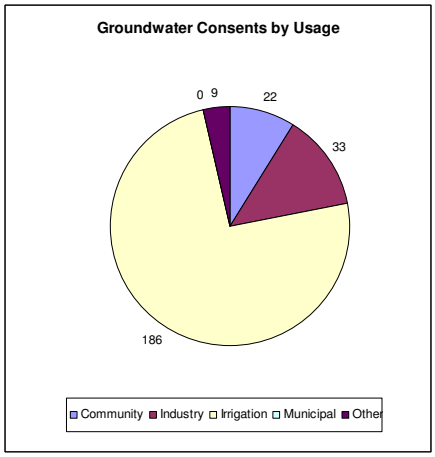
Zones 1a and 1f currently have use exceeding availability (Table 8). For the year 2006-2007 the total use in zone 1a was 114% of the availability and 1f was 170% of the availability. Both of these zones are very small and are surrounded by Zone 2. Zone 2 currently has 365,000 m^3 of surplus water. Remembering there are no hydro-geological boundaries between these zones then the excess use in zone 1a and 1f is balanced by

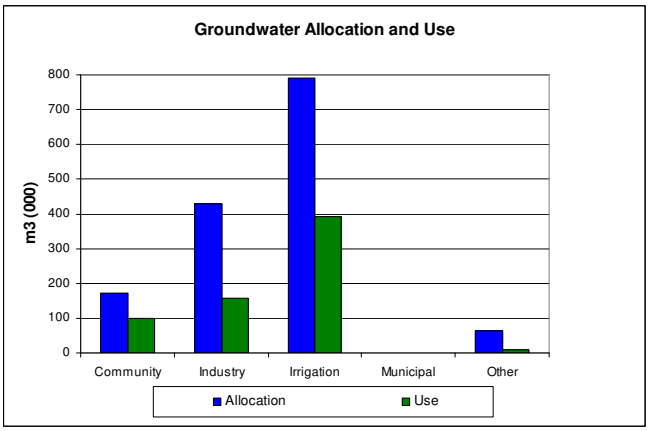
the surplus of water in zone 2, therefore the actual use in the area is well within the total availability (Table 8). The Selaks monitoring bore is showing no signs of adverse effects from these small concentrated areas of exceeding users.

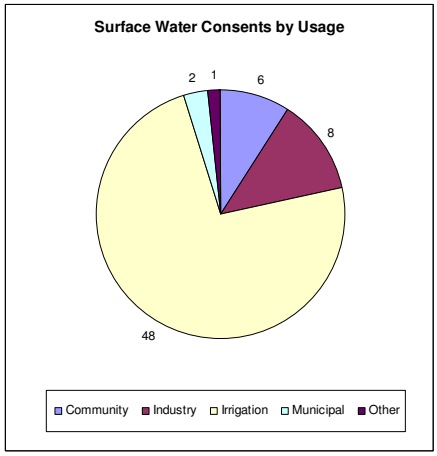
Table 8 Kumue-Watemata high use aquifer management area, availability allocation and use for 2005-2006 and 2006-2007

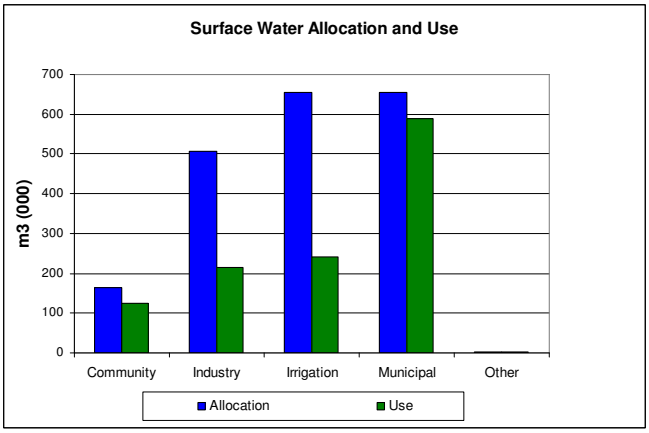
Kumeu Waitemata Aquifer sub area	Availability m^3(000)	2005-2006		2006-2007	
		Allocation m^3(000)	Use m^3(000)	Allocation m^3(000)	Use m^3(000)
1a	116	136	113	133	133
1b	21	16	19	9	6
1c	30	26	24	24	10
1d	33	30	2	32	8
1e	6	6	3	6	3
1f	5	13	0.04	13	8.5
1	211	227	161	217	168
2	586	540	180	516	221
3	762	70	31	67	33

Figure 25 Surface water and groundwater allocation and use for the Kaipara - North Shore water resource area and the number of consents for each purpose









5 Waitakere

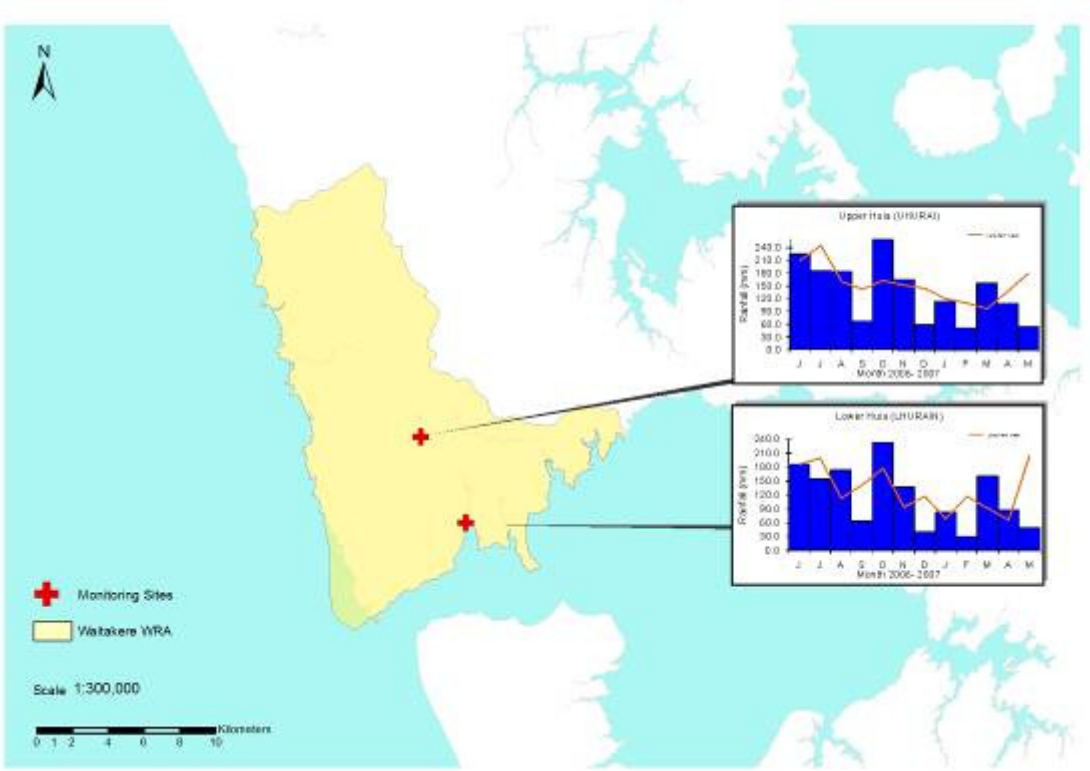
5.1 Rainfall

The Waitakere water resource area had approximately 13% less rainfall than average (Table 9). Winter 2006 received normal rainfall conditions while October 2006 and March 2007 were well above average. The area was very dry in September, December, February and May with rainfall being 50% less than average (Figure 26).

Table 9 Comparison of 2006 - 2007 rainfall with long term mean at 2 sites

Site Number	Site Name	Mean Annual Rainfall June - May (mm)	Total Rainfall June 2006 - May 2007 (mm)	% Deviation from Average Rainfall
Lhurain	Lower Huia Dam	1574	1336	-15.1
Uhurain	Upper Huia Dam	1857	1628	-12.3

Figure 26 Total monthly rainfall (bars) and long term mean monthly rainfall (line) at 2 sites in the Waitakere water resource area



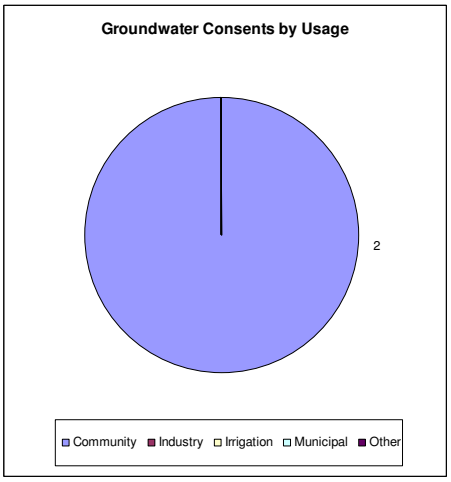
5.2 Surface Water & Groundwater

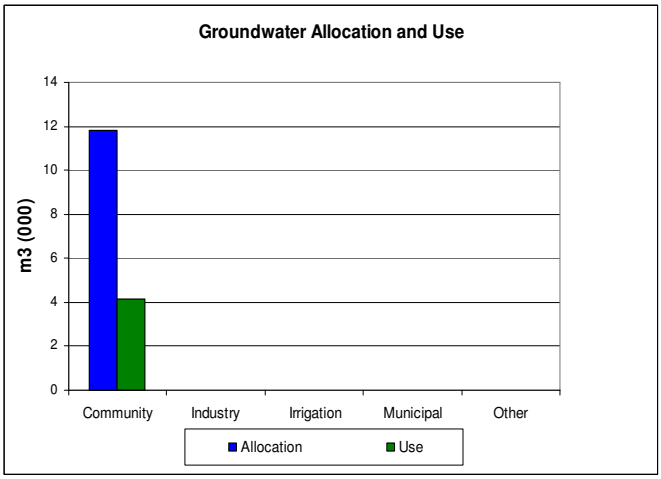
The Waitakere water resource area does not contain any high use stream or high use aquifer management areas. This area does, however, have the second highest water allocation in Auckland Region due to the surface water taken from dams by Watercare Services Ltd.

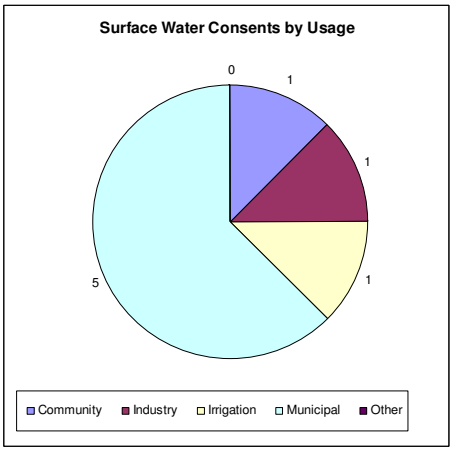
5.3 Water Allocation and Use

Watercare Services Ltd, abstractions from large supply dams in the Waitakere ranges is the foremost use of water in the Waitakere water resource area. These include the Waitakere Dam in the Waitakere River catchment, the Upper and Lower Nihotupu dams on the Nihotupu Stream and the Upper and Lower Huia dams on the Huia Stream (Crowcroft and Bowden, 2002). The total water allocated to Watercare Services represents 99.5% of all the water allocated in the area (Figure 27). Watercare Services have increased water use by 6.0 Mm^3 from the previous year. When Watercare Services values have been excluded the surface water allocation and use data is very similar to the previous year. The irrigation consent has been exercised to its full allocation which could be attributed to the dry hydrological year. There is still a large amount of water allocated to Industry but this consent has not been used (Figure 28).

Figure 27 Surface water and groundwater allocation and use for the Waitakere water resources area and the number of consents for each purpose







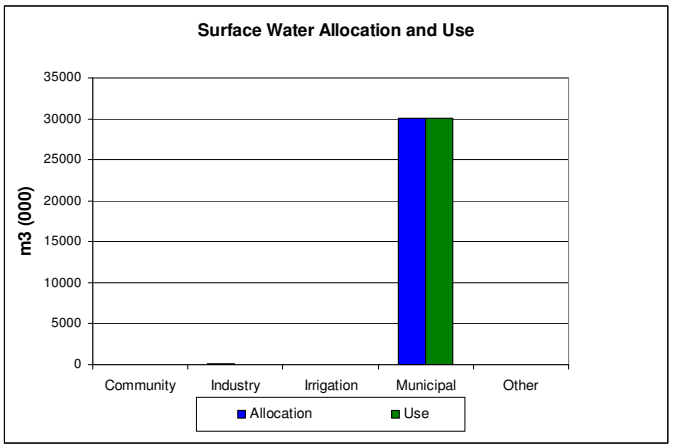
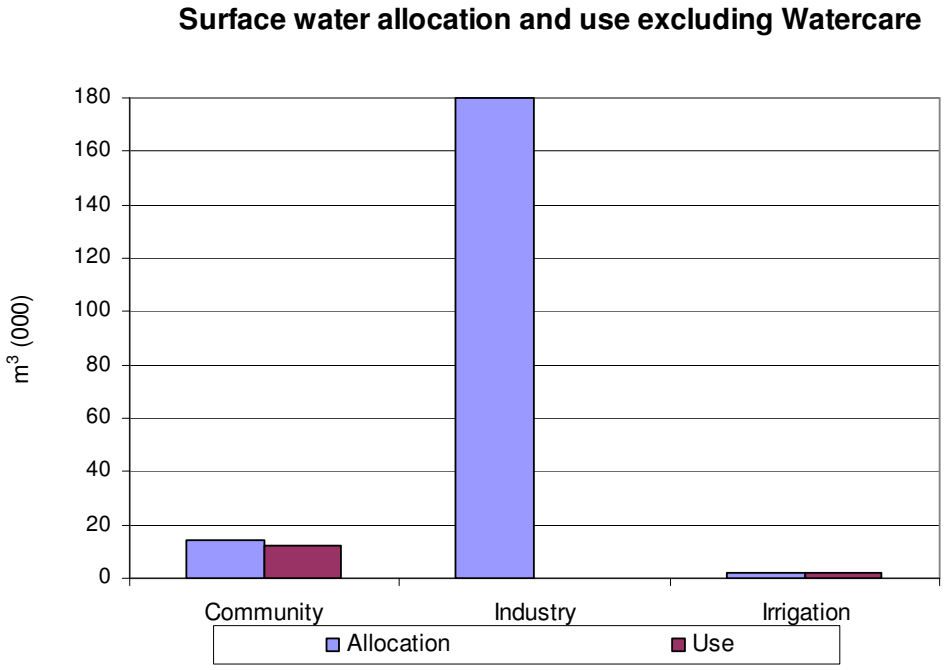


Figure 28 Surface water allocation and use excluding Watercare Service's use in the Waitakere water resource area

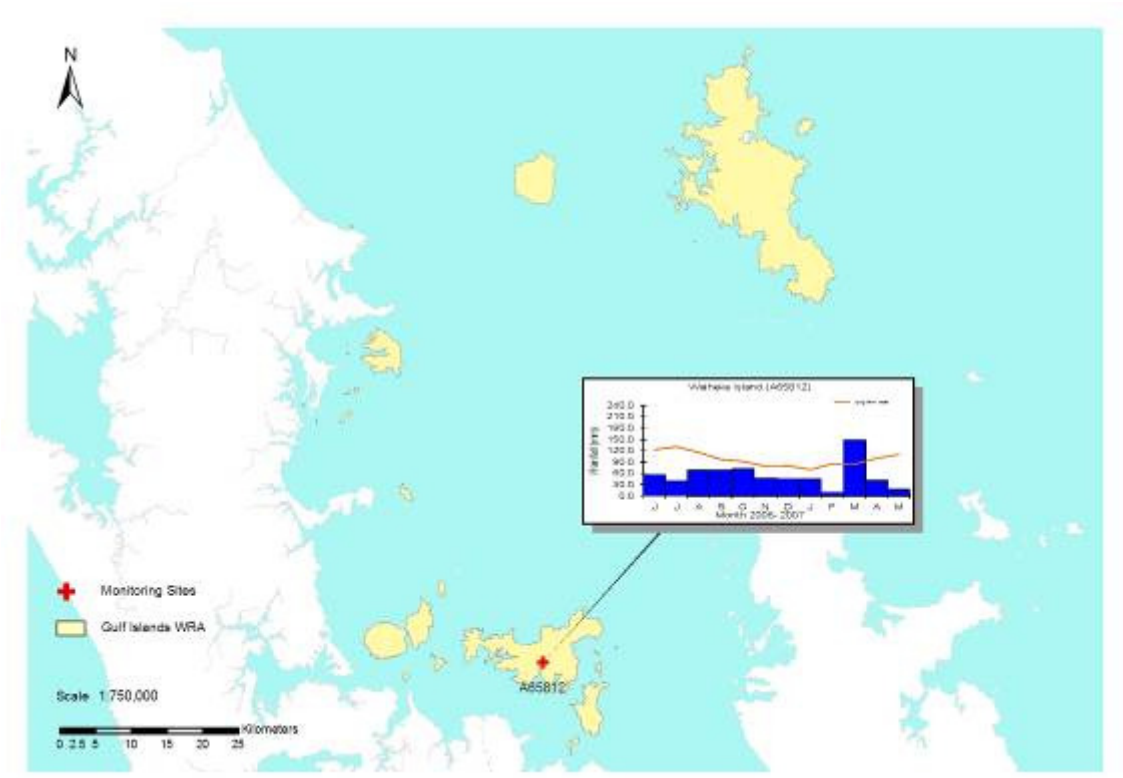


6 Gulf Islands

6.1 Rainfall

The Gulf Islands were one of the driest areas in the Auckland Region in 2006-2007. The total rainfall was 43.3% lower than the long term average (Figure 29). The islands experienced extremely dry conditions in early winter, spring and autumn, the only month with above average rainfall was in March 2007. Rainfall is an extremely important water resource on the gulf islands, as most water demand is supplied from roof caught rainfall.

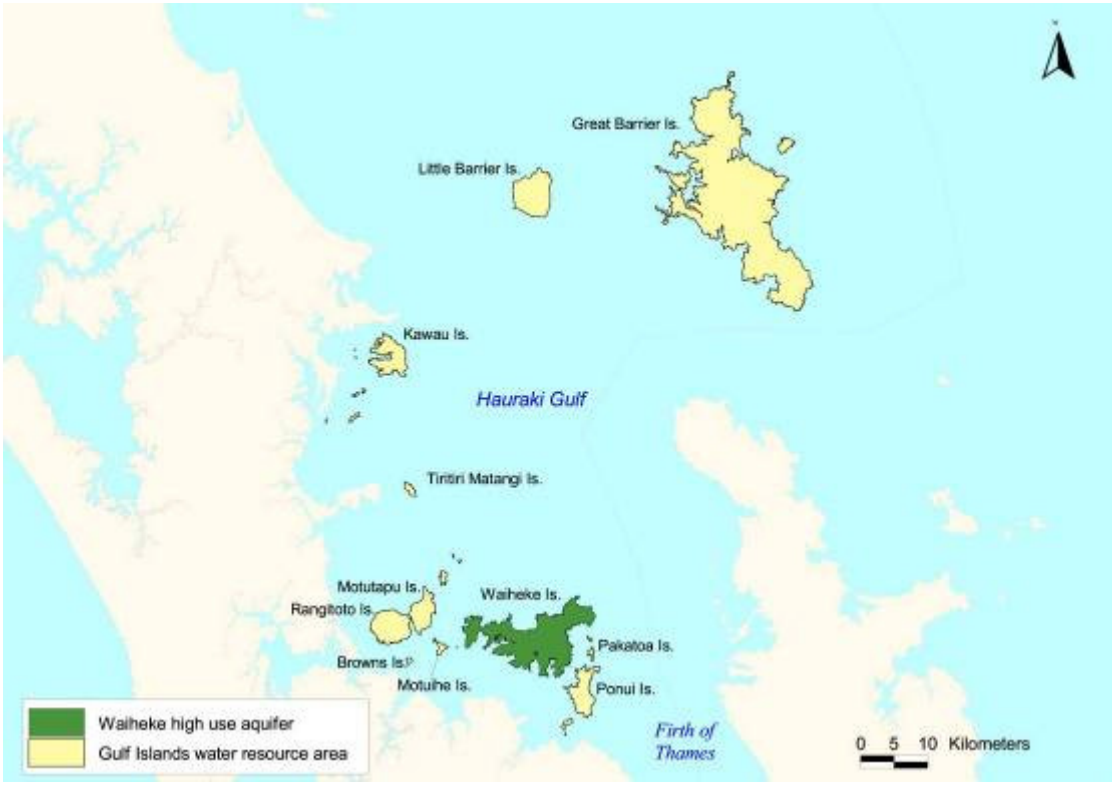
Figure 29 Total monthly rainfall (bars) and the long term mean monthly rainfall (line) at Waiheke Island in the Gulf island resource area



6.2 Surface Water and Groundwater

There are no high use stream management areas in the Gulf Islands water resource area (Figure 30). All aquifers on Waiheke Island are classified as high use aquifer management areas. Several groundwater monitoring sites have been established on the islands, but insufficient data has been collected to report any long term trends. In 2004 ARC initiated a 3-year study of the island's groundwater resources to determine how much is available and to develop a suitable water management regime.

Figure 30 Gulf Islands water resource area and high use aquifer management



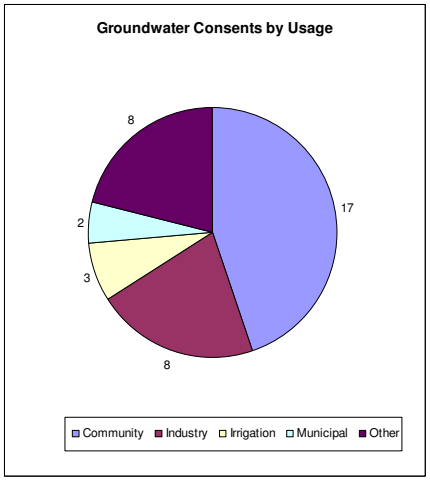
6.3 Water Allocation and Use

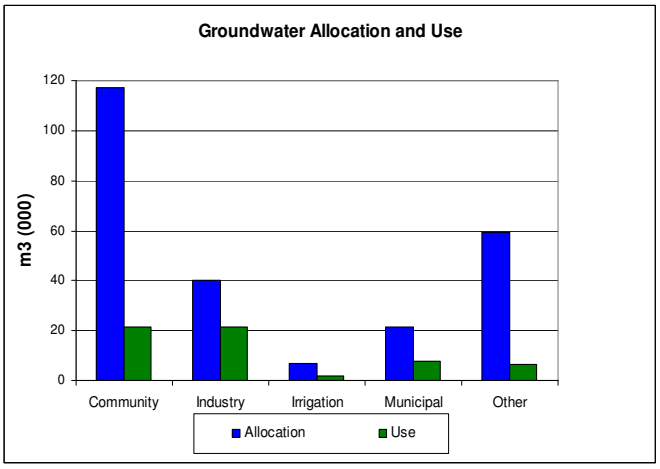
The majority of private residences use tanks to collect rainfall for their own personal household use. Resource consents are not required for this. There are resource consents which have been granted for community water supply, school supply, irrigation, and hotels. In May 2006 there were 13 surface water consent holders. This has decreased to just 8 in May 2007. There still remain 38 groundwater consents in 2007 as in 2006. The majority of the use is for community supply and industry (Figure 31).

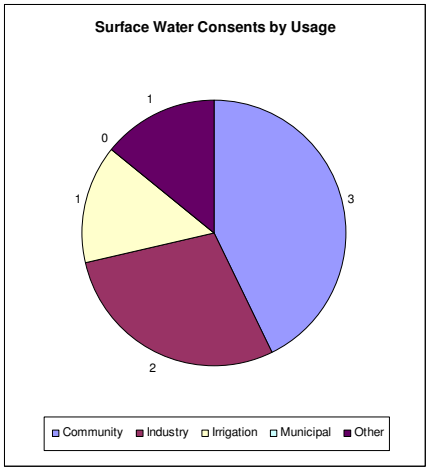
For the year ending May 2006, surface water for community allocation was 34,000 m^3 and use 22,500 m^3. In May 2007 they both had decreased to an allocation of 22,500 m^3 and use of 6,500 m^3. Total groundwater industry use was down by approximately 35%, and groundwater municipal use was up by 7,000 m^3.

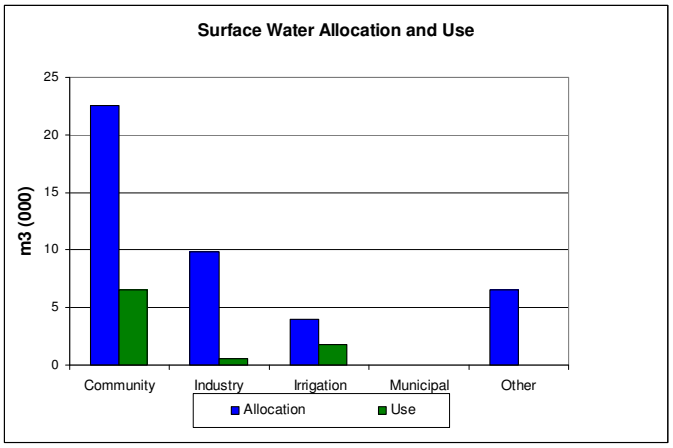
Total demand on Waiheke Island is high, but the small streams and low yielding aquifers limit the potential supply. Water demand is predicted to increase but overall in for 2006-2007 the surface water use was less than the previous year by 15,000 m^3, and groundwater was also down by 9700 m^3. This was due to several large irrigation consents becoming inactive.

Figure 31 Surface water and groundwater allocation and use for the Gulf Islands water resource area and the number of consents for each purpose









7 Auckland Central

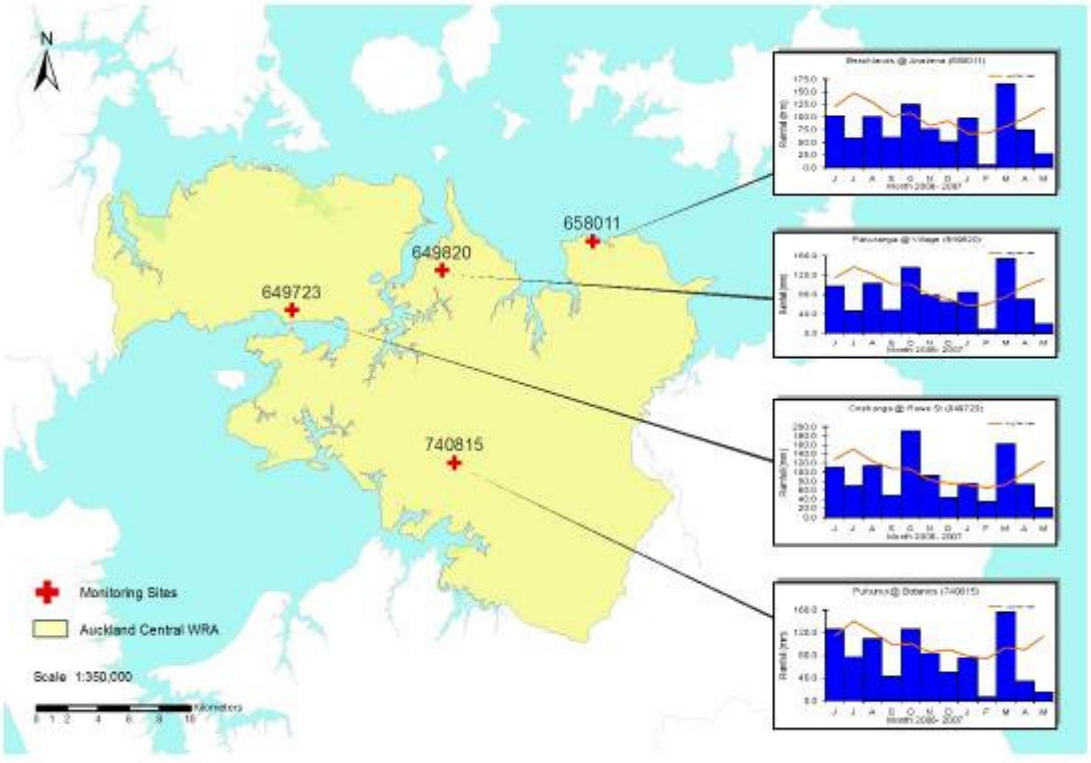
7.1 Rainfall

Rainfall in the Auckland Central water resource area was between 14 – 25% below the long term average (Table 10). Winter 2006 received below average rainfall. Spring 2006 was close to the average with October being 20-50% above average. February and May were very dry months approximately 70% less than average. Rainfall in March was 50% above average making it a very wet month (Figure 32).

Table 10 Comparison of 2006 - 2007 rainfall with long term mean at 4 sites

Site Number	Site Name	Mean Annual Rainfall June - May (mm)	Total Rainfall June 2006 - May 2007 (mm)	% Deviation from Average Rainfall
649723C	Onehunga at Rowe St	1207	1039	-13.9
649820	Pakuranga at Village	1129	912	-19.2
658011	Beachlands at Anakena	1216	948	-22.0
740815	Puhinui at Botanics	1209	908.2	-24.9

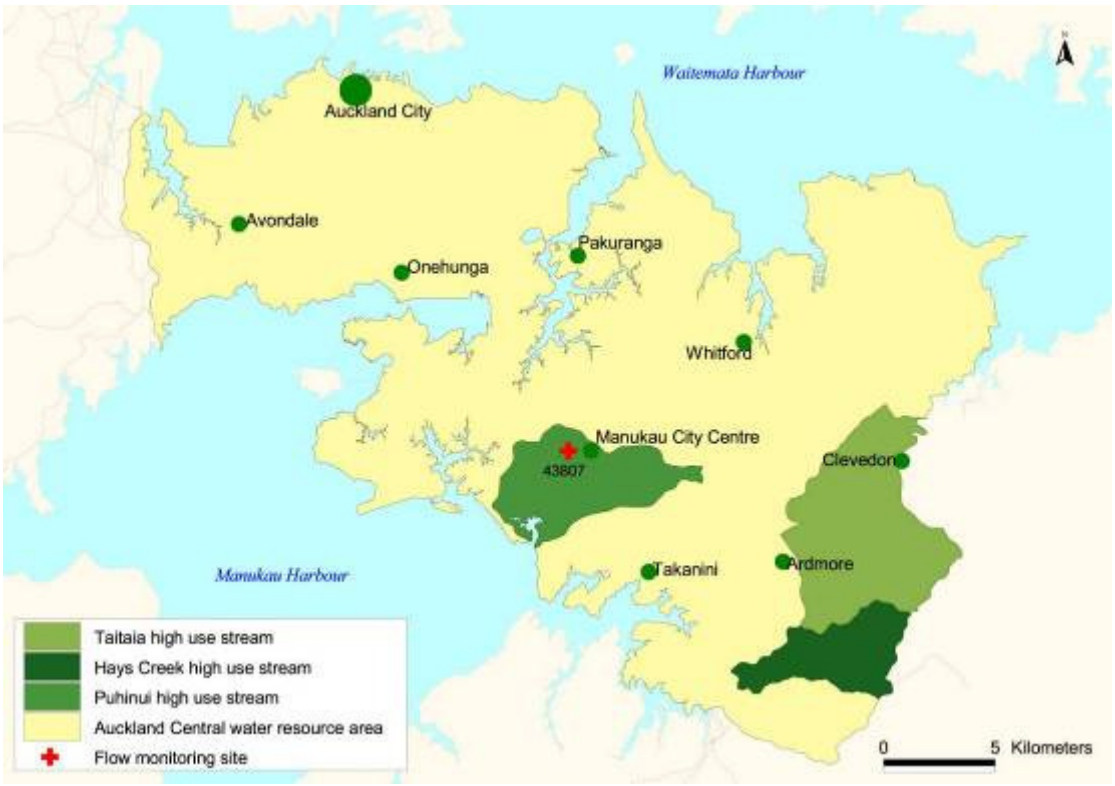
Figure 32 Total monthly rainfall (bars) and long term mean monthly rainfall (line) at 4 sites in the Auckland Central water resource area



7.2 Surface Water

In the Auckland Central water resource area there are three high use management streams, Puhinui, Hays Creek and Taitaia a sub-catchment of the Wairoa River (Figure 33). The Puhinui stream is the only one that has a monitoring site (# 43807, catchment area 11.60km^2). It is located upstream from the consented water abstractors and downstream from large storm water containment. The MALF for the site is 14.4 l/s and the lowest recorded flow during 2006-2007 was 15.0 l/s (Table 14).

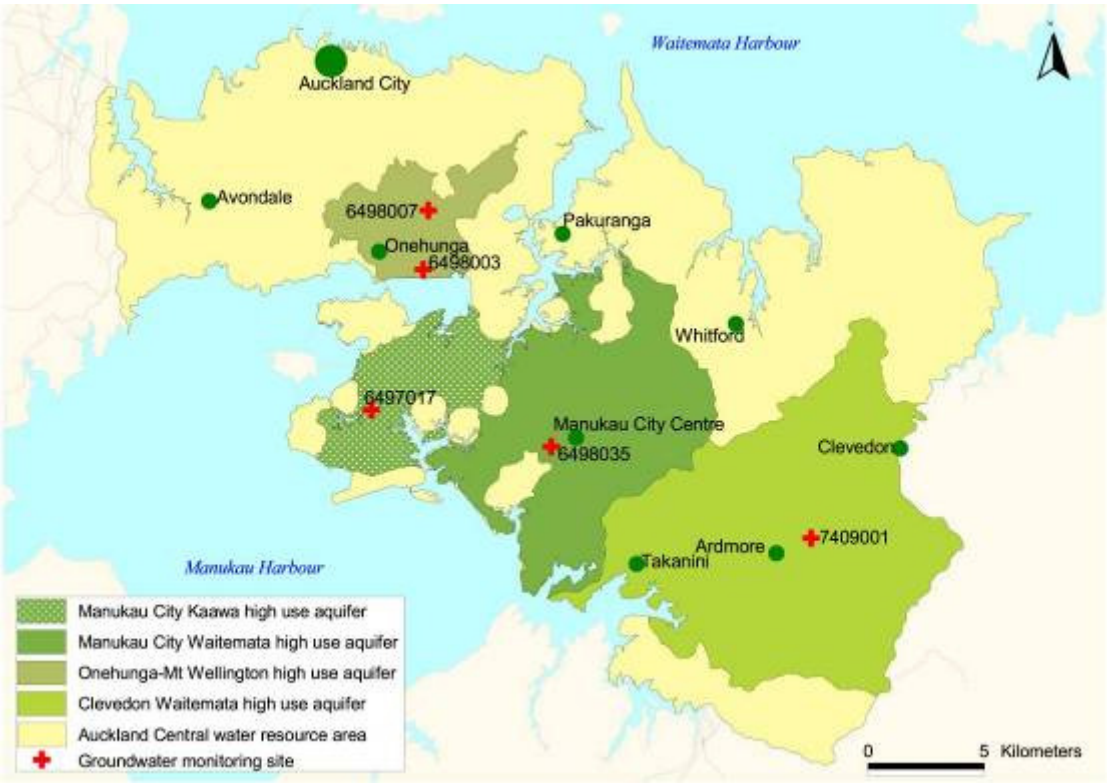
Figure 33 Auckland Central water resource area, high use stream management areas and flow-monitoring site



7.3 Groundwater

The Auckland Central water resource area has four high use management aquifers (Figure 34). These are the Onehunga-Mt Wellington Volcanic aquifer, Manukau Waitemata aquifer, Manukau Kaawa aquifer and the Clevedon Waitemata aquifer. There is currently no water availability value for the Manukau Kaawa aquifer.

Figure 34 Auckland Central water resource area, high use aquifer management areas and groundwater monitoring sites



7.3.1 Onehunga – Mt Wellington Volcanic Aquifer

Isthmus volcanic aquifers are very responsive to rainfall events particularly as most storm water is discharged directly into the aquifer. The groundwater envelopes display the aquifers responsiveness to dry and wet periods. The Central Park bore (6498007) (Figure 35) recorded varying levels of minimum groundwater throughout the year. This envelope closely follows the rainfall recorded in central Auckland.

The Angle Street bore (6498003) has a consistent monthly minimum groundwater level for 2006-2007 (Figure 36). From the previous years the aquifers long term maximums have increased. And the monthly mean level is greater than long term mean. The plotted minimum levels show they are close to the long term mean levels.

Figure 35 Groundwater envelope for Central Park (6498007) Onehunga-Mt Wellington volcanic aquifer bore

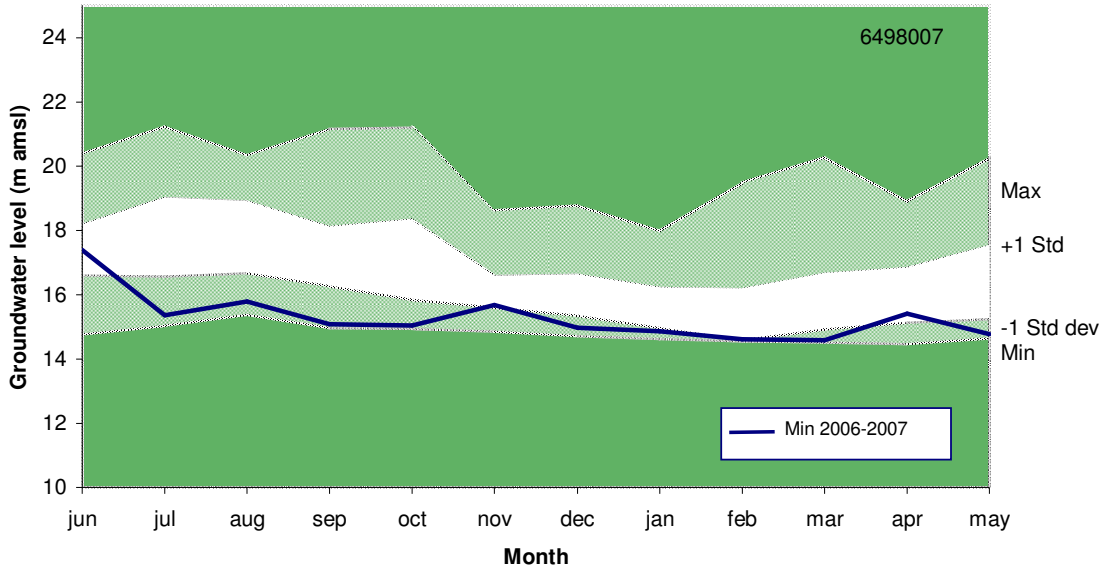
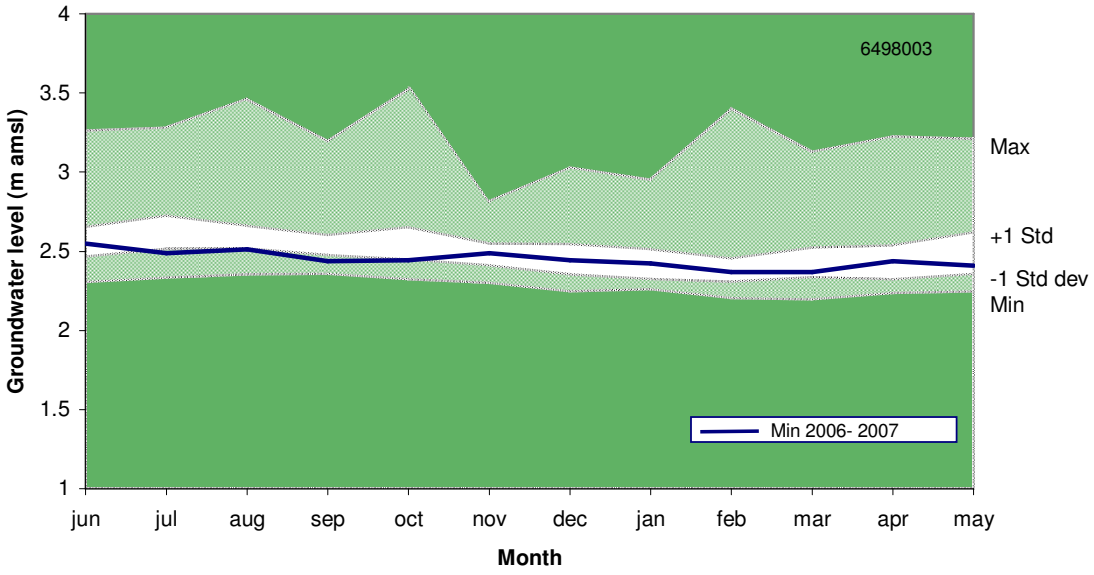


Figure 36 Groundwater envelope for Angle Street Onehunga-Mt Wellington volcanic aquifer (6498003) bore



7.3.2 Manukau City Waitemata Aquifer

The Manuaku Waitemata high use management aquifer is monitored at Lambie Drive bore (6498035). The minimum monthly groundwater level for 2006-2007 was 24.148m amsl which is well above the long term monthly mean. The minimum levels for the 2006

-2007 year are very close to the aquifers maximum levels ever recorded prior to the period shown. The groundwater level has continued to rise since the site was established in 1993 (Figure 37). This is possible due to the reduced groundwater usage in the water resource area.

7.3.3 Manukau Kaawa Aquifer

In the Manukau Kaawa aquifer groundwater levels are monitored at Amelia Earhart Drive bore (6497017). There is insufficient data to form a groundwater envelope since groundwater levels were only collected since August 2001 (Figure 38). The absence of a summer water level decline since 2002/2003 is due to surrender of two large irrigation take consents. Now the aquifer is experiencing general trends of lows in autumn and highs in spring.

Figure 37 Groundwater envelope for Lambie Drive Manuaku Waitemata (6498035) bore

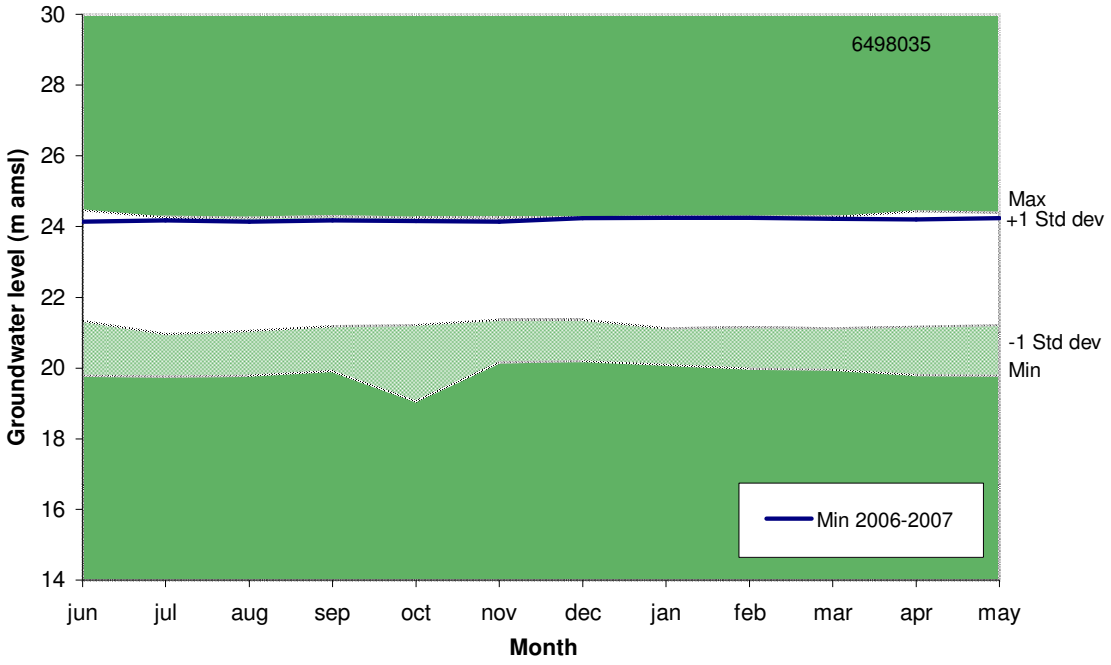
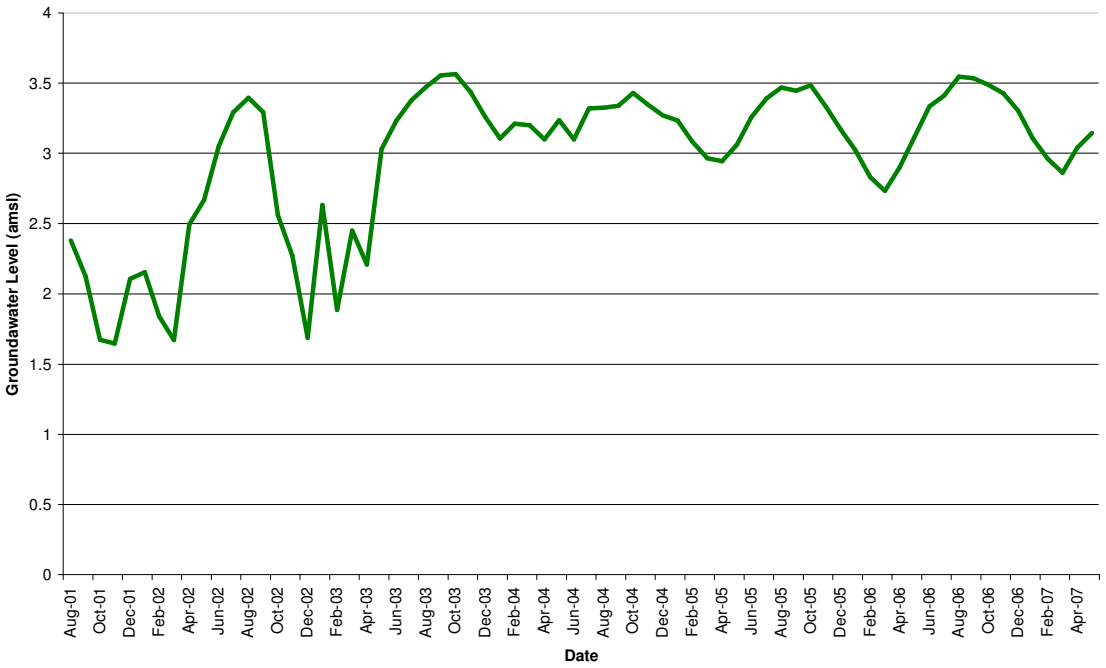


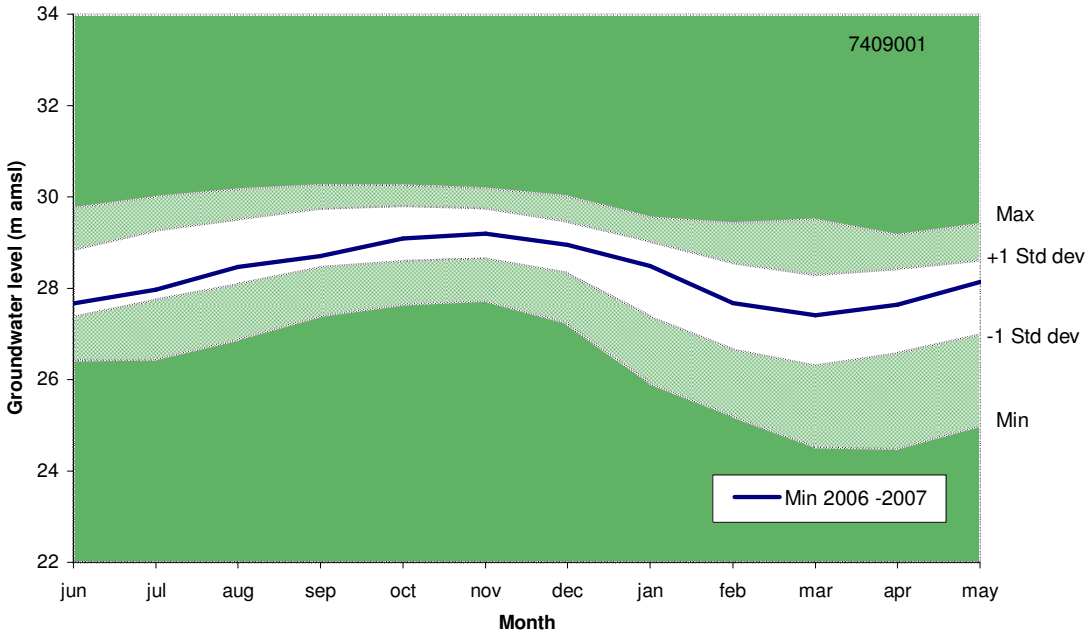
Figure 38 Groundwater levels in Amelia Earhart bore (6497017)



7.3.4 Clevedon East Waitemata Aquifer

The groundwater levels at the Burnside bore (7409001) during June 2006 to May 2007 has recovered well since the previous year. Levels were lower during June – August 2006, but were near the long term mean from October 2006 – May 2007 (Figure 39).

Figure 39 Groundwater envelope for Burnside Road Clevedon - Waitemata East (7409001) bore



7.4 Water Allocation and Use

The Auckland central area is the most populated and urbanised water resource area in the Auckland region. Most water supplies are taken from 5 high use aquifer management areas (Table 11). Water Allocation in the Celevdon West Waitemata high use aquifer management area was less than the availability. This is a management improvement from the previous year. There is a large volume of groundwater still available in the Auckland central area.

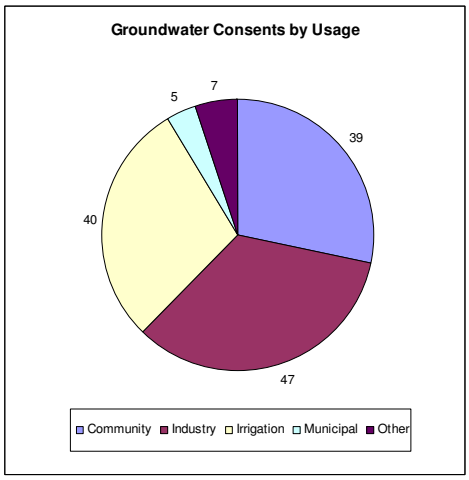
Table 11 High use aquifers, groundwater availability and use in Auckland Central

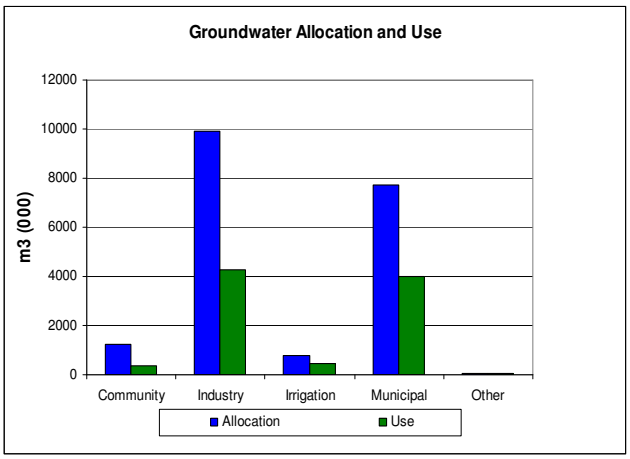
Management Area	Aquifer	Availability m^3(000)	2005-2006		2006-2007	
			Allocation m^3(000)	Use m^3(000)	Allocation m^3(000)	Use m^3(000)
Clevedon East Waitemata		379	155	86	164	83
Clevedon West Waitemata		964	815	423	849	373
Manukau City Waitemata	Manukau Waitemata	660	359	148	276	124
Onehunga-Mt Wellington Volcanic	Onehunga-Mt Wellington Volcanic	15,038	8,959	5,200	8,722	5,268
Manukau City Kaawa	Manukau Kaawa	-	196	24	196	67

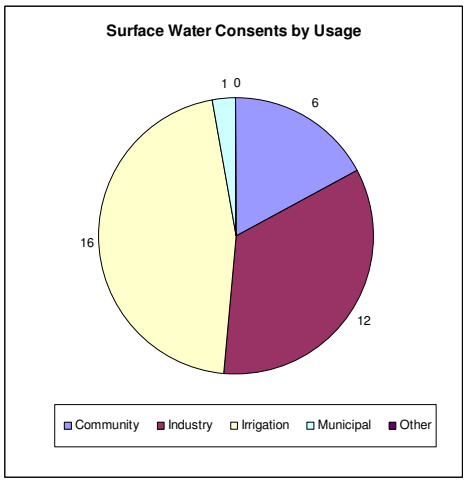
There has also been a 50% increase in use of groundwater for industry during 2006-2007. This was from two large consents having started to use their consented allocation. Surface water use for municipal needs has basically stopped due to the Watercare Services Ltd Hays Creek dam consent not being exercise. Surface water Allocation for irrigation has increased by 140,000m3 (Figure 40).

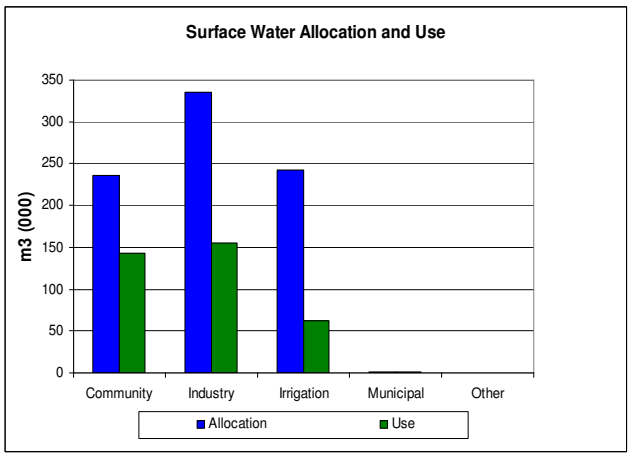
The number of groundwater consents has decreased by 61 from 2006 to 2007 compared to the previous hydrological year. The Surface water consent numbers are similar to the previous year.

Figure 40 Surface water and groundwater allocation and use for the Auckland central water resource area and the number of consents for each use









8 Hunua

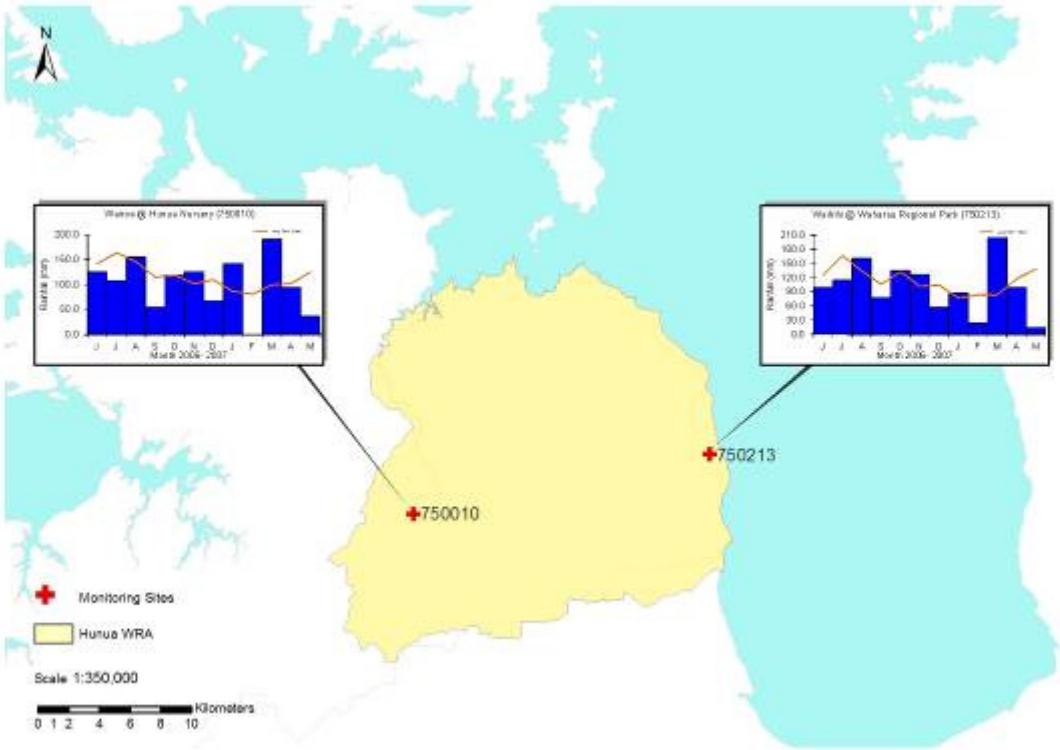
8.1 Rainfall

The total rainfall for the Hunua water resource area was approximately 12% below the long term average for the 2006 -2007 hydrological year (Table 12). The monthly totals were quite variable compared to the long term mean. February was an extremely dry month with rainfall totals near 80% below the average. March was extremely wet with totals being 100% above the average (Figure 41).

Table 12 Comparison of 2006 - 2007 rainfall with long term mean at 2 sites

Site Number	Site Name	Rainfall Mean Total for Period June - May (mm)	Rainfall Total June 2006 - May 2007 (mm)	% Deviation from Average Rainfall
750010	Wairoa at Hunua Nursery	1391	1226	-11.9
750213	Waihihi at Waharau Regional Park	1377	1206	-12.4

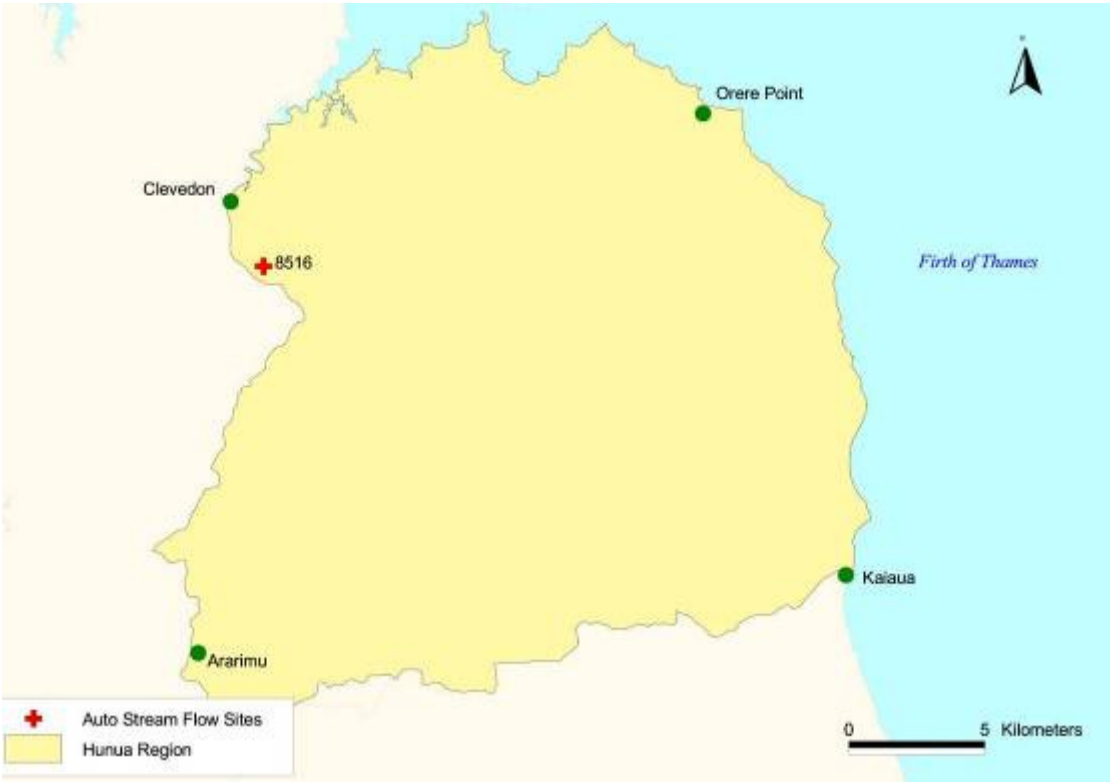
Figure 41 Total monthly rainfall (bars) and long term mean monthly rainfall (line) at 2 sites in the Hunua water resource area



8.2 Surface Water and Groundwater

There are no high use stream management areas in the Hunua water resource management area (Figure 42). There is one ARC flow monitoring site with a catchment area 161km^2, located downstream of Wairoa Dam and Cosseys Dam (Watercare Services Ltd) at Tourist Road site #8516. The consents on these dams do not have specific allocations but conditions require that flow above 340 l/s is maintained at the Tourist Road monitoring site. The lowest measured flow for 2006-2007 was 389 l/s.

Figure 42 Hunua water resource area and flow monitoring site



8.3 Water Allocation and Use

Of the total surface water allocation in the Hunua water resource area, Watercare Services Ltd uses 99% for municipal supply (Figure 43). Watercare Services do not have annual allocations on their water use so the allocations are set in this report equal to the total amount used. During the 2006-2007 hydrological year total municipal use was decreased by 4Mm^3 from the Hunua dams. There has been a large increase in the water allocated and used from groundwater for industry use. This is because of a new large consent required for quarry de-watering and dust control that has become active during the 2006-2007 period. The numbers of consents have not changed for surface water, with only one new consent being issued for groundwater use (Figure 43).

When the Watercare Services Ltd surface water consents are removed it can be seen that irrigation is the major user of water with 40% of the allocation being used (Figure 44).

Figure 43 Surface water and groundwater allocation and use for Hunua water resource area and the number of consents for each purpose

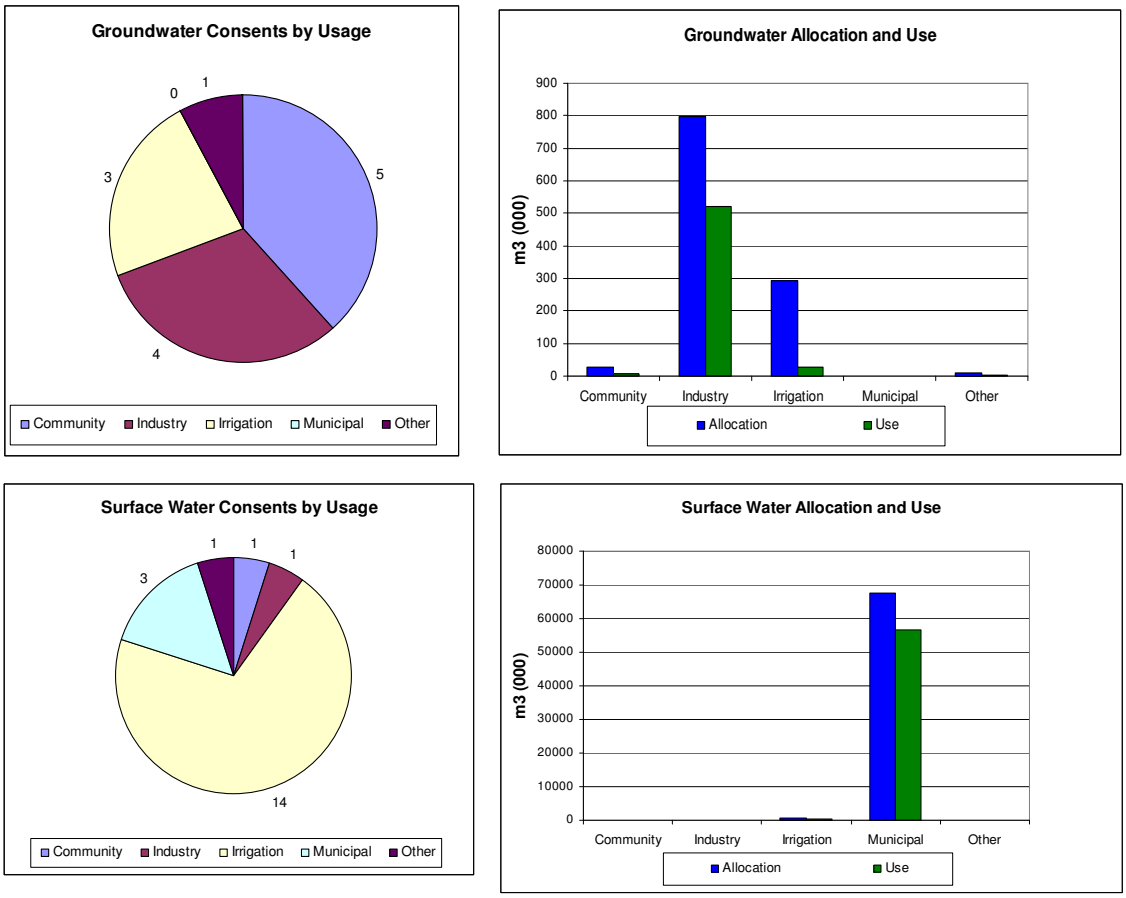
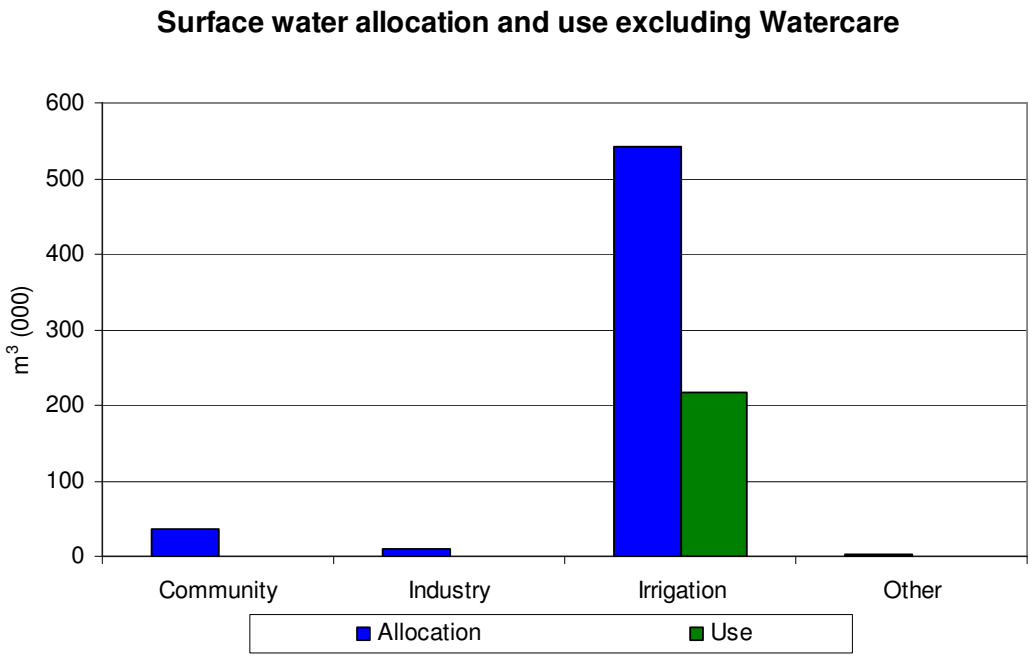


Figure 44 Surface water allocation and use excluding Watercare Service's in the Hunua water resource area



9 South Auckland

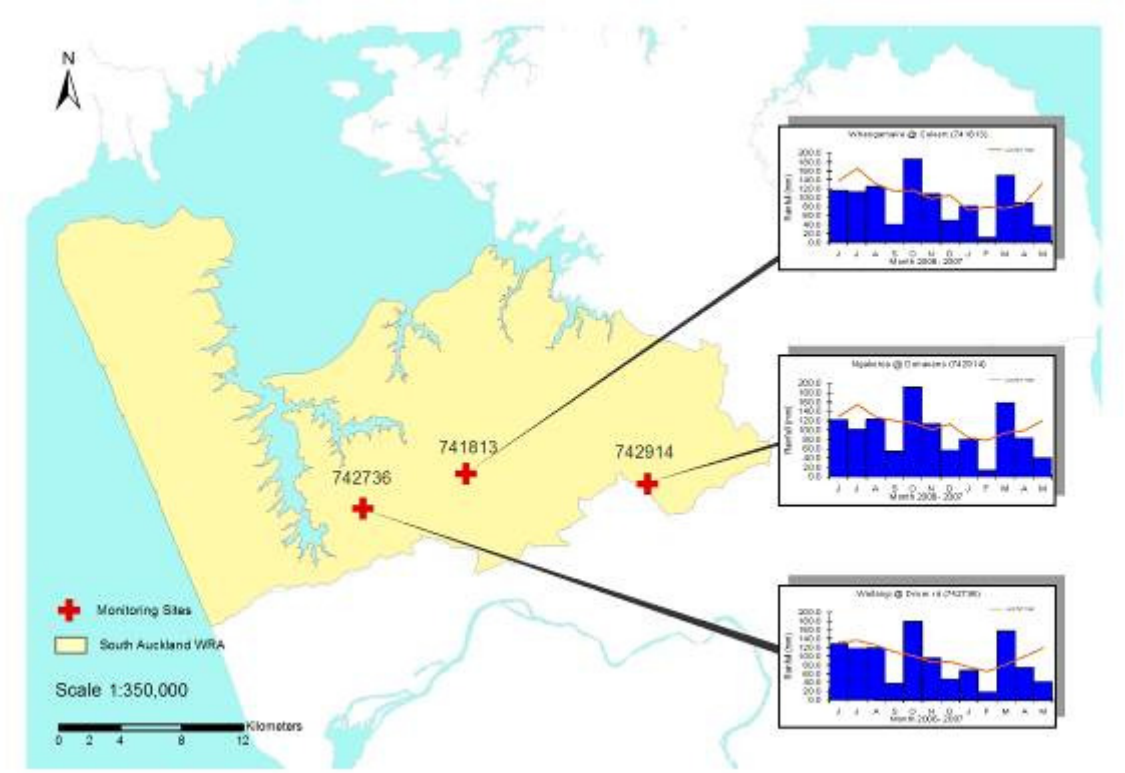
9.1 Rainfall

The South Auckland water resource area was between 9.6 and 14.9% below the long term average for the 2006 – 2007 hydrological year (Table 13). The monthly rainfall totals were variable throughout the year. September and February were 50-70% below average while October and March were 50% above the long term monthly average (Figure 45).

Table 13 Comparison of 2006 - 2007 rainfall with long term mean at 3 sites

Site Number	Site Name	Mean Annual Rainfall June - May (mm)	Total Rainfall June 2006 - May 2007 (mm)	% Deviation from Average Rainfall
742914	Ngakaroa at Donavans	1339	1140	-14.9
742736	Waitangi at Diver Rd	1220	1087	-10.9
741813	Whangamaire at Culvert	1224	1107	-9.6

Figure 45 Total monthly rainfall (bars) and long term mean monthly rainfall (line) at 3 sites in the South Auckland water resource area



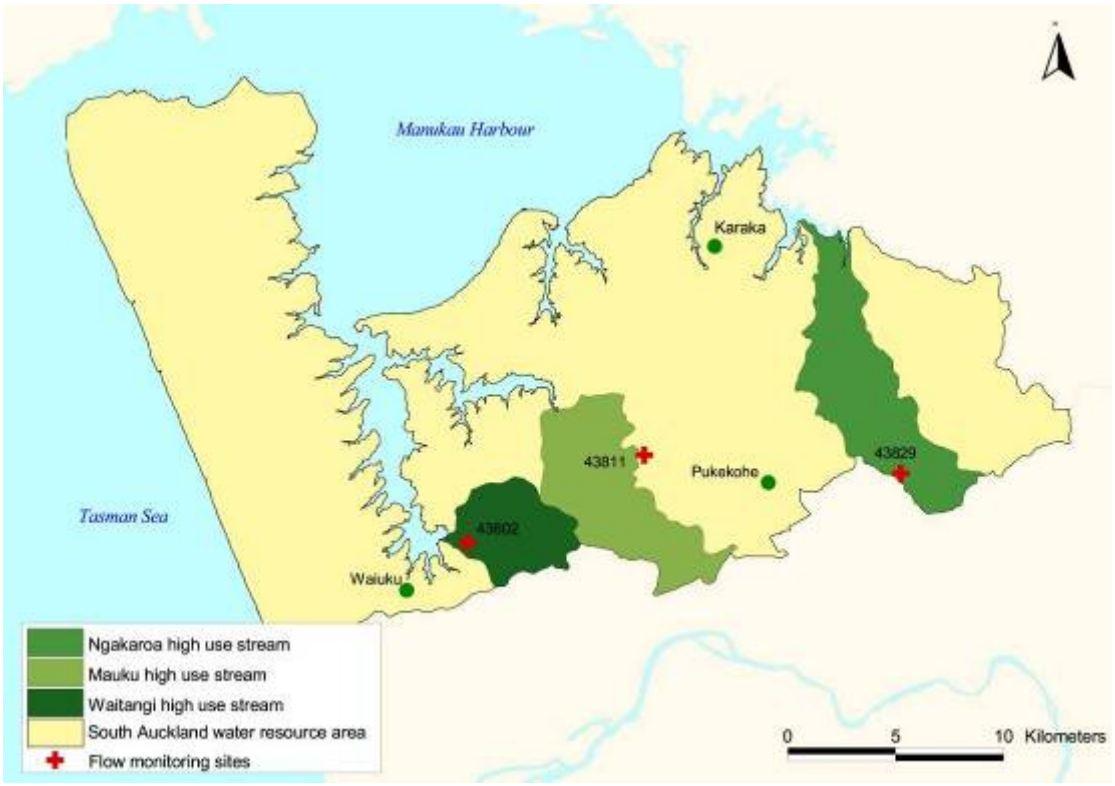
9.2 Surface Water

In the South Auckland water resource area there are three high use stream management areas, the Ngakaroa (site #43829) (catchment area 4.73km^2), Waitangi (site #43602) (catchment area 17.60km^2) and the Mauku (Figure 46). The Mauku Stream does not have a flow-monitoring site.

On 18 occasions during February/March 2007 the flow at the Ngakaroa stream was recorded below the MALF of 7.8 l/s with 3.0 l/s being the lowest. The hydrograph for this site showed the low flows were induced by pumping up stream of the monitoring site. A minimum flow regime is likely to be imposed on consents on this stream in the near future.

The Waitangi Stream has a MALF of 33.0 l/s. On 5 occasions in February 2007, the flow fell below the MALF, 30.6/s being the lowest recorded flow. The low flow recorded at the stream is due to the low rainfall in December and February.

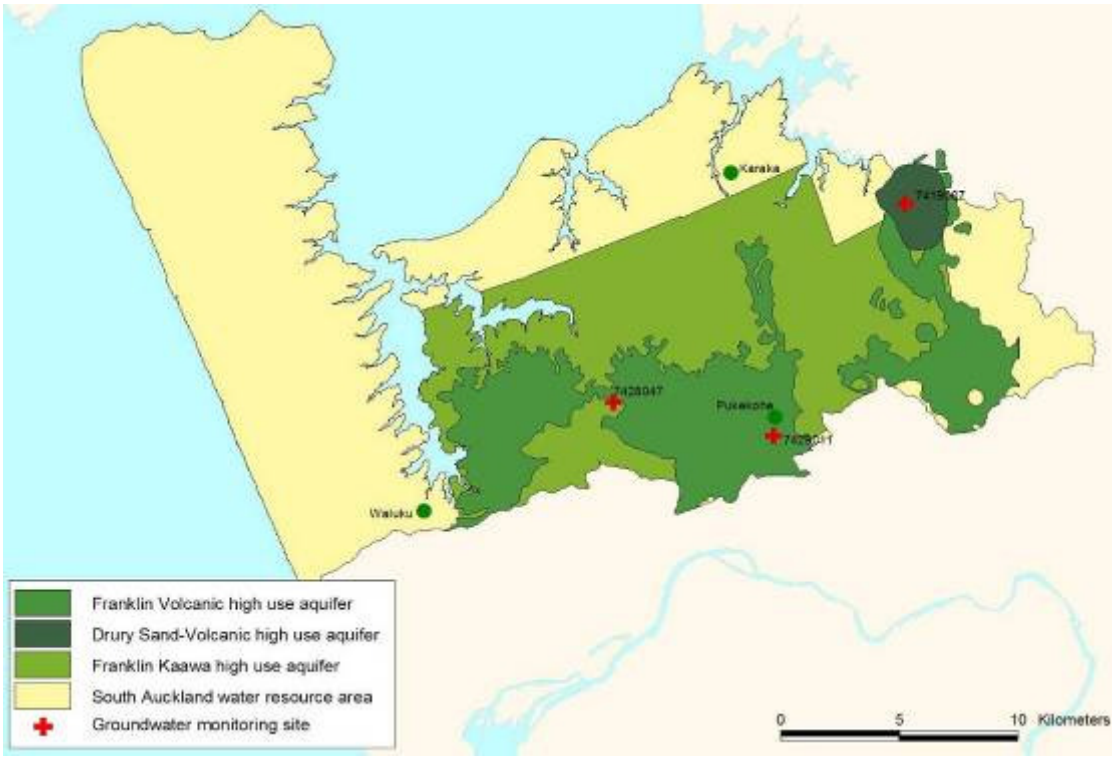
Figure 46 South Auckland water resource area high use stream management areas and flow monitoring sites



9.3 Groundwater

The South Auckland water resource area has three high use aquifers, Franklin Volcanic aquifer (which includes Pukekohe basalt, Glenbrook basalt and Bombay basalt), the Franklin Kaawa aquifer and the Drury Sand-Volcanic aquifer (Figure 47).

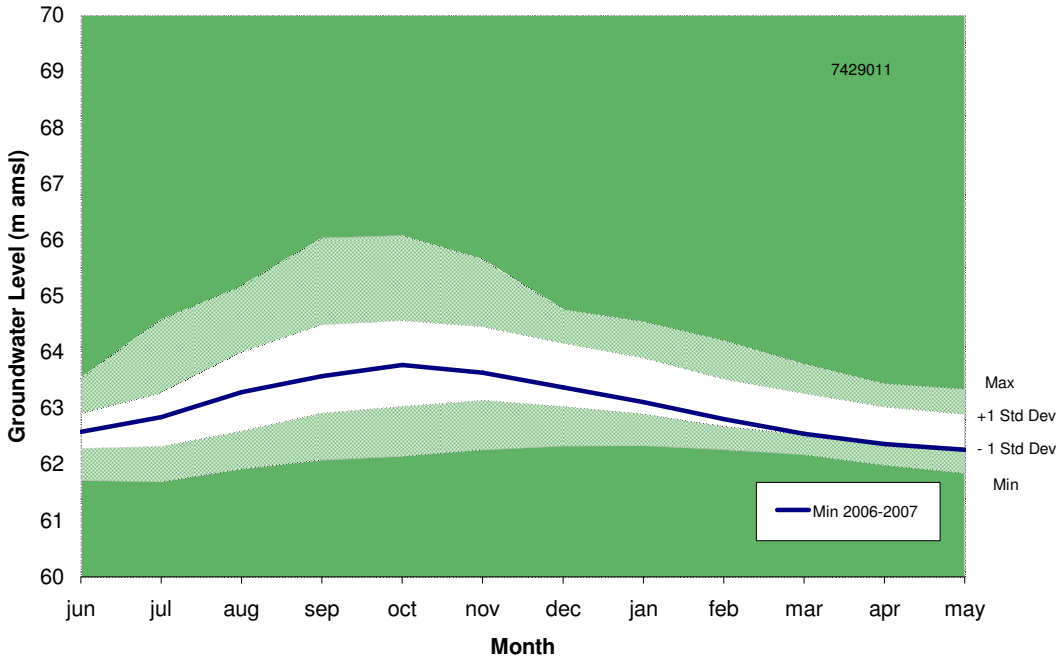
Figure 47 South Auckland water resource area, high use aquifer management areas and groundwater monitoring sites



9.3.1 Franklin Volcanic Aquifer

The Revell Court bore (7429011) is the Franklin Pukekohe Volcanic high use aquifer management area representative monitoring site. The Revell court bore has replaced the DSIR bore (7428001) which is no longer used. During the 2006-2007 hydrological year the minimum groundwater level was very close to the long term mean. This is especially evident during July to November which is the winter aquifer recharge period.

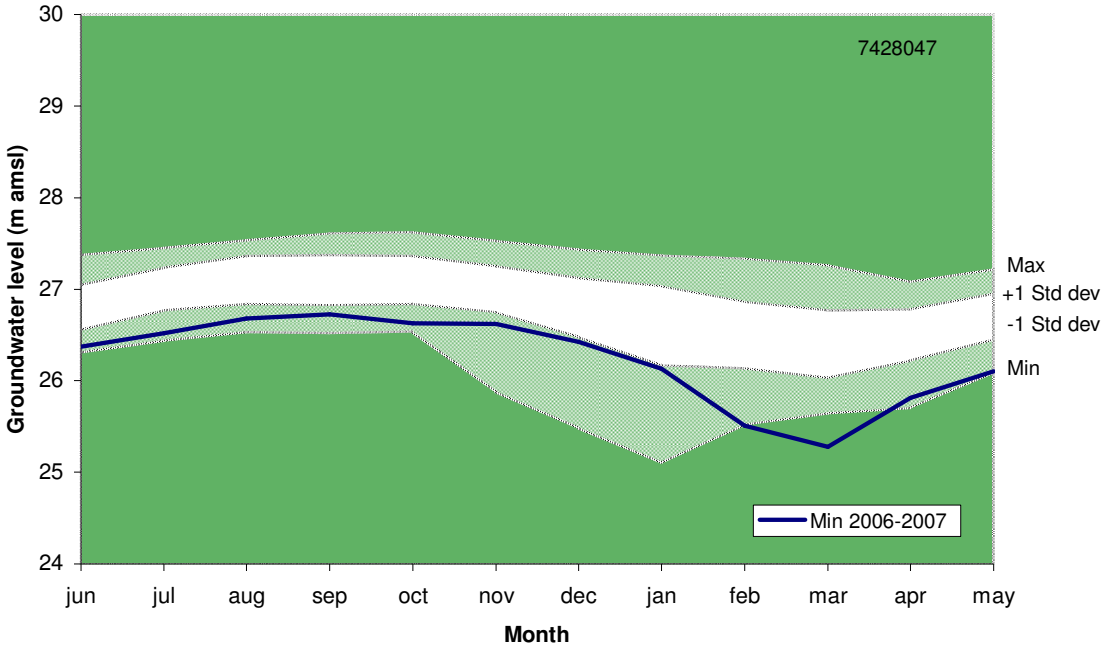
Figure 48 Groundwater envelope for Revell Court Franklin Pukekohe Volcanic bore (7429011)



9.3.2 Franklin Kaawa Aquifer

The Franklin Kaawa high use aquifer management area has numerous groundwater monitoring sites, the Mauku bore (7428047) has been selected for long term groundwater monitoring. The groundwater levels for 2006-2007 show a continuation from the low level in May 2006 (Figure 49). The mean minimum groundwater level remained below the -1 standard deviation all year round. This was even during the winter recharge period. In March 2007 the levels dropped below the minimum ever recorded in the aquifer. This is responsive to high water use in the area. The aquifer water levels were still very low during May 2007, and will require average to above average rainfall to lift the levels over the winter period.

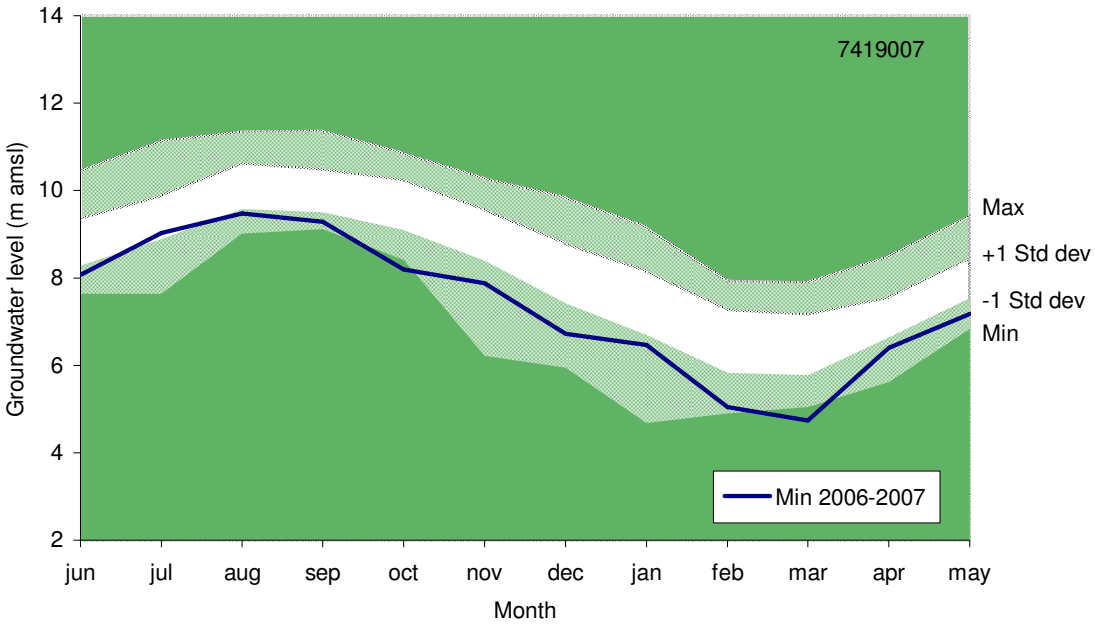
Figure 49 Groundwater envelope for Mauku Franklin Kaawa bore (7428047)



9.3.3 Drury Sand Volcanic Aquifer

The Fielding Road bore (7419007) is used to monitor groundwater levels at the Drury Sand volcanic aquifer (Figure 50). The groundwater levels for 2006-2007 show a typical response to seasonal recharge and water abstraction. In October and March the aquifer experienced its lowest groundwater levels on record. This occurred due to low rainfall prior to those months, but high rainfall occurred during those months showing a marked increase in water level in November and April.

Figure 50 Groundwater envelope for Drury Sand Volcanic Fielding Road Bore (7419007)



9.4 Water Allocation and Use

The major land use and water demand in the South Auckland area is for market gardening. The main areas are in Bombay and Pukekohe. In these areas water demand is high due to the need for crop irrigation. There are several other high demand uses such as Municipal supply for the Franklin District Council, and industry supply for business.

The South Auckland water resource area has three high use aquifer management areas the Drury Sand Volcanic, Franklin Kaawa and Franklin Volcanics. The latter two of these areas have a number of sub zones within the high use aquifers (Table 14, Table 15). The use in the Pukekohe Kaawa aquifer has exceeded the allocation in the last 2 years, but during 2006-2007 use was only 75% of allocation. In the Pukekohe West volcanic aquifer use was 99% of allocation. All other zones of high use aquifers are well within availability and allocation. The Bombay and Glenbrook volcanic aquifers do not have an availability quantity set for them.

Table 14 Franklin Kaawa high use aquifers, availability, allocation and use for 2005-2007

Management Area	Aquifer	Availability m^3(000)	2005-2006		2006-2007	
			Allocation m^3(000)	Use m^3 (000)	Allocation m^3(000)	Use m^3 (000)
Franklin Kaawa	Bombay - Drury Kaawa	718	296	234	339	141
	Glenbrook/Waiau Pa Kaawa	1,560	1,207	991	1200	770
	Karaka Kaawa	617	484	168	469	169
	Pukekohe Kaawa	1,860	1,210	1,282	1,185	887
	Pukekohe West Kaawa	1,780	466	236	459	180
	Waiuku Kaawa	2,450	994	380	988	417

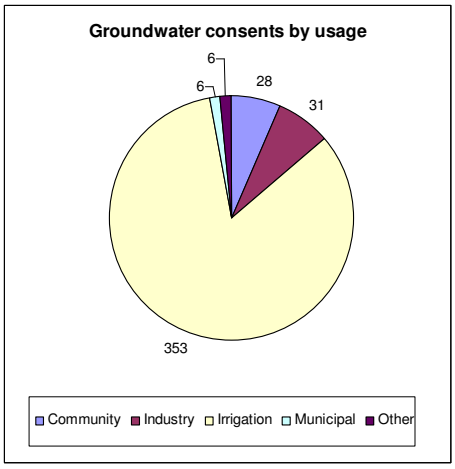
Table 15 Franklin volcanic high use aquifers, availability, allocation and use for 2005-2007

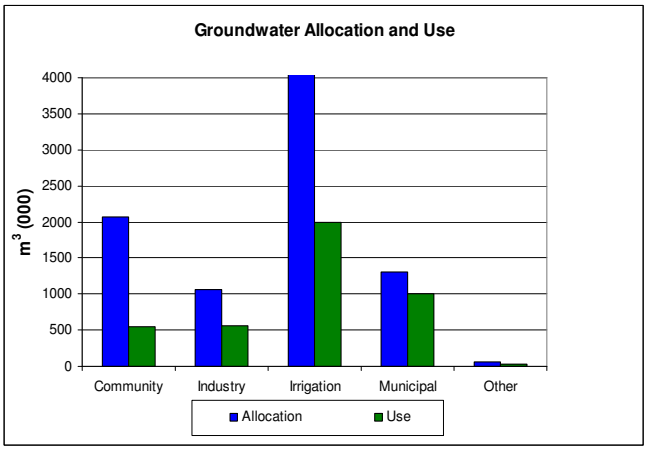
Management Area	Aquifer	Availability m^3(000)	2005-2006		2006-2007	
			Allocation m^3(000)	Use m^3 (000)	Allocation m^3(000)	Use m^3 (000)
Franklin Volcanics	Pukekohe Central Volcanic	856	652	286	625	218
	Pukekohe North Volcanic	420	120	91	143	82
	Pukekohe South Volcanic	650	148	88	148	90
	Pukekohe West Volcanic	420	296	299	260	257
	Bombay	-	62	34	127	44
	Glenbrook	-	162	101	136	80

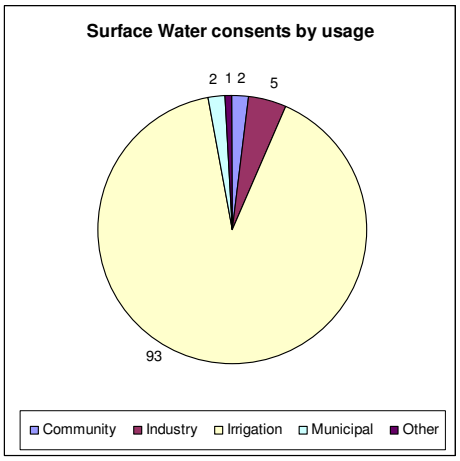
The largest water user in the South Auckland water resource area is irrigation. There were no significant changes in the surface water allocations and use from last year. For groundwater there was a 1Mm^3 increase in the water allocation for community supply for Franklin District Council, but use did not change. There was also a decrease in the groundwater irrigation use of approximately 700,000m^3. Overall from all the high use aquifers there was a decrease in annual use. This could have been associated with the high rainfall during October and March which caused water use for irrigation to be down in the months that followed.

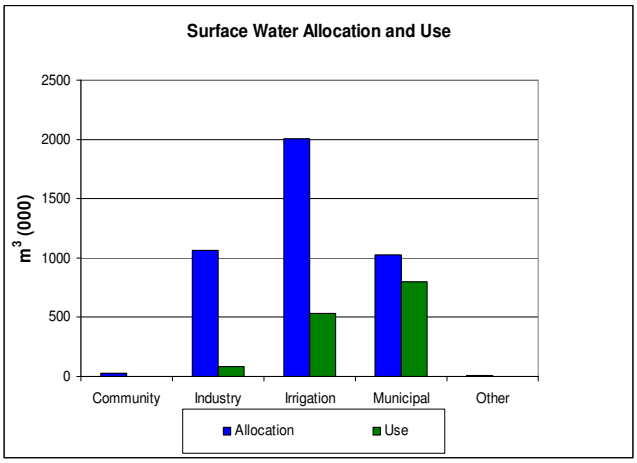
There has been an increase of 5 groundwater consents, and a decrease of 12 surface water consents from the previous year.

Figure 51 Surface water and Groundwater allocation and use for the South Auckland water resource area, and the number of consents for each purpose









10 Conclusion

The 2006- 2007 hydrological year was on average 23% drier than the previous year and 17% drier than the average across the region. The rainfall was characterised by amost months being well below average, with the exception of an extremely wet October and March. The summer stream flows were extremely low due to decreased winter rainfall causing base flows to be effected early in the year. Several stream flow sites recorded flows well below their MALF. Groundwater levels were very low in March 2007 with some sites experiencing the lowest recorded levels on record. This was due to a combination of low rainfall throughout the year, low winter recharge in some aquifers and high water use in other aquifers.

In the Auckland region there are 13 high use stream management areas and 26 high use aquifer management areas (PARP: ALW). Currently the fully allocated aquifers are the Kumeu – Waitemata zone1a and Kumeu Waitemata zone1f.

The Waiwera geothermal aquifer was under extreme stress during the 2006-2007 hydrological year. The mean levels recorded were well below the management level of 0.5m amsl, the level only exceed this management in June 2006. From the data supplied by consent holders it can be seen that total use was less than allocation, this is some concern for the management of the aquifer, as the allocated volumes may be greater than the aquifer can maintain.

The Kumeu – Waitemata aquifer zone 1 and 2 has a history of high water demand. Currently water allocation is 92% of the availability and use this year was only 49% of the availability. Therefore the aquifer is at sustainable use compared to the past. There are the zones 1a and 1f which are currently have use exceeding availability but there are no signs of these zones being adversely affected by these consents.

Stream flows during the 2006-2007 hydrological year fell below the MALF for four of the seven high use streams. These lowest flows occurred during February and May and are attributed to the low rainfall over the summer period of 2007 for some sites. The low flows recorded at Ngakaroa were attributed to high water demand upstream of the recorders.

Water use in the Auckland Region is mainly taken by Watercare Services Ltd for Municipal supply. Their surface and groundwater takes make up 65% of all the water allocated in the Auckland region. Municipal water is supplied to an estimated population of 1.28million people, with the remainder of the population receiving water via roof rainfall or private bores. Water use for industry rose by approximately 1 Mm^3, and use dropped by 0.7Mm^3 for irrigation needs.

Overall the 2006-2007 hydrological year was much drier than the previous year, stream flows were down, several groundwater aquifers hit record lows and water use was up.

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