D – Supporting Information

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Appendix I

Policy Analysis

Introduction

The proposed management objectives and solutions of the water allocation strategy must be consistent with the purpose and principles of the Resource Management Act 1991 and the objectives, policies and methods of the Auckland Regional Policy Statement (ARPS). The development of the water allocation strategy should follow the process for the development of Water Resource Assessment Reports (WRARS), also described in the ARPS. The following description demonstrates that the water allocation strategy does meet these requirements.

Purpose and Principles of the RM Act

Resource Management Act	Water Allocation Strategy
5. Purpose—	
(1) The purpose of this Act is to promote the sustainable management of natural and physical resources.	The Water Allocation Strategy aims to promote the sustainable management of the surface water resources of the Kaipara River catchment.
(2) In this Act, "sustainable management" means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety while—	The proposed management objectives recognise that, in parts of the catchment, water is a key resource on which economic activity is reliant. Cultural and recreational values are also recognised as having importance for the further development of management objectives. Management solutions aiming to minimise the risk of dam failure have regard for health and safety.
(a) Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and	Management solutions are proposed which aim to address the potential over-abstraction of water in areas of high demand, and so sustain the potential of the water resource for future generations.
(b) Safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and	The proposed management objectives have as their key focus safeguarding the life-supporting capacity of rivers and streams in the catchment.
(c) Avoiding, remedying, or mitigating any adverse effects of activities on the environment.	Management solutions are proposed which aim to ensure that adverse effects, including cumulative effects, are avoided, remedied or mitigated, both through the imposition of appropriate conditions of consent and other statutory and non-statutory means.

6. Matters of national importance— In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall recognise and provide for the following matters of national importance:	
(a) The preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development:	The water allocation strategy proposes management objectives and solutions which recognise and provide for the preservation of natural character of wetlands, rivers and their margins, for instance by maintaining flow regimes which contribute to this natural character.
… (c) The protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna:	The water allocation strategy proposes management objectives and solutions which recognise and provide for the protection of the significant habitat of native freshwater fauna.
… (e) The relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga.	The water allocation strategy recognises and provides for the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga to be taken into account through consultation during the ongoing developing of management objectives and solutions.
7. Other matters— In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall have particular regard to—	
(a) Kaitiakitanga:	The water allocation strategy shall have particular regard to kaitiakitanga through consultation during the ongoing developing of management objectives and solutions.
[(a) The ethic of stewardship:]	It also recognises the need to have regard to the ethic of stewardship as expressed through consultation with the wider catchment community.
(b) The efficient use and development of natural and physical resources:	The proposed management solutions include measures which aim to ensure allocations are based on efficient use of water and which seek to improve efficiency of use through education and advocacy.
(c) The maintenance and enhancement of amenity values:	The water allocation strategy recognises that regard should be had to amenity (for exmaple, recreational and landscape values) in developing management objectives.

(d) Intrinsic values of ecosystems:… … (f) Maintenance and enhancement of the quality of the environment:…	The proposed management objectives have regard to the intrinsic values of ecosystems by seeking to manage to maintain and enhance ecological values.
8. Treaty of Waitangi— In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall take into account the principles of the Treaty of Waitangi (Te Tiriti o Waitangi).	The principles of the Treaty of Waitangi are taken in to account in the following ways: - In recognising that regard should be had to the results of ongoing consultation with tangata whenua when developing management objectives and solutions. - In requiring consent applicants to consult with tangata whenua.

Auckland Regional Policy Statement

Auckland Regional Policy Statement	Water Allocation Strategy
9.3 OBJECTIVES 1. To maintain water levels and flows sufficient to protect the: (i) natural character, (ii) cultural, amenity and intrinsic values, and (iii) aquatic habitats and ecosystems, of streams, rivers, lakes and wetlands… …3. To manage the use of water so as to enable people and communities to provide for their present and future social, economic and cultural wellbeing, and for their health and safety, while being consistent with Objectives 9.3-1…	The water allocation strategy proposes management objectives which have as their key focus the maintenance and enhancement of the ecological values of surface water bodies in the catchment. It also provides for the further development of objectives to take into account cultural, recreational and landscape values. The proposed management objectives recognise that, in parts of the catchment, water is a key resource on which economic activity is reliant. Management solutions aiming to minimise the risk of dam failure have regard for health and safety.
9.4.1 Policies: Land use and water resources. 1. Land use activities that affect the quantity of water contributed to streams, rivers, lakes, wetlands or aquifers shall be managed so as to: (i) protect the quantity of water in water bodies which have high amenity, cultural or ecological values;…. (iv) protect highly used water bodies. 2. Planning for changes or intensification of land use shall have particular regard to current water availability and priorities for allocation of available water resources.	The proposed management solutions include measures which aim to ensure that land use activities which could affect surface water resource quantities are appropriately managed.
9.4.2 Methods 1. The ARC will give effect to Policy 9.4.1-1 and -2 by seeking the inclusion of appropriate provisions in district plans or, where desirable, through the provisions of regional plans. 2. The ARC will record and make available to the public, appropriate information on current water availability for significant or priority surface water catchments and aquifers.	The water allocation strategy provides for the ARC to make submissions on District Plans to ensure that adverse effects on surface water resource quantities resulting from land use change are avoided, remedied or mitigated. It also recommends that controls on land use be considered in the development of the LAW plan. The water allocation strategy proposals indicate that water availability for run-of-stream takes during the period November to April is fully allocated.

9.4.4 Policy: Water availability. The availability of water in water bodies and coastal water for taking, use, damming or diversion shall be determined on the following basis: (i) A precautionary approach shall be taken. (ii) The following matters shall be recognised and provided for: (a) the ability of the water body to sustain the abstraction; (b) the relationship of Tangata Whenua and their culture and traditions with their ancestral water, waahi tapu and other taonga; (c) preservation of the natural character of the coastal environment, streams, rivers, lakes and wetlands and their margins; (d) protection of indigenous vegetation and habitats of indigenous fauna in streams, rivers, lakes, wetlands and the coastal environment; (e) maintenance of the natural flow variability in streams, rivers, lakes and wetlands. (iii) Particular regard shall be had to the following matters: (a) kaitiakitanga; (b) maintenance and enhancement of the recreational, scenic, amenity and intrinsic values of streams, rivers, lakes and wetlands; (c) maintenance of water quality including sufficient capacity for streams, rivers, lakes and wetlands to assimilate contaminants; (d) the security of a specific quantity of water being available in streams, rivers, lakes and wetlands during periods of low flow;… …(iv) The principles of the Treaty of Waitangi (Te Tiriti o Waitangi) shall be taken into account.	The water allocation strategy highlights that the determination of water availability is dependent on further investigations and the setting of management objectives. In the interim, it is proposed that a precautionary approach be adopted and no further water be allocated unless assessments of effects indicate that adverse effects will be avoided, remedied or mitigated. The water allocations strategy proposes management solutions which recognise the limits on the ability of the rivers and streams of the catchment to sustain abstractions. The water allocation strategy recognises and provides for the cultural values of tangata whenua to be taken into account when developing management objectives and solutions. The water allocation strategy provides for landscape values to be taken into account in the further development of management objectives. The water allocation strategy proposes management objectives which have as their key focus the maintenance and enhancement of the ecological values of surface water bodies in the catchment. Management solutions are proposed which aim to maintain the frequency and duration of natural low flows. The water allocation strategy recognises that regard should be had to the results of ongoing consultation with tangata whenua when developing management objectives and solutions. The proposed management objectives have as their key focus the maintenance and enhancement of ecological values whilst providing for the further development of management objectives to take into account recreational and landscape values. The proposed management objectives include the maintenance of flows to provide for assimilation in the main Kaipara River. The proposed management solutions include the setting of minimum flows and higher thresholds for new users. Different securities of supply correspond with these different thresholds. Refer to section B2.

9.4.5 Methods 1. The ARC will record and make available to the public, appropriate hydrological and other information such as the following: (i) For selected surface water bodies: flow regimes, water levels, water quality, aquatic habitat, indigenous vegetation, indigenous fauna and other uses… 2. The ARC may impose conditions on consents which require consent holders to record and forward to the ARC, as appropriate, information on water use and the effects of that use on the adjacent environment. Consent holders may also be required to record water level, temperature, quality information, and other information as required by the ARC…	The resource statement documents this information. The proposed actions include the requirement for consent holders to monitor and record water use.
…4. The process for determining the availability of water for abstraction from a water body which is identified as having priority for investigation will be as follows: (i) A non-statutory Water Resource Assessment Report (WRAR), which is part of the catchment planning process, will be prepared (see Appendix A). In the process of preparing the WRAR the ARC will: (a) consult with the Tangata Whenua, and persons interested or affected (see Appendix D - for consultation); refer any issues which are not resolved by consultation to a Hearings Commission, which will receive and hear submissions and evidence from any person interested, (b) deliberate thereon, and recommend any changes which it considers should be made to the WRAR. (ii) If any issue then remains unresolved at the completion of the hearings process, either appropriate provisions will be included in a regional plan to give effect to the findings of the study or, any consent applications relevant to the study will be notified. The plan, provisions, or consents will proceed in accordance with the statutory processes set out in the RM Act. (iii) Where all issues are resolved by (i)(a) above, Water Resource Assessment Reports will be regarded in the resource consent process. Where the process proceeds to (b) the WRAR will be superseded by the provisions of any relevant regional plan.	The preparation of the water allocation strategy is, and will continue, to follow this process.

Non-statutory ARC Water Resource Assessment Reports will, as appropriate: (i) describe the area and water resource to which the assessment report applies; (ii) identify issues that affect the use, development or protection of the natural and physical resources; (iii) provide information on quantities of water available for abstraction including the setting of any minimum water levels or flow regimes; (iv) evaluate alternative strategies for addressing the issues including priorities of allocation, economic instruments, and assessment of efficient use; propose ongoing monitoring or investigation of the water resource; (vi) have a review or expiry date on the assessment report.	

9.4.7 Policies: Allocation and use of water. The following Policies and Methods give effect to Objectives 9.3 -1, 2, and -3.	
1. The conservation, efficient use and reuse of the Region's water shall be promoted.	The water allocation strategy proposes to allocate water on the basis of efficient use. It also recognises opportunities to support the potential for water re-use associated with the Project West proposal.
2. Priority shall be accorded to uses of water which give effect to the RPS strategic direction and the regional development policies (see Chapter 2).	All current water uses in the catchment are consistent with the strategic development and regional development policies.
3. The taking, damming, diversion and use of available water as determined by Policy 9.4.4, shall be controlled so that:	
(i) Actual or potential adverse effects on the environment, including effects on other authorised water users, the water body, ecosystems, and amenity values, are avoided, remedied, or mitigated.	The proposed management solutions aim to ensure that adverse effects on the environment of the taking and damming of water are avoided, remedied or mitigated.
(ii) The relationship of Tangata Whenua and their culture and traditions with their ancestral water, waahi tapu and other taonga is recognised and provided for.	The water allocation strategy recognises and provides for the cultural values of tangata whenua to be taken into account when developing management objectives and solutions.
(iii) Particular regard is had to: (a) kaitiakitanga;	The water allocation strategy recognises that regard should be had to the results of ongoing consultation with tangata whenua when developing management objectives and solutions.
(b) promoting efficient use of water;	The water allocation strategy propose to allocate water on the basis of efficient use. It also recognises opportunities to support the potential for water re-use associated with the Project West proposal.
(c) avoiding, remedying, or mitigating adverse effects of dams, weirs and other instream structures on the environment including but not limited to reduction in flows, obstruction to the passage and migration of any indigenous fauna; bank or bed erosion or aggradation; flooding or restricting the drainage of any property;	The proposed management solutions include measures which aim to address the effects of dams on low flows, provide for fish passage and minimise the risks of dam failure.

(d) providing, in the case of fresh water, for the individual's reasonable domestic needs and for the individual's animal's drinking water;…	Management solutions such as minimum flows and dam residual flows will help to ensure that water availability for stock and domestic purposes is not compromised.
…(iv) The principles of the Treaty of Waitangi (Te Tiriti o Waitangi) are taken into account.	Refer to Section B2.
9.4.8 Methods	
1. The ARC will promote the conservation, efficient distribution and use and reuse of water through: (i) the resource consent process,…	The water allocation strategy proposes the determination of allocations for consent holders on the basis of efficient water use.
(iii) …public education programmes,	The water allocation strategy proposes continued education and advocacy of water conservation measures.
2. The ARC will control the taking, damming, diversion, use and allocation of water by means of: (i) The resource consent process, and consent transfer, having regard to Water Resource Assessment Reports where these are applicable (see Policy 9.4.4, Method 9.4.5 and Appendix A).	Decisions on applications for resource consents will be made in accordance with the recommendations of the water allocation strategy.
(ii) Regional plan provisions where appropriate.	Relevant rules in the Transitional Regional Plan apply to the taking and damming of water in the catchment. The water allocation strategy recommends actions for the development of the Proposed Regional Plan: Land, Air and Water.
(iii) Monitoring any taking of fresh water or geothermal water as provided for by Policies 9.4.7-3(iii)(d) and (e) to ensure that no adverse effects occur.	A land and water use survey was completed as part of the collation of information in the resource statement. Based on the findings of this survey, estimates of water demand for stock and domestic use can be taken into account when allocating water to consent applicants.

Appendix II

Soil Types and Land Use Capability

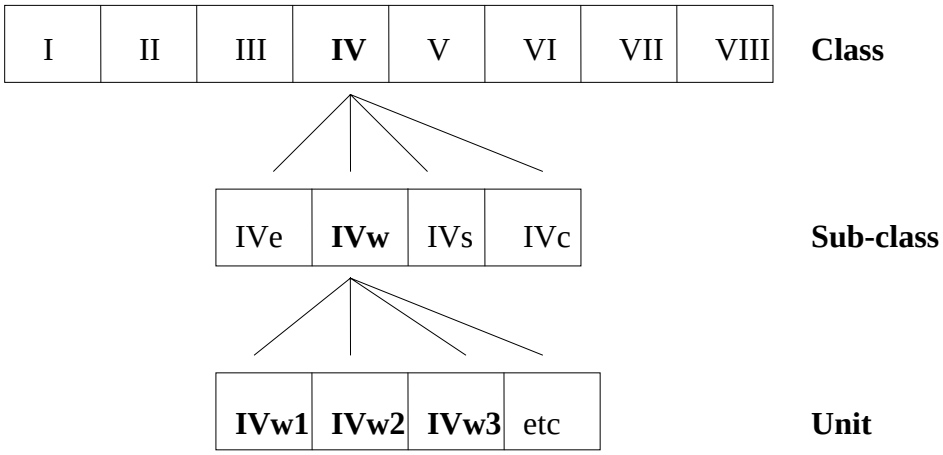
Soil Types (refer to map 3)

Soil code K___	Soil name	Soil type and brief description
AK	Awapuku clay loam	Brown granular loams and clays of the rolling and hilly land. Moderately well drained.
AKH	Awapuku clay loam hill soil	Brown granular clays associated with steepland areas
C1	Otao - Waitemata - Albany - Coatesville - Otonga complex	Complex of well to moderately well drained water-sorted soils of undulating terraces and lowlands
C1A	Otao - Waitemata - Hobsonville - Albany - Coatesville - complex	Complex of well to moderately well drained water-sorted soils of undulating terraces and lowlands
CW	Cornwallis clay	Brown granular loams and clays of the rolling and hilly land. Moderately well drained. Strongly to very strongly leached.
CWH	Cornwallis clay hill soil	Brown granular loams and clays of the rolling and hilly land. Moderately well drained. Strongly to very strongly leached. Steepland soils.
HAS	Huia steepland soils	Brown granular loams and clays associated with steepland soils. Weakly to moderately leached and often excessively drained.
KP and KPy	Kaipara clay and clay loam, and peaty clay loam	Gley soils of estuarine flats and former lake beds. Imperfectly to very poorly drained.
MV	Mahurangi fine sandy loam	Weakly to moderately podzolised yellow brown earth soils associated with rolling and hilly land. Imperfectly to very poorly drained.
MVH	Mahurangi sandy loam hill soil	Weakly to moderately podzolised yellow brown earth soils associated with hilly and steep land. Imperfectly to very poorly drained.
MX	Mount Rex clay soil	Yellow brown earth soils associated with hilly and steep land. Imperfectly to very poorly drained.
OGv	Otonga peaty clay loam	Organic soils of undulating terraces and lowlands. Imperfectly to very poorly drained.
PA	Parau clay loam	Brown granular loams and clays of the rolling and hilly land. Well to moderately well drained. Moderately to strongly leached.
PAH	Parau clay loam hill soil	Brown granular loams and clays of the steeper land. Well to moderately well drained. Moderately to strongly leached.
PBuH	Puhoi light brown clay loam	Weakly to moderately leached yellow brown earths of rolling and hilly land. Imperfectly to very poorly drained.
PN	Pinaki sand	Soils of the coastal sand dune complex. Weakly weathered and weakly to moderately leached yellow-brown sands.
PNH	Pinaki sand hill soil	Soils of the coastal sand dune complex, steep land. Weakly weathered and weakly to moderately leached yellow-brown sands.
PZ	Parore peaty sandy loam	Organic soils associated with lowland areas of the coastal sand dune complex. Imperfectly to very poorly drained.
RLH	Red Hill sandy loam	Moderately to strongly leached yellow-brown sands of the coastal sand dune complex. Well to moderately well drained.
RL1	Red Hill sandy clay loam	Moderately to strongly leached yellow-brown sands of the coastal sand dune complex. Well to moderately well drained. Similar to RLH but with stronger clay texture.
RL1H	Red Hill sandy clay loam	Moderately to strongly leached yellow-brown sands of the

	hill soil	coastal sand dune complex. Well to moderately well drained. Similar to RLH but with stronger clay texture. And associated with steeper areas
TC	Takahiwai clay soil	Weakly saline gley soils of estuarine flats and former lake beds. Imperfectly to very poorly drained.
WA	Warkworth clay and sandy clay loam	Yellow brown earth soils associated with rolling and hilly land. Well to moderately well drained. Strongly leached to weakly podzolised.
WAH	Warkworth clay and sandy clay loam hill soil	Yellow brown earth soils associated with steep land. Well to moderately well drained. Strongly leached to weakly podzolised.
WF and WFm	Whakapara clay loam	Recent water-sorted soils associated with the flood-plains. Well to moderately well drained except for the mottle phase (WFm) which is imperfectly to very poorly drained.
WR	Whangaripo clay loam	Yellow brown earth soils associated with rolling and hilly land. Well to moderately well drained. Moderately to strongly leached.
WRH and WReH	Whangaripo hill soil	Yellow brown earth soils associated with steep land. Well to moderately well drained. Moderately to strongly leached.
YK	Waikare silt loam	Weakly to moderately podzolised yellow brown earth soils associated with rolling and hilly land. Imperfectly to very poorly drained.
YT	Waitakere clay	Brown granular loams and clays associated with rolling and hilly land. Moderately to strongly leached. Well to moderately well drained.
YTH	Waitakere clay hill soil	Brown granular loams and clays associated with steepland soils. Moderately to strongly leached. Well to moderately well drained.
YUy	Waipu peaty silt loam	Gley soils of undulating terraces and lowlands. Imperfectly to very poorly drained. Strongly to very strongly leached.

Land Use Capability (refer to map 5)

The Land Use Capability (LUC) system of land classification assesses land in terms of its capacity for long-term sustained productive use, taking into account physical limitations, management requirements and soil conservation needs. The LUC assessment in the New Zealand Land Resource Inventory (NZLRI), (DSIR 1988) is based on an interpretation of the physical information in the land resource inventory, supplemented with information on climate, flood risk, land-use practices and erosion history. There are 8 possible land-use capability classes, each of which has three components as can be seen in the following diagram.



The LUC class indicates the increasing degree of limitation to use, i.e. an LUC class of 1 is prime production land, compared with class 8 which is getting to be like the Southern Alps. The sub-class indicates the dominant kind of limitation within that class, and the unit indicates different management and conservation requirements.

The 'Kaipara Catchment - Land Use Capability Map' indicates the main tracts of land which have been classified with the same LUC class. Note that there is no class I, V or VIII land classified in this district. Each LUC class is briefly described as follows.

LUC II

Undulating to gently rolling slopes on broad (well drained) terraces with a complex of soil types. Soils are typically yellow brown loam soils formed from water-sorted unconsolidated clays and silts, sometimes associated with peats. Soils are highly suited to intensive cropping production and horticulture but has slight limitations under intensive use on account of some wetness and spatial variation of soil quality. Potential erosion is slight sheet and rill erosion when cultivated. Maximum carrying capacity under grazing is 24 su/ha and the site index for *Pinus radiata* is typically 30-33. Deforestation of mainly Podocarp forest occurred from the middle of last century. Slopes are typically 0-7^{o}.

LUC III

Gently rolling to rolling slopes on broad terraces on alluvium. Slopes are typically 8-15^{o}. Soils are a complex of water-sorted alluvium and volcanic ash, including yellow brown

loams, brown granular loams, podzolised yellow brown loams, podzolised yellow brown earths and organic soils of the Waitemata suite. Soils are generally very versatile for a variety of production activities, although soil depth, structure, texture and natural fertility can vary considerably over a short distance. Present land use comprises mainly cropping and horticulture on undulating slopes and grazing on steeper slopes. Soils are well suited to intensive horticulture and protected cropping. Maximum carrying capacity under grazing is 24 su/ha and the site index for *Pinus radiata* is typically 29-32. Potential erosion can include slight sheet, rill and tunnel-gully erosion.

This LUC class also includes undulating to rolling coastal sand country. Soils are typically yellow brown sands on unconsolidated to compact dunesands of the Pinaki suite. Erosion potential can include slight to moderate sheet, rill and wind erosion when cultivated. Attainable physical carrying capacity under grazing is 18 su/ha and the site index for *Pinus radiata* is typically 27-30. This country has moderate limitations for arable use, largely due to the potential for erosion when cultivated and limitations due to soil characteristics and seasonal soil moisture deficit.

LUC IV

Sedimentary rock terrain, excluding greywacke. Includes soils formed from and over interbedded and massive sandstone and mudstone, limestone and includes podzols on sedimentary rock. Landform is generally a mixture of rolling and strongly rolling slopes. Slopes are typically 8-20^{o}. The sub-classes are quite diverse within this LUC class, varying according to rock type, soil characterisation, management requirements and soil conservation needs. Soils range from weakly to strongly leached, and weakly podzolised to podzolised. Potential for erosion can be moderate to severe with soil slip frequency increasing greatly above slope angles of about 20^{o}. Most soil slips are relatively shallow, however other commonly found erosion forms include sheet, earth slip and tunnel gully erosion. High producing pasture is the principal vegetation cover on land within this class, but with tracts of exotic conifer forest and scrub also being dominant. Cropping is generally unsuitable on account of slope angles and soil limitations. Most of the land types within this class have been deforested in the last 50 to 150 years.

LUC VI

The class VI areas east of the Kaipara river are strongly rolling to moderately steep slopes forming hilly terrain on interbedded and occasionally massive sandstones, mudstone and conglomerate, excluding limestone and greywacke. Soils are typically weakly to strongly leached yellow brown earths. Erosion potential includes moderate soil slip, sheet and tunnel gully erosion. Slopes are typically 16-25^{o}. Attainable physical carrying capacity under grazing is 12 su/ha and the site index for *Pinus radiata* is typically 31-34.

The class VI areas west of the Kaipara river and to the south of Kumeu predominantly include young unstable sand-dune complexes of the Pinaki suite. Soils are weakly developed, weakly weathered yellow brown sands on slopes ranging between 4 and 25^{o}. Landform is typically ‘hummocky’. Attainable physical carrying capacity under grazing is 9 su/ha and the site index for *Pinus radiata* is typically 27-30. Erosion potential is moderate to severe wind and sheet erosion.

LUC VII

The only class 7 land indicated in the district at the original mapping scale of 1:50,000 is at the north-west corner. This is designated class VIIe9 which comprises old stable sand dunes on unconsolidated to compact sands of the Pinaki suite. The land typically comprises rolling to very steep slopes forming sides of gullies, narrow valleys, low steep hills and terrace scarps. Slopes range from 16-35^{o}. Typical soils are steepland and hill soils related to yellow brown sands and podzolised yellow brown earths. Erosion potential includes severe to extreme sheet and wind erosion and very severe gully erosion. Attainable physical carrying capacity under grazing is 9 su/ha and the site index for *Pinus radiata* is typically 18-27.

Appendix III

Historic Places

Database Name	NZAA Site No.		Metric Easting	Metric Northing	Site Type	Name (s)
BUILDINGS			2647690	6482250	BUILDING - SCHOOL HALL	Waitakere School Hall
BUILDINGS			2649427	6482256	BUILDING-DWELLING	Betula Hill
BUILDINGS			2648864	6481791	BUILDING-DWELLING	
BUILDINGS			2648182	6482454	BUILDINGS - EX STORE	"Cottage Gardens"
BUILDINGS			2648173	6482259	BUILDING - PUBLIC HALL	Waitakere Public Hall
BUILDINGS			2648500	6479500	BUILDING - INDUSTRIAL	Garelja Orchard Building
MARITIME	Q10		2640100	6502300	SAWMILL/WHARF/BOOM	John McLeod, Issac McLeod, McLeods Mill
MARITIME	Q10		2640100	6502500	SAWMILL	Charles West's sawmill/Charles S. West
MARITIME	Q10		2638700	6500900	HULK	
MARITIME	Q10		2639820	6501500	SAWMILL	Coulthards
MARITIME	Q10		2639910	6501500	FLOURMILL	Bates
MARITIME	Q10		2639850	6501500	SAWMILL/WHARF/BOOM	Helensville Timber Company's Mill, Helensville Timber Company's Wharf, Kauri Timber Company
MARITIME	Q10		2639500	6499900	BOOM	Ohirangi Boom
MARITIME	Q10		2640050	6502100	BRIDGE	
MARITIME	Q10		2640050	6502250	WHARF	Railway wharf
MARITIME	Q10		2640050	6502400	FACTORY(FISH)/WHARF	
MARITIME	Q10		2639920	6502300	FLAX MILL	Henry Ballans
MARITIME	Q10		2639300	6502100	BRIDGE	Te Horo Point Bridge, Helensville Bridge
BUILDINGS	Q10		2639600	6500550	BUILDING - DWELLING	Te Makiri
BUILDINGS	Q10		2640100	6501700	BUILDING - JUSTICE	HELENSVILLE COURTHOUSE
NZAASRF	Q10	61	2639200	6491700	PA (RIDGETOP)	Ruarangi-haerere?
NZAASRF	Q10	62	2638700	6491800	PITS	
NZAASRF	Q10	63	2639300	6491900	PITS	
NZAASRF	Q10	64	2638700	6492200	PA(RIDGE)	
NZAASRF	Q10	65	2638600	6492600	TERRACES	
NZAASRF	Q10	66	2638700	6492400	PITS	
NZAASRF	Q10	67	2639300	6492600	PITS	
NZAASRF	Q10	68	2638400	6492700	PITS/TERRACES	
NZAASRF	Q10	69	2638300	6492800	PIT/TERRACE	
NZAASRF	Q10	70	2638300	6492900	PITS	
NZAASRF	Q10	71	2638700	6492900	PITS	
NZAASRF	Q10	72	2639200	6493100	PITS	
NZAASRF	Q10	73	2638000	6493100	MIDDEN (SHELL)	
NZAASRF	Q10	74	2638000	6493400	BOTANICAL (TARO)	
NZAASRF	Q10	75	2637800	6493500	PIT/TERRACES/MIDDEN (SHELL)/BOTANICAL (TARO)	
NZAASRF	Q10	76	2638200	6493800	PITS/TERRACE	
NZAASRF	Q10	77	2640500	6493900	PA (RIDGE)	Tauwhare
NZAASRF	Q10	78	2638100	6494100	PIT	
NZAASRF	Q10	79	0.26378	6494200	PITS/TERRACE	

NZAASRF	Q10	80	2637800	6494300	PITS/TERRACE
NZAASRF	Q10	81	2638500	6494600	PIT
NZAASRF	Q10	82	2638600	6494600	PITS
NZAASRF	Q10	83	2637800	6494700	PITS
NZAASRF	Q10	84	2637500	6494800	PIT
NZAASRF	Q10	85	2637800	6494900	PITS
NZAASRF	Q10	86	2637600	6495000	PITS/TERRACES/ BOTANICAL (KARAKA)
NZAASRF	Q10	87	2637500	6495100	PITS/TERRACES/ BOTANICAL (KARAKA)
NZAASRF	Q10	88	2638200	6495100	?PITS/?TERRACES
NZAASRF	Q10	89	2637200	6495500	PITS
NZAASRF	Q10	90	2637200	6495600	PA (RINGDITCH)
NZAASRF	Q10	91	2637000	6495900	PITS/MIDDEN (SHELL)
NZAASRF	Q10	92	2637800	6496000	PIT
NZAASRF	Q10	93	2637200	6496200	PIT
NZAASRF	Q10	94	2636700	6496300	PITS
NZAASRF	Q10	95	2637900	6496300	PITS
NZAASRF	Q10	96	2636700	6496600	PITS
NZAASRF	Q10	97	2636500	6496800	PITS
NZAASRF	Q10	98	2636300	6497000	?PIT
NZAASRF	Q10	99	2636500	6497000	PITS/TERRACES
NZAASRF	Q10	100	2636300	6497100	PITS/TERRACES
NZAASRF	Q10	101	2636200	6497100	PITS/?TERRACES
NZAASRF	Q10	102	2636100	6497100	PITS/TERRACE
NZAASRF	Q10	103	2636200	6497200	PA (RINGDITCH)
NZAASRF	Q10	104	2636200	6497300	PITS/MIDDEN (SHELL)
NZAASRF	Q10	105	2637000	6497300	PITS/TERRACES/MIDDEN (SHELL)
NZAASRF	Q10	106	2637100	6497500	PITS/TERRACE
NZAASRF	Q10	481	2639400	6490000	PITS/TERRACES
NZAASRF	Q10	482	2639500	6490100	PIT/TERRACES
NZAASRF	Q10	483	2638900	6490300	PA(RIDGE)
NZAASRF	Q10	484	2638400	6490800	PIT/MIDDEN (SHELL)
NZAASRF	Q10	485	2638800	6490700	PITS
NZAASRF	Q10	486	2638700	6490700	?PA (RIDGE)
NZAASRF	Q10	487	2638700	6490800	PA(RIDGE)
NZAASRF	Q10	501	2632900	6502000	PITS/TERRACES/MIDDEN (SHELL)
NZAASRF	Q10	502	2633300	6502000	TERRACE/PIT/ BOTANICAL(TARO)
NZAASRF	Q10	503	2633700	6502000	TERRACE
NZAASRF	Q10	504	2634100	6502000	TERRACE
NZAASRF	Q10	505	2633100	6501800	PIT/TERRACE/ BOTANICAL (KARAKA)
NZAASRF	Q10	506	2633100	6502000	BOTANICAL SITE (TARO)
NZAASRF	Q10	508	2632900	6501900	TERRACES/BOTANICAL (KARAKA)
NZAASPF	Q10	510	2632800	6502000	PITS
NZAASRF	Q10	511	2633100	6501800	PIT/TERRACE/ BOTANICAL (KARAKA)
NZAASRF	Q10	534	2633600	6501800	PA (RIDGE)
NZAASRF	Q10	535	2633400	6501500	PITS

NZAASRF	Q10	536	2633100	6501800	PIT	
NZAASRF	Q10	538	2636100	6497500	PITS/TERRACE/MIDDEN (HANGI STONE)	
NZAASRF	Q10	539	2635900	6497500	PITS/STONEWORK (MOUND)	
NZAASRF	Q10	540	2635800	6497500	PIT/?PIT	
NZAASRF	Q10	541	2636400	6497500	PIT	
NZAASRF	Q10	542	2635900	6497700	TERRACE/?PITS	
NZAASRF	Q10	543	2636000	6497700	PITS/TERRACES/MIDDEN (SHELL)	
NZAASRF	Q10	544	2636300	6497700	PITS/TERRACE	
NZAASRF	Q10	545	2636400	6497700	PITS	
NZAASRF	Q10	546	2636300	6497800	PITS/TERRACE	
NZAASRF	Q10	547	2635800	6498000	PITS/TERRACE	
NZAASRF	Q10	548	2636200	6497900	BOTANICAL SITE (NORFOLK ISLAND PINES)	
NZAASRF	Q10	549	2636600	6498000	PITS/MIDDEN (SHELL)	"FOOD PA"
NZAASRF	Q10	550	2636800	6498000	PITS	
NZAASRF	Q10	551	2635900	6498000	WELL(HISTORIC)	?Bishop Selwyn's Well
NZAASRF	Q10	552	2636500	6498000	PITS/?TERRACES	
NZAASRF	Q10	553	2636200	6498200	?PITS	
NZAASRF	Q10	554	2636000	6498400	PITS/?TERRACES	
NZAASRF	Q10	555	2636000	6498600	PITS	
NZAASRF	Q10	556	2635500	6498600	PITS/TERRACES	
NZAASRF	Q10	557	2637600	6498650	?PITS/?TERRACES	
NZAASRF	Q10	558	2635800	6498700	PA (RINGDITCH)	
NZAASRF	Q10	559	2635900	6498700	?PITS	
NZAASRF	Q10	560	2635600	6498900	PIT/BOTANICAL SITE (KARAKA)	
NZAASRF	Q10	561	2635500	6498900	?PIT/?TERRACE	
NZAASRF	Q10	562	2635600	6499000	PIT	
NZAASRF	Q10	563	2634900	6499000	PIT/TERRACE/BOTANICAL SITE (KARAKA)	
NZAASRF	Q10	564	2634900	6499100	PITS	
NZAASRF	Q10	565	2635000	6499100	PITS	
NZAASRF	Q10	566	2636200	6499000	PITS	
NZAASRF	Q10	567	2634900	6499200	?BANK	
NZAASRF	Q10	568	2634900	6499200	PIT/TERRACES	
NZAASRF	Q10	569	2635900	6499100	PITS	
NZAASRF	Q10	570	2636300	6499100	PITS/MIDDEN (SHELL)	
NZAASRF	Q10	571	2636100	6499100	PITS	
NZAASRF	Q10	572	2636400	6499200	PITS	
NZAASRF	Q10	573	2634900	6499400	PITS/MIDDEN (SHELL)	
NZAASRF	Q10	574	2634900	6499500	?PITS	
NZAASRF	Q10	575	2634900	6499400	PITS/MIDDEN (SHELL)	
NZAASRF	Q10	576	2634900	6499500	PITS/TERRACES	
NZAASRF	Q10	577	2634900	6499500	PITS	
NZAASRF	Q10	578	2635200	6499400	PITS/TERRACE	
NZAASRF	Q10	579	2635300	6499500	PITS/TERRACE	
NZAASRF	Q10	580	2634800	6499500	PITS/BOTANICAL SITE (KARAKA)	
NZAASRF	Q10	581	2636200	6499600	?TERRACES/?PITS	
NZAASRF	Q10	582	2636700	6499600	?PITS/?TERRACES	

NZAASRF	Q10	583	2635200	6499600	PITS/TERRACES/MIDDEN (SHELL)
NZAASRF	Q10	584	2634800	6499700	PA(RIDGE)
NZAASRF	Q10	585	2635000	6499800	PITS/DITCH
NZAASRF	Q10	586	2634400	6499900	PITS/TERRACES/MIDDEN (SHELL)
NZAASRF	Q10	587	2634900	6500000	?PIT/?TERRACE
NZAASRF	Q10	588	2635000	6500200	PIT
NZAASRF	Q10	589	2635200	6500300	PIT
NZAASRF	Q10	590	2635000	6500300	PITS
NZAASRF	Q10	591	2632500	6500300	MIDDEN (SHELL)
NZAASRF	Q10	592	2632500	6500300	MIDDEN (SHELL)/?PIT
NZAASRF	Q10	593	2632500	6500300	MIDDEN(SHELL)
NZAASRF	Q10	594	2632600	6500400	MIDDEN(SHELL)
NZAASRF	Q10	595	2634700	6500400	BOTANICAL SITE (KARAKA)/MIDDEN (SHELL)
NZAASRF	Q10	596	2635200	6500400	?TERRACE/?PIT
NZAASRF	Q10	597	2634100	6500700	PITS/TERRACES/MIDDEN (SHELL)
NZAASRF	Q10	598	2632700	6500700	MIDDEN (SHELL)/DEPRFSSIONS
NZAASRF	Q10	599	2633700	6500800	PA (RIDGE)
NZAASRF	Q10	600	2633400	6500800	MIDDEN(SHELL)
NZAASRF	Q10	601	2633400	6500900	PIT
NZAASRF	Q10	602	2634200	6500800	PA (RING DITCH)
NZAASRF	Q10	603	2634300	6500800	PITS/TERRACES
NZAASRF	Q10	604	2634400	6500900	PIT
NZAASRF	Q10	605	2633600	6501100	PA(RIDGE)
NZAASRF	Q10	606	2635300	6501100	?PITS
NZAASRF	Q10	607	2633800	6501200	PITS/BOTANICAL (KARAKA)
NZAASRF	Q10	608	2633700	6501300	PITS
NZAASRF	Q10	609	2633500	6501300	PITS/TERRACE
NZAASRF	Q10	610	2632500	6501300	MIDDEN(SHELL)/TERRACES
NZAASRF	Q10	611	2633600	6501400	PITS/TERRACES
NZAASRF	Q10	612	2633400	6501400	MIDDEN (SHELL)
NZAASRF	Q10	613	2633400	6501400	BURIAL
NZAASRF	Q10	614	2632800	6501400	MIDDEN (SHELL)
NZAASRF	Q10	615	2632600	6501400	MIDDEN(SHELL)
NZAASRF	Q10	616	2633700	6501500	?PITS/MIDDEN (SHELL)
NZAASRF	Q10	617	2633600	6501500	?PITS
NZAASRF	Q10	618	2634200	6501500	FINDSPOT(ADZES)
NZAASRF	Q10	619	2634200	6501600	PIT/TERRACES
NZAASRF	Q10	620	2634600	6501700	PITS/TERRACES
NZAASRF	Q10	626	2633700	6502000	MINING SHAFT (HISTORIC)
NZAASRF	Q10	627	2633300	6501900	PITS/TERRACES
NZAASRF	Q10	650	2637900	6493600	MIDDEN (SHELL)
NZAASRF	Q10	651	2637600	6493300	FINDSPOT(HISTORIC)
NZAASRF	Q10	652	2637500	6493500	PA
NZAASRF	Q10	653	2637700	6493100	TERRACE/BOTANICAL SITE (KARAKA/TI)
NZAASRF	Q10	654	2637800	6493300	BOTANICAL SITE (TARO)

NZAASRF	Q10	690	2649400	6499900	TERRACE (SOD WALLED HUT SITE) (REPORTED)	George Baker's First Home
NZAASRF	Q10	691	2648800	6499700	TERRACE (GUM SHANTY SITE) (REPORTED)	George Baker's Second Home
NZAASRF	Q10	692	2646700	6497500	SKID(LOGGING)	
NZAASRF	Q10	693	2646400	6496400	DAM(KAURI TIMBER)	
NZAASRF	Q10	694	2646100	6495700	DAM (KAURI TIMBER)	
NZAASRF	Q10	695	2646600	6497200	?DAM	
NZAASRF	Q10	696	2646100	6497700	PIT (DEPRESSION)	
NZAASRF	Q10	697	2646200	6495100	TUNNEL (BRICK)/?DAM	BLAKE'S MILL
NZAASRF	Q10	698	2645900	6499100	TERRACES	
NZAASRF	Q10	699	2646100	6495600	FINDSPOT (DAM STRINGERS)	
NZAASRF	Q10	700	2646900	6497900	DAM (KAURI TIMBER) (REPORTED)	
NZAASRF	Q10	760	2637200	6494300	PA (RIDGE)	
NZAASRF	Q10	766	2640600	6501900	PIT/TERRACE	
WAITAKERE	Q11		2646133	6479663	HOUSE SITE	Seaman's House
WAITAKERE	Q11		2646786	6479265	HOUSE SITE	
WAITAKERE	Q11		2649391	6479018	SHACK	
WAITAKERE	Q11		2641824	6488513	SCHOOL	Muriwai School
WAITAKERE	Q11		2645819	6494192	TIMBER MILL	Hunter's Mill
WAITAKERE	Q11		2648876	6479076	TIMBER DAM	Cassel Stream
WAITAKERE	Q11		2649544	6480063	TIMBER DAM	Gin Bottle Stream
WAITAKERE	Q11		2649521:2649417	6479240:6478786	TRAMLINE	Swanson Pipeline Tramline
WAITAKERE	Q11		2645547	6484292	QUARRY	North Hunters Quarry
WAITAKERE	Q11		2645263	6483934	QUARRY	South Hunters Quarry
WAITAKERE	Q11		2649926	6480704	BRIDGE	
WAITAKERE	Q11		2649183	6491061	TANKER RIDING	
WAITAKERE	Q11		2642332:2647963	6480541:6482394	TRAMLINE	Kauri Timber Company Tramline
NZAASRF	Q11	86	2638100	6488600	PITS	
NZAASRF	Q11	87	2638500	6488700	PITS	
NZAASRF	Q11	88	2638700	6488800	PITS/TERRACE	
WAITAKERE	Q11	350	2648023	6479231	HOUSE SITE	Haunted House
NZAASRF	Q11	350	2647900	6479100	HOUSE	
WAITAKERE	Q11	374	2646878:2650473	6479589:6480585	TRAMLINE	Gibbons' Tramline Swanson
NZAASRF	R10	695	2652200	6496200	MIDDEN (GLASS AND CERAMIC) (HISTORIC)	Puketui Gum Camp (depot)
WAITAKERE	R11		2650567:2649390	6480674:6481073	TRAMLINE	North Trunk Line
WAITAKERE	R11		2650748:2646720	6480578:6477216	TRAMLINE	Waitakere Dam Tramline
TREES	R11		2649378	6480726	tree	
TREES	R11		2647750	6482143	tree	Waitakere Primary School
NZAASRF	R11	1376	2650500	6487500	GUMDIGGERS CAMP	

Appendix IV

Water Quality Data

BASELINE WATER QUALITY DATA
(source: ARC baseline water quality monitoring report, 1998)

(a) Kumeu River - Raw data and summary statistics (April 1994 - March 1997)

Date	pH	Temperature (degrees C)	Non-filtrable residue (mg/l)	Turbidity (ntu)	Chloride (mgCl/l)	Conductivity (mS/m)	Total Phosphorus (mgP/l)	Soluble Phosphorus (mgP/l)	Nitrate (mgN/l)	Ammonia (mgN/l)	BOD (mgO/l)	Total Coliforms (cfu/100ml)	Faecal Coliforms (cfu/100ml)	Dissolved Oxygen (%)	Black Disk (rn)
6-Apr-94	7.4	16.0	21.0	11.0	35.4	18.6	0.106	0.022	0.061	0.003	<2	490	230	77	0.45
10-May-94	7.3	13.6	11.1	12.0	35.9	19.3	0.092	0.026	0.185	0.048	<2	1700	460	61	0.57
7-Jun-94	7.2	7.4	6.5	6.5	34.8	18.6	0.042	0.022	0.463	0.023	<2	790	790	88	0.71
4-Jul-94	6.9	9.1	6.5	6.8	33.3	18.4	0.045	0.009	0.795	0.044	<2	2300	490	89	0.63
8-Aug-94	6.7	14.6	11.6	9.0	32.6	17.8	0.054	0.011	1.065	0.051	<2	3300	700	93	0.4
7-Sep-94	6.7	12.8	16.3	13.0	30.2	16.3	0.110	0.008	0.855	0.038	3	1300	1300	88	0.4
6-Oct-94	6.6	13.8	16.1	8.4	28.5	16.2	0.072	0.017	0.725	0.055	<2	2300	490	80	0.41
8-Nov-94	6.9	9.0	13.3	12.0	29.3	15.9	0.088	0.039	0.343	0.026	2	790	230	63	0.53
6-Dec-94	7.7	19.5	7.3	9.6	30.9	16.7	0.116	0.049	0.299	0.064	<2	790	790	86	0.38
10-Jan-95	7.2	20.2	6.7	21.0	34.3	20.9	0.136	0.039	0.148	0.053	<2	3300	3300	52	0.28
8-Feb-95	7.3	20.8	8.3	16.0	35.6	19.1	0.160	0.040	0.164	0.034	<2	3300	700	67	1.86
7-Mar-95	6.9	16.7	5.6	10.0	33.1	18.3	0.094	0.034	0.332	0.033	<2	1100	330	68	0.76
4-Apr-95	6.7	19.5	12.9	7.2	29.9	17.3	0.070	0.036	0.741	0.020	<2	3300	1300	75	0.54
2-May-95	7.2	16.0	9.9	12.0	32.0	16.5	0.060	0.023	0.470	0.046	<2	4900	4900	71	0.4
7-Jun-95	6.7	10.2	16.6	14.0	29.6	16.7	0.070	0.010	1.260	0.053	<2	2300	300	79	0.42
7-Jul-95	6.4	12.5	21.4	19.0	29.4	16.7	0.060	0.020	1.407	0.003	<2	3100	1700	78	0.35
1-Aug-95	6.8	11.8	18.4	14.0	32.5	16.2	0.100	0.010	0.947	0.039	<2	1100	1100	85	0.28
5-Sep-95	7.1	13.2	24.4	18.0	30.2	16.5	0.090	0.030	0.649	0.048	<2	2300	790	84	0.21
3-Oct-95	6.9	16.5	28.8	27.0	26.2	14.6	0.110	0.030	0.853	0.058	<2	2300	790	87	0.2
7-Nov-95	7.1	16.0	10.7	13.0	28.6	16.1	0.080	0.020	0.499	0.049	<2	940	700	90	0.31
5-Dec-95	7.2	20.5	6.8	10.0	30.2	16.4	0.080	0.020	0.417	0.040	<2	3300	790	89	0.45
10-Jan-96	7.3	18.6	7.4	9.7	29.8	16.1	0.070	0.030	0.258	0.034	<2	7900	4900	75	0.48
7-Feb-96	7.3	20.0	7.9	14.0	31.6	17.4	0.080	0.040	0.206	0.023	<2	2300	2300	77	0.39
5-Mar-96	7.0	18.5	8.0	13.0	27.9	15.3	0.060	0.010	0.436	0.050	<2	7000	1300	82	0.48
2-Apr-96	7.4	17.5	16.0	13.0	31.6	17.1	0.060	0.050	0.189	0.089	<2	1700	700	85	0.45
7-May-96	7.0	12.5	6.8	7.9	27.7	15.3	0.050	0.010	0.441	0.022	<2	790	330	89	0.57
5-Jun-96	6.9	10.5	16.0	7.7	29.3	15.6	0.040	0.020	0.784	0.032	<2	790	490	86	0.5
2-Jul-96	6.6	11.3	49.0	37.0	24.0	14.5	0.090	0.010	0.940	0.076	<2	3300	1700	81	0.12
5-Aug-96	6.7	13.2	22.0	22.0	26.2	15.2	0.060	0.010	0.950	0.046	<2	3000	500	85	0.27
3-Sep-96	6.5	13.8	44.0	54.0	19.7	12.8	0.190	0.020	0.900	0.078	2.5	3000	3000	82	0.15
1-Oct-96	7.0	15.0	13.0	17.0	29.7	15.8	0.060	0.010	0.531	0.046	<2	3000	2300	91	0.47
5-Nov-96	7.2	16.0	13.0	21.0	27.8	16.5	0.130	0.030	0.521	0.168	2.4	13000	2800	86	0.3

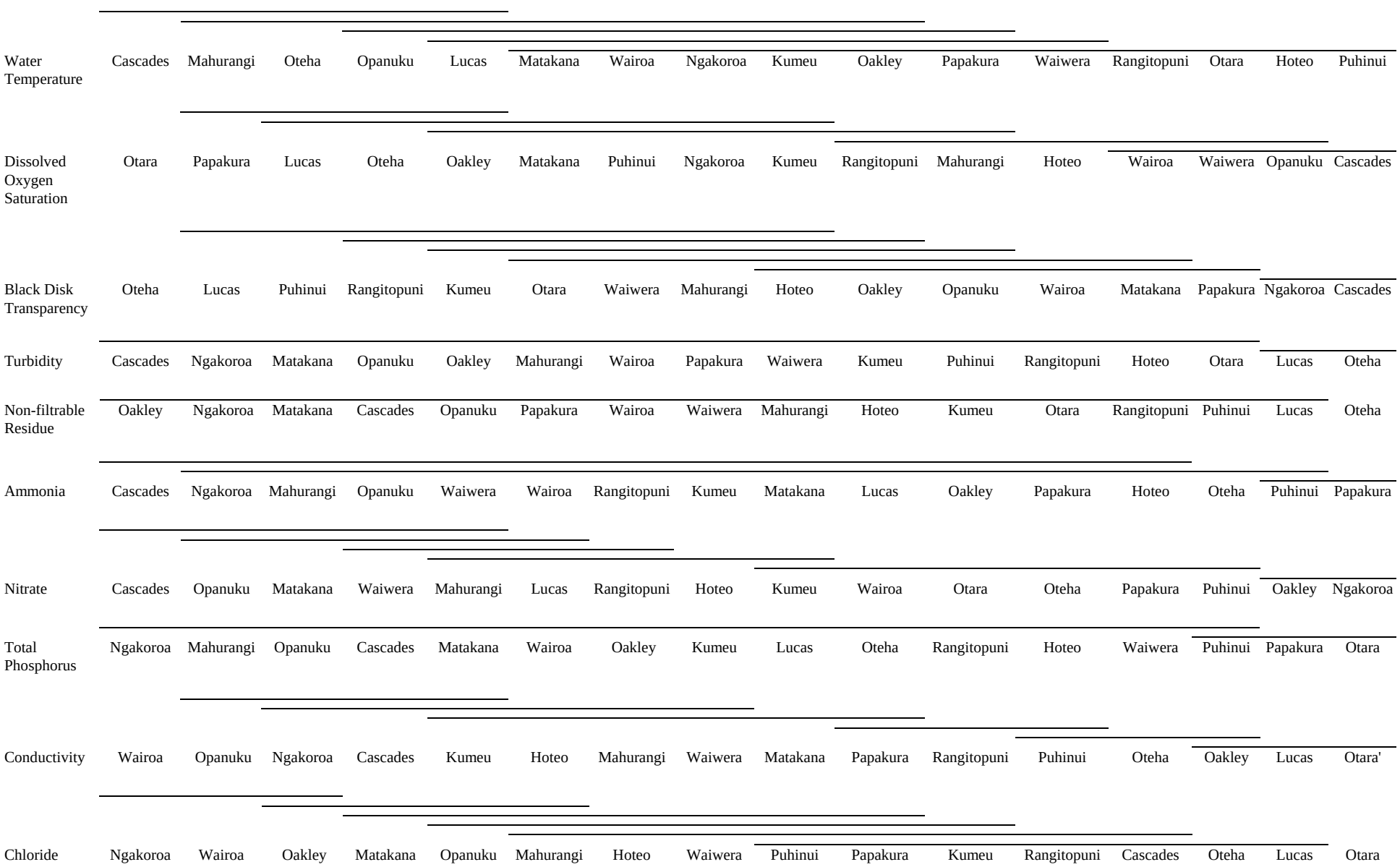
3-Dec-96	6.9	19.0	7.7	15.0	27.2	15.8	0.060	0.010	0.568	0.044	<2	5000	1100	81	0.34
7-Jan-97	7.1	-19.0	8.0	8.2	27.1	15.8	0.050	0.020	0.349	0.215	<2	2300	800	91	0.55
11-Feb-97	7.3	20.0	13.0	17.0	38.8	18.2	0.050	0.020	0.201	0.050	<2	700	1100	79	0.39
4-Mar-97	7.1	22.0	19.0	27.0	26.4	NR	0.090	0.020	0.538	0.070	2.7	17000	5000	70	0.25
Median	7.0	16.0	12.9	13.0	29.8	16.5	0.076	0.020	0.510	0.046	<2	2300	790	82	0.41
IQR/Median (%)	6.0	33.0	46.0	40.0	15.0	10.0	36.000	95.000	162.000	54.000	11	25	46	15	57

(b) Kumeu River - Summary statistics for all surveys August 1993 - March 1997 (n=43)

Median	7.1	15.5	13.0	13.0	29.9	16.5	0.080	0.020	0.466	0.046	<2	2300	790	82	0.42
Normality	NS	NS	98%	98%	NS	80%	98%	90%	90%	98%	98%	98%	98%	98%	98%
Seasonality	90%	95%	75%	NS	NS	75%	NS	95%	95%	NS	NS	NS	NS	NS	NS
Trend	80%	95%	80%	95%	95%	95%	90%	95%	95%	95%	NS	NS	95%	95%	95%
Slope	-0.04	0.52	0.88	2.55	-1	-0.45	-0.010	-0.004	0.070	0.006	NS	NS	235	2.00	-0.06

(c) Freshwater Site MANOVA Comparisons for Selected Parameter

Sites ordered as increasing median concentration from right to left. Levels of significance 95% for all comparisons



SUMMARY STATITISTICS OF PREVIOUS WATER QUALITY MONITORING, reported in Kaipara River Catchment Water allocation and Management Plan 1989, ARWB Technical Publication No 56))

(i) Long Term Baseline - Kaipara River at Waimauku (Q10 438921) (November 1978 to March 1982, June 1986 to September 1986)

Variable	Units **	N	Mean	Standard Deviation	Minimum Value	Maximum Value	Std Error of Mean	Variance	C.V.
GAUGE HT	(m)	18	2.78	0.71	0.37	4.02	0.17	0.51	25.58
TEMP W	(^{o}c)	44	15.63	3.79	6.10	22.50	0.57	14.39	24.28
DO		44	8.88	1.23	5.56	10.70	0.19	1.53	13.91
DO SATN	%	44	88.95	11.05	62.00	106.00	1.67	122.09	12.42
PH		44	7.12	0.43	6.21	8.50	0.06	0.18	5.98
COND 1	ms/m	40	17.94	2.50	11.90	22.90	0.40	6.27	13.96
CL		44	34.44	5.60	21.00	44.80	0.84	31.32	16.25
NFR		34	21.90	28.67	2.00	167.20	4.92	822.12	130.94
TURBIDITY	NTU	44	19.63	21.96	2.10	140.00	3.31	482.14	111.87
BOD DARK		38	1.18	1.06	0.30	6.64	0.17	1.12	89.91
COD		17	17.19	7.79	10.00	43.10	1.89	60.65	45.31
NH3 N		44	0.06	0.07	0.00	0.39	0.01	0.00	118.32
N02 N		44	0.01	0.01	0.00	0.04	0.00	0.00	58.25
N03 N		44	0.79	0.32	0.08	1.40	0.05	0.10	40.15
TON		40	0.77	0.32	0.09	1.41	0.05	0.10	41.49
SRP		44	0.03	0.01	0.01	0.06	0.00	0.00	40.07
TOT P		44	0.12	0.09	0.05	0.58	0.01	0.01	73.16
COLI TOT	MPN/100mls	44	*		110.00	90000.00			
FAE MPN	MPN/100mls	44	*1202		70.00	80000.00			

* The geometric mean, minimum and maximum values only for bacteria results are reported as the other summary statistics in the above table are not suitable for this type of raw data.
** All units are in g^3/m unless otherwise specified.

(ii) Long Term Baseline - Kumeu River at Matua Rd (September 1986)

Variable	Units **	N	Mean	Standard Deviation	Minimum Value	Maximum Value	Std Error of Mean	Variance	C.V.
GAUGE HT	(m)	7	0.34	0.10	0.18	0.46	0.04	0.01	31.00
TEMP W	(^{o}c)	18	15.73	3.53	9.5	23.5	0.83	12.45	22.43
DO		18	8.32	1.34	5.10	10.30	0.36	2.38	18.56
DO SATN	%	18	82.79	12.01	60.00	103.00	2.83	144.30	14.51
PH		18	6.72	0.37	6.10	7.40	0.09	0.13	5.46
COND 1	ms/m	0							
CL		18	33.17	6.04	24.00	52.00	1.42	36.50	17.18
NFR		18	18.47	11.65	8.70	46.00	2.75	135.64	63.07
TURBIDITY	NTU	18	17.13	7.87	11.00	36.00	1.85	61.89	43.92
BOD DARK		0							
COD		0							
NH3 N		17	0.36	0.89	0.03	3.60	0.22	0.79	248.41
N02 N		17	0.04	0.13	0.00	0.55	0.03	0.02	314.48
N03 N		18	0.79	0.53	0.00	1.80	0.13	0.28	66.87
TON		0							
SRP		18	0.02	0.01	0.01	0.05	0.00	0.00	50.91
TOT P		18	0.13	0.07	0.01	0.37	0.02	0.01	54.70
COLI TOT	MPN/100mls	17			500.00	50000.00			
FAE MPN	MPN/100mls	17	* 851		170.00	17000.00			

* The geometric mean, minimum and maximum values only for bacteria results are reported as the other summary statistics in the above table are not suitable for this type of raw data.
** All units are in g^{3}/m unless otherwise specified.

(iii) Kaipara River at Waimauku Bridge (Q10 436921)

Variable	Units **	N	Mean	Standard Deviation	Minimum Value	Maximum Value	Std Error of Mean	Variance	C.V.
GAUGE HT	(m)	3	0.50	0.00	0.50	0.50	0.00	0.00	0.00
TEMP W	(^{o}c)	8	13.67	1.61	12.50	17.30	0.57	2.58	11.75
DO		8	8.77	1.06	7.30	10.10	0.37	1.12	12.07
DO SATN	%	8	83.88	8.32	75.00	95.00	2.94	69.27	9.92
PH		8	6.60	0.59	5.90	7.30	0.21	0.35	8.95
COND 1	ms/m	0							
CL		8	35.50	8.98	28.00	56.00	3.17	80.57	28.62
NFR		5	7.48	2.14	4.90	10.10	0.96	4.58	25.28
TURBIDITY	NTU	5	8.38	0.93	6.90	9.00	0.42	0.87	11.14
BOD DARK		5	2.20	1.20	0.50	3.50	0.54	1.45	54.64
COD		0							
NH3 N		1	0.11		0.11	0.11		0.11	
N02 N		4	0.01	0.01	0.01	0.04	0.01	0.00	100.62
N03 N		4	1.29	0.01	1.28	1.31	0.01	0.00	1.16
TON		0							
SRP		4	0.03	0.00	0.02	0.03	0.00	0.00	14.63
TOT P		4	0.12	0.03	0.09	0.15	0.01	0.00	23.68
COLI TOT	MPN/100mls	8			2300.00	46000.00			
FAE MPN	MPN/100mls	3	*4467		2300.00	9300.00			

* The geometric mean, minimum and maximum values only for bacteria results are reported as the other summary statistics in the above table are not suitable for this type of raw data.
** All units are in g^{3}/m unless otherwise specified.

iv) Kaipara River at Railway Bridge (Q10 396998)

Variable	Units **	N	Mean	Standard Deviation	Minimum Value	Maximum Value	Std Error of Mean	Variance	C.V.
GAUGE HT	(m)	0							
TEMP W	(^{o}c)	4	12.75	0.25	12.40	13.10	0.18	0.12	2.75
DO		4	9.14	1.14	7.70	10.20	0.57	1.31	12.52
DO SATN	%	4	86.00	10.49	73.00	95.00	5.24	110.00	12.20
PH		4	6.15	0.06	6.10	6.20	0.03	0.00	0.94
COND 1	ms/m	0							
CL		4	30.25	0.96	29.00	31.00	0.48	0.92	3.17
NFR		0							
TURBIDITY	NTU	0							
BOD DARK		0							
COD		0							
NH3 N		0							
N02 N		4	0.01	0.00	0.00	0.01	0.00	0.00	25.53
N03 N		4	1.19	0.05	1.13	1.24	0.02	0.00	4.07
TON		0							
SRP		3	0.04	0.01	0.03	0.05	0.01	0.00	24.22
TOT P		4	0.12	0.03	0.09	0.15	0.01	0.00	23.79
COLI TOT	MPN/100mls	4			430.00	43000.00			
FAE MPN	MPN/100mls	4	*3664		430.00	43000.00			

* The geometric mean, minimum and maximum values only for bacteria results are reported as the other summary statistics in the above table are not suitable for this type of raw data.
** All units are in g^{3}/m unless otherwise specified.

v) Kaipara River at Dairy Company (Q10 399015)

Variable	Units **	N	Mean	Standard Deviation	Minimum Value	Maximum Value	Std Error of Mean	Variance	C.V.
GAUGE HT	(m)	0							
TEMP W	(^{o}c)	10	12.67	0.67	12.20	14.50	0.21	0.45	5.30
DO		10	8.90	0.53	8.22	10.10	0.17	0.28	5.95
DO SATN	%	9	84.56	4.67	78.00	95.00	1.56	21.78	5.52
PH		10	6.45	0.13	6.30	6.60	0.04	0.02	2.01
COND 1	ms/m	0							
CL		10	98.10	70.35	32.00	202.00	22.25	4948.54	71.71
NFR		1	231.00		231.00	231.00		231.00	
TURBIDITY	NTU	1	110.00		110.00	110.00		110.00	
BOD DARK		0							
COD		0							
NH3 N		1	0.34		0.34	0.34		0.34	
N02 N		10	0.01	0.00	0.00	0.01	0.00	0.00	40.28
N03 N		10	1.14	0.14	0.75	1.25	0.05	0.02	12.67
TON		0							
SRP		10	0.03	0.01	0.00	0.05	0.00	0.00	41.09
TOT P		10	0.22	0.02	0.19	0.26	0.01	0.00	11.24
COLI TOT	MPN/100mls	10			0.00	43000.00			
FAE MPN	MPN/100mls	10	*6607		0.00	43000.00			

* The geometric mean, minimum and maximum values only for bacteria results are reported as the other summary statistics in the above table are not suitable for this type of raw data.
** All units are in g^{3}/m unless otherwise specified.

vi) Kaipara River at Sand Barge (Q10 396048)

Variable	Units **	N	Mean	Standard Deviation	Minimum Value	Maximum Value	Std Error of Mean	Variance	C.V.
GAUGE HT	(m)	12	3.02	0.64	2.42	4.25	0.19	0.41	21.23
TEMP W	(^{o}c)	29	15.70	3.70	10.50	23.00	0.69	13.72	23.59
DO		29	8.51	1.08	6.48	11.10	0.20	1.16	12.65
DO SATN	%	29	85.72	7.21	72.00	108.00	1.34	51.99	8.41
PH		29	7.06	0.30	6.60	7.80	0.06	0.09	4.26
COND 1	ms/m	24	17.80	1.98	15.00	21.80	0.40	3.93	11.13
CL		29	646.41	2084.46	25.60	9900.00	387.07	4344969.86	322.47
NFR		13	21.17	12.71	4.70	56.20	3.53	161.64	60.06
TURBIDITY	NTU	24	22.80	12.79	3.80	65.00	2.61	163.56	56.08
BOD DARK		23	1.36	0.68	0.56	3.34	0.14	0.46	49.94
COD		10	18.75	4.72	12.90	27.90	1.49	22.29	25.18
NH3 N		24	0.08	0.08	0.00	0.32	0.02	0.02	105.83
N02 N		29	0.01	0.01	0.00	0.04	0.00	0.00	60.49
N03 N		29	1.00	0.32	0.45	1.76	0.06	0.10	31.85
TON		23	1.03	0.34	0.46	1.77	0.07	0.11	32.74
SRP		29	0.04	0.02	0.00	0.09	0.00	0.00	50.43
TOT P		29	0.15	0.09	0.07	0.54	0.02	0.01	57.66
COLI TOT	MPN/100mls	29			90	55000.00			
FAE MPN	MPN/100mls	29 *1230			90	43000			

* The geometric mean, minimum and maximum values only for bacteria results are reported as the other summary statistics in the above table are not suitable for this type of raw data.
** All units are in g^{3}/m unless otherwise specified.

vii) Ararimu Stream at Ararimu Valley Road (Q10 454944)

Variable	Units **	N	Mean	Standard Deviation	Minimum Value	Maximum Value	Std Error of Mean	Variance	C.V.
GAUGE HT	(m)	0							
TEMP W	(^{o}c)	52.00	14.40	3.46	7.30	20.70	0.48	11.97	24.02
DO		47	8.62	1.60	4.60	11.48	0.23	2.57	18.59
DO SATN	%	47	84.00	11.07	50.00	100.00	1.62	122.57	13.18
PH		52	6.96	0.28	6.15	7.47	0.04	0.08	4.07
COND 1	ms/m	52	16.24	2.00	11.30	21.00	0.28	4.00	12.31
CL		52	30.02	2.91	24.40	38.00	0.40	8.49	9.70
NFR		50	19.35	19.33	2.90	100.50	2.73	373.70	99.89
TURBIDITY	NTU	52	21.03	16.03	7.70	97.00	2.22	257.01	76.29
BOD DARK		45	1.16	0.92	0.08	5.50	0.14	0.85	79.06
COD		40	19.61	8.45	7.80	49.60	1.34	71.44	43.11
NH3 N		52	0.08	0.06	0.00	0.29	0.01	0.00	73.04
N02 N		52	0.01	0.00	0.00	0.02	0.00	0.00	48.53
N03 N		52	0.35	0.11	0.02	0.63	0.02	0.01	31.78
TON		52	0.36	0.10	0.13	0.64	0.01	0.01	28.27
SRP		52	0.03	0.01	0.01	0.08	0.00	0.00	55.10
TOT P		52	0.09	0.04	0.03	0.26	0.01	0.00	44.43
COLI TOT	MPN/100mls	52			50	80000.00			
FAE MPN	MPN/100mls	52	1493		50	50000			

* The geometric mean, minimum and maximum values only for bacteria results are reported as the other summary statistics in the above table are not suitable for this type of raw data.
** All units are in g^3/m unless otherwise specified.

viii) Pakinui Stream at Taupaki Rd (Q11 503874)

Variable	Units **	N	Mean	Standard Deviation	Minimum Value	Maximum Value	Std Error of Mean	Variance	C.V.
GAUGE HT	(m)	4.00	0.10	0.00	0.10	0.10	0.00	0.00	0
TEMP W	(^{o}c)	5	13.86	1.91	12.10	17.00	0.85	3.64	13.76
DO		5	5.24	1.06	3.90	6.70	0.47	1.12	20.18
DO SATN	%	5	50.40	10.85	36.00	63.00	4.85	117.80	21.53
PH		5	6.72	0.33	6.20	7.00	0.15	0.11	4.98
COND 1	ms/m	0							
CL		5	34.40	2.19	32.00	38.00	0.98	4.80	6.37
NFR		5	7.58	2.82	4.80	12.00	1.26	7.95	37.20
TURBIDITY	NTU	5	8.82	2.56	6.10	13.00	1.15	6.56	29.04
BOD DARK		5	1.62	0.90	0.40	2.70	0.40	0.82	55.80
COD		0							
NH3 N		1	0.60		0.60	0.60			
N02 N		1	0.10		0.10	0.10			
N03 N		1	3.14		3.14	3.14			
TON		0							
SRP		1	0.16		0.16	0.16			
TOT P		1	0.42		0.42	0.42			
COLI TOT	MPN/100mls	5			2300	46000			
FAE MPN	MPN/100mls	0							

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** All units are in g^3/m unless otherwise specified.

xi) Kays Stream at Waitakere Rd (Q10 485869)

Variable	Units **	N	Mean	Standard Deviation	Minimum Value	Maximum Value	Std Error of Mean	Variance	C.V.
GAUGE HT	(m)	5	0.20	0.07	0.10	0.30	0.03	0.00	35.36
TEMP W	(^{o}c)	5	14.40	1.74	13.00	17.20	0.78	3.04	12.12
DO		5	7.98	0.64	7.20	8.70	0.29	0.41	7.99
DO SATN	%	5	77.20	4.21	71.00	82.00	1.88	17.70	5.45
PH		5	6.88	0.26	6.60	7.10	0.12	0.07	3.76
COND 1	ms/m	0							
CL		5	32.00	1.41	30.00	34.00	0.63	2.00	4.42
NFR		5	4.82	0.54	4.10	5.50	0.24	0.30	11.31
TURBIDITY	NTU	5	5.76	1.19	4.90	7.80	0.53	1.42	20.71
BOD DARK		5	1.06	0.36	0.80	1.50	0.16	0.13	33.75
COD		0							
NH3 N		0							
N02 N		1	0.00		0.00	0.00			
N03 N		1	0.22		0.22	0.22			
TON		0							
SRP		1	0.01		0.01	0.01			
TOT P		1	0.06						
COLI TOT	MPN/100mls	5			0.06	0.06			
FAE MPN	MPN/100mls	0			430	4300			

* The geometric mean, minimum and maximum values only for bacteria results are reported as the other summary statistics in the above table are not suitable for this type of raw data.
** All units are in g^{3}/m unless otherwise specified.

x) Ahukuramu Stream at Main Rd (Q10 456917)

Variable	Units **	N	Mean	Standard Deviation	Minimum Value	Maximum Value	Std Error of Mean	Variance	C.V.
GAUGE HT	(m)	4	0.33	0.46	0.01	1.00	0.23	0.21	138.93
TEMP W	(^{o}c)	5	14.68	1.40	13.60	17.00	0.63	1.97	9.57
DO		5	9.36	0.41	9.00	10.00	0.18	0.17	4.38
DO SATN	%	5	91.80	3.49	88.00	96.00	1.56	12.20	3.8
PH		5	7.14	0.27	6.80	7.50	0.12	0.07	3.78
COND 1	ms/m	0							
CL		5	38.80	1.10	38.00	40.00	0.49	1.20	2.82
NFR		5	7.98	2.04	5.10	9.90	0.91	4.16	25.55
TURBIDITY	NTU	5	8.40	1.23	6.90	10.00	0.55	1.51	14.60
BOD DARK		5	1.50	0.20	1.30	1.70	0.09	0.04	13.33
COD		0							
NH3 N		1	0.03		0.03	0.03			
N02 N		1	0.00		0.00	0.00			
N03 N		1	0.49		0.49	0.49			
TON		0							
SRP		1	0.01		0.01	0.01			
TOT P		1	0.08		0.08	0.08			
COLI TOT	MPN/100mls	5			2300	4300.00			
FAE MPN	MPN/100mls	0							

* The geometric mean, minimum and maximum values only for bacteria results are reported as the other summary statistics in the above table are not suitable for this type of raw data.
** All units are in g^3/m unless otherwise specified.

xi) Waikoukou Stream at Old North Rd (Q10 454944)

Variable	Units **	N	Mean	Standard Deviation	Minimum Value	Maximum Value	Std Error of Mean	Variance	C.V.
GAUGE HT	(m)	5	0.17	0.07	0.10	0.25	0.03	0.00	39.46
TEMP W	(^{o}c)	5	14.32	1.77	12.80	17.20	0.79	3.13	12.36
DO		5	9.08	0.39	8.70	9.50	0.17	0.15	4.29
DO SATN	%	5	88.20	3.03	84.00	91.00	1.36	9.20	3.44
PH		5	7.12	0.18	7.00	7.40	0.08	0.03	2.51
COND 1	ms/m	0							
CL		5	32.80	2.28	30.00	36.00	1.02	5.20	6.95
NFR		5	11.24	3.38	7.90	16.00	1.51	11.40	30.04
TURBIDITY	NTU	5	11.54	2.98	7.70	16.00	1.33	8.86	25.79
BOD DARK		5	1.82	0.64	1.10	2.70	0.29	0.41	35.05
COD		0							
NH3 N		1	0.08		0.08	0.08			
N02 N		1	0.02		0.02	0.02			
N03 N		1	0.54		0.54	0.54			
TON		0							
SRP		1	0.03		0.03	0.03			
TOT P		1	0.11		0.11	0.00			
COLI TOT	MPN/100mls	5		230.00	43000				
FAE MPN	MPN/100mls	0							

* The geometric mean, minimum and maximum values only for bacteria results are reported as the other summary statistics in the above table are not suitable for this type of raw data.
** All units are in g^{3}/m unless otherwise specified.

xii) Waimauku Stream at Main Rd (Q10 435915)

Variable	Units **	N	Mean	Standard Deviation	Minimum Value	Maximum Value	Std Error of Mean	Variance	C.V.
GAUGE HT	(m)	5	0.26	0.23	0.01	0.50	0.10	0.05	86.80
TEMP W	(^{o}c)	5	14.98	1.60	14.00	17.80	0.71	2.55	10.66
DO		5	8.04	2.83	4.90	10.30	1.26	7.99	35.16
DO SATN	%	5	78.40	25.56	49.00	99.00	11.43	653.30	32.6
PH		5	7.18	0.22	6.90	7.40	0.10	0.05	3.02
COND 1	ms/m	0							
CL		5	45.00	1.41	44.00	47.00	0.63	2.00	3.14
NFR		5	14.62	9.46	7.40	31.00	4.23	89.53	64.72
TURBIDITY	NTU	5	14.90	3.54	10.50	19.00	1.58	12.55	23.78
BOD DARK		5	1.46	0.43	1.00	2.00	0.19	0.19	29.70
COD		0							
NH3 N		1	0.09		0.09	0.09			
N02 N		1	0.01		0.01	0.01			
N03 N		1	0.75		0.75	0.75			
TON		0							
SRP		1	0.02		0.02	0.02			
TOT P		1	0.07		0.07	0.07			
COLI TOT	MPN/100mls	5			2300	24000.00			
FAE MPN	MPN/100mls	0							

* The geometric mean, minimum and maximum values only for bacteria results are reported as the other summary statistics in the above table are not suitable for this type of raw data.
** All units are in g^{3}/m unless otherwise specified.

xiii) Waipatukahu Stream at Rewiti (Q10 402929)

Variable	Units **	N	Mean	Standard Deviation	Minimum Value	Maximum Value	Std Error of Mean	Variance	C.V.
GAUGE HT	(m)	5	0.28	0.20	0.10	0.50	0.09	0.04	73.19
TEMP W	(^{o}c)	5	15.20	1.51	14.00	17.80	0.68	2.29	9.97
DO		5	5.94	1.11	4.60	7.40	0.50	1.23	18.66
DO SATN	%	5	58.60	9.99	45.00	72.00	4.47	99.80	17.05
PH		5	7.08	0.08	7.00	7.20	0.04	0.01	1.18
COND 1	ms/m	0							
CL		5	59.00	3.32	55.00	64.00	1.48	11.00	5.62
NFR		5	8.22	6.76	3.90	20.00	3.02	45.64	82.19
TURBIDITY	NTU	5	5.22	2.44	2.80	9.00	1.09	5.96	46.78
BOD DARK		5	1.24	0.53	0.60	2.00	0.24	0.28	42.90
COD		0							
NH3 N		1	0.02		0.02	0.02			
N02 N		1	0.00		0.00	0.00			
N03 N		1	0.48		0.48	0.48			
TON		0							
SRP		1	0.01		0.01	0.01			
TOT P		1	0.08		0.08	0.08			
COLI TOT	MPN/100mls	5			430	1500.00			
FAE MPN	MPN/100mls	0							

* The geometric mean, minimum and maximum values only for bacteria results are reported as the other summary statistics in the above table are not suitable for this type of raw data.
** All units are in g^{3}/m unless otherwise specified.

xiv) Awaroa Stream at Inland Rd (Q10 421012)

Variable	Units **	N	Mean	Standard Deviation	Minimum Value	Maximum Value	Std Error of Mean	Variance	C.V.
GAUGE HT	(m)	0							
TEMP W	(^{o}c)	6	13.45	2.25	11.00	17.50	0.92	5.05	16.71
DO		6	7.42	1.09	5.70	8.70	0.45	1.19	14.71
DO SATN	%	5	68.80	11.95	52.00	85.00	5.34	142.70	17.36
PH		6	6.85	0.16	6.60	7.00	0.07	0.03	2.4
COND 1	ms/m	0							
CL		5	36.80	3.03	32.00	40.00	1.36	9.20	8.24
NFR		6	7.42	9.16	1.90	26.00	3.74	83.96	123.54
TURBIDITY	NTU	6	9.00	3.21	6.20	15.00	1.31	10.32	35.69
BOD DARK		5	0.86	0.40	0.20	1.20	0.18	0.16	46.22
COD		0							
NH3 N		2	0.01	0.01	0.01	0.02	0.00	10.00	62.23
N02 N		2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
N03 N		2	0.08	0.05	0.04	0.12	0.04	0.00	67.18
TON		0							
SRP		2	0.01	0.01	0.00	0.01	0.00	0.00	115.71
TOT P		2	0.06	0.00	0.05	0.06	0.00	0.00	7.44
COLI TOT	MPN/100mls	6			93.00	930.00			
FAE MPN	MPN/100mls	6	* 363		93.00	2300			

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** All units are in g^{3}/m unless otherwise specified.

xv) Coopers Creek at Main Rd (Q10 466915)

Variable	Units **	N	Mean	Standard Deviation	Minimum Value	Maximum Value	Std Error of Mean	Variance	C.V.
GAUGE HT	(m)	0							
TEMP W	(^{o}c)	2	15.50	2.83	13.50	17.50	2.00	8.00	18.25
DO		6	8.60	2.76	3.00	10.33	1.13	7.64	32.14
DO SATN	%	1	30.86		30.86	30.86			
PH		4	6.30	0.29	6.00	6.70	0.15	0.09	4.67
COND 1	ms/m	0							
CL		0							
NFR		7	267.86	245.86	8.00	661.00	92.93	60446.48	91.79
TURBIDITY	NTU	6	94.67	117.17	8.00	328.00	47.84	13729.87	123.78
BOD DARK		5	6.46	3.09	1.40	9.20	1.38	9.54	47.81
COD		0							
NH3 N		7	0.29	0.30	0.00	0.87	0.11	0.09	103.51
N02 N		7	0.01	0.00	0.00	0.01	0.00	0.00	53.03
N03 N		7	1.58	1.39	0.05	3.57	0.52	1.92	87.55
TON		0							
SRP		7	0.05	0.09	0.01	0.26	0.03	0.01	169.78
TOT P		7	0.70	0.73	0.07	2.27	0.28	0.53	103.82
COLI TOT	MPN/100mls	1	9300		9300.00	9300.00			
FAE MPN	MPN/100mls	1			24000.00	24000.00			

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** All units are in g^{3}/m unless otherwise specified.

xvi) Coopers Creek at Trigg Rd (Q10 465907)

Variable	Units **	N	Mean	Standard Deviation	Minimum Value	Maximum Value	Std Error of Mean	Variance	C.V.
GAUGE HT	(m)	0							
TEMP W	(^{o}c)	1	13.50		13.50	13.50			
DO		3	9.03	0.21	8.80	9.20	0.12	0.04	2.30
DO SATN	%	0							
PH		2	6.20	0.42	5.90	6.50	0.30	0.18	6.84
COND 1	ms/m	0							
CL		0							
NFR		3	511.33	669.78	10.00	1272.00	386.70	1534.00	130.99
TURBIDITY	NTU	3	233.00	339.81	9.00	624.00	196.19	699.00	145.84
BOD DARK		3	5.27	3.69	1.20	8.40	2.13	13.61	70.06
COD		0							
NH3 N		3	0.24	0.20	0.09	0.46	0.11	0.04	81.17
N02 N		3	0.01	0.01	0.00	0.01	0.00	0.00	91.65
N03 N		3	1.03	0.76	0.30	1.82	0.44	0.58	74.24
TON		0							
SRP		3	0.03	0.03	0.01	0.07	0.02	0.00	122.57
TOT P		3	0.64	0.53	0.04	1.03	0.31	0.28	82.51
COLI TOT	MPN/100mls	1			930.00	930.00			
FAE MPN	MPN/100mls	1			15100.00	15100.00			

* The geometric mean, minimum and maximum values only for bacteria results are reported as the other summary statistics in the above table are not suitable for this type of raw data.
** All units are in g^3/m unless otherwise specified.

xvii) Coopers Creek at Motu Rd (Q10 467897)

Variable	Units **	N	Mean	Standard Deviation	Minimum Value	Maximum Value	Std Error of Mean	Variance	C.V.
GAUGE HT	(m)	0							
TEMP W	(^{o}c)	2	18.20	3.68	15.60	20.80	2.60	13.52	20.20
DO		4	8.59	0.74	7.50	9.10	0.37	0.54	8.56
DO SATN	%	1	82.55		82.55	82.55			
PH		3	6.33	0.60	5.70	6.90	0.35	0.36	9.53
COND 1	ms/m	0							
CL		0							
NFR		4	97.00	94.22	14.00	227.00	47.11	8878.00	97.14
TURBIDITY	NTU	4	38.25	34.00	9.00	86.00	17.00	1156.25	88.90
BOD DARK		3	5.35	3.38	2.10	8.85	1.95	11.44	63.21
COD		0							
NH3 N		4	0.05	0.04	0.00	0.08	0.02	0.00	71.90
N02 N		4	0.00	0.00	0.00	0.01	0.00	0.00	38.49
N03 N		4	0.55	0.41	0.18	0.98	0.21	0.17	74.73
TON		0							
SRP		4	0.01	0.01	0.00	0.03	0.01	0.00	108.16
TOT P		4	0.31	0.20	0.10	0.54	0.10	0.04	63.84
COLI TOT	MPN/100mls	1			230.00	230.00			
FAE MPN	MPN/100mls	1			4300.00	4300.00			

* The geometric mean, minimum and maximum values only for bacteria results are reported as the other summary statistics in the above table are not suitable for this type of raw data.
** All units are in g^{3}/m unless otherwise specified.

xviii) Coopers Creek at Chooks (Q10 465905)

Variable	Units **	N	Mean	Standard Deviation	Minimum Value	Maximum Value	Std Error of Mean	Variance	C.V.
GAUGE HT	(m)	0							
TEMP W	(^{o}c)	2	14.65	0.49	14.30	15.00	0.35	0.25	3.38
DO		2	10.15	0.78	9.60	10.70	0.55	0.61	7.66
DO SATN	%	0							
PH		2	6.45	0.07	6.40	6.50	0.05	10.01	1.10
COND 1	ms/m	0							
CL		0							
NFR		2	28.00	31.11	6.00	50.00	22.00	968.00	111.12
TURBIDITY	NTU	2	22.00	4.24	19.00	25.00	3.00	44.00	19.28
BOD DARK		2	1.95	0.21	1.80	2.10	0.15	3.90	10.88
COD		0							
NH3 N		2	0.07	0.01	0.06	0.08	0.01	0.14	12.86
N02 N		2	0.00	0.00	0.00	0.01	0.00	0.01	84.85
N03 N		2	0.27	0.05	0.23	0.31	0.04	0.54	19.83
TON		0							
SRP		2	0.01	0.00	0.01	0.02	0.00	0.02	39.60
TOT P		2	0.15	0.01	0.14	0.15	0.01	0.29	6.73
COLI TOT	MPN/100mls	2			2300.00	9300.00			
FAE MPN	MPN/100mls	2			2300.00	24000.00			

* The geometric mean, minimum and maximum values only for bacteria results are reported as the other summary statistics in the above table are not suitable for this type of raw data.
** All units are in g^{3}/m unless otherwise specified.

xix) Kumeu River at Oraha Rd (Q10 498912)

Variable	Units **	N	Mean	Standard Deviation	Minimum Value	Maximum Value	Std Error of Mean	Variance	C.V.
GAUGE HT	(m)	0							
TEMP W	(^{o}c)	7	12.83	0.75	12.00	14.30	0.28	0.56	5.83
DO		7	8.90	0.51	8.30	9.70	0.19	0.26	5.72
DO SATN	%	7	85.29	7.67	77.00	98.00	2.90	59.90	9
PH		5	6.60	0.07	6.50	6.70	0.03	0.00	1.07
COND 1	ms/m	0							
CL		5	87.00	54.73	40.00	158.00	24.47	2995.00	62.90
NFR		0							
TURBIDITY	NTU	0							
BOD DARK		5	2.48	0.79	1.65	3.40	0.35	0.62	31.77
COD		0							
NH3 N		0							
N02 N		5	0.01	0.00	0.01	0.01	0.00	0.00	25.62
N03 N		0							
TON		0							
SRP		5	0.02	0.01	0.01	0.03	0.00	0.00	24.78
TOT P		5	0.32	0.21	0.19	0.70	0.10	0.05	67.40
COLI TOT	MPN/100mls	5			7500.00	24000.00			
FAE MPN	MPN/100mls	5	*6166		2300.00	23000.00			

* The geometric mean, minimum and maximum values only for bacteria results are reported as the other summary statistics in the above table are not suitable for this type of raw data.
** All units are in g^{3}/m unless otherwise specified.

xx) Kumeu River at SH 16 Bridge (Q10 498904)

Variable	Units **	N	Mean	Standard Deviation	Minimum Value	Maximum Value	Std Error of Mean	Variance	C.V.
GAUGE HT	(m)	0							
TEMP W	(^{o}c)	74	19.03	1.25	12.20	20.80	0.15	1.57	6.57
DO		74	4.17	0.72	3.60	8.30	0.08	0.52	17.29
DO SATN	%	1	78.00		78.00	78.00		78.00	
PH		0							
COND 1	ms/m	0							
CL		0							
NFR		0							
TURBIDITY	NTU	0							
BOD DARK		1	3.9		3.90	3.90		3.90	
COD		0							
NH3 N		0							
N02 N		0							
N03 N		0							
TON		0							
SRP		0							
TOT P		0							
COLI TOT	MPN/100mls	0							
FAE MPN	MPN/100mls	0							

* The geometric mean, minimum and maximum values only for bacteria results are reported as the other summary statistics in the above table are not suitable for this type of raw data.
** All units are in g^{3}/m unless otherwise specified.

xxi) Kumeu River at Saleyards (Q10 492908)

Variable	Units **	N	Mean	Standard Deviation	Minimum Value	Maximum Value	Std Error of Mean	Variance	C.V.
GAUGE HT	(m)	0							
TEMP W	(^{o}c)	148	19.75	2.24	13.80	23.80	0.18	295.01	11.34
DO		148	3.61	1.69	1.40	8.80	0.14	52.85	46.47
DO SATN	%	1	83.00		83.00	83.00			
PH		0							
COND 1	ms/m	0							
CL		0							
NFR		0							
TURBIDITY	NTU	0							
BOD DARK		1	2.1		21.10	2.10			
COD		0							
NH3 N		0							
N02 N		0							
N03 N		0							
TON		0							
SRP		0							
TOT P		0							
COLI TOT	MPN/100mls	0							
FAE MPN	MPN/100mls	0							

* The geometric mean, minimum and maximum values only for bacteria results are reported as the other summary statistics in the above table are not suitable for this type of raw data.
** All units are in g^{3}/m unless otherwise specified.

xxii) Kumeu River at Taupaki (Q10 487856)

Variable	Units **	N	Mean	Standard Deviation	Minimum Value	Maximum Value	Std Error of Mean	Variance	C.V.
GAUGE HT	(m)	5	0.32	0.18	0.10	0.50	0.08	0.03	55.90
TEMP W	(^{o}c)	5	14.10	1.75	13.00	17.00	0.78	73.05	12.39
DO		5	8.84	0.85	8.00	10.00	0.38	40.72	9.62
DO SATN	%	5	77.20	19.18	46.00	97.00	8.58	367.70	24.84
PH		5	7.20	0.29	6.70	7.40	0.13	0.08	4.05
COND 1	ms/m	0							
CL		5	33.80	0.45	33.00	34.00	0.20	0.20	1.32
NFR		5	6.56	0.77	5.60	7.40	0.34	0.59	11.74
TURBIDITY	NTU	5	7.78	1.50	6.00	9.60	0.67	2.25	19.29
BOD DARK		4	1.92	0.73	1.30	2.70	0.37	0.54	38.03
COD		0							
NH3 N		2	0.85	0.50	0.49	1.20	0.35	0.25	59.06
N02 N		1	0.07		0.07	0.07			
N03 N		1	1.22		1.22	1.22			
TON		0							
SRP		1	0.10		0.10	0.10			
TOT P		1	0.19		0.19	0.19			
COLI TOT	MPN/100mls	5			2300.00	9300.00			

* The geometric mean, minimum and maximum values only for bacteria results are reported as the other summary statistics in the above table are not suitable for this type of raw data.
** All units are in g^{3}/m unless otherwise specified.

SUMMARY STATITISTICS OF WATER QUALITY MONITORING FOR BULK WATER SUPPLY STUDY, reported in KRTA Limited and Tonkin & Taylor Limited, 1988b. Auckland Regional Authority Bulk Water Supply Study. Phase 4: Background Report No. 8.2 - Water Quality.

Ararimu Stream at Map ref Q10 454944 (16 Jan 1998 - 2 March 1981)

Parameter		n	Mean	Min Value	Max Value
RIVER DEPTH	m	30	0.2	0.015	0.7
RIVER FLOW (KAIPARA)	I/s	26	3435	477	22567
RIVER FLOW (ARARIMU)	l/s	26	1374	191	9027
TEMPERATURE	degrees Celsius	36	15	7.3	22
PH		36	7	6.15	7.47
COLOUR-UNFILTERED	Hazen units	36	108.8	40	250
TURBIDITY	FTU	36	21.1	10	97
SUSPENDED SOLIDS	g/cu m	36	20.1	4.7	85
CONDUCTIVITY 25 DEG C	mS/M	36	16.3	11.3	21
CHEMICAL OXYGEN DEMAND	g/cu m	32	19	7.8	39.2
TANNIN AS TANNIC ACID	g/cu m	35	0.64	0.28	2.44
UV ABS 1CM, 254 NM	Absorbance units	36	0.25	0.112	0.466
DISSOLVED OXYGEN	g/cu m	36	8.6	4.6	11.48
DISSOLVED OXYGEN	% saturation	36	84.5	50	100
BOD 5 DAY:20 DEG C DARK	g/cu m	34	1.22	0.26	5.5
BORON	g/cu m	32	0.04	0	0.08
CHLORIDE	g/cu m	36	30.3	24.4	38
FLUORIDE	g/cu m	36	0.08	0.02	0.16
SILICA	g/cu m	36	16.3	9.4	21.6
SULPHATE	g/cu m	36	10.8	4.2	17.1
PHOSPHATE-TOTAL	g/cu m	36	0.09	0.027	0.183
PHOSPHATE-REACTIVE	g/cu m	36	0.03	0.01	0.079
NITROGEN-NITRATE	g/cu m	36	0.37	0.016	0.625
NITROGEN-NITRITE	g/cu m	36	0.01	0.003	0.023
NITROGEN-AMMONIACAL	g/cu m	36	0.06	0	0.173
TOTAL ALKALINITY	g/cu m CaCO3	36	17.8	4.7	36.7
TOTAL HARDNESS	g/cu m CaCO3	36	31.4	22.7	45
ALUMINIUM	g/cu m	36	0.2	0.07	1.15
ARSENIC	g/cu m	10	0	0	0.002
IRON-TOTAL	g/cu m	36	1.47	0.3	4.3
IRON-SOLUBLE	g/cu m	36	0.65	0.2	1.65
MANGANESE-TOTAL	g/cu m	36	0.06	0.02	0.25
MANGANESE DIOXIDE	g/cu m	36	0.04	0.008	0.146
SODIUM	g/cu m	36	19	15.4	24.2
POTASSIUM	g/cu m	36	2.06	1.43	6.12
ZINC	g/cu m	35	0.01	0	0.03
CHROMIUM	g/cu m	8	0.02	0.02	0.02
CADMIUM	g/cu m	7	0.01	0.005	0.02
LEAD	g/cu m	8	0.05	0.05	0.05
COLIFORMS-PRESUMPTIVE	MPN/100 mls	36	5668	350	80000
COLIFORMS-FAECAL	MPN/100 mls	36	3346	250	50000
TOTAL ALGAL CELLS	no/ml	7	71	20	144
TOTAL ALGAL COLONIES	no/ml	33	51	2	1200

Datasonde Data

The following plots water quality data collected at 7 sites in the Kaipara River catchment during May/June 1998 and April/May 1999. The sites are:

45311 - Kaipara River at Waimauku recorder site (map reference Q10 438921)
45326 - Ararimu Stream at Old North Rd recorder site (map reference Q10 453944)
45352 – Ararimu Stream at Campbell Rd (map reference Q10 495991)
45357 - Kumeu River upstream of Huapai Stream confluence (map reference Q10 488912)
45358 - Kumeu River upstream of Pakinui Stream confluence (map reference Q11 498881)
45359 - Waimauku Stream at Muriwai Rd (map reference Q10 430908)
45360 - Tributary of Kaipara River opposite Twin Peaks Rd (map reference Q10 397957)

Data Interval

The data sondes were set up to measure five water quality parameters at 15 minute intervals. Collection of data at this frequency provides highly detailed information on the variability of each parameter, such as diurnal patterns, that is not apparent at less frequent data collection intervals (for instance daily sampling).

Errors

Prior to installation, the datasondes were calibrated against a water sample of known quality (pH, temperature, turbidity, conductivity and dissolved oxygen) to establish an initial measurement error range for each parameter. Measurements taken with two datasondes at the same site during installation and removal gave an indication of the error between the two sets of equipment. The differences were greater for most parameters at the end of the period of data collection indicating that ‘instrument drift’ had occurred. This describes an underlying trend in a dataset that does not correspond with real changes in the parameter being measured but with gradual changes in the condition of the instrument.

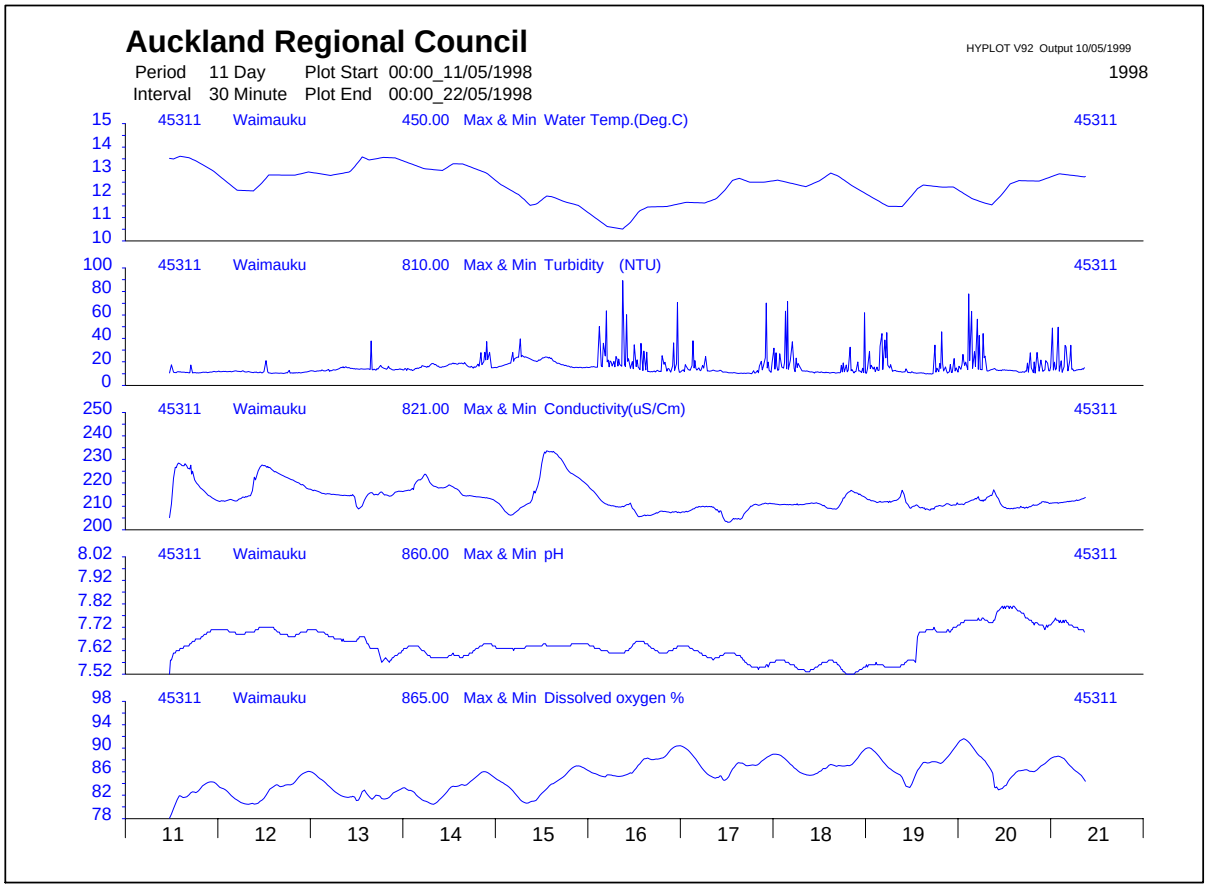
Other errors in the data are more easily identifiable, where sudden high or low values in one dataset are not reflected in concurrent changes in the other parameters being measured. The following ‘spurious’ data were removed from the data presented here:

Site 45326 – Elevated conductivity (of up to 339 uS/Cm) on 12 and 14 May 1998, and elevated dissolved oxygen levels (of up to 163 %) on 11 May 1998. Extremely elevated turbidity over the period 29 April to 13 May 1999 due to crayfish obscuring the sensor. Data series omitted from following plots.

Site 45358 - Elevated dissolved oxygen levels (of up to 167 %) on 11 June 1998.

Site 45359 – Low values of dissolved oxygen over the period 29 April to 13 May 1999 due to sensor malfunctioning. Data series omitted from following plots.

Site 45360 - Elevated dissolved oxygen levels (of up to 167 %) on 28 May 1998.


Auckland Regional Council
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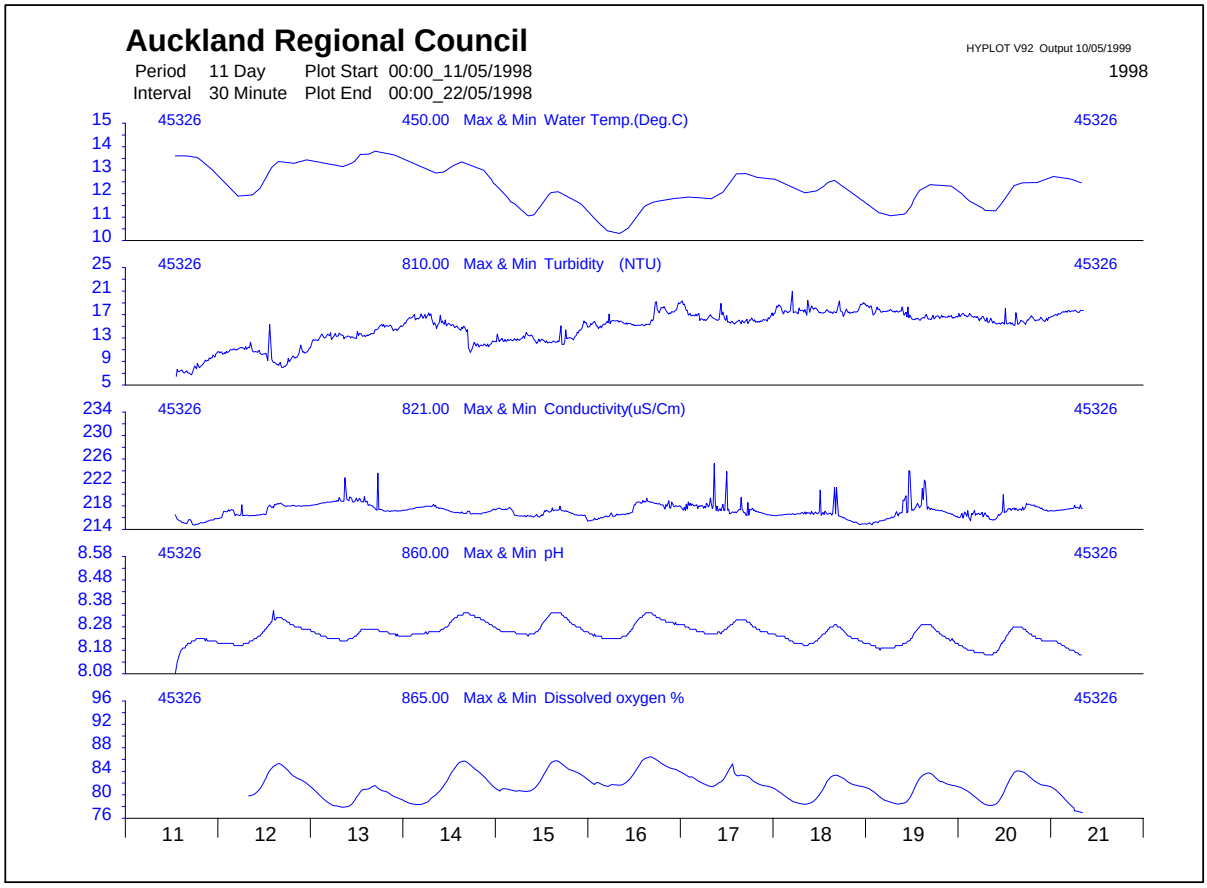
Period 11 Day Plot Start 00:00_11/05/1998
Interval 30 Minute Plot End 00:00_22/05/1998
1998
45311 Waimauku 450.00 Max & Min Water Temp.(Deg.C) 45311
45311 Waimauku 810.00 Max & Min Turbidity (NTU) 45311
45311 Waimauku 821.00 Max & Min Conductivity(uS/Cm) 45311
45311 Waimauku 860.00 Max & Min pH 45311
45311 Waimauku 865.00 Max & Min Dissolved oxygen % 45311
11 12 13 14 15 16 17 18 19 20 21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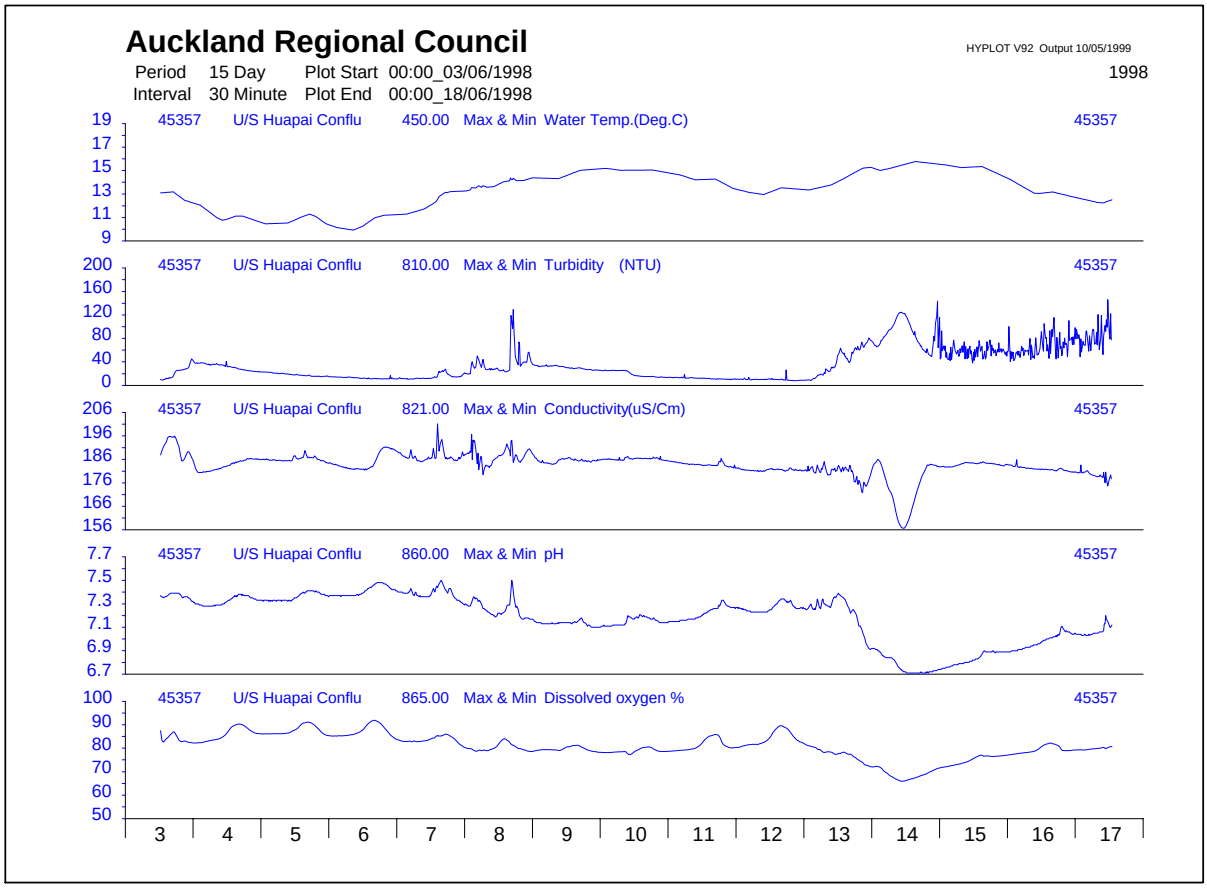
1998
45326 450.00 Max & Min Water Temp.(Deg.C) 45326
45326 810.00 Max & Min Turbidity (NTU) 45326
45326 821.00 Max & Min Conductivity(uS/Cm) 45326
45326 860.00 Max & Min pH 45326
45326 865.00 Max & Min Dissolved oxygen % 45326
11 12 13 14 15 16 17 18 19 20 21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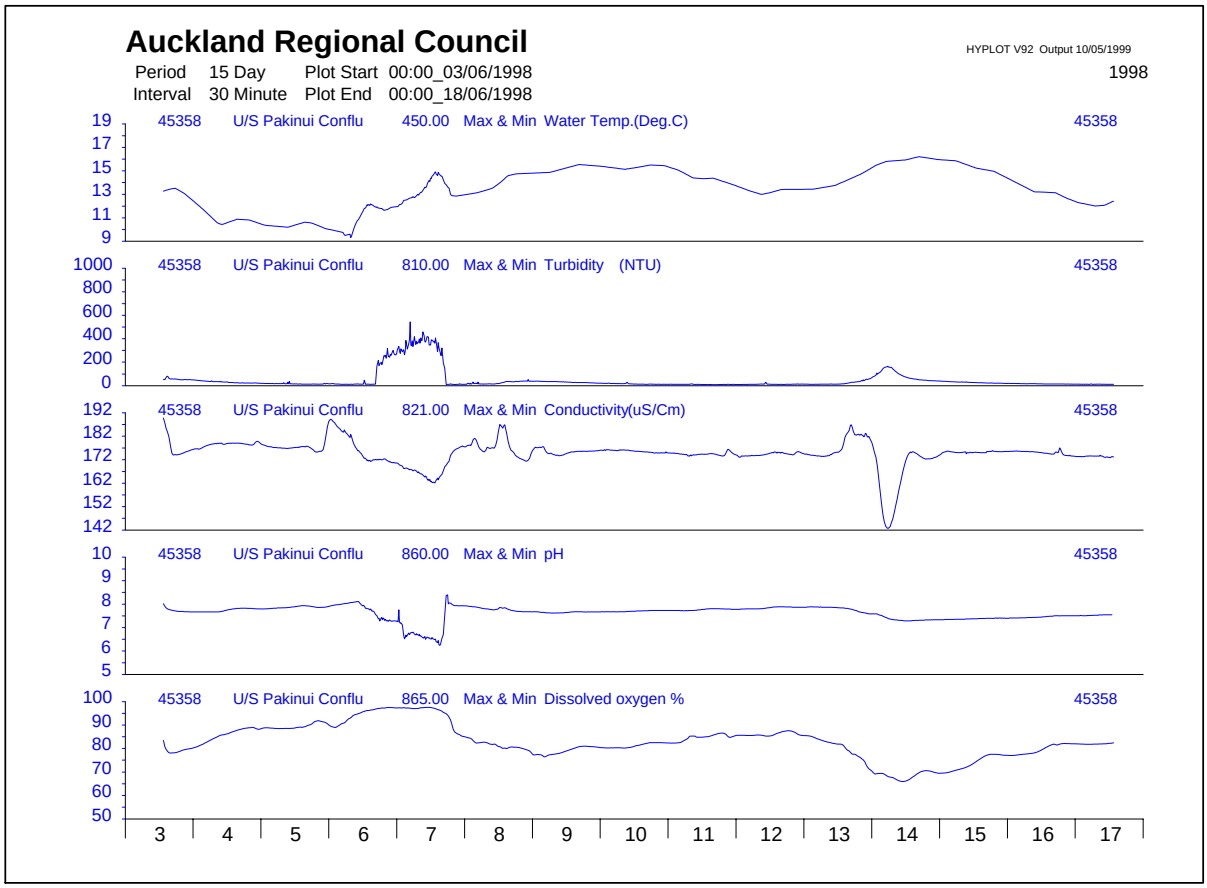
Interval 30 Minute Plot End 00:00_18/06/1998
1998
45357 U/S Huapai Conflu 450.00 Max & Min Water Temp.(Deg.C) 45357
45357 U/S Huapai Conflu 810.00 Max & Min Turbidity (NTU) 45357
45357 U/S Huapai Conflu 821.00 Max & Min Conductivity(uS/Cm) 45357
45357 U/S Huapai Conflu 860.00 Max & Min pH 45357
45357 U/S Huapai Conflu 865.00 Max & Min Dissolved oxygen % 45357
3 4 5 6 7 8 9 10 11 12 13 14 15 16 17


Auckland Regional Council
HYPLOT V92 Output 10/05/1999
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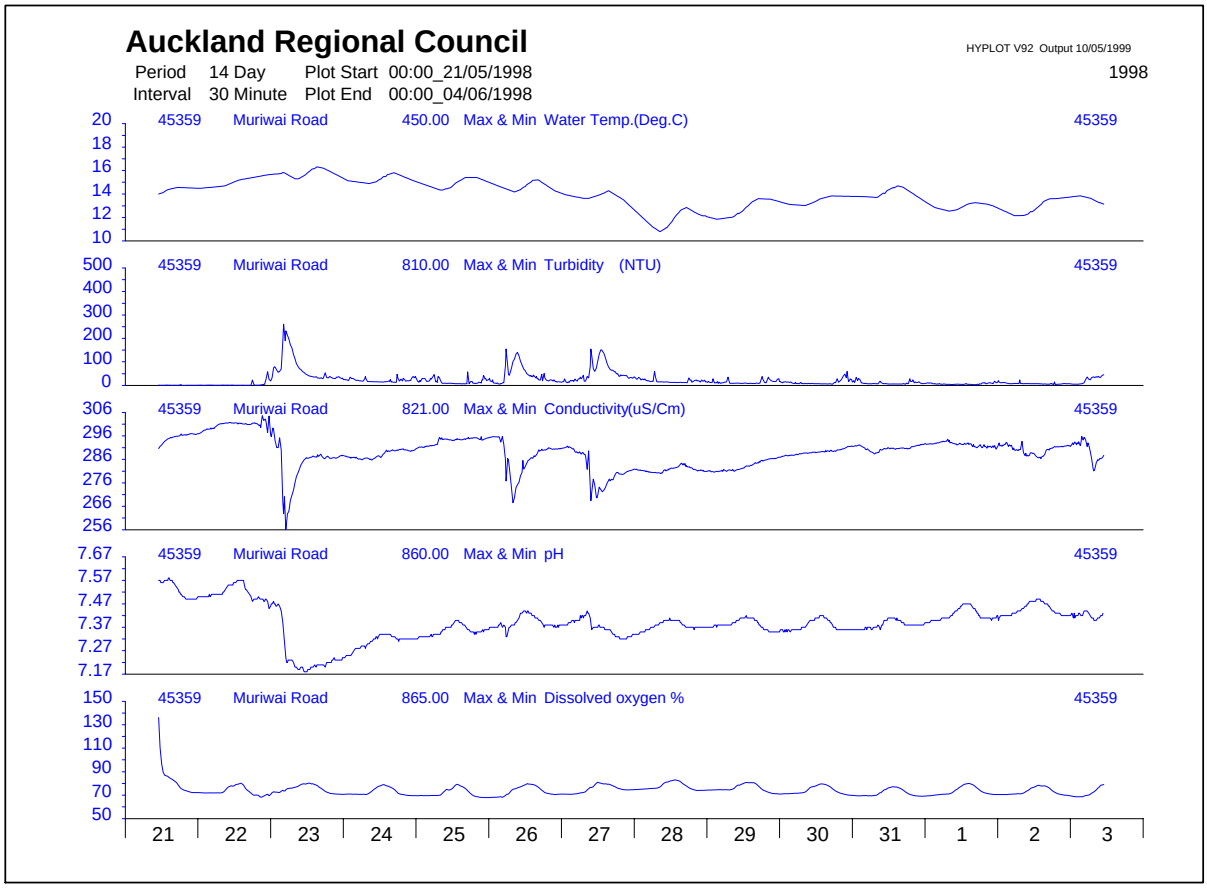
Interval 30 Minute Plot End 00:00_18/06/1998
1998
45358 U/S Pakinui Conflu 450.00 Max & Min Water Temp.(Deg.C) 45358
45358 U/S Pakinui Conflu 810.00 Max & Min Turbidity (NTU) 45358
45358 U/S Pakinui Conflu 821.00 Max & Min Conductivity(uS/Cm) 45358
45358 U/S Pakinui Conflu 860.00 Max & Min pH 45358
45358 U/S Pakinui Conflu 865.00 Max & Min Dissolved oxygen % 45358
3 4 5 6 7 8 9 10 11 12 13 14 15 16 17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Interval 30 Minute Plot End 00:00_04/06/1998
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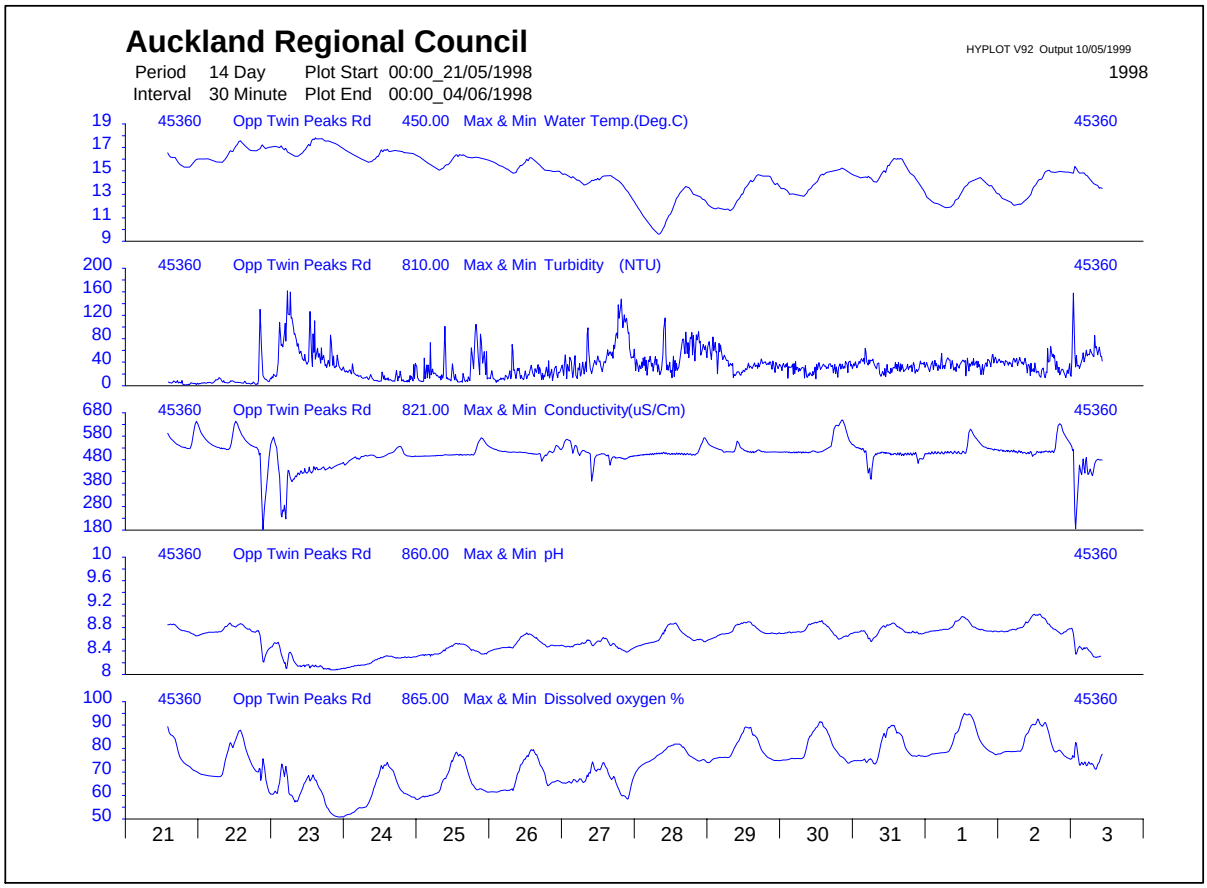
45359 Muriwai Road 810.00 Max & Min Turbidity (NTU) 45359
45359 Muriwai Road 821.00 Max & Min Conductivity(uS/Cm) 45359
45359 Muriwai Road 860.00 Max & Min pH 45359
45359 Muriwai Road 865.00 Max & Min Dissolved oxygen % 45359
21 22 23 24 25 26 27 28 29 30 31 1 2 3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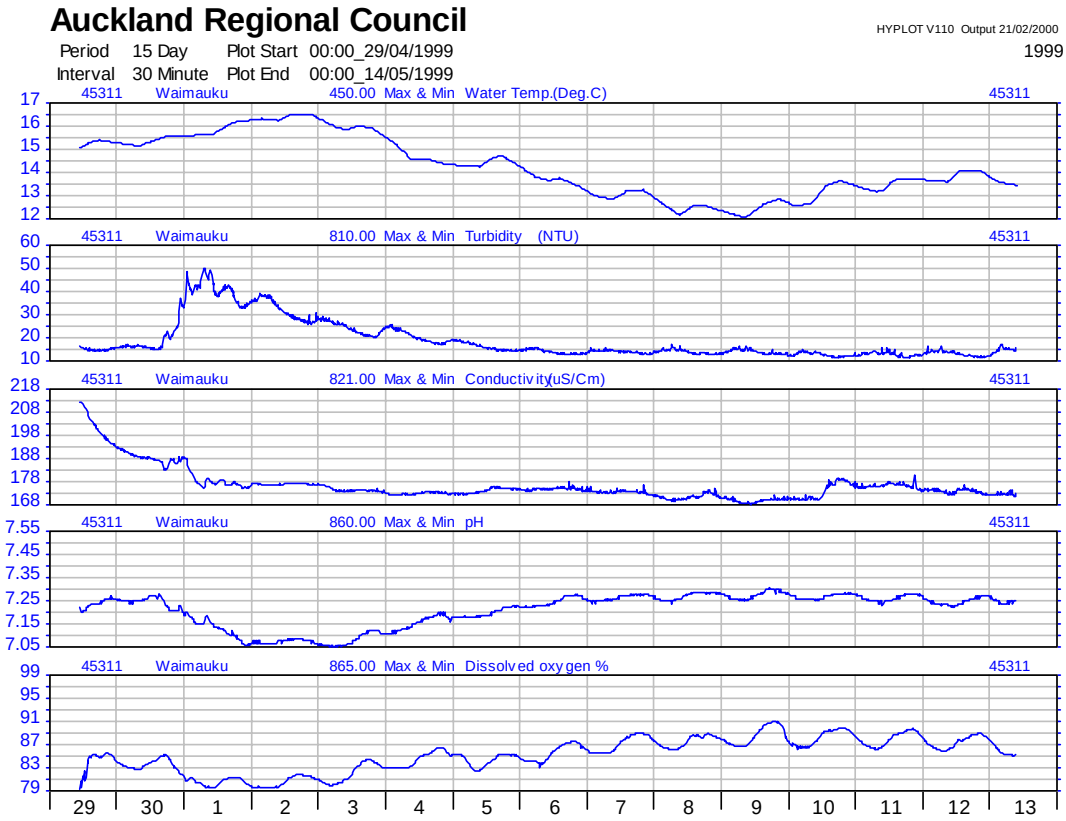
1998
Interval 30 Minute Plot End 00:00_04/06/1998
45360 Opp Twin Peaks Rd 450.00 Max & Min Water Temp.(Deg.C) 45360
45360 Opp Twin Peaks Rd 810.00 Max & Min Turbidity (NTU) 45360
45360 Opp Twin Peaks Rd 821.00 Max & Min Conductivity(uS/Cm) 45360
45360 Opp Twin Peaks Rd 860.00 Max & Min pH 45360
45360 Opp Twin Peaks Rd 865.00 Max & Min Dissolved oxygen % 45360
21 22 23 24 25 26 27 28 29 30 31 1 2 3


Auckland Regional Council
HYPLOT V110 Output 21/02/2000
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1999
Interval 30 Minute Plot End 00:00_14/05/1999
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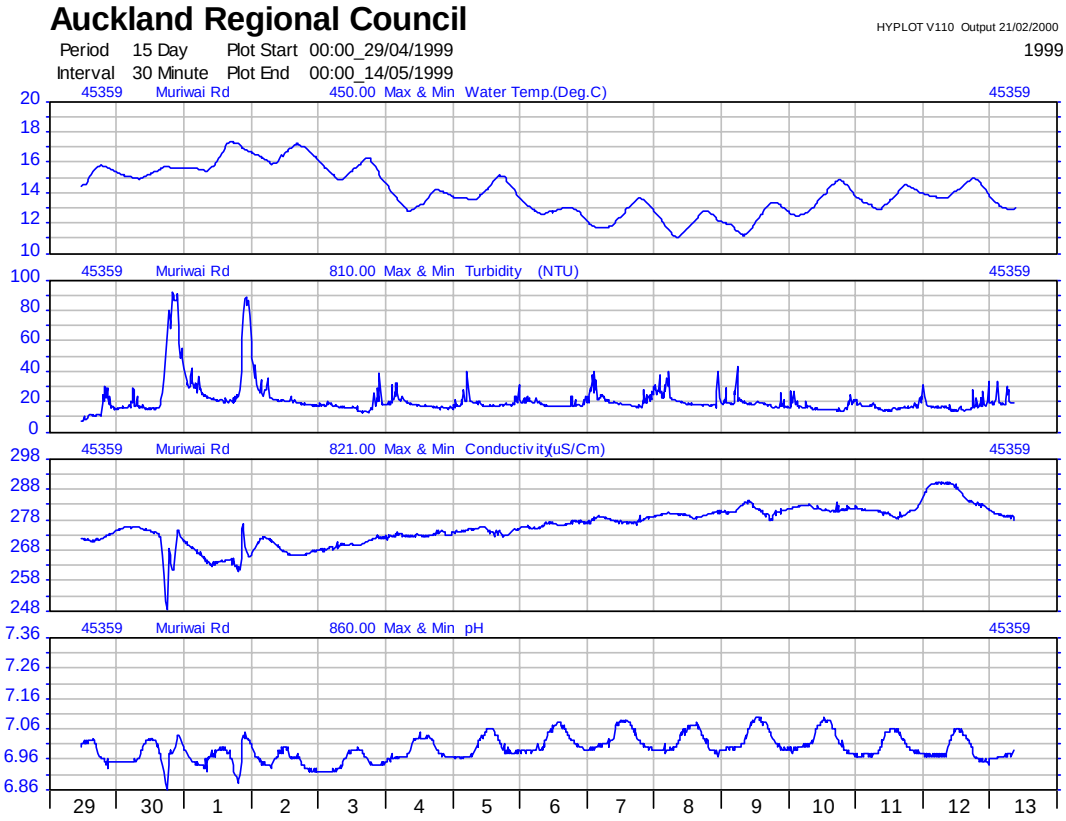
17 16 15 14 13 12
45311 Waimauku 810.00 Max & Min Turbidity (NTU) 45311
60 50 40 30 20 10
45311 Waimauku 821.00 Max & Min Conductivity(uS/Cm) 45311
218 208 198 188 178 168
45311 Waimauku 860.00 Max & Min pH 45311
7.55 7.45 7.35 7.25 7.15 7.05
45311 Waimauku 865.00 Max & Min Dissolved oxygen % 45311
99 95 91 87 83 79
29 30 1 2 3 4 5 6 7 8 9 10 11 12 13


Auckland Regional Council
HYPLOT V110 Output 21/02/2000
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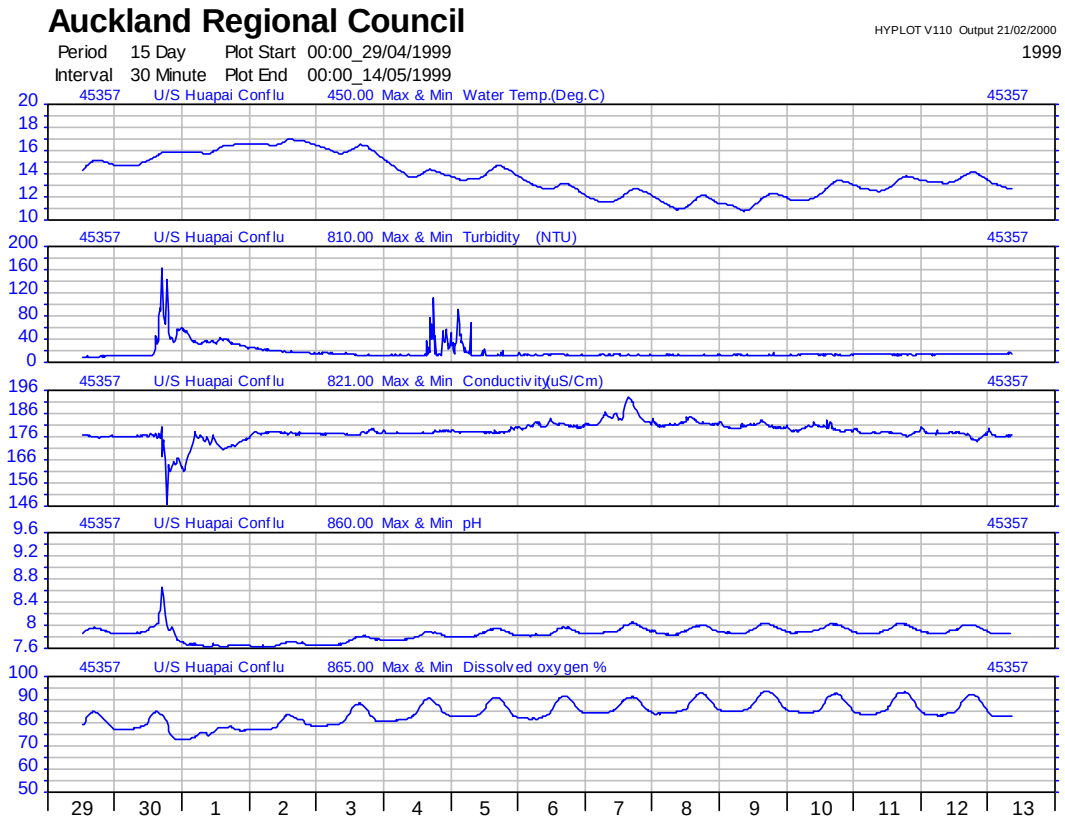
1999
Interval 30 Minute Plot End 00:00_14/05/1999
45359 Muriwai Rd 450.00 Max & Min Water Temp.(Deg.C) 45359
20 18 16 14 12 10
45359 Muriwai Rd 810.00 Max & Min Turbidity (NTU) 45359
100 80 60 40 20 0
45359 Muriwai Rd 821.00 Max & Min Conductivity(uS/Cm) 45359
298 288 278 268 258 248
45359 Muriwai Rd 860.00 Max & Min pH 45359
7.36 7.26 7.16 7.06 6.96 6.86
29 30 1 2 3 4 5 6 7 8 9 10 11 12 13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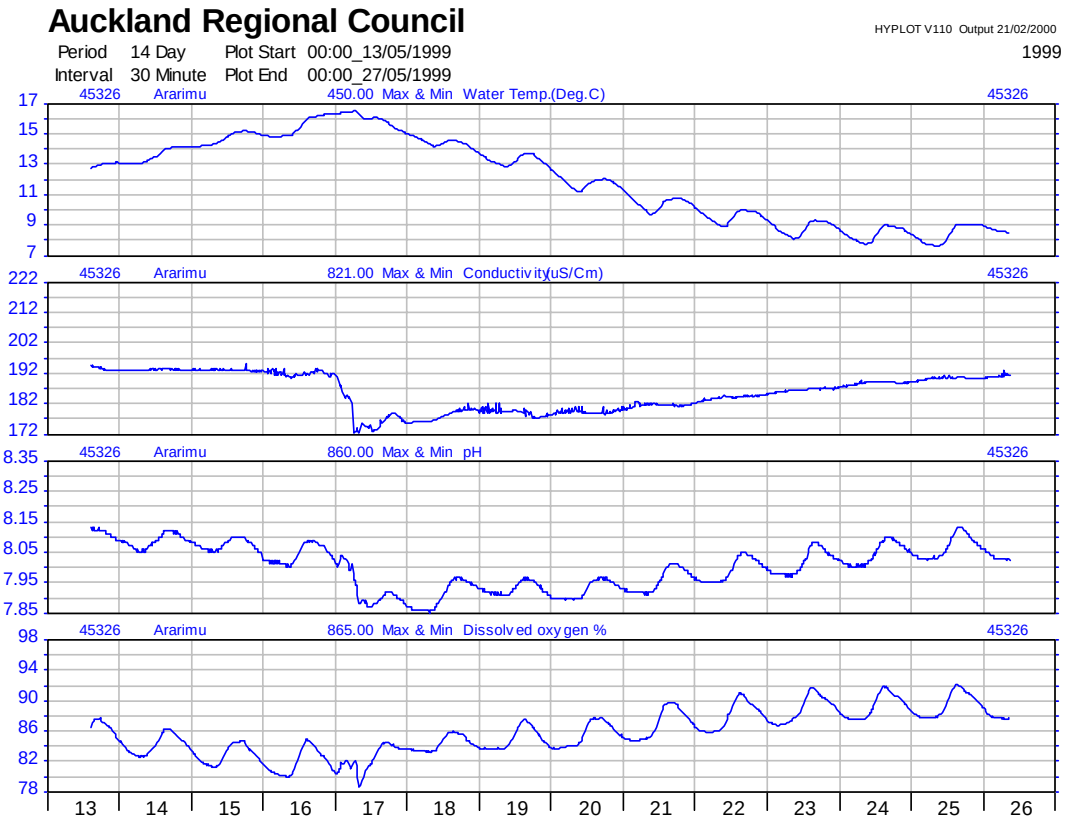
45357 U/S Huapai Conflu 450.00 Max & Min Water Temp.(Deg.C) 45357
45357 U/S Huapai Conflu 810.00 Max & Min Turbidity (NTU) 45357
45357 U/S Huapai Conflu 821.00 Max & Min Conductivity(uS/Cm) 45357
45357 U/S Huapai Conflu 860.00 Max & Min pH 45357
45357 U/S Huapai Conflu 865.00 Max & Min Dissolved oxygen % 45357
29 30 1 2 3 4 5 6 7 8 9 10 11 12 13


Auckland Regional Council
HYPLOT V110 Output 21/02/2000
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1999
Interval 30 Minute Plot End 00:00_27/05/1999
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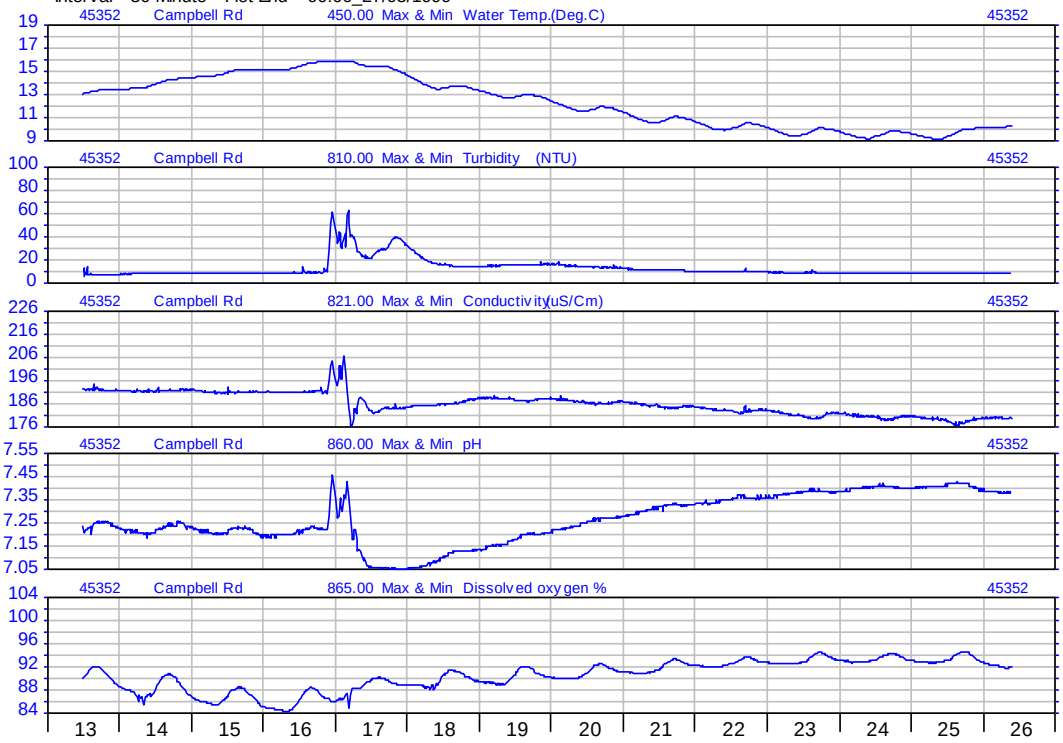
45326 Ararimu 821.00 Max & Min Conductivity(uS/Cm) 45326
45326 Ararimu 860.00 Max & Min pH 45326
45326 Ararimu 865.00 Max & Min Dissolved oxygen % 45326
13 14 15 16 17 18 19 20 21 22 23 24 25 26

Auckland Regional Council

HYPLOT V110 Output 21/02/2000

Period 14 Day Plot Start 00:00_13/05/1999 1999

Interval 30 Minute Plot End 00:00_27/05/1999



Appendix V

Fish Surveys

Summary of results of electric fishing surveys, Kaipara River catchment (source: National Freshwater Fisheries Database)

Sub-catchment	Card number	Date	Stream	Easting	Northing	Altitude (masl)	Distance Inland (km)	parane	anguil	angaus	angdie	gobcot	gobhut	Gobbas	galmac	galfas	retret	chefos	caraur
Ararimu	3604	18-Apr-84	Ararimu Stream	26495	64992	40	93			4		1	1					3	
	3605	18-Apr-84	Ararimu Stream	26495	64980	40	91	occ		common	2	4							
	3606	18-Apr-84	Waikoukou Stream	26463	64960	20	85	common		occ		1	1						
	3607	18-Apr-84	Ararimu Stream	26459	64952	20	84		occ										
	3608	1-May-84	Ararimu Stream	26477	64965	30	88	common			common	occ	occ						
	3609	1-May-84	Ararimu Stream tributary	26478	64966	30	88	common			1					6			
	9241	2-Apr-91	Ararimu Stream	26451	64929	10	41	common		7	1	1			6		1		
	9242	13-Mar-91	Ararimu Stream	26496	64987	30	53	common		6		15			2			7	
	9247	16-May-91	Ararimu Stream	26460	64952	10	43			4	2								
	9248	15-May-91	Ararimu Stream	26477	64964	30	48	common			4	2							
	9249	15-May-91	Ararimu Stream	26454	64943	10	43	common		1	3	8							
	9250	15-May-91	Ararimu Stream	26452	64935	10	42			12	1	1			3				
	9259	15-May-91	Waikoukou Stream	26471	64982	40	48	common		5	1	1		1					
	9261	15-May-91	Waikoukou Stream	26468	64978	40	47				1	3							
	9262	16-May-91	Waikoukou Stream	26458	64954	15	44			1		2							
Kumeu	3621	31-May-84	Kumeu River	26498	64905	30	50	abund		abund					occ				
	3622	31-May-84	Kumeu River	26486	64912	30	48			abund					1				
Lower Kaipara	3601	8-Sep-83	Kaipara River	26397	64949	10	69								24	105			
	55792	7-Feb-65	Kaipara River tributary	26388	65030	10	47								recorded				

Tikokopu	3610	1-May-84	Tikokopu Stream	26453	65002	60	91				common								
	3611	1-May-84	Tikokopu Stream	26455	65006	60	91			2									
	9240	2-Apr-91	Tikokopu Stream	26455	65010	40	51			6	1								
	9251	16-May-91	Tikokopu Stream	26453	64947	15	44			3	4	2							
	9258	16-May-91	Tikokopu Stream	26455	64992	30	49			2	8	5		1					
Upper Kumeu	2676	31-May-84	Kumeu River	26481	64826	60	59	common			occ	1							
	3623	31-May-84	Kumeu River tributary	26486	64870	30	55			abund	1				1				
	3624	31-May-84	Kumeu River tributary	26462	64863	60	58	common			occ								
	3625	31-May-84	Kumeu River tributary	26475	64807	70	61	occ			common								
	9237	28-Mar-91	Hunter Stream	26471	64844	50	57			10		7			1				
	9238	28-Mar-91	Kumeu River	26479	64815	70	60	common		54		4							
	9239	28-Mar-91	Matariki Stream	26476	64807	70	62	common		3		21				2			
	9264	17-May-91	Kumeu River	26471	64800	80	63	abund		2		6				5			
	9265	17-May-91	Hunter Stream	26475	64844	50	57			24	2								
	9266	17-May-91	Hunter Stream	26486	64855	40	55			1									
	9267	17-May-91	Annandale Stream	26485	64869	30	55			25	2								3
	9268	17-May-91	Annandale Stream	26462	64863	70	58		2										
	9269	17-May-91	Annandale Stream	26458	64861	70	58	occ		2				1					
Waimauku	13293	21-Dec-94	Wharauroa Stream	26425	64974	95	42	abund			abund								
	13294	21-Dec-94	Wharauroa Stream trib	26422	64960	100	41	abund			3								
	13295	21-Dec-94	Kaipara River tributary	26414	64953	110	38				2								
	13296	21-Dec-94	Kaipara River tributary	26417	64949	60	37	abund			abund					4			

	13297	21-Dec-94	Kaipara River tributary	26418	64939	30	36	common		common	common								

Key to fish surveys

occ = occasional, abund = abundant

parane	Koura (*Paranephrops*)
anguil	Eels (*Anguilla*)
angaus	Shortfin eel (*Anguilla australis*)
angdie	Longfin eel (*Anguilla dieffenbachii*)
gobcot	Common bully (*Gobiomorphus cotidanus*)
gobhut	Redfin bully (*Gobiomorphus huttoni*)
gobbas	Crans bully (*Gobiomorphus basalis*)
galmac	Inanga (*Galaxias masculatus*)
galfas	Banded kokopu (*Galaxias fasciatus*)
retret	Common smelt (*Retropinna retropinna*)
chefos	Torrentfish (*Cheimarrichthys fosteri*)
caraur	Goldfish (*Carassius auratus*)

Appendix VI

Community Consultation

KAIPARA RIVER CATCHMENT - Resource, environmental and management concerns

1. Survey method and response

This report summarises findings derived from two surveys and three public meetings on resource, environmental and management concerns in the Kaipara River catchment.

The public meetings targeted three audiences: the general farming community; consent holders, horticulturalists and market gardeners; and the general community.

A short survey was sent to 6,000 people in and around the Kaipara catchment, while a more detailed land and water use survey was sent to 1,615 land holdings larger than 2-3 hectares.

Table 1 shows that there was a high response rate to the detailed land and water use surveys: in seven of the eight subcatchments over 50% of owners or occupiers responded to the survey. Overall, 42% of these also indicated resource, environmental and management concerns and/or values.

Over 50% of land owners or occupiers responded in all subcatchments except the Lower Kaipara, with the highest response rate in the Waimauku and Awaroa subcatchments.

The most interested and concerned respondents were in the Waimauku, where 82% of owners and occupiers responded to the survey and 57% of these indicated concerns and/or values.

2. Resource, environmental and management concerns

Tables 2 and 3 summarise resource, environmental and management concerns by subcatchment.

Concerns in general order of importance were:

- flooding and the related issues of river clearance, blockages, weeds and willows
- water quality
- water availability
- sewage
- growth
- riparian management, fish habitat and bush protection and bird habitat
- rubbish in streams and rivers
- use of chemicals

Flooding and related issues attracted by far the highest proportion of all responses to resource concerns, especially in the Upper Kumeu, Lower Kaipara, Waimauku and Kumeu subcatchments, and also in the Awaroa. Only respondents in the Tikokopu seemed to have a lower level of concern. As well as expressing general concerns about flooding and its actual or potential future increase, many respondents also wanted Council to remove trees and other blockages, clean out the river and remove weeds.

Water quality was the next most frequently cited issue and was of particular concern to respondents in the Kumeu, Waimauku, Upper Kumeu and Lower Kaipara subcatchments. Industrial land uses

came in for particular criticism, although rural wastes were also mentioned. Water quality was also cited in the Ararimu and Tikokopu subcatchments.

Water availability and the allocation process were of concern in the Kumeu, Waimauku, Upper Kumeu and Ararimu subcatchments. As most of the surface water takes in the Kaipara are in these subcatchments and there are restrictions on groundwater in the Kumeu and Upper Kumeu subcatchments, this probably reflects the high level of demand on both surface and groundwater resources.

Sewage disposal concerned respondents in the Kumeu and Waimauku subcatchments, where inadequate community schemes were criticised. The inadequacy of septic tanks was cited in all subcatchments except the Moau and Awaroa.

Growth was also an issue in the Waimauku, Upper Kumeu and Kumeu subcatchments, reflecting increasing rural-residential and more intensive subdivision development. Concern about Auckland's growth generally may also affect those in Kumeu-Huapai, which have a growing function as commuter settlements.

The inter-related issues of sediment, riparian management, fish habitat and bush and bird habitat were most frequently cited in the Waimauku, Kumeu, Upper Kumeu and lower Kaipara subcatchments, but also appeared in the Awaroa, Tikokopu and Ararimu.

Concern about high chemical use (sprays, fertilisers) was most common in the Waimauku, Upper Kumeu and Lower Kaipara subcatchments, the first two possibly reflecting a higher input from residential rather than primary productive land users.

Refuse in streams concerned respondents in the Upper Kumeu, but was also mentioned in the Kumeu, Waimauku and Lower Kaipara subcatchments.

The highest number of people requesting more or improved management was in Upper Kumeu, although interestingly, as shown in Table 3, it also contributed the highest number of respondents complaining about over-regulation.

More control was sought over:

- spraying
- fertiliser use
- pests
- industrial development, especially by the river, because of concerns about water pollution
- residential development and its implications for sewage disposal and flooding
- development in the Waitakeres

Complaints about too much control cited:

- bureaucracy (don't study, do something; or things are fine without needing to investigate)
- riparian issues (can't graze stock)
- too many rules, regulations, red tape, controls on what you can do on your own property

The last cited reflects matters more likely to be the jurisdiction of Rodney District Council, although the highest number of specific complaints about the ARC also derived from the Upper Kumeu.

Other subcatchment-specific resource concerns are summarised in Table 3. The only other matters cited more than once in any subcatchment were:

- maritime concerns (localised nearest the most common local users, in the Moau)
- the cost of this Kaipara project (in the Kumeu subcatchment)
- the need to drain low-lying areas (in the Lower Kaipara)
- the need for education (from the Awaroa)
- general concern for the area (in the Upper Kumeu)

Resource, environmental and management concerns noted from the short survey and public meetings which were not able to be localised to a subcatchment are summarised in Tables 4 and 5. They reflect the same array of concerns as expressed by respondents to the land and water use survey, and were, in order of number of citations:

- flooding and related issues
- water quality
- water availability
- sewage and growth-related issues, including sediment in rivers and streams
- concerns about better management or protection of the Kaipara Harbour
- improved provision of recreational facilities and better public access to streams and rivers in the catchment

3. Recreational uses

Tables 6, 7 and 8 summarise the recreational uses noted by respondents to both surveys and those mentioned in the public meetings.

Again, the largest number of responses came from the more populous Upper Kumeu, Kumeu, Waimauku and Lower Kaipara subcatchments, with several also from the Tikokopu and Ararimu. Those from the Moau, Awaroa and Lower Kaipara related to maritime pursuits, reflecting their proximity to the Kaipara Harbour.

Picnicking, eeling, fishing and tramping were the top four recreational uses, with duck shooting, swimming, sea fishing and boating, general enjoyment and kayaking the other very popular activities. Other water-based activities, horse riding and camping were also cited.

Activities had strong geographical associations. Eeling was most popular in the Waimauku subcatchment, possibly reflecting a higher population of children there. Freshwater fishing was equally popular in the Waimauku and Upper Kumeu subcatchments, possibly for the same reason. Tramping was most popular in the Upper Kumeu, reflecting the presence of the Waitakere Ranges, and the same applied to swimming in streams. Tramping was also popular in the Waimauku subcatchment, again possibly because of its proximity to the Waitakeres.

Duck shooting was most popular in the Lower Kaipara, with adherents also from the Waimauku, Upper Kumeu and Kumeu.

Picnicking was the most widespread pursuit: it was the only one mentioned in each of the eight subcatchments. General enjoyment as a resource use was most frequently cited in the Ararimu, Kumeu and Upper Kumeu subcatchments.

4. Areas particularly valued

Tables 10 - 13 summarise the areas nominated as being of particular value.

Possibly the most interesting finding is that respondents were almost equally split between local and global affiliations in nominating their most valued area: 47 cited their own property or local area, while 45 cited the entire catchment as being of value to them.

These two were a long way ahead of the next two most valued areas, which were also generic rather than geographic: nearby bush and forest; and stream surrounds and streamside parks, followed by parks and reserves generally.

Leading the geographic nominations were Muriwai, the Waitakere Ranges, the Cascades, Bethells and other West Coast beaches, followed by the Kaipara Harbour, other waterfalls and the Parakai hot pools.

The geographic spread of geographically specific nominations is also interesting: of the 38 respondents citing places in the Waitakere Ranges - West Coast area, 37 were from the Upper Kumeu subcatchment. Similarly, of the 15 who nominated Muriwai, 12 were from Waimauku - the gateway to Muriwai. Other more local sites were also nominated only by people from within their own subcatchment.

The only nominations made in every subcatchment were local and global: their own property or local area and the entire catchment.

This seems to indicate that while people value what they know well, they are also very aware of the impact of wider, potentially adverse, influences on their local values. As such, statements of global value can possibly also be interpreted as expressions of concern - a finding of relevance for integrated catchment management.

It was interesting to observe that many respondents cited types of areas (such as stream surrounds, parks, bush, own property or local area) rather than specific localities. However, as these generic types of areas did not really fit into the category of resource concerns, they were still included in the analysis of areas specifically valued.

These generic statements are nevertheless revealing, as they indicate a general appreciation of local amenity values. That is, although people make journeys to specific destinations for various types of recreation, or are aware of particular areas of great value, they spend most of their leisure or non-work time at home or locally, and consequently value a high quality local environment.

Again, this finding has resource management implications somewhat wider than those encompassed by the Kaipara River Water Allocation Strategy.

5. Specific requests for action

Tables 14 and 15 summarise specific request for action included in the two surveys. Analysis of the nature of the complaints yields some interesting findings of wider relevance than the Kaipara River Water Allocation Strategy alone. Although fewer than 100 requests were received, responses have been reported as percentages for ease of interpretation in spite of the resultant inaccuracy.

34% of the specific requests were pollution complaints, indicating that respondents didn't know they could call the ARC's 24-hour water pollution hotline, or that they had tried this without success. Some complaints may fall into the jurisdiction of Rodney District, suggesting a similar lack of public awareness of its pollution control responsibilities, especially as they relate to septic tanks.

13% of the requests were for specific information, and may have been elicited by the survey itself. Again, however, this raises the question of public awareness of information lines such as *ENVIROLINE* and any similar services provided by Rodney District.

11% of requests related to site-specific flooding complaints or suggestions about flood control.

10% related to water availability, water use, illegal use and allocation processes.

Some of the requests for beautification or development relate to refuse in streams, but others fall within the ambit of Rodney District Council's responsibilities, suggesting that people are taking the opportunity offered by the survey to raise these ideas, or that they are unaware of the differing roles of the two councils.

Riparian-related requests indicate that it may be beneficial to explore opportunities for LandCare groups and Trees for Survival in the catchment.

Although the number of specifically maritime requests or complaints was small, they may indicate a need to promote coastal management in the Kaipara.

Most of these requests do not relate to the brief so far established for the Kaipara River Water Allocation Strategy. Actions in response thus fall into three main areas:

- referral to appropriate body for action (whether this is ARC pollution abatement staff, Telecom or Rodney District)

- general publicity and/or information in the next Kaipara Water News (for example, about flooding or the pollution hotline)

- consideration for further development and extension of the Kaipara River Water Allocation Strategy into a Catchment Management Strategy, broadening its scope to encompass wider public and resource management concerns

Table 1: Resource, environmental and management concerns as a proportion of all survey responses and in relation to subcatchment uses

Results are for the detailed land and water use survey only. Subcatchment-based responses from the short survey are not included.

Catchment	Area (ha)	No. of Holdings larger than 3 ha	No. responses to survey	% of holdings responding	No. citing concerns/values	% of responses with concerns per subcatchmt
Moau	1360	84	49	58	14	29
Awaroa	1086	22	16	73	6	38
Tikokopu	2237	90	48	53	20	42
Ararimu	5184	127	75	59	33	44
Lower Kaipara	4824	152	85	56	39	46
Waimauku	3884	203	166	82	95	57
Kumeu	3819	440	259	59	80	31
Upper Kumeu	4372	498	292	59	128	44
TOTAL	**26766**	**1619**	**976**	**X = 61%**	**415**	**X = 42%**

Table 2: Resource, environmental and management concerns by sub-catchment (including newsletter survey sub-catchment responses)

Issue	Moau	Awaroa	Tikokopu	Ararimu	L. Kaipara	Waimauku	Kumeu	U. Kumeu	TOTAL
No.responses[#]	**17**	**12**	**23**	**35**	**48**	**108**	**86**	**130**	**459**
Flooding only	3	4	2	2	22	27	21	36	117
River clearing		4			7	5	5	15	36
Blockages [1]	1	1		3	1	2	2	9	19
Weeds only	1	1			9				11
Weeds+floods		2		1	2			1	6
Willows		1			1	2	1	2	7
Floods+weeds	5	13	2	6	42	36	28	63	195
Water quality[2]	2	2	5	6	9	16	30	11	81
Water Avail[3]			1	7	1	14	15	9	47
Sewage [4]			2	3	1	6	9	2	23
Growth	1	3	1	2	1	7	4	7	26
Sediment [7]	1	2	2		2	2	3	3	15
Riparian [5]		1	1	1	1	4	3	6 *	17
Fish habitat[6]		1			2	4	4		11
Bush/birds [10]				2	4	3	2	3 *	14
Chemicals [8]			2	2	3	4	2	3	16
Rubbish [11]				1	2	2	2	5	12
City water				1		4		2	7
Management [9]	1		1			1	2	5	10
Other [12]	4	1	1	0	1	6	6	9	28
specific action[13]	3	2	2	7 #	7 #	15 #	23 # ^	24 # ^	83

\# Numbers do not add up to total responses as respondents cited more than 1 issue

1. Includes logs and trees in streams
2. Includes rural and industrial pollution concerns
3. Includes stream flows, allocation process, concern that too much is taken, dams
4. Existing concerns, mainly related to septic tanks, but includes 7 concerns about future sewage disposal including Western Area Scheme
5. Riparian concerns supporting management and protection of streams by riparian planting (one comment in opposition *)
6. Protecting native fish, habitat & water quality, concerns about stream ecosystems
7. Includes stream bank erosion, rural soil erosion, effects of earthworks
8. Includes biocide sprays and fertilisers
9. Seeking more active management in the catchment for more sustainability
10. More protection for bush, wetlands, birds on private land (one opposing: *)
11. Concerns about landfills, refuse disposal and rubbish dumped in streams
12. See Table 3 for more detail
13. See Table 6. #: plus many requests to clear stream to prevent flooding. ^: plus many requests to clean up water quality in river

Table 3: Other resource, environmental and management concerns by sub-catchment

Issue	Moau	Awaroa	Tikokopu	Ararimu	L. Kaipara	Waimauku	Kumeu	U. Kumeu	TOTAL
No. responses	**4**	**1**	**0**	**0**	**1**	**5**	**6**	**9**	**26**
Over-regulation							2	6	8
Boats	3								3
Project Cost						1	2		3
Education			2						2
Drain low areas					2		1		3
ARC complaint		2				2	1	5	10
RDC complaint		1			1	1		1	4
Pipes in strms						1			1
General		1		1			1	2	5
No problems			1	1		1	1	1	5
Better access [1]		1	1	1		1		1	5
Recreation [2]		1			1	1	1	1 *	5
Pests/weeds					1	1		1	3
Muriwai S/F [3]						1			1
Kaipara Hbr							1		1
No Services								1	1
Illegal uses						1	1 (koi)		2
More tourism	1								1
Privatisation [4]								1	1
Power lines								1	1
Forestry								1	1
Sand mining [5]						1			1
Commercial Fishing [6]								1	1

1. Better access to streams and rivers needed
2. More parks and recreational facilities (including equestrian *)
3. Damage to shellfish beds by vehicles on beach
4. Opposes privatisation of water resources
5. Opposes mining sand from Muriwai Beach
6. Opposes commercial fishing in the Kaipara Harbour

Table 4: Resource, environmental and management concerns from newsletter and three public meetings

Issue	Newsletter: Short Survey [1]	General Farming Meeting [2]	Consent Holders Meeting	General Community Meeting
No. responses	**16**	**28**	**24**	**70**
Flooding only		4	3	13
River clearing		2		3
Blockages				1
Weeds only				3
Weeds+floods		2		3
Willows				1
Floods + weeds	0	8	3	24
Water quality *	9	2	2	1
Water Avail *	7	5	7	3
Sewage *	3	2	1	3
Growth	3	3	2	5
Sediment *	4			4
Riparian *	2	4		2
Fish habitat *	3			2
Bush/birds *				
Chemicals *	2	1		2
Rubbish *	1			
City water	3	1	1	
Management*	1			1
General	2			
No problems			1	
Other *	4	4		6
specific action*	5	N/A	N/A	N/A

* See Table 2 for definitions

1. 69 in total, but only 16 (ie those not allocated to a sub-catchment) are included here. Others are reported by sub-catchment in Table 2.
2. Responses from public meetings have not been allocated to sub-catchments.

N/A It is assumed that specific requests for information or action were addressed at these meetings, so they are not included here.

Table 5: Other concerns raised in short newsletter survey and public meetings

Issue	Newsletter: Short Survey [1]	General Farming Meeting [2]	Consent Holders Meeting	General Community Meeting
No. responses	**4**	**4**	**0**	**6**
Better access				3
Recreation			1	2
Costs [1]			4	
Term (yrs) [2]				
Kaipara Hbr	4			
Education			2	
Reclamations			1	
Stopbanks			1	
Compliance			1	
Forestry	1			

1. Costs of resource consents, processing etc
2. Term that consents are granted for

Table 6: Recreational uses by sub-catchment[4]

Issue	Moau	Awaroa	Tikokopu	Ararimu	L. Kaipara	Waimauku	Kumeu	U. Kumeu
No. responses	**5**	**5**	**14**	**21**	**20**	**51**	**25**	**48**
Picnicking	1	1	4	6 [2]	3	5	11	6
Eeling	1		3	2	2	16	3	9
F/w fishing		1		1	2	11	6	11
Tramping [1]			2	4	4	9		16
F/w swimming			3	3	2	3	2	6
Duck shooting	1			1	6	4	2	4
Train gundog			1	1		2		
Dog swimming						2		1
Kayaking				2	1	4	4	
Fishing: sea	4	3	2		3	3 [3]		2
Boating	4	2 [4]	1		6	1	1	1
Beach swims	2							1
Horse riding						1	2	
Camping						2		
General enjoy				4	1	1	4	4
Other	2	1	0	0	4	4	7	3

1. Includes walking, enjoyment of scenery and birds
2. Area around ornamental pond is extensively used for functions and picnics
3. All fishers specified Kaipara Harbour except one who specified Muriwai Beach
4. One example is rowing on farm dam
5. Only those who specifically said they did not use local recreational resources were listed. Note that this will result in under-reporting as many respondents left a blank space instead of recording a 'No' response
6. Used to use and still would but stream now only a trickle

Table 7: Other recreational uses by sub-catchment

Issue	Moau	Awaroa	Tikokopu	Ararimu	L. Kaipara	Waimauku	Kumeu	U. Kumeu
No. responses	**1**	**1**	**0**	**0**	**4**	**4**	**7**	**3**
Not suitable		1 [1]						
Tourism					2			
Ponds/birds							2	1
Water/jet skiing	1					1	2	
Kids play						1		1
Education							1 [2]	
Take f/w plants					1		1	
Whitebaiting					1			
F/w crayfishing						1		
Parks						1		
Water gardening							1	
Bike riding								1

1. Awaroa Stream used to be navigable - now not
2. Would use but concerned about water quality

Table 8: Other recreational uses identified from short newsletter survey and public meetings

Issue	Newsletter: Short Survey [1]	General Farming Meeting [2]	Consent Holders Meeting	General Community Meeting
No. responses	**2**	**1**	**0**	**4**
Duck shooting	1			
Fishing: Hbr				1
Kayaking				1
General enjoy				1
Whitebaiting	1			1
Kids play		1		
Community focus		1		

Table 9: Recreational uses ranked in order of overall popularity, as cited in surveys and meetings

Recreational Use	No. Responses	% of Responses
Picnicking	37	14
Eeling	36	14
Fishing (not specified if freshwater or marine)	32	12
Tramping	28	10
Duck shooting	19	7
Swimming in freshwater	19	7
Sea fishing	18	7
Boating	16	6
General enjoyment: view, relaxation, tranquillity	15	6
Kayaking	12	5
Gun dog training	4	1
Water skiiing and jet skiing	4	1
Taking dog for swims	3	1
Swimming at the beach	3	1
Horse riding	3	1
Enjoyment of ponds and birdlife	3	1
Children playing	3	1
Whitebaiting	3	1
Camping	2	0.5
Tourist activities (as service provider)	2	0.5
Other (excl 10 who said ‘Don’t use’ or ‘Not suitable’)	7	3
Total	**269**	**100%**

Table 10: Areas particularly valued, by sub-catchment

Issue	Moau	Awaroa	Tikokopu	Ararimu	L. Kaipara	Waimauku	Kumeu	U. Kumeu
No. responses	**4**	**5**	**11**	**15**	**12**	**50**	**19**	**62**
All of it	2	3	2	3	7	14	2	12
Local / own [1]	4	1	5	4	2	14	8	8
Strm surrounds		1	3	3	1		6	3
Streamside parks		1	1	1		1	3	1
Bush/forest/bird			2	4 [2]	3	6	5	9
Cascades					1			7
Other waterfalls			1	1		1	1 [3]	1 [4]
Waitakere Ra.								10
West Coast bchs						1		6
Bethells								7
Kaipara Hbr		1			1	1		2
Goldies Bush								3
Muriwai					1	12	2	
QE II Trust			1	2				
Parks/reserves		1	1	1		1	3	1
Kerr-Taylor Res.						3		
Would be if . . [5]		2		1			2	1

1. Stream spring, dam or pond on own property, or local stream/subcatchment stream or local swimming hole
2. Includes reference to a kahikatea stand below Old North Road bridge
3. Dalton's Orchard, Trigg Road, Kumeu
4. Mokoroa Falls
5. Would value/use area more if cleaned up

Table 11: Other areas particularly valued, by sub-catchment

Issue	Moau	Awaroa	Tikokopu	Ararimu	L. Kaipara	Waimauku	Kumeu	U. Kumeu
No. responses	**1**	**4**	**3**	**1**	**3**	**9**	**3**	**4**
Mokoroa [1]							1	
Dune lakes		1						1
H'ville town [2]					3	1		
Heritage					1			
Hot pools		3				2		
Ararimu valley			1	1				
Wetlands			1					
Settlers Lodge			1					
Woodhill forest						1		1
Houghton's Lake							1	
All recr. areas							1	
Wenderholm						1		
South Head						1		
Shelly Beach						1		
Rural landscape						1		
Glasgow Park [3]						1		
Coatesville								1
Golf Course								1
Parakai Boat Ramp	1							

1. The area, the falls and the reserve 2. The historic town 3. The Pony Club

Table 12: Areas particularly valued, from short newsletter survey and public meetings

Issue	Newsletter: Short Survey [1]	General Farming Meeting [2]	Consent Holders Meeting	General Community Meeting
No. responses				
Heritage				1
Local stream	2			
H'ville town		1		

Table 13: Areas of value ranked in order of overall popularity, as cited in surveys and public meetings

Area	No. Responses	% of Responses
Own property or immediate local area	48	19
All of the catchment	45	18
Bush and forest nearby	29	11
Stream surrounds and streamside parks	25	10
Muriwai	15	6
The Waitakere Ranges	10	4
The Cascades	8	3
Parks and reserves	8	3
The West Coast Beaches	7	2.5
Bethells Beach	7	2.5
Other waterfalls (Dalton's Orchard; Mokoroa, cited twice)	6	2
Kaipara Harbour	5	2
Parakai hot pools	5	2
Helensville town	5	2
Goldies Bush	3	1
Kerr-Taylor Reserve	3	1
Queen Elizabeth II Trust area	3	1
Dune Lakes	2	1
Ararimu Valley	2	1
Woodhill Forest	2	1
Areas that would be valued if cleaned up	6	2
Other areas cited only once	13	5
Total	**256**	**100%**

Table 14: Specific requests for action summarised by topic of concern

Topic	No. Responses	% of Responses
Pollution Complaint	28	34 %
Requests for project or specific topic information	11	13%
Site-specific flooding actions requested	9	11%
Water allocation or consent-specific issues	8	10%
Site-specific clean-up, beautification or parks	7	8%
Requests for riparian funding or information	5	6%
Maritime or boating actions requested	4	5%
More monitoring of specific matters	3	4%
More education	2	2%
Miscellaneous (only one request per topic)	6	7%
Total number of specific requests	**83**	**100%**

Table 15: Specific requests for action

# denotes a subcatchment-specific request from the short newsletter survey

Subcatch.	Survey #	Nature of complaint or request	Possible solution	Action by:
Moau	1	Edge of flood gate at southern end of Parakai does not seal well at present	Put new rubber mat around edge	
"	7	Pleasure and commercial craft exceed speed restrictions causing river bank erosion		
"	43 #	Navigational hazards in the Kaipara, especially by the old Dairy Company		
Awaroa	4	Runoff from Inland Road creating bog on property (has been discussed with Council to no avail)		
"	5	Beautify reach of the Kaipara River that flows through Helensville behind town centre and make it more accessible to the public		
Tikokopu	12 #	Requests financial assistance for planting eroding stream banks	Publicise Trees for Survival	
"	32 #	Please keep us informed on issues in the Kaipara		
Ararimu	11	Pollution complaint: sewage/long drops at Buddhist community (no action by RDC)		
"	17	Can filters remove Giardia? Can river water quality be improved at reasonable cost?	Send filter information / letter	
"	19	Need a mass cleaning/clearing of Waikaukau River		
"	22	Pollution complaint: rubbish and toxic waste disposal by upstream land owners		
"	26	Need more access to water holes for fire-fighting equipment in Riverhead forest		
"	29	Fence all streams from stock	Landcare groups/info re benefits	
"	31	Link water quality and demand to Project West Wastewater programme		
"	Many	Remove trees fallen in river, clean out rubbish/maintain properly to prevent flooding		
L. Kaipara	2	Drain under SH 16 at end of Rimer road needs to be enlarged to prevent flooding		
"	4	Better monitoring of flooding in Woodhill and alligator weeds		
"	5	Improved flow control on Waitakere catchment		
"	9	Pollution complaint: arsenic in water from mill in Bradly Road		
"	23	Clean up area around old dairy factory in Helensville - unsightly scrap		
"	15 #	Pollution complaint: poor effluent management by dairy farmers overwintering cows		
"	53 #	Cut a channel around the foothills bordering the race course to reduce flooding		
"	Many	Requests for river to be cleaned out to reduce flooding		
Waimauku	13	Concerns about resource consent for Settlers Lodge		
"	19	Pollution complaint: stream on property polluted by oily road runoff		
"	20	Pollution complaint: stream polluted by septic tank runoff from neighbour		
"	21	Pollution complaint: possible effects on stream quality from downstream neighbours		
"	30	Pollution complaint: possible effects of oxidation ponds on border of property		
"	35	Monitor Kaipara River water quality	Send results and interpretation	
"	39	Monitor pesticides in water and effluent disposal		
Subcatch.	**Survey #**	**Nature of complaint or request**	**Possible solution**	**Action by:**

Waimauku	39	Monitor pesticides in water and effluent disposal		
"	45	What are proposed controls on dam heights/qualities (standards?) likely to be?		
"	46	Object to ARC consent annual charges when do all the work ourselves. ARC should enforce policies more thoroughly instead of just threatening		
"	76	Pollution complaint: stream on boundary polluted		
"	76	Cars on Muriwai beach are ruining shellfish	ARC Parks have an interest here	
"	4 #	Educate everyone, not just consent holders - but especially market gardeners, about environmental responsibilities	Re-issue Helen Moodie's RMA leaflets. Public education in newslet.	
"	4 #	Pollution complaint: creek full of foam has been reported twice so far		
"	26 #	Possible Pollution complaint: Is there a dump leaching into the Waimauku Stream?		
"	50 #	Settlers Lodge weir blocks stream		
"	Many	Requests for river to be cleaned out to reduce flooding		
Kumeu	14	Improve the river at Huapai and create a park by the new library (like bank opposite)		
"	22	Pollution complaint: pollution every 6 weeks from chicken sheds when washed out		
"	23	Show perennial stream running thru' farm on ARC maps. Delete ephemeral stream		
"	24	Pollution complaint: discharges from Coopers Creek winery from large functions		
"	34	Pollution complaint: rubbish in Ahukurama Stream		
"	39	Pollution complaint: rubbish in stream at Kumeu, Huapai and Weza Lane bridges		
"	44	Pollution complaint: septic tank pollution of stream		
"	46	Pollution complaint: faecal pollution of spring		
"	48	Please consult with local community about all changes proposed; don't just dictate		
"	51	Pollution complaint: water smells of effluent in summer due to lack of sewerage systems in Huapai/Kumeu area		
"	55	Plan nice rural townships		
"	57	Please keep informed of new information and progress with Kaipara Strategy		
"	60	Pollution complaint: septic tank overflows in stream		
"	61	Please send any information on water quality test results		
"	63	Pollution complaint: occasional fish kills		
"	66	Provide more parks for children		
"	67	Offer unused water allocations to existing bore users not new ones		
"	68	Pollution complaint: possible contamination from upstream		
"	Xtra	Please send information about sewage disposal in the area		
"	Xtra	Pollution complaint: roadside Roundup spraying: it has killed some trees I planted		
"	Many	Requests for river to be cleaned out to reduce flooding		
"	Many	Requests to clean up Kumeu River - it is dirty and polluted		
Subcatch.	**Survey #**	**Nature of complaint or request**	**Possible solution**	**Action by:**
U. Kumeu	2	Pollution complaint: when neighbour harvests grapes, stream turns white		

“	7	Riparian areas of streams should be planted	Landcare groups/info re benefits	
“	10	Provide more recreational parks		
“	14	Pollution complaint: illegal pesticide use in area		
“	21	All 9 properties in our lane get flooded plus Boord Cres opposite.DO SOMETHING!		
“	22	The flood plain area has been estimated from a seriously flawed computer model		
“	31	Can’t put bore down because people have consents but are not exercising them		
“	35	Repair culvert beside property		
“	35	Protect Shelly Beach and Kaipara Harbour from commercial fishing		
“	47	Pollution complaint: rubbish washed downstream from Waitakere area		
“	71	Pollution complaint: discharge from abandoned Sunnyvale Road piggery ponds		
“	74	Pollution complaint: quality of water from Covic landfill, upstream of property		
“	76	Put in a weir south of Kumeu + a canal to the Waitemata controlled from Woodhill		
“	78	Who has responsibility for managing the Kaipara River catchment?		
“	79	Annoyed about having to have riparian strips: can’t graze them/take up a lot of room	Landcare groups/info re benefits	
“	87	Interested in information on recycling/re-using water		
“	98	Believes he cannot spray weeds in covenanted bush on property		
“	103	Vehemently oppose privatising water resources, which these qu.s are leading up to		
“	106	Concerned about Telecom power lines		
“	108	Illegal dam on neighbour’s property		
“	115	Possible Pollution complaint: is there septic tank effluent in the water? (kids play in)		
“	126	Please keep Anzac Valley forest in one block: don’t chop it up		
“	Xtra	What is happening to combat population growth?		
“	Many	Requests for river to be cleaned out to reduce flooding		
“	Some	Requests to clean up poor water quality in Kumeu River		
Short Survey	**Survey #**	**Nature of complaint or request**	**Possible solution**	**Action by:**
“	20	Concerned about plastic waste. Provide a waste depot in the area		
“	20	Provide funding for education (eg by Green Image NZ) in schools, techs, universities		
“	53	Improve water quality and maintain stream flow by creating wetlands and dams		
“	60	Quantitative research results on runoff quality from hard surfaces: roads, urban/rural		
“	61	Please keep me informed of any new information about decision-making processes for my Bursary Research Assignment.		

Maps

No.	Name
1	Locality Map
2	Schematic Geological Map
3	Schematic Soils Map
4	Schematic Slope Map
5	Land Use Capability Map
6	Maori Placenames in Text
7	Recorded Historic Places and Areas
8	Natural Heritage Sites
9	Mean Annual Low Flow
10	One in Five Year One Day Duration Low Flow
11	Discharge Sites
12	Resource Consents to Take or Dam Water
13	Proposed Management Objectives