Tikapa Moana - Hauraki Gulf
State of the Environment Report

JUNE 2008

Hauraki Gulf Forum
Tikapa Moana

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Key to acronyms and abbreviations

AMA	Aquaculture management area
ARC	Auckland Regional Council
BOD	Biochemical oxygen demand
CCP-NZ	Communities for Climate Protection New Zealand
CHI	Cultural Heritage Inventory
DoC	Department of Conservation
EW	Environment Waikato
GHG	Greenhouse gases
HPT	Historic Places Trust
MFish	Ministry of Fisheries
NIWA	National Institute of Water and Atmospheric Research
QMS	Quota Management System
RMA	Resource Management Act
TCDC	Thames Coromandel District Council
2004 Report	The Hauraki Gulf State of the Environment Report 2004

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Chairman's Foreword

It is with great pleasure that one of my first responsibilities as the new Chair of the Hauraki Gulf Forum is to introduce this, the second Hauraki Gulf State of the Environment Report.

It is three years since the Forum issued its first state of the environment report. Throughout that period, the Forum parties have individually and collectively worked to recognise and protect the values and opportunities offered by the extraordinary stretch of water that is the Hauraki Gulf.

Despite the good work, as this report shows, the challenges continue. In some cases they are greater than ever. This report reinforces the critical need for the Gulf Forum. It shows how the quality and sustainability of the Gulf's environment is dependent on so many agencies and, importantly, on those agencies working together in an informed and collaborative manner.

From my perspective, this is an enormously important document. Not only does it disclose, as best we currently can, what the environment of the Gulf is really like and in so doing inform and educate the Gulf community, but it also serves to focus the Forum members on the challenges that lie ahead and on the interdependencies of our actions. This report, like the last, will be used to help the Forum target priorities (including research and monitoring) for the next three years.

The first (2004) State of the Gulf Report was a mammoth account of all we knew at that time about the Gulf. While that was an impressive effort, we have deliberately taken a different approach this time around. This report is less of an encyclopaedia and more of an "update". It is briefer and, we trust, more accessible. Where readers are interested in greater background and context to an issue they should refer back to the 2004 report.

Whilst this report has a sharper focus than the earlier report it has nevertheless involved considerable work by many people and I thank them all for their contributions. I have no doubt that the future management of the Gulf will be better for their input.

John Tregidga
Chair, Hauraki Gulf Forum

Contents

Executive summary

The human population of the Hauraki Gulf catchment recently passed the one million mark and is growing by around 20,000 per year. That population is becoming increasingly urban. It is also becoming increasingly wealthy. Incomes increased 29% between 2001 and 2006 while the number of two car households increased more the 21%. Property prices averaged a 32% increase between 2004 and 2007.

Urbanisation of land is a direct consequence of these trends and urbanisation is, in turn, one of the great drivers of change in the state of the Hauraki Gulf's environment.

Water quality

Near shore water quality of the Gulf is determined by what is flushed from the land. Land use change is therefore a key pressure on water quality. In addition to urbanisation, the Gulf catchment is also under pressure from rural land use – especially dairy farming. There are 410,000 cows farmed on the Hauraki Plains and these are accommodated at a denser stocking rate than in 2004 (up from 2.98 cows per hectare to 3.03 cows per hectare). This combined herd produces the same amount of faecal matter as 6 million people.

More water than ever is supplied to Aucklanders with each person consuming more than they did in 2004 and stormwater and wastewater systems continue to flush contaminants to the coast.

- Microbial contamination (bad bugs in water) at bathing beaches may well be reducing. Certainly there is no indication that it is getting worse. There is no doubt that there are still problems after rain but less so than in the past. Given the investment in wastewater networks, improvement is to be expected. Coastal water monitoring indicates that microbial pollution at beaches is a near shore issue only and is of short duration. Nevertheless, it is clear that on-going investment in wastewater infrastructure will be required to keep beaches safe.
- Heavy metal contamination is a growing problem in Auckland's poorly flushing harbours and estuaries particularly those receiving stormwater from older urban and industrialised areas. In short, contaminated areas are continuing to degrade with implications (as yet largely unknown in scale) for marine ecology. Solutions need to address the contamination sources, especially land transport and building materials. Metal concentrations in the Firth of Thames are lower than in Auckland's urban harbours and lower than relevant guidelines. However, they are enriched relative to other Waikato sites. It will be difficult to address heavy metal build up in the Firth given natural sources. However, agricultural and horticultural sources (of zinc and cadmium in particular) will need to be watched.
- Organic pollution (chemicals such as DDT, Dieldrin and PCBs), as measured by contamination of Auckland shellfish is low by international standards. There

are no significant trends in accumulation (either up or downwards) detectable over the past three years.

- A vast amount of nitrogen is discharged to the Firth of Thames each year. At this point there is no indication that it is leading to algal blooms but the potential clearly exists, particularly in the less turbid western waters of the Firth. Nutrient loads into Auckland coastal waters are small by comparison and seem to have reduced. Nevertheless, where nutrients are discharged to enclosed waters they can have local impacts although to date turbid waters have limited potential for algal growth.
- In summary, on the basis of current information, the big issues for the Gulf's waters are; (a) the build up of heavy metals in Auckland harbour sediments; and (b) the nutrient flows into the Firth of Thames. While action is being taken on both these issues, it is not clear that they are yet having any impact.

Main responses to pressures on water quality are the ARC's regulatory initiatives to better manage stormwater and progressively improve waste water discharges. Territorial authorities are investing heavily in upgrading stormwater and waste water networks and promoting water sensitive urban design. EW is tightening control over farming practices using regulatory and non regulatory measures. It is too early to say whether these responses will be adequate to address the key issues.

Natural and social character of the coast

The Hauraki Gulf has been something of a picture postcard for decades – it has become an iconic coast-scape that has sustained generations of holiday-makers.

While many of those qualities remain, the Gulf is changing. On the Coromandel Peninsula, the number of dwellings grew by 18% between 2001 and 2006 even though the permanent population barely grew at all. The coastline from the Auckland isthmus to the Mahurangi Harbour is highly urbanised with regional parks providing buffers to existing or proposed development.

Interestingly, visitor numbers to Auckland and the Coromandel Peninsula have not changed markedly in recent years and are down from the high levels of 2000-2003. This suggests perhaps that the nature of visitors (especially to the Coromandel) may have changed with more staying in second homes/rented residential units. Certainly the number of camping grounds continues to decline.

Public parks continue to be well used with 15 of the 22 monitored sites showing increases in use since 2004 of between 10% and 140%.

In Auckland the social pattern is clear with the Hauraki Gulf coastal suburbs housing the wealthier segment of the population.

Sediment associated with current and past soil disturbance continues to fill (and redistribute within) estuaries changing their character, allowing mangroves to colonise former sand and shell banks.

Main responses by the ARC are the regulatory containment of growth with urban limits imposed to the north and south of metropolitan Auckland and the purchase of regional parkland. EW and Thames Coromandel District are developing an urban growth strategy for the Coromandel.

Public ownership of the coastline has increased slightly over the past few years. This probably reflects that reserves have been taken as condition of coastal subdivision as well as parkland purchase.

Biodiversity

Tikapa Moana is a place for our treasures. It is home to a diverse range of common and rare species and is an increasingly important place for threatened species recovery.

Outside of the public conservation estate, habitat modification and disturbance resulting from urban and peri urban development is a significant pressure on biodiversity. Pests and weeds are a significant pressure everywhere. The biosecurity risk associated with major sea and air ports is ever present.

The Hauraki Gulf is a busy place with evidence that ship traffic and marine tourism poses a growing threat to marine mammals (through ship strike and behaviour modification).

It is difficult to gain an overall view about the state of biodiversity as, to some extent, it will be place specific. There is both positive and negative news.

On the positive side, many seabirds, terrestrial birds and lizards seem to be making a recovery thanks to pest control on islands. DoC, working with conservation groups on island restoration, has achieved significant gains with self reintroductions of birds (between islands and from islands to the mainland) occurring to complement a programme of official translocations.

On the negative side, it is clear that 35% of the Gulf catchment has less than 10% of its original vegetation remaining. Any vegetation that does remain within these areas is described as acutely threatened. The coastal wading bird community in the Firth of Thames has changed over time as a result of sediment being locked in place by mangrove colonisation modifying preferred habitat and displacing some species. There is evidence that fragments of privately held bush on the Coromandel Peninsula need to be better managed to avoid decline in condition. Two unwanted marine organisms have been confirmed to be present in the Gulf that were not known in 2004.

The main responses are pest management on land by both ARC and EW and the declaring of the Hauraki Gulf a Controlled Area under the Biosecurity Act enabling greater control over the movement on species between islands. DoC restoration and pest control work (in partnership with community groups) forms another other key response. Territorial authorities also have many regulatory and voluntary initiatives in place. In the marine area MAF Biosecurity continues to work on securing borders against pests.

Fisheries and marine space

Demand for fish and aquaculture space within the Gulf is occurring against the global backdrop of increasing fish demand and declining wild fish catch. Aquaculture is increasingly important to meet global fish demand and the New Zealand government is attempting to grow the industry here.

Overall commercial fishing within the Hauraki Gulf (and east off the Coromandel Peninsula) took an average of 6816 tonnes of fish (all species) per year between

2004 and 2007. That compares with 6247 per year in the three years prior to the 2004 Report.

By far the most valued species continues to be snapper with an average 2047 tonnes caught per year.

A comparison of the commercial snapper catch with the recreational catch for the smaller areas of the inner Gulf waters (statistical areas 005 and 006) shows that the recreational take may be 35% greater than the commercial take.

It is difficult to identify a clear trend in commercial fishing or provide an overall assessment of fish stocks within the Hauraki Gulf as fisheries management is based on larger management areas.

It is clear, however, that cockle populations in some areas (particularly Umupuia Beach) are suffering steady decline due to over harvest by recreational fishers.

Notwithstanding the government's aquaculture aims, there have been no new marine farms provided for in the Hauraki Gulf since the 2004 Report although some farms have been developed within the previously approved Wilson Bay area.

There is clear evidence of continued demand for marine space for aquaculture.

Moorings are another valued use of marine space within the Hauraki Gulf. There appears to have been some modest growth in demand (and supply) of moorings adjacent to urbanising areas (i.e. of the Rodney coast and off some of the Gulf islands). There has been a reduction in the number of moorings in the inner Waitemata, thought to reflect the increasing supply of marinas and out of water boat storage options. Although official growth in consented moorings is modest it is also clear that between 11-15 % of all moorings are unauthorised.

The main responses have been community shellfish monitoring, devising new (or refining existing) aquaculture management regimes (ARC and EW respectively) and providing for a limited number of new moorings in high demand locations. In the near future fisheries management plans will be an important response.

Cultural heritage

Cultural heritage is our link to the past.

There is a high level of requests for authorities (131 over the past 3 years) to be issued by the HTP for modification of archaeological sites. This trend is probably growing (although this may be related to an increasing awareness of statutory requirements). The main driver (45% of all applications) for authorities to disturb such sites is urban development, with forestry a significant secondary driver.

Little is known about the trends associated with other (non archaeological) cultural heritage sites within the Gulf and its catchment. We do know that within the Auckland part of the Gulf catchment there are records for almost 7500 sites (5200 archaeological sites and 2300 other buildings and structures - including 462 maritime sites).

The main response to the threat to cultural heritage is in the maintenance of the CHI and the regulatory controls of the HTP and local authorities. There is on-going work to improve, and make more comprehensive, existing databases and local authorities are generally adding to inventories of protected sites over time.

Natural hazards

The science of climate change is becoming more certain and the implications for the Hauraki Gulf are becoming clearer.

Climate change may have implications for the incidence and/or impact of a number of natural hazards which will affect the natural environment (including biodiversity) and public infrastructure, as well as people and their property. There will be additional cultural impacts for Māori.

Although information is improving, there is still considerable uncertainty about what, where and how much will be affected. It is clear, however, the risk of climate related hazards is likely to increase.

There are some things we cannot control (although we can play our part in a global response) but there are some things, like our exposure to risk, we can control.

Studies in the Waikato part of the Gulf indicate that our risk exposure is growing as more building occurs in actual or potential hazard prone areas. Unfortunately data on risk to people and property from coastal and other natural hazards is patchy and what does exist is already outdated.

There are some important responses to these issues. A number of local authorities have changed, or are in the process changing, their district plans to better recognise hazard risk, some are working directly with affected communities to find durable solutions, while on the Coromandel, EW's Peninsula Project includes a focus on undertaking works to give better protection to several Coromandel towns. Research into potential hazards has also occurred in both regions and in Rodney and Thames Coromandel districts in particular.

At a more strategic level, five of the nine local authority Forum members are member of the Communities for Climate Protection New Zealand (CCP-NZ) programme and are committed to reducing greenhouse gas emissions as a contribution towards a global response to climate change.

State of information

In preparing the state of the environment report it has become apparent that information on the environment of the Gulf that we should know, and have easy access to, often does not exist because no one collects it. Alternatively, information is difficult to obtain due to the way it is collected, or because it is held by many organisations and not collated.

It is clear that future state of the environment reports would benefit from an agreed set of the Hauraki Gulf *environmental indicators* (which incorporate the Māori environmental indicators already being discussed).

The development of indicators is a multi stage process that requires selection of the best measure to provide an insight into either: a pressure; or state; or response. It also requires the development of a *monitoring programme/protocol* for each indicator that will in turn require agreement about when, where and how to monitor. (In many cases this will already exist but may need fine tuning).

Finally, it requires agreement about the *benchmark* to be used to report information (i.e. some standard that can tell us whether a particular result is good, bad or indifferent) and about how indicator information should be presented.

Once indicators and the monitoring required have been agreed, systems need to be put in place to collect and collate relevant information on a regular basis - with the same indicators used on an on-going and regular basis to enable trend analysis.

While some of the information reported here is based on indicators already in use by ARC and EW, the two data sets are often not directly comparable for a variety of technical and practical reasons. Sometimes compatibility can be achieved by reworking data. Other times the differences are more fundamental. Other data used in this report has been collected for the first time. The approach taken with that information may form the basis of a future Gulf indicator but some information presented in this report may not be the most revealing measure and is included here simply because it is the only information currently available.

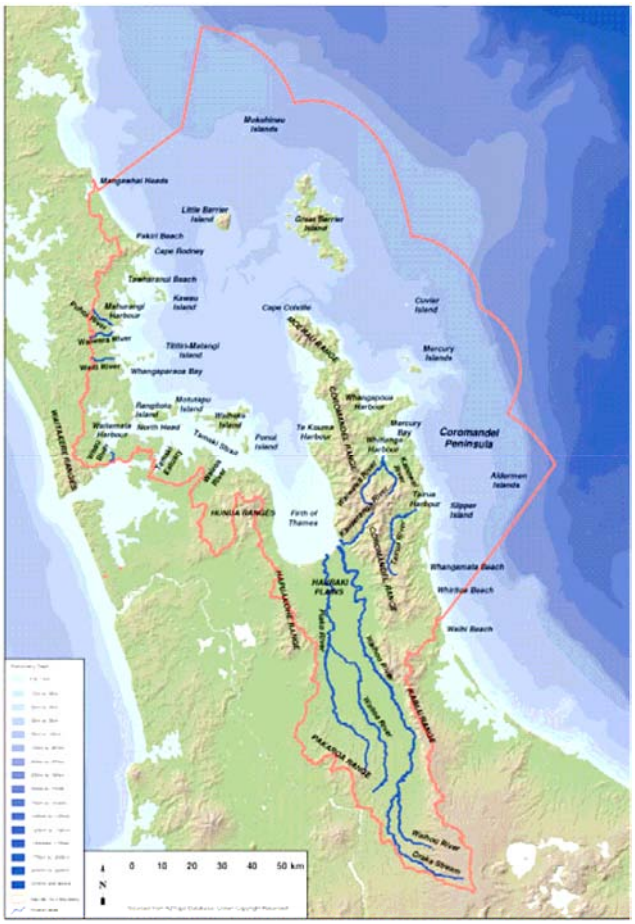
Effective, integrated management of the Gulf requires, first and foremost, a much better approach to understanding the strategic picture of the Gulf and that means making sure we have the best possible understanding of what is happening. Future state of environment reports will be able to provide that insight if the investment is made in considered, regular and prioritised information gathering and analysis.

1 Introduction

1.1 Purpose of the Report

The Hauraki Gulf Forum ("the Forum") is a grouping of local authorities, tangata whenua and government agencies with a management role and kaitiaki interest in the Gulf, its islands and/or the catchments that drain to the Gulf. Tikapa Moana - Hauraki Gulf and its catchment are shown in Figure 1 below.

Figure 1 - Hauraki Gulf, its islands and catchment



The Forum is constituted under the Hauraki Gulf Marine Park Act 2000 and works to integrate management across the Gulf and its catchments. One of the key functions of the Forum under the Act is to prepare a State of the Environment Report (SER) for the Hauraki Gulf. It must do so every three years.

This report serves to meet that statutory requirement. It is the second such report. The first, published in 2004 ("the 2004 Report"), reported a collection of available data and identified a need for agreed environmental indicators for the Hauraki Gulf and corresponding coordination and collaboration in the monitoring carried out by various agencies. Inevitably, the 2004 Report provided an incomplete picture of the issues faced by the Gulf but was always regarded as a first attempt which would be improved over time.

This report is a step forward in reporting on the environmental health of the Gulf. While indicators and monitoring systems for the Gulf remain under-developed, this report attempts to update key information set out in that 2004 and supplements the indicators used in 2004 with additional indicators where necessary (and available) to provide a fuller picture of the Gulf.

In so doing the report progresses the debate about the best environmental indicators to be used for long term reporting. However, the development and confirmation of Hauraki Gulf indicators (and the alignment and, in some cases, redesign of monitoring programmes that will entail) is a project in its own right and one which the Forum has yet to complete.

As a result, some indicators used in this report are opportunistic by nature. That is they are used because they represent the information available rather than being consciously selected because they provide the best technical measure.

Nevertheless, this report is less descriptive and more quantitative about the state of the Gulf and attempts, wherever possible, to show change relative to, and since, 2004 in quantitative terms.

1.1.1 Māori environmental indicators

It is worth noting that the Forum has approved, in principle, a project for development of *Māori environmental indicators* within the Gulf. A scoping paper setting out the nature of the enquiry was adopted by the Forum. Partners and external funding are currently being sought for implementing this project. The project has two general aims: to record traditional knowledge for its intrinsic value; and to determine how this can be applied to contemporary environmental management.

Hopefully future state of the environment reports will benefit from the availability of Māori environmental indicators. Such information is not, however, able to be included in this report.

1.2 Report structure and format

The report adopts a *pressure, state, response* framework as a way of organising data and suggesting links between cause and effect and the corresponding actions of management agencies and communities.

The approach is common to most state of the environment reports (including the 2004 Hauraki Gulf report). However, this report also includes *driving forces* at the beginning of the report. In this report:

- *Driving forces* are the underlying social, demographic and economic pressures driving change in the patterns and rates of production and consumption which in turn have down stream implications for the environment. Driving forces tend to be cross-cutting in that they influence what is happening across a range of resource issues.
- *Pressures* are the specific activities carried out by people (or result directly or indirectly from people's activities) that cause some damage or stress to the environment.
- The *State* is the quality or quantity of the environment or specific natural resource.

- *Responses* are the actions carried out by government agencies, community groups and others in response to the environmental issues or risks identified.

This report is structured around seven chapters:

- **Driving forces**. Chapter 1 outlines the main demographic and social indicators.
- **Flushed away?** Chapter 2 reports on *water quality* in the Gulf. In considers pressures such as population growth, water consumption, land use change, wastewater and stormwater. The state is assessed in terms of microbial contamination at beaches, heavy metals contamination in marine sediments, organic pollutants in shellfish and general coastal water quality.
- **Still a picture postcard?** Chapter 3 considers the *natural character and accessibility* of the Gulf to people and communities. It looks at development pressure for second/holiday homes, visitor numbers, property values and rural land use change. The state is measured by reviewing coastal development, coastal land ownership, socio-economic barriers to access, the use of public space and sedimentation.
- **A place for our treasures?** Chapter 4 focuses on the *biodiversity* of the Gulf. It acknowledges the role of habitat modification and disturbance, border issues, vessel movements and tourism as pressures. The state is described by considering change in vegetation cover, distribution of threatened terrestrial species, protected areas, the pest status of the Gulf Islands and marine pest incursions.
- **Enough for everyone?** Chapter 5 looks at *public resources – fisheries and marine space*. Pressures reviewed include fishing, aquaculture and moorings. The state is described in terms of change in fish catch and availability of coastal space for exclusive use.
- **Links to the past**? Chapter 6 provides an overview of *cultural heritage*. Urbanisation and land use change is identified as a driving force with disturbance of archaeological sites used as a key indicator of pressure (associated with land use change). The state of the Gulf's cultural heritage is described in terms of the number of sites recorded on public databases and the number of sites protected through planning mechanisms.
- **Forces beyond our control?** Chapter 7 reviews *natural hazards*. The driving force and pressures are climate change and land use intensification. The state is described in terms of the increased risk faced by the Gulf and its communities.

2 Driving forces

2.1 Demographic change

2.1.1 Population growth

The 2004 State of the Environment Report recorded the 2001 population of the Hauraki Gulf catchment as 955,250. The 2006 census shows that figure to have risen to 1,060,653. In other words, more than 100,000 more people lived within the Hauraki Gulf catchment in 2006 than did in 2001.

Around 97% of the population growth occurred in the Auckland part of the Gulf catchment. 93% of the Gulf catchment population now live within the Auckland Region (up from 91% 5 years earlier).

The fastest growing parts of the Gulf catchment between 2001 and 2006 are those parts within:

- Waikato District, 857 additional people (93% growth)
- Rodney District 19,422 additional people (42% growth)
- Manukau City, 48,000 additional people (35% growth).

The areas with the least population growth are those parts within:

- Hauraki District, 38 fewer people (-0.2% growth)
- Matamata-Piako, 1017 additional people (3.5% growth).

In other words, notwithstanding population growth in the Waikato District, the population of the Gulf catchment is becoming increasingly urban.

2.1.2 Māori population

The Māori ethnic group resident population of New Zealand at 30 June 2007 was 632,900.

The Auckland Region has the largest Māori population of 137,133; the Waikato Region has the second largest at 76,572. These populations represent 24% and 14% of the national Māori population.

The median age of Māori was 22.7 years in the 2006 Census, compared to 35.9 years for all of New Zealand. It is projected that 22 percent of population will identify as Māori by 2051.

The Te Puni Kokiri website Te Kahui Mangai which identifies iwi and hapu organisations to be consulted in RMA implementation has 19 separate entities listed for the Gulf.

2.1.3 Development growth

Metropolitan Auckland added 51,000 additional residential units between 2001-2006 with a little over half of this being on greenfield or vacant land within the Metropolitan Urban Limits (MUL) and the remainder as infill (i.e. intensified development within established urban areas). A further 9000 dwellings were built in rural areas of the region over the same period. Furthermore, approximately 2000 hectares of business zoned land has been developed in the past 10 years.

2.2 The wealth factor

2.2.1 Income

Mean household incomes have continued to increase at a rate above the rate of inflation. Between 2001 and 2006 household incomes in the Auckland Region increased from $49,000 to $63,400 (29%) while those in the Waikato Region increased from $38,500 to $49,500 (29%). The national average increased from $39,600 to $51,400.

2.2.2 Car ownership

Rates of consumption in the Gulf catchment generally reflect growing population and growing wealth. The number of two (or more) car households in the Auckland Region increased 21.3% to 236,214 between 2001 and 2006. The number of two car households in the Waikato grew a similar proportion to 73,968. In both cases the rate in the growth of two car households was around double the growth in the number of households.

2.2.3 Property values

Property prices in the Auckland local authority areas and in the Thames Coromandel District increased by an average 32% between June 2004 and June 2007. Analysis of the price changes in specific coastal locations shows considerable consistency although price increases in the Coromandel and Gulf Islands have been below the Hauraki Gulf median (see Table 1).

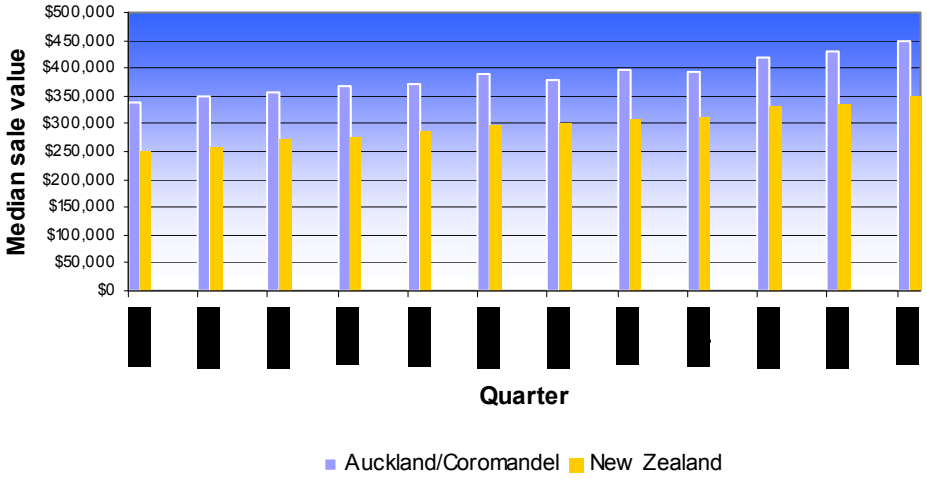
Table 1 - Increases in sales price of dwellings around the Hauraki Gulf 2004-2007

Area/Suburb	Median Sale Value March- June Quarter 2004	Median Sale Value March-June Quarter 2007	Proportion Value Increase 2004-2007
Rodney North	340,000	437,000	28.5%
Hibiscus Coast	385,000	485,000	32.8%
East Coast Bays	430,000	560,000	30.2%
Milford/Takapuna	517,250	675,000	30.5%
Devonport	577,500	757,500	31.2%
Birkenhead	380,000	544,000	43.0%
Upper Harbour	410,000	535,000	30.5%
City/ Point Chevalier	310,000	378,000	21.9%
Gulf Islands	411,000	508,000	23.6%
Eastern Beaches	422,000	555,000	31.5%
Coromandel Peninsula	305,000	370,000	21.3%

Source: Real Estate Institute of NZ

Although Hauraki Gulf dwelling price increases have been high over the 2004-2007 period, they have been below the national increase of 40%. However, national increases are coming off a significantly lower base value. In dollar terms, the price differential between the value of properties in the Hauraki Gulf and elsewhere in New Zealand are being maintained as shown in Figure 2 below.

Figure 2 - Median sales price of dwellings in the Auckland region and Coromandel district 2004-2007



Source: Real Estate Institute of NZ

2.2.4 Māori economic development and resource interests

The national Māori economic asset base in 2007 was recorded as $9222.4 million; $2,057 million (22%) is the Auckland Region; and $1268.1 million (14%) in the Waikato Region.

The Māori ownership of the national fishing industry is approximately 40%; and Māori ownership of the aquaculture industry has been estimated as 50%.

Increased enrolment of Māori in tertiary education, and the existence of wananga with environmental/kaitiakitanga studies, is building business and managerial capacity of Māori.

Many Māori organisations in the Hauraki Gulf catchment have established environmental or resource management units.

3 Flushed away?

3.1 Pressures

3.1.1 Water consumption

Water consumption is up (at least within the Auckland metropolitan area). Watercare now supplies more water to more people with each person consuming more than they did in 2004[1]. This is shown in Table 2.

Table 2 - Water consumption in the Auckland metropolitan area

	Connected population	Supplied volume	Litres per person per day
2004	1,174,500	127,089,000	296
2005	1,193,500	131,052,000	301
2006	1,213,000	134,699,000	304
2007	1,232,000	136,220,334	303

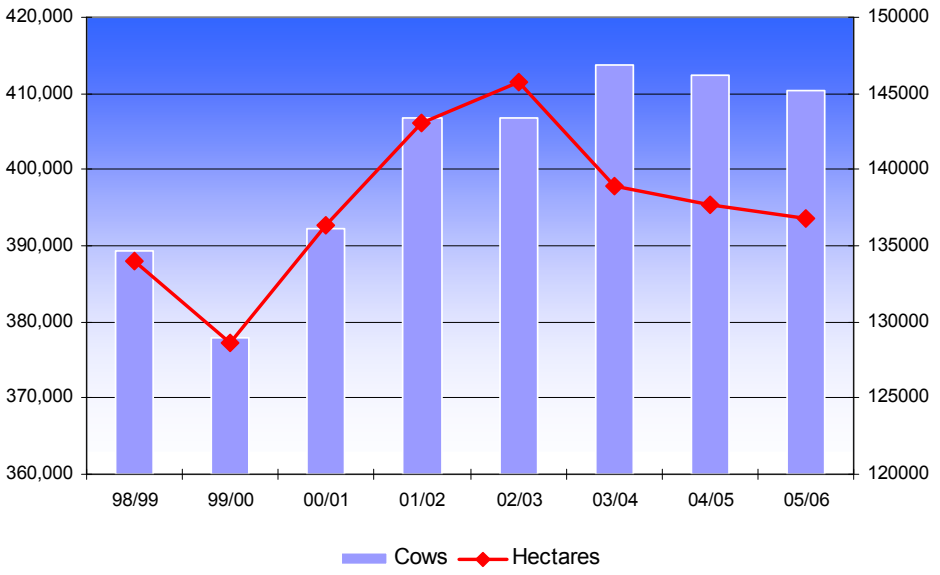
Source: Watercare Services Ltd Annual reports 2004-2007

3.1.2 Rural land use change

Land use change and intensification continues in the rural areas of the catchment as well. A significant trend has been the intensification of dairy farming, particularly in the Hauraki Plains. Figure 3, below, shows that although cow numbers are down slightly from the 2003/04 peak, the area of land devoted to dairying has dropped at a greater rate. This means that the 410,000 cows farmed on the Hauraki Plains are accommodated by denser stocking rates (up from 2.98 cows per hectare in 2003/04 to 3.03 cows per hectare in 2006/07). That is significant as the rate of nitrogen loss to ground water is related to the number of animals per hectare.

[1] Although consumption per day is now 303 litres, this is still well below consumption in New Zealand's other major cities, Wellington and Christchurch, with rates of 500 and 420 litres per person per day respectively. On the other hand, Auckland's consumption is higher than Sydney's which consumes water at a rate of around 275 litres per person per day.

Figure 3 - Cow numbers in the Matamata-Piako and Hauraki Districts



Source: LIC New Zealand Dairy Statistics 1998/99 – 2006/07

The application of fertiliser is another associated pressure. Environment Waikato calculates that there has been a six-fold increase in fertiliser use on Waikato dairy farms since 1990. In 2003/04 alone, fertiliser use on Waikato farms increased 16%.

3.1.3 Waste water and stormwater

Waste water and stormwater flows are a source of microbial and heavy metal and organic pollution.

- *Wastewater and stormwater networks*

In Auckland City about 15% (300km) of the drainage system is combined. Combined sewers are those that carry both wastewater (sewerage) and stormwater in the same pipe with combined stormwater and waste water being directed to the Mangere wastewater treatment plant. However, combined sewers cannot cope at times of heavy rain so the system is designed to overflow into local waterways (and from there to the coast) at specific "relief overflow" points.

Even where wastewater and stormwater systems are separate, microbial (and other) contamination of surface (and coastal) waters can result because of *infiltration* and *exfiltration*.

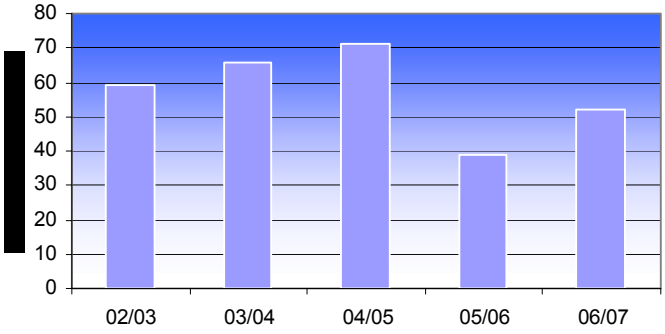
Infiltration is when stormwater or groundwater infiltrates the wastewater system (through faults in pipes or through illegal connections) loading that system above its design capacity causing it to overflow to streams discharging to the coast.

Exfiltration is when wastewater leaks from wastewater pipes and enters the groundwater and stormwater system which discharges untreated into waterways or directly to the coast. This tends to be characterised as "dry weather overflows" since it is not related to rainfall but rather to faulty pipes and/or blockages caused by foreign matter such as tree roots, fat or silt.

Unfortunately, quantitative data on overall incidence and volume of these sources of contamination is patchy and under constant revision as on-going catchment studies improve our understanding of the system. In January 2007 Metrowater estimated the volume of wet weather overflows from the Metrowater and Watercare systems into the Hauraki Gulf as 2.9 million m^3 (Metrowater, 2007a). The vast majority of this volume comes from those central and western parts of the network that continue to be served by combined sewers.

The rate of dry weather overflows is show in Figure 4 below.

Figure 4 - Dry weather overflows from the Metrowater network 2003-2007



Metrowater, 2007b

- *Wastewater discharges*

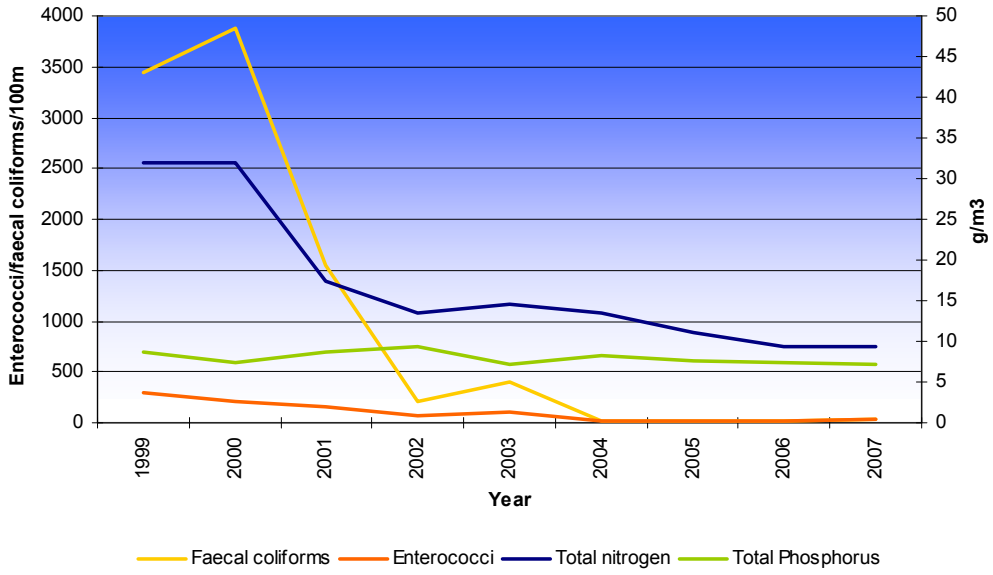
There are 12 waste water treatment plants located within the Auckland Region that have outfalls to the Hauraki Gulf. By far the largest of these facilities is the North Shore wastewater treatment plant.

The North Shore plant currently discharges 54,000 m^3/day of treated effluent 600 metres off shore. The quality of the discharge has improved in recent years due to a major upgrade of the facility. In particular, UV treatment of wastewater introduced in 2004 has dramatically reduced microbial contamination. As shown in Figure 5, both enterococci and faecal coliform levels have reduced median levels below 30/100ml from rates of several hundred/100ml prior to UV treatment. Total nitrogen levels have also reduced as a result of other upgrade features.

Annual median levels of ammonia and BOD[2] have similarly reduced. In 2003 ammonia was 7.1 g/m^3 and BOD 3.9 g/m^3. By 2007 that had reduced to 0.3 and 2 respectively.

[2] BOD stands for biochemical oxygen demand. BOD indicates decomposing organic matter by measuring the amount of dissolved oxygen used by micro-organisms and biochemical processes.

Figure 5 – Annual median contaminant levels in discharge from the North Shore Wastewater treatment plant 1999-2007



3.1.4 Freshwater inputs

Freshwater inputs (the discharge of rivers to coastal areas) is a pressure on coastal water quality. It is likely that the quality of freshwater inputs affect the quality of near shore water in enclosed, or poorly flushed, coastal areas[3]. Research (ARC 2007c) shows Auckland's river water quality to be closely related to land use in the catchment. Rivers in urban catchments tend to have high concentrations of nutrients and suspended sediment, and high levels of faecal coliform bacteria. The same research found that the conditions in some Auckland streams might have improved between 1995 and 2005.

- *Nutrients*

Environment Waikato research (EW, 2007) has shown that the Hauraki and Coromandel rivers draining to the Firth have a combined total nitrogen (total N) load of about 3500 tonnes per year upstream of the point of discharge[4] (reflecting a mean combined flow of 68.4 m^3/s and a median total nitrogen concentration of around 1 mg N/L).

By contrast, the flow from Auckland rivers has a median total nitrogen concentration of less than 0.5 mgN/L from a combined flow of about 8.5 m^3/s and a total nitrogen load of 133 tonnes. This means that Waikato rivers contribute about 96% of the total nitrogen entering the Gulf from river systems.

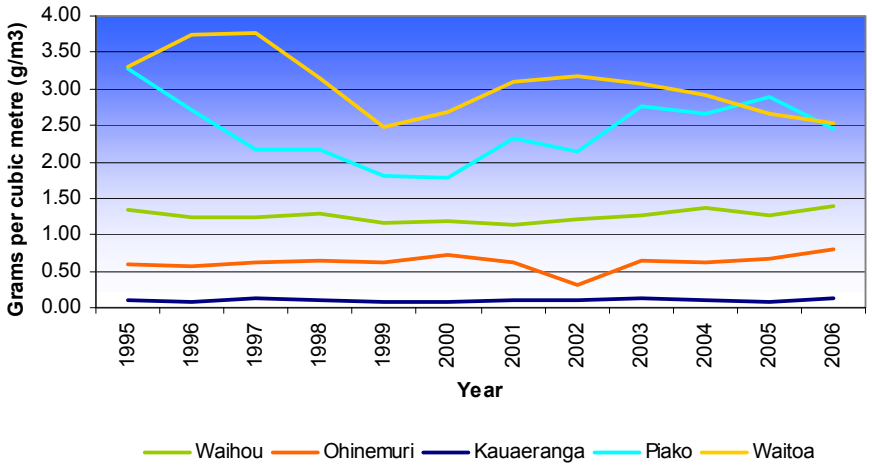
The nitrogen load is a product of total N concentration in the water and flow (i.e. the amount of water). River monitoring shows that the median total nitrogen concentration of the Hauraki's rivers has not changed significantly over recent years

[3] The extent to which this occurs in Auckland and the nature of the relationship is the subject of research recently commissioned (from NIWA) by the ARC.

[4] This figure underestimates the actual load discharged to the Gulf because, in several cases, there is a considerable portion of the catchment that lies downstream of monitoring sites.

(see Figure 6). A 2007 review (ARC 2007c) of Auckland's river water quality found overall improvements in nutrient concentrations in the region's rivers. While this may have some localised benefit (in terms of isolated coastal edge effects of elevated nitrate levels) the effect on the Gulf as a whole of such an improvement needs to be seen in context of the much larger contribution made by the Hauraki Rivers (which are not decreasing).

Figure 6 - Median Total N concentrations in Hauraki Rivers



- *Microbial contaminants*

Although many of Auckland's rivers are generally in poor condition, ARC research (ARC 2007d) shows that the overall microbial contamination of Auckland's rivers seems to have decreased over the 1995-2005 period. The reason for this is not proven but may in part be related to the improvements in stormwater and wastewater systems. Despite the trend of overall improvement, 50 percent of monitored Auckland streams have more than 1000 cfu[5] per 100 mL (5 times the national guideline) and there was at least one case of a river in an urbanised catchment experiencing a step change (upwards) in microbial contaminant levels. While the river is not within the Hauraki Gulf Catchment it does illustrate how change can occur. On the other hand, faecal coliforms at one monitoring site within the Hauraki Gulf catchment (at Pakuranga) trended down significantly during the period 1992-2005, very likely because of the removal a single point source discharge.

Microbial contamination of Waikato rivers is also monitored. The data suggests that, like Auckland, there is a strong correlation between microbial (and other) contamination and the dominant catchment land use (with forested catchments having lower microbial counts than catchments with livestock). Overall microbial contamination in rivers in the Waikato region is moderate, with median levels of faecal coliform bacteria often in the range 100-to-1000 cfu per 100 mL (EW 2007b). Few trends in levels of bacteria have been apparent over the past decade. Levels of faecal coliform bacteria measured in the southern Firth of Thames are typically low, with median levels in the range 1-to-3 cfu per 100 mL, suggesting that

[5] cfu stands for colony forming units – a measure of viable bacteria.

dilution and die-off of the bacteria in the seawater means that the loads of bacteria carried in the inflowing rivers have little effect on the bacterial water quality of the Hauraki Gulf.

3.1.5 Microbial contamination beach water

In 2006 bathing beach water monitoring was carried out at 83 beaches around the Gulf. This is around 14 more beaches than were monitored in 2004[6].

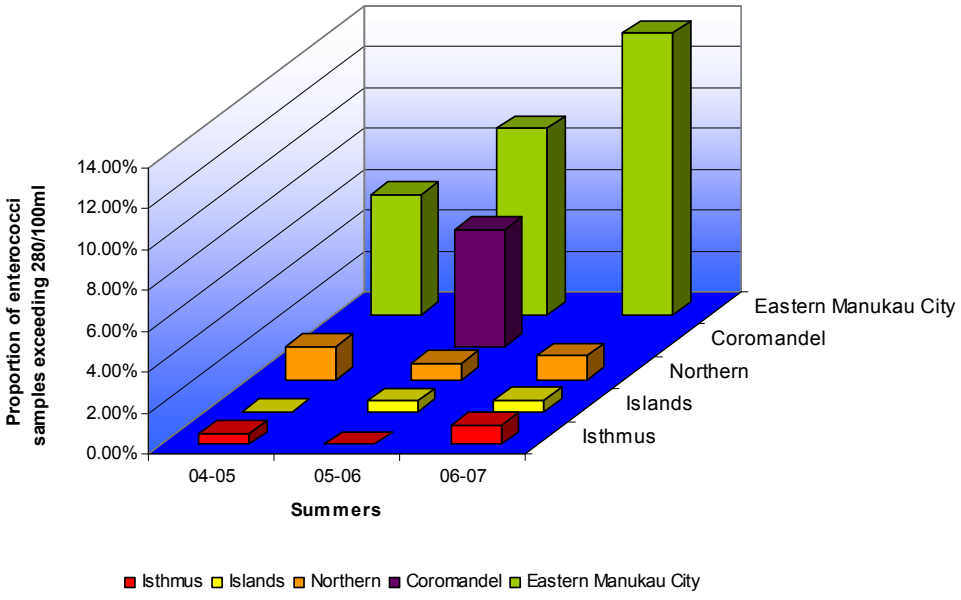
Monitoring records the number of *enterococci* per 100 mls of seawater. Enteroccoci are bacteria found in the human gut and are used as an indicator of potentially harmful micro-organisms in salt water.

Overall results of the 4883 samples taken in the Auckland region over the 04/05, 05/06 and 06/07 summers show a total of 82 exceedences of the 280 enterococci/100mls guideline value upon first sample. This equates to a 3 year average exceedence rate of 1.68%. The 2004 report showed a 3.8% exceedence rate. On that basis there would appear to be some improvement.

Monitoring of Coromandel/Firth of Thames beaches has only been undertaken over one summer since 2004. That was the 2005/06 summer. Results show a total of 11 exceedences from 192 samples over that summer giving a one year exceedence rate of 5.73%.

The breakdown of these data between different parts of the Gulf is shown in Figure 7.

Figure 7 - Incidence of enterococci levels exceeding 280/100ml



Source: Local authority beach water quality monitoring databases

[6] Manukau City has "graded" its beaches (categorised beaches according to their suitability for contact recreation) with the result that fewer beaches are monitored. In accordance with national guidelines, beaches graded as very poor and very good are not regularly monitored since their suitability/ unsuitability for contact recreation is well known.

Figure 7 shows that exceedences were a small fraction of samples at isthmus, gulf islands and northern beaches and with no trend apparent. The results for the Eastern Manukau City beaches on the other hand are considerably higher and appeared to worsen over the three year period.

Considerable care should be taken in interpreting these results. Beach water quality monitoring is fraught because the results are largely weather-dependent. High levels of enterococci can be expected immediately after heavy rain[7]. During periods of fine weather enterococci levels will generally be low. Thus, results for any particular beach typically display a pattern of low microbial contamination with intermittent high results corresponding to heavy rain events. How direct this relationship is and how high (or low) levels may be is related to the land use within the corresponding catchment, the natural drainage pattern and the state of any wastewater and stormwater systems.

It is important to note that Figure 7 does not show all the instances when 280 enterococci have been exceeded since the samples reported here relate to weekly summer monitoring only. Other factors to take into account include:

(a) Monitoring of several eastern Manukau beaches has been discontinued since the last SER. Three of these because they have been graded as "very good" and under the national guidelines monitoring every week is not required. Similarly, Kawakawa Bay, is no longer monitored because it is known to be very poor and has been signposted accordingly until improvements can be made. No other local authority with the Gulf Catchment has yet graded its beaches.

(b) The data set is not complete and it is clear that there were a number of instances when sampling of isthmus, islands and northern beaches was abandoned due to adverse weather. Given that such weather events are associated with high levels of enterococci, the abandonment of sampling may have skewed results.

Furthermore, it is important to note that results relate to the initial or first sample. Monitoring of Manukau's eastern beaches since 1995 has identified that while an exceedence may be registered on the first sample, particularly if taken during offshore wind conditions, that a second consecutive sample taken within 24 hours often shows compliance. Additional testing and investigation identified some of these exceedences to be the result of faulty sewerage network connections which were subsequently repaired. Other exceedences were linked to wastewater network overflows during heavy rainfall events which led to improvements including installation of detention tanks to avoid overflows. In general, urban beaches are likely to be graded lower than rural beaches. In context, the four south eastern beaches around Beachlands-Maraetai are graded "very good". The rural Umupuia beach and three urban beaches around Buckland Beach at the entrance to Tamaki Estuary are graded "good". Beaches off Howick are graded "fair" or "poor" due to their heavily urbanised nature and older wastewater networks. Kawakawa Bay and Orere Point are graded "very poor" and "fair" respectively due to their proximity to unserviced settlements. Improvements to their sewerage systems are being planned. Re-grading of these beaches in 2008/9 will assess monitoring information over the previous five years and take account of any improvements.

[7] For reasons set out in section 3.1.3.

Although it is difficult to draw firm conclusions from beach water monitoring data, there are known "hot spots" of poor water quality being beaches most likely to record high levels of enterococci. Over the past three years, 22 beaches have recorded more than one exceedence, with exceedences being most frequent at Howick Beach (11), Cockle Bay (9), Mellons (8) and Kawakawa (no longer monitored). Similarly, Tairua Harbour on the Coromandel recorded 3 exceedences from 12 samples over the 2005/06 summer.

3.1.6 Heavy metals and organic compounds

- *Metals in sediments - Auckland*

Monitoring of Auckland's stormwater contaminants in marine sediments has shown that 34 of the 52 Hauraki Gulf coast monitoring sites have concentrations of at least one metal or above Threshold Effects Levels (TEL), in simple terms greater than "low"[8]. The majority (20) of these sites were located adjacent to the Isthmus. Monitoring shows a pattern of greatest concentrations of contaminants in sheltered areas (i.e. estuaries) adjoining older urban and industrial parts of the urbanised catchments. These include the stretch of Waitemata coast from Henderson Creek to Coxs Bay and the upper reaches and side branches of the Tamaki Estuary. These areas tend to have concentrations above the Effect Range Low (ERL) values (meaning levels are elevated[9]) and two sites (upper Whau River and the upper Pakuranga Creek) with zinc levels exceeding the "Probable Effects Level" (PEL) (meaning levels are "high"[10]).

As shown in Figure 8, contaminants in these areas continue to accumulate rapidly. Zinc concentrations are increasing at 14 of the 20 sites for which trend analysis is possible. Copper is increasing at 16 of the 20 sites.

In some cases the accumulation rates shown in Figure 8 represent significant proportional increases. For example, between 1998 and 2005 zinc concentrations in the fine sediment fraction at Kaipatiki Creek (a side branch of Hellyers Creek) increased 51%, in the Upper Lucas creek by 55% and in the Weiti Estuary by 33%. This is attributable to recent large scale urban development in those catchments.

In general, recent monitoring[11] has confirmed the findings reported the in 2004 SER. Namely that there is a trend for the most contaminated coastal areas to continue to degrade rapidly due to on-going zinc and copper inputs. Most open coastal sites, such as Awaruku, Browns and Cheltenham have maintained low concentrations of contaminants due to good dispersal characteristics.

Lead accumulation continues to be more variable over time reflecting the removal of the primary source of lead (i.e. leaded petrol).

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[8] The 2004 SER applied the ARC's *Environmental Response Criteria* (now under review) and in broad terms referred to what is called here the "TEL" level as "green". The TEL for zinc is less than 124 mg/kg^{-1}, for copper it is 18.7mg/kg^{-1} and for lead it is 30.2 mg/kg^{-1}.

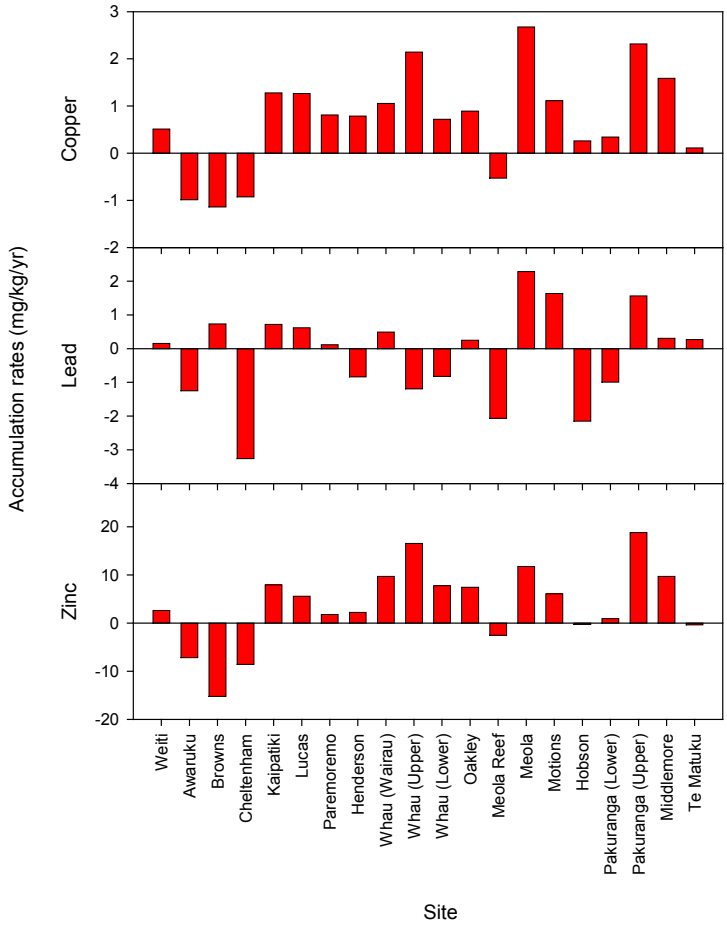
[9] The 2004 SER referred to this level as "amber". The ERL level for zinc is 150 mg/kg^{-1}, for copper it is 34mg/kg^{-1} and for lead it is 47 mg/kg^{-1}

[10] The 2004 SER referred to this level as "red". The PEL level for zinc is 271 mg/kg^{-1}, for copper it is 108.2mg/kg^{-1} and for lead it is 112.2 mg/kg^{-1}

[11] *Marine Receiving Environment Stormwater Contaminants: Status Report 2007*, ARC, June 2007, TP333.

ARC research (ARC 2007a) has also confirmed that spatial patterns in ecological health broadly reflect spatial patterns of contamination. In other words, although there are some anomalies in the data, there is a clear relationship between the ecological health of coastal areas and the levels of heavy metal contamination[12].

Figure 8 - Accumulation rates of copper, lead and zinc in Auckland (Hauraki Gulf) coastal monitoring sites



Source: ARC, 2007a

ARC monitoring of sediments also considered a number of other contaminants but did not find levels to be of concern.

- *Metals in contaminants – Waikato*

Recent monitoring of sediments in the lower Firth of Thames (EW, 2007a) has found arsenic, cadmium, copper, mercury, lead and zinc enrichment relative to concentrations present before Polynesian and European settlement[13]. Relative to

[12] Ecological health was assessed by analysing ecological (benthic) community structure at 84 sites and ranking those sites according to the degree of degradation.

[13] Concentrations of chromium, nickel, aluminium, iron and lithium are more typical of those observed in harbour sediments in other areas.

expected background concentration the most highly enriched element is mercury (on average 7 times higher in the Firth of Thames than at other sites). In mass terms the most highly enriched element is zinc with Firth of Thames sediments containing about 10mg/kg more zinc than reference sites.

Although concentrations of copper, cadmium, lead and zinc are higher than typical values for uncontaminated sediments, they are still below the lowest sediment quality guideline values[14] and are believed to pose a low risk to health of aquatic ecosystems. The two elements that are nearest to, or occasionally exceed guideline values for sediments at some locations are arsenic and mercury.

The probable source of lead is past mining in the Ohinemuri catchment. Elevated levels of zinc and cadmium are likely to be due to historic mining (as for lead) and on-going agricultural practices[15]. The source of arsenic and copper is most likely weathering of minerals such as pyrite in coastal areas (a natural process probably exacerbated by historic land clearance). Mercury seems to be associated with the drainage of the wetlands and peatlands of the Hauraki Plains.

Kuranui Bay (and the area to the south) stands out as a hotspot of localised metal contamination in the Firth. This seems associated with industrial fill or landfill as part of historic land reclamation (the Moanataiari reclamation). There may be risks to marine organisms living in sediments in this area.

As monitoring of sediments is only recent, trend analysis (and hence accumulation rates) cannot be reported.

- *Shellfish biomonitoring*

As reported in the 2004 SER, sedentary filter feeding shellfish are useful "bio-monitors" since they process large amounts of water from a fixed location and have the propensity to accumulate a wide range of contaminants in their tissues. For that reason mussels are monitored at four sites in Waitemata Harbour and Tamaki Estuary areas. The purpose of the monitoring is to detect long term trends in (stormwater and wastewater derived) contaminants in seawater. Mussels are particularly suitable for monitoring trends in organic pollutants[16].

In general, the levels of organic contaminants present in shellfish tissues are low by international standards. The Tamaki estuary has the highest levels of the Hauraki Gulf monitoring sites with elevated levels of dieldrin and PCBs.

Only one additional year of monitoring data is available since the 2004 SER was published (ARC, 2007b). In general, these data show no significant trends in accumulation of organic contaminants. Results are shown in Figure 9 below.

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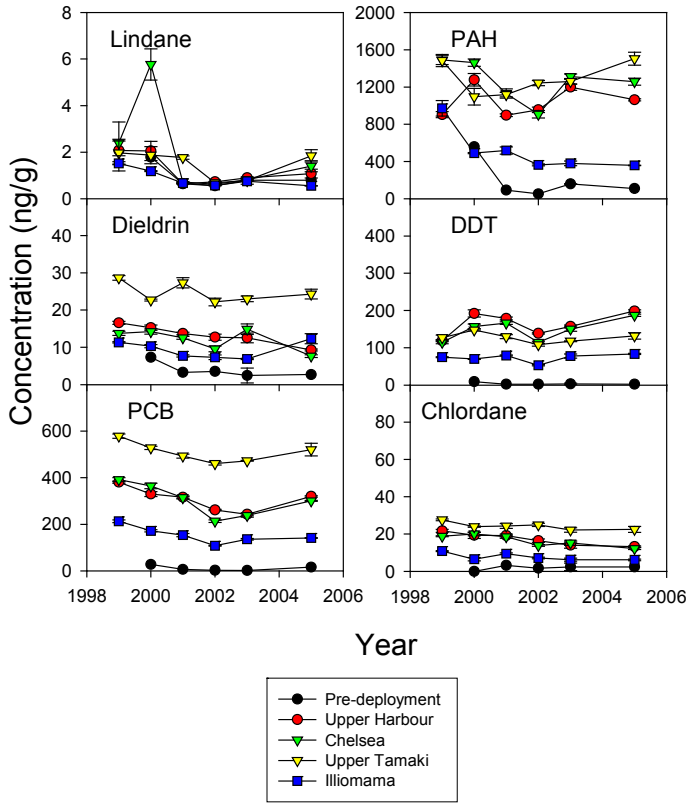
[14] Note the guideline referred to here is the Australian and New Zealand Environment and Conservation Council Interim Sediment Quality Guideline (ANZECC ISQG) not the guideline referred to in the context of ARC data.

[15] Cadmium is an impurity in phosphate fertilisers used extensively in the catchment. Zinc sulphate is also used extensively in the catchment as a remedy for facial eczema in stock.

[16] Heavy metal contamination is also recorded but these data are generally regarded as less suitable for state of the environment monitoring purposes.

Figure 9 - Mean concentrations of organic contaminants in mussels at Hauraki Gulf monitoring sites



Source: ARC, 2007b

3.1.7 Coastal water quality

The data presented earlier in this report relating to microbial contamination, nutrients, heavy metals and organic pollutants related to the near shore environment (in the case of microbes, knee depth water).

Both ARC and EW also monitor water quality further off shore. The ARC has 20 coastal monitoring sites in Hauraki Gulf coastal waters harbours and estuaries where routine (monthly) monitoring of water quality is undertaken.

The last results from this monitoring to be analysed and reported relate to 2004 (ARC, 2006d). However, the most recent (unreported) data show continuing good water quality with data showing a consistent pattern over time with lowest levels of suspended solids in open coastal sites and highest levels in the upper Tamaki Estuary. There are some specific sites that record high faecal contaminants such as the Warkworth Town Basin.

In general, there are two different hydrological systems in the Auckland coastal environment: (a) open coastal areas where good flushing (tides and waves) ensures quick dispersal of pollutants and therefore good water quality; and (b) sheltered estuarine and upper harbour areas where poor flushing and shallow water means contaminants do not easily dilute and disperse. Nutrient levels are low on the seven coastal monitoring sites stretching north to Goat Island. Preliminary trend analysis indicates that between 1998 and 2007 nitrate/nitrite levels may have increased at four of the seven sites. However, the increases are modest and come from a very

low base[17]. On the other hand soluble phosphorous levels appear to be decreasing at all sites while total phosphorus levels are trending down at three sites and up at two.

Although nutrient levels are not high on the coastal sites they reach moderate levels at some estuarine/inner harbour sites. Although Auckland does periodically experience off shore algal blooms these events seem principally related to climatic conditions and associated oceanic processes (up welling of ocean nutrients) rather than land based sources of nutrient. In the sheltered estuarine/harbour areas, algal growth is limited by relatively high turbidity (i.e. suspended solids in the water column blocking light).

Environment Waikato recently initiated the first ever monitoring of water quality in the southern Firth of Thames (along a line extending from Miranda to Tararu, near Thames). Initial results do not suggest there is risk of algal blooms from nutrient enrichment in the southern Firth under current conditions although the water quality in that environment (in particular the clarity of water and relatively high light penetration in the western side of the Firth) does suggest that the area could be susceptible to algal blooms should nutrient conditions alter in the future. Clarity is poorer on the eastern side of the Firth.

In 2006-2007 EW also monitored water quality of the Whangapoua Harbour. Results indicate that water quality is generally good. Water is saline, clearer near the mouth, but more turbid further inland and has normal pH. BOD levels are low, indicating very little gross organic pollution, levels of *E. coli* and enterococci are also generally low, but do increase substantially following heavy rainfall, and nutrient levels are similar to those of seawater.

3.1.8 Gross contamination events

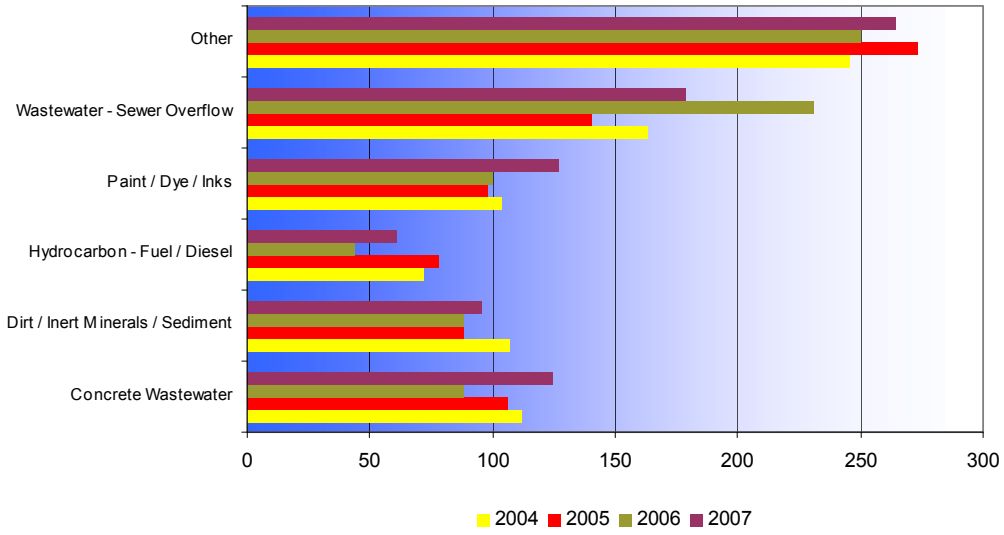
Periodically the Gulf, or more usually the rivers draining to the Gulf, suffer gross contamination events as a result of an (either a deliberate or accidental) illegal discharge of material that contaminates waterways and/or causes severe disruption to aquatic ecosystems.

In the period 2004 to 2007 the ARC pollution response team responded to over 1000 reports of such events each year in the Hauraki Gulf catchment. Many of the reports were found to be due to natural causes such as landslips or no evidence of pollution was found when the site was visited. The most common pollution incidents relate to: sewer overflows; hydrocarbons; paint, dye or inks; concrete wastewater; dirt, inert minerals or sediment. The number of these incidents where there were reports of fish or eels being killed were: 11 in 2004, 21 in 2005, 10 in 2006, and 14 in 2007. The pollutants in these incidents were generally concrete wastewater, hydrocarbons or sewer overflows.

Figure 10 shows the four year trend in the main types of contamination events. The results do not show a particular trend.

[17] Nitrate/nitrite levels are a factor of ten lower than at monitoring sites around the Manukau Harbour.

Figure 10 – Reported pollution incidents in the Hauraki Gulf (Auckland only) 2004-2007



3.1.9 Māori perspectives

Though impossible to quantify, there is an important Māori dimension to water issues. Many Māori feel pain at the damage which has been caused to Papatūānuku (the waterways are seen as her veins) and the mauri of waterways, the cultural offence caused by practices such as sewage and effluent discharge, the damage to and loss of mahinga kai, damage to the health of those who rely on that mahinga kai, the loss of cultural wellbeing caused by degradation of the mauri of the waters, and the cumulative effects on all aspects of wellbeing (MfE 2005).

3.2 Responses

3.2.1 Regulatory Responses

The Auckland Regional Council's *Air, Land and Water Regional Plan* ("ALW Plan"), notified in 2001, establishes the regulatory framework within which the performance of the wastewater and stormwater discharges can be enhanced over time taking account of better information and improvement in technologies. Operators of waste and stormwater networks were required to apply for consents under the ALW Plan to authorise their operations by 2001. Different operators have managed this requirement in different ways reflecting the various levels of readiness to seek consents. The ALW Plan promotes a whole-of-catchment/whole of network approach. This allows for investments to be targeted and prioritised to: (a) optimise opportunities to reduce wastewater overflows; and (b) better manage the quality and quantity of stormwater and flood risk in the context of limited public funding for such investment.

Regulating networks and discharges, however, is just part of the current regulatory response. Territorial authorities also regulate land use to encourage water sensitive urban design and on-site stormwater management.

The Waikato Regional Plan provides for the discharge of untreated animal waste to land as a permitted activity that is subject to a number of conditions – including a maximum nitrogen loading per hectare per year. Environment Waikato has recently stepped up its monitoring of compliance with these conditions. The results of this

increased monitoring effort have not, however, been encouraging. Farmer compliance checks by Environment Waikato in 2004/05 found only 43% of farms to be compliant with the rules. 41% were judged to be in minor non-compliance while 16% were found to be in significant non-compliance. Similarly, a 2006 helicopter survey of 100 dairy farms in the Hauraki Plains found 25 (i.e. 25%) of farmers visibly in non compliance of the relevant rules.

From 2006 across the whole of the Waikato region a nutrient management plan must be used to plan fertiliser application where nitrogen is being applied at rates greater than 60 kg N/ha/yr.

3.2.2 Works and Services

- *Auckland Isthmus*

On the Auckland isthmus, Metrowater is working towards target of 35% reduction in wastewater discharge by 2012. This will include a target of having no more than one overflow per year in heavily used eastern isthmus beaches; 12 per year in the Whau estuary area and two per year in other areas of the isthmus. As detailed in Table 3, Metrowater over the past three years has removed 1781 properties from combined sewers on the Auckland isthmus. This is an increase on the period 2001-2004 during which 1401 properties had been removed from combined sewers. Furthermore, it has budgeted a total of $205 million over the next ten years for combined sewer separation and a further $133 million on addressing inflow/infiltration and on other overflow reduction projects (including $15 million to reduce dry weather overflows[18]). Achievement in sewer separation for the period 2004 to 2007 is shown in Table 3 below.

Table 3 - Buildings removed from combined sewer in the Auckland isthmus 2004-2007

Catchment	2004-05	2005-06	2006-07	TOTALS
Point Chevalier	501	130	24	**655**
Upland	147	101	4	**252**
Motions	253	248	151	**652**
CBD	-	2	3	**5**
Orakei	136	65	16	**217**
	1,037	**546**	**198**	**1,781**

Source: Metrowater (pers comms)

[18] Dry weather overflows are leaks of wastewater that are unrelated to wet weather. These typically result from faulty pipes and/or blockages caused by foreign matter such as tree roots, fat or silt. Dry weather overflows include exfiltration – when waste water enters the stormwater system.

- *Manukau City*

In the Manukau City part of the Gulf catchment, Manukau Water operates its wastewater network in accordance with a "global"[19] consent issued in 2003. As a condition of that consent Manukau Water must systematically apply for individual consents for each of its 36 catchments (at a rate of at least 2 per year). These individual consents will require mitigation works to be implemented to reduce wastewater overflows. Manukau Water has budgeted $100 million over the next 20 years for such works.

Manukau Water is also currently seeking consent for a new $20 million wastewater treatment plant at Kawakawa Bay which will reduce reliance on underperforming septic tank systems. Other areas will be further investigated when land use changes are reviewed.

Manukau City Council is responsible for the stormwater system and is currently developing *Integrated Catchment Management Plans* (ICMPs) which address stormwater quantity and quality management issues to gain Network Discharge Consents in accordance with *Regional Plan ALW*. Manukau City has already spent about $3 million in preparing the ICMPs with the cost of implementation as yet unknown.

- *North Shore*

Network consents have been sought by NSCC from the Auckland Regional Council for the city's wastewater network. Extensive research was being carried out to help set higher standards that will reduce the impact of these systems on the city's streams, lakes and beaches. The consent was granted at the end of 2007 but some of the conditions are subject to appeal.

Project CARE is the North Shore City's 20-year project to establish and meet the community's beach water quality expectations. Some of the city's sewer network is old and leaky, and is a risk to public health. To improve beach water quality the city is aiming to reduce the number of wet weather overflows from an average 12 per year to two per year. This 20-year design target was adopted in 2001 after extensive public consultation.

The current wastewater network has insufficient capacity to meet the design target of two wet weather overflows per year. Certain identified works in new growth areas are required and a large programme of works under project CARE is required to reduce wet weather overflows. A new outfall tunnel 3km off Mairangi Bay required to meet resource consent conditions with regard to the quantity and quality of wastewater discharge has been consented. Construction is programmed for 2008/10 at an estimated cost of $103 million.

- *Rodney*

Rodney, Auckland's fastest growing region and the second fastest in New Zealand has seven public treatment plants whose catchments drain into the Hauraki Gulf and also many settlements that are still dependent on on-site systems. Since 2004, Rodney has made significant progress on the Hibiscus Coast Trunk System Project

[19] A global consent is a consent that is not tied to a particular site but is generic in nature allowing the holder to undertake a specific activity, in accordance with condition specified, anywhere within the district/region.

and upgraded the Army Bay Wastewater Treatment Plant. The oxidation ponds in Orewa discharging into the Whangaparaoa Bay are to be decommissioned once the Hibiscus Coast trunk system has been fully commissioned. Currently, around 50% of the flow from Orewa is treated at Army Bay and discharge to Whangaparaoa Bay reduced.

Over the next two years, the Point Wells (currently unserviced) and Matakana (discharge to the Matakana River) systems will be connected to the Jones Road Treatment Plant in Omaha Flats where the effluent is beneficially reused for irrigation.

New consents for the Warkworth and Snells Beach/Algies Bay treatment plants have been issued and treatment plants are being upgraded for the short term. A strategic review of the Mahurangi wastewater systems is underway and due to be completed in 2009. The process will involve comprehensive consultation with the community, iwi and stakeholders.

Rodney lodged a wastewater network consent application in March 2001. Since then, a number of projects to investigate wastewater overflows and the effects have been initiated. Hydraulic modelling and inflow and infiltration programmes have been developed for the entire district and are being implemented on a priority basis.

Rodney has continued its programme of catchment management planning with applications for Orewa CBD, Silverdale North, Stanmore Bay and Snells Beach. This work is aimed at improving both quantity and quality issues in respect of stormwater discharges. In the rural areas Rodney has applied for consent to remove weeds and blockages from streams to improve flow and the quality of the surrounding riparian margin. Particular attention has been paid to proposals within the Mahurangi Catchments to ensure the highest standards of discharge and attenuation of those resulting flows to minimise erosion.

- *Thames-Coromandel and the Waikato*

In 2006 the Thames Coromandel District Council awarded a $42 million contract for the upgrading the Tairua-Pauanui, Whitianga and Whangamata waste water systems. Another $23 million will be spent upgrading wastewater plants in Hahei, Thames, Coromandel and Matarangi over the next decade.

The Te Aroha wastewater system (in the Matamata-Piako District) which discharges to the Waihou River has been upgraded over the last period. This was undertaken to meet resource consent requirements.

3.2.3 Community and private sector initiatives

Environment Waikato operates a Clean Stream Fund which provides grants of up to 35% of the cost of fencing streams. The Auckland Regional Council also operates similar funds (the Environmental Initiative Fund and the Coastal Enhancement Fund) that support community initiatives.

A number of streamcare groups operate throughout the catchment with the encouragement and support of local authorities.

- *Project Twin Streams*

One such initiative noted in the 2004 Report is Waitakere City's Project Twin Streams. Although the project has many objectives, it is principally about working

with communities to restore 56 kms of Waitakere stream banks. The banks are weeded, replanted with natives and maintained. The stream bank plantings will improve the habitat for native fish, birds, bats, lizards, geckos and insects. As at the end of 2007, the total of 341,607 plants had been planted.

In 2007 alone Project Twin Streams:

- planted 113,364 plants, 62% of them by local communities
- cleared 33% of the project area of weeds
- involved 5,944 volunteers in planting, site preparation, weeding and maintenance
- enabled 29 groups and 11 schools to adopt sections of stream bank.

- *Harbour clean up*

A group called the Waitamata Harbour Clean-up Trust oversees the removal of litter from Auckland's Waitemata Harbour and inner Gulf Islands, and promotes the concept of clean, clear rubbish-free waterways. Supported by five local authorities of the Auckland region, the Trust operates a vessel and coordinates volunteers. Since inception in 2002 the Trust has been responsible for removing over 1,000,000 litres of litter from the Gulf.

- *Impacts of dairying*

At the national level the *Dairying and Clean Streams Accord* (signed by Fonterra, regional councils and central government agencies and also known as the "Fonterra Accord") committed the dairy industry to meet a range of performance targets.

Monitoring of progress towards the Accord's targets in the Waikato for the 2003/04 season (through Fonterra's On-Farm Environment and Animal Welfare Assessment) found 68% of "accord-type" waterways fenced and 37% of farmers having completed nutrient budgets. An independent audit of those findings resulted in the compliance rate being revised downwards to 60% and 18% respectively. The target had been 50% fenced and 100% use of nutrient budgets by 2007.

3.2.4 Research

Much research has recently been carried out in context of new stormwater consents. Metrowater, for example, has completed a major *Integrated Catchment Study* (ICS) which has greatly improved knowledge about volumes, overflows, contaminants loads and the source of those contaminants of Auckland wastewater and stormwater systems. Of particular note, the ICS found that the primary source of zinc on the isthmus is galvanised iron surfaces. It calculated that as much as 95% of the zinc coming from industrial areas (where galvanised iron is dominant building material) originates from roof run-off. The primary source of zinc had been previously thought to be car tyres.

The ARC is currently developing a model that will help predict contaminants accumulation in central Waitemata sediments over a 100 year time horizon. The model will provide a useful tool to enable the testing of different treatment and source control scenarios, and will build on the previous work modelling contaminant accumulation in the Upper Waitemata Harbour. The ARC has also recently commissioned NIWA to undertake a trend analysis of saline water

monitoring results for the period 1991-2007. That research will identify change over time and compare trends in saline water quality with trends in the quality of freshwater inputs to assess the influence of the Region's rivers on coastal water quality. This research will be a useful input to the next Hauraki Gulf SER.

A recent NIWA modelling study (NIWA, 2005) showed that algal blooms are very likely to occur at the mouth of the Waihou River and extend into the Firth of Thames by 5-10 kms if there is a five fold increase in nitrogen reaching the Firth.

3.3 Conclusions

All land within the Hauraki Gulf catchment drains to the sea. Therefore waste or contaminants we create on land has the potential to end up flushed into the Gulf. The key question is how much pollution reaches the Gulf and once there, is it accumulating and/or causing problems or is it flushed away out of sight out of mind and out of the Gulf.

Available data indicates that:

- Microbial contamination (bad bugs in bathing beach water) may well be reducing. Certainly there is no indication that it is getting worse. There is no doubt that there are still problems after rain but less so than in the past. Given the investment in wastewater networks improvement is to be expected. Coastal water monitoring indicates that microbial pollution at beaches is a near shore issue only and that there is short term impact. Nevertheless, it is clear that on-going investment in wastewater infrastructure will be required to keep beaches safe.
- Heavy metal contamination is a growing problem in Auckland's poorly flushing harbours and estuaries particularly those adjacent to industrialised areas. In short, contaminated areas are continuing to degrade with implications (as yet largely unknown in scale) for marine ecology. Solutions need to address land transport and building materials. Metal concentrations in the Firth of Thames are lower than Auckland and lower than relevant guidelines. However they are enriched relative to other Waikato sites. It will be difficult to address heavy metal build up in the Firth given natural sources. However, agricultural and horticultural sources (of zinc and cadmium in particular) will need to be watched.
- Organic pollution (chemicals such as DDT, Dieldrin and PCBs), as measured by contamination of Auckland shellfish is low by international standards. There are no significant trends in accumulation (either up or downwards) detectable.
- A vast amount of nitrogen is discharged to the Firth of Thames each year. At this point there is no indication that it is leading to algal blooms but the potential clearly exists, particularly in the less turbid western waters of the Firth. Nutrient loads into Auckland coastal waters are small by comparison and seem to have reduced. Nevertheless, where nutrients are discharged to enclosed waters they can have local impacts although to date turbid waters have limited potential for algal growth.
- In summary, on the basis of current information, the big issues for the Gulf's waters are (a) the build up of heavy metals in Auckland harbour sediments; and (b) the nutrient flows into the Firth of Thames. While action is being taken on both these issues, it is not clear that they are yet having any impact.

3.3.1 State of information

Of all issues managed by Forum members, water quality is the subject of most and longest monitoring attention. In some cases data sets go back a decade or more and trend analysis is possible. However, information availability reflects relative priorities (in terms severity of issues faced) as observed by regional councils. Waikato has significant monitoring information on nutrients load and sources but much less information on beach water quality, metal accumulation in sediments and has only recently begun a programme of monitoring coastal water. Auckland, on the other hand has significant and long standing coastal water and sediment monitoring programmes. Even when both authorities do monitor similar indicators, programmes are not aligned and approaches to reporting information not consistent.

While that situation may be appropriate, reflecting as it does the issues faced by the respective regional councils, it continues to make reporting on water quality across the Gulf as a whole challenging. Further work is required to develop Hauraki Gulf water quality indicators that make best use of available data and/or recommend changes to existing monitoring programmes.

3.3.2 Change since 2004

Little has changed since the 2004 Report. Modest improvement in river water quality and beach water quality seems apparent. However, heavy metal contamination in marine sediment is increasing and organic compounds in indicator shellfish show no sign of reducing. Nutrients remain a concern. The suggestion made in the 2004 report that the Tamaki River, the most polluted waterway in Auckland, might be improving may have been premature with recent monitoring indicting continuing high levels of pollution.

4 Still a picture post card?

4.1 Pressures

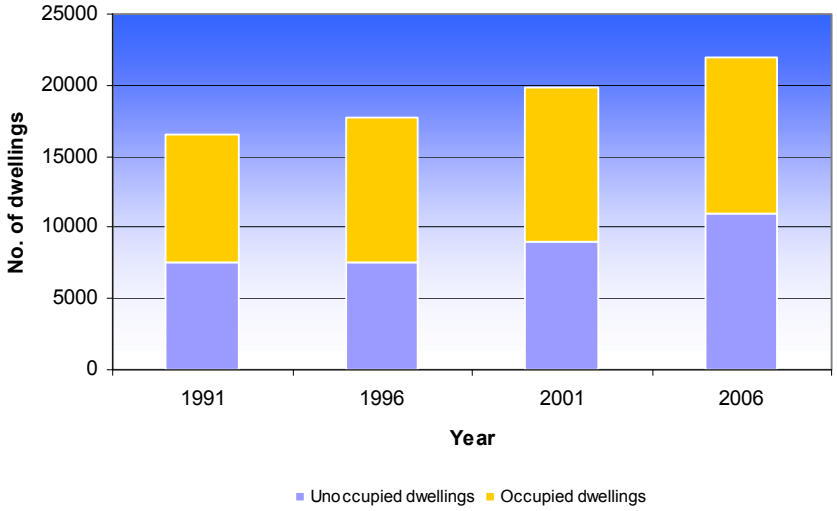
4.1.1 Holiday and second homes

The Hauraki Gulf coast has continued to grow as a holiday destination with the Coromandel and the beaches north of metropolitan Auckland experiencing high levels of development (though not necessarily high rate of permanent population growth).

Between 2001 and 2006 the resident population of the Thames Coromandel District grew just 2.8% from 28,008 to 28,800. However, that modest increase masks a much greater increase in dwellings (2,540 new dwellings, or 18% growth, over the same period) and in temporary residents – that is, those people who call the Coromandel their second or holiday home.

The number of unoccupied dwellings in the Thames Coromandel District on census night 2006 was 10,920 or almost half the district's 22,700 dwellings. That represents a 31% increase on 2001. The other way to determine the incidence of holiday homes is to look at the proportion of absentee ratepayers (owners who had rates demands posted to an address outside that district). On that basis the proportion of holiday homes within the district maybe as high as 55%.

Figure 11 - Occupied and unoccupied dwellings in the Thames Coromandel District 1991-2006



Source: Statistics NZ as reported Demographic Profile Statement: Beca Carter Hollings & Ferner Ltd, 2007

This trend is not so pronounced in Auckland's northern coastal area. However, intensification of land use in northern coastal areas has been significant. Between 2001 and 2006, the population of that part of Rodney District within the Gulf catchment increased 18% from 52,728 to 62,412. During this time, the number of occupied dwellings in the area increased by 17% while the number of unoccupied

dwellings increased by 8%. In 2006 there were 23,802 occupied dwellings and 4,662 unoccupied dwellings.

The situation in the Gulf Islands is similar to the Coromandel Peninsula but with a much lower degree of change. Between 2001 and 2006 the population decreased by 1% but the number of occupied dwellings increased by 4% and unoccupied dwellings by 6%. In 2006 there were 4,086 occupied dwellings and 2,421 unoccupied dwellings[20].

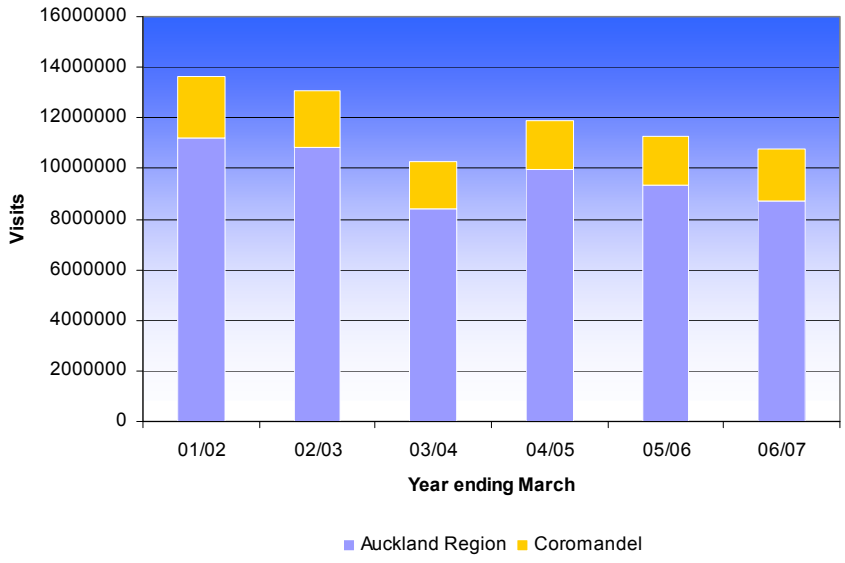
The number of unoccupied dwellings shows that the Coromandel, in particular, has been, and continues to be, a popular location for second/holiday homes. Population growth is not a revealing indicator given the disconnection between population and dwelling growth. More dwellings in coastal locations (whether occupied permanently or occasionally) place pressure of the natural character of the coast.

4.1.2 Visitor numbers

The number of visitors to the Coromandel has edged up over the past three years from 1,842,669 for the year ending March 2004 to 2,054,554 for year ending March 2007[21] mostly due to increasing domestic overnight visitors. Figure 12 shows that although there has been recent growth, visitor numbers are still below the high numbers seen earlier this decade.

Total visitor numbers to the Auckland Region have declined in recent years (from 9.9 million in 2004/05 to 8.4 million in 2006/07) - due to a reduction in domestic visitors. Overseas visitor numbers have increased 12.5% over the same period.

Figure 12 - Visitors to the Auckland Region and Coromandel Peninsula 2002- 2007



Source: Ministry of Tourism, Tourism Databases

[20] Note dwellings and population change is not reported here for the North Shore and Auckland City (isthmus) areas as the respective coastlines are fully developed.

[21] This includes day and overnight trips by domestic and overseas visitors.

4.1.3 Rural land use change

Forestry or more specifically the removal of vegetation and associated tracking and earthworks poses a significant risk in terms of sediment generation and landscape change. As at April 2006 there was 23,500 hectares of plantation forestry on the Coromandel Peninsula (down from 24,200 ha in 2003), of which 4300 hectares were in the 25-30 year age class (meaning trees are likely to be harvested over the next few years). Data on harvesting rates over the 2004-2007 period is not currently available.

There is also considerable forestry with Rodney District (32,200 hectares as at 2006) but only about a third of this lies within the Hauraki Gulf Catchment.

4.2 State of our coastal margin

Along the Hauraki Gulf coast line of the Auckland Region there is little remaining non urbanised coastal fringe. Urban development stretches unbroken north of the Waitemata Harbour as far as Long Bay (zoned for growth but not yet developed). The Long Bay Regional Park marks the end of the coastal sprawl and demarcates the formal metropolitan urban limit.

Northwards, across the Okura estuary, consent has recently been granted for the Weiti Forest Development (see side bar) that, although not dense continuous development, will tend to link the southern urban coastal sprawl with the Whangapararoa Peninsula which in turn links to the Red Beach/Orewa area. North of Waiwera regional parks create a buffer between the long stretch of coastal development and the deeply incised and largely non urbanised Mahurangi Harbour. From Mahurangi north development is more intermittent although all major beaches north to Pakari (including Snells, Algies, Buckletons, Omaha, Mathesons/Leigh) are extensively developed. Only those adjacent to land now held as regional parks remain in an undeveloped state. The land to the north of Pakiri remains the only large area of private undeveloped beach front along the entire northern coast. That may not be for long as a large development is proposed for Te Arai Point. (See side bar – Significant coastal development proposals since 2004).

South of the Waitemata Harbour development stretches to Cockle Bay. The coast east and south remains much less urbanised than the north although there has been significant growth in the Beachland/Maraetai area. The coastal settlements south of Beachlands/Maraetai are small and growth has been limited. However, even in this less coastal environment development there has been pressure for development over the past three years – most notably in the form of the Wairoa River Maritime Village. (See side bar – Significant coastal development proposals since 2004).

That part of the Gulf coast that lies within the Waikato Region remains much less urbanised than that of the Auckland region. However, parts of the Coromandel Peninsula are subject to intense development pressure. Between 2001 and 2006 2664 new dwellings were added the Thames-Coromandel District. 2266 of those dwellings were built in one of the seven serviced settlements (Coromandel, Cooks Beach, Matarangi, Pauanui, Tairua, Thames, Whangamata and Whitianga). The remaining 400 dwellings were scattered around smaller settlements. This extra development has by and large being accommodated by the outward extension of settlements (rather than through more intensive development).

4.2.1 Coastal land ownership

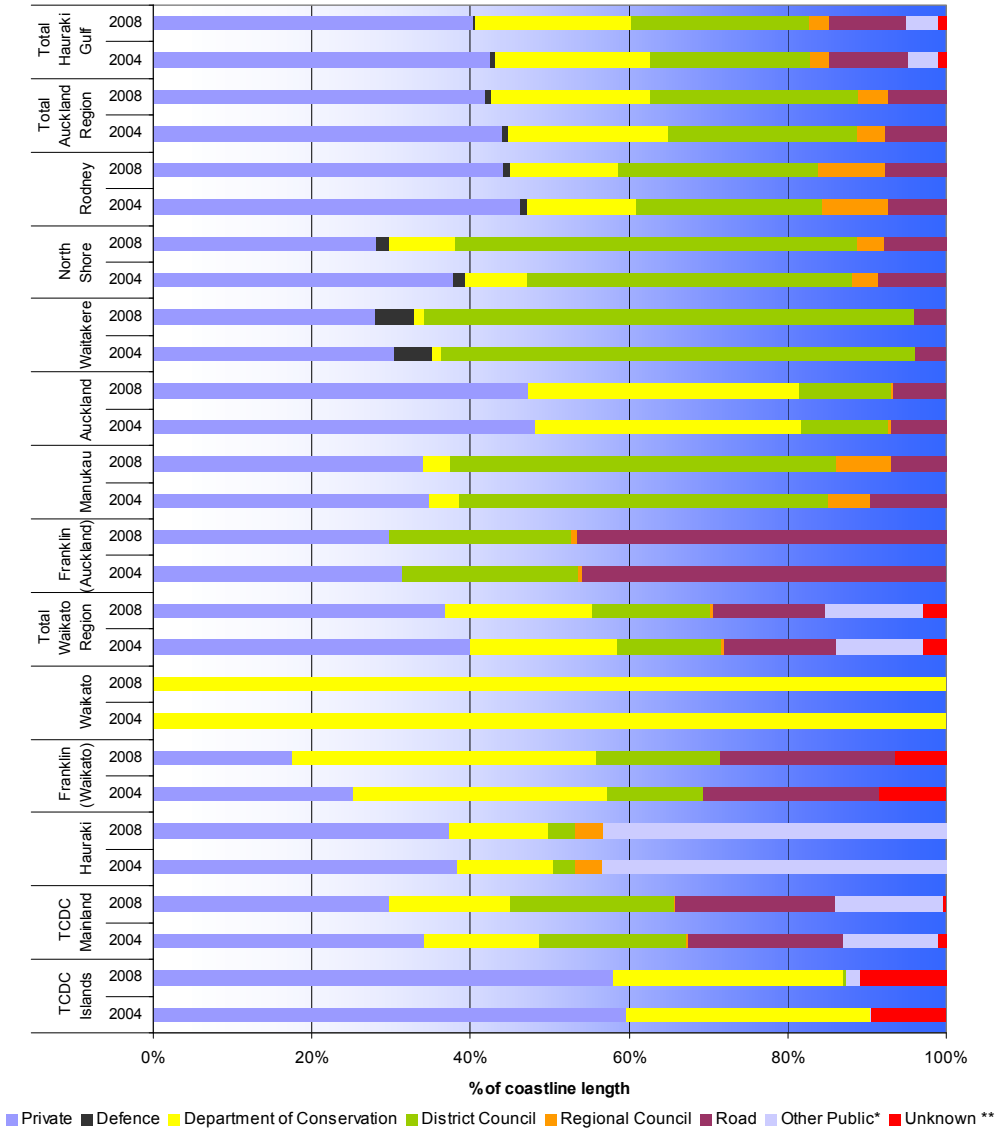
The 2004 report noted that over half (58%) of the 2500 km Gulf coastline is adjacent to publicly owned land. Analysis of the same data sources now indicates that publicly owned land has increased slightly to 60% of the coastline (see Figure 13). The proportion of coastal land in public ownership is a common indicator of the amount of public access to and along the coast. Access may not be available to all public land due to topography, risks to public safety, or the need to protect conservation or cultural values of an area.

The increases in public ownership have occurred around the Gulf, in every city and district (other than Waikato district which has 100% of its Gulf coastline in public ownership). Often this has been due to an increase in city and district council reserves. These could be reserve purchases or reserves created at the subdivision of the adjacent land. There have also been slight increases in coastline adjacent to Department of Conservation and Regional Council land in some areas.

Significant coastal development proposals since 2004

- In 2007 Rodney District Council received as request for a private plan change relating to Te Arai Point just north of Pakiri. The plan change would enable development of 850 residential lots, a lodge/hotel, campgrounds, a golf course, a commercial/community village and provision for public recreation activities and a coastal park management area. The plan change has been publicly notified and public submissions have been received. At the time of publication RDC is yet to issue a decision on the proposal.
- Also in 2007 Rodney District Council approved an application for 150 lots to be created in the Weiti Forest Park zone (a zone designed to preserve open space between urban Auckland and the Hibiscus Coast and which provides 215 ha for residential development). The development clusters lots within a larger undeveloped (forested) area. The decision to approve the proposal subject to conditions has been appealed by the applicant.
- In 2001 Rodney District Council received a submission to its proposed district plan seeking a special zone to provide for urban expansion to the south-west of the existing Omaha settlement. The proposal would allow for 850 houses plus countryside living, commercial, resort and golf course development. The Council rejected the submission and the matter is currently being considered through the appeal process.
- In 2007 Manukau City Council received a request for a private plan change to create a Wairoa River Maritime Village zone. The purpose of such a zone is to facilitate a canal style village on the western bank of the Wairoa River 5km north of Clevedon – to be known as Clevedon Quays. The development involves 297 dwellings and mitigation works including 32 hectares of wetland. Manukau City approved the plan change in August 2007 but that decision has been appealed to the Environment Court.
- The Thames Coromandel District Council has approved significant residential subdivisions in or adjacent to all major settlements and some of the smaller settlements with those of the eastern coast being subject to greatest growth. Some of the larger developments built/proposed since 2004 area as follows:
  - Resource Consent was granted in June 2007 for 78 self-contained residential units, a managers unit and 221 car and boat parks at Purangi Road *(Cooks Beach Campground).* This application is currently at appeal.
  - Consent has been granted for a 79 lot residential subdivision within the coastal (Residential Policy Area) zone at Black Jack Road, *Opito Bay*. The application is currently subject to Limited Notification with the submission period closing at the end of February 2008. (This decision is currently subject to High Court proceedings). The relevant regional consents from Environment Waikato have been granted.
  - In June 2006 consent was granted for Stage 5 of *Whitanga Waterways*. This stage involved the creation 97 residential lots on an island within the existing 220 hectare canal development. Stage 6 of Whitianga Waterways has recently been lodged being a smaller small 10 lot development. Whitianga Waterways has also lodged an application for a Retirement Complex which will comprise approximately 228 units being a mixture of housing styles including three multi storey towers.
  - At least six 3-4 storey apartment buildings have either recently been built or are under construction in Whitianga. Another three apartment buildings have received approval.
  - An application has been lodged to rezone and subdivide land into around 260 residential lots (over 6 stages) at Hikuai Settlement Road (to be known as *Pauanui* Mountain Estates). A decision on this proposal has yet to be made.
  - A Plan Change application has been lodged for the "Kiwifruit Block" at *Tairua/Pauanui* if approved the zone would provide for 350 new lots.
  - In August 2006 an application for a 128 lot subdivision and earthworks was granted for land on Matarangi Drive, Matarangi). A further application has recently been lodged for a further stage of the development - a 67 lot subdivision.
  - A concept plan has been developed and a Structure Plan is being developed for land from Kopu North to Thames. Plans allow for a potentially 900 lots.

Figure 13 - Percentages of Gulf coastline adjacent to public and privately owned land[22]



4.2.2 Socio-economic barriers to coastal living

In 2006, almost all coastal suburbs in the Auckland region, particularly the north and east facing, were rated as 1, 2 or 3 on the NZ Deprivation Index[23]. That is,

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[22] Data collected February 2008.

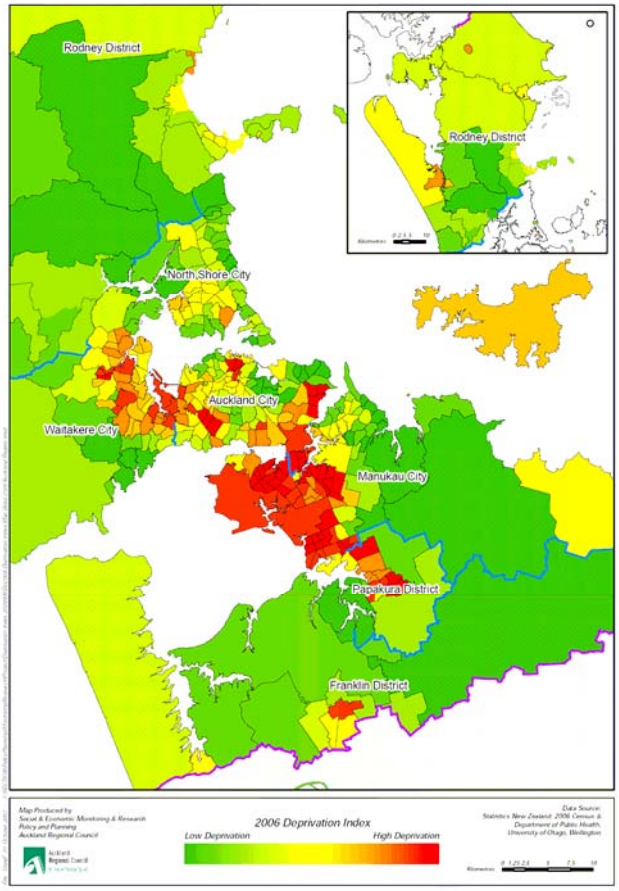
* "Other Public" includes Waikato Region land described as: Crown Land Reserved from Sale (Marginal Strip), Foreshore, Recreation Reserve, State Forest, Vested in Crown for Flora & Fauna Preservation, Local Purpose Reserve (Esplanade), Land Information New Zealand Schools, Transit NZ.

** "Unknown" is Waikato Region land that is described as coastal edge with unknown ownership, most likely Crown Land, for example, small islands off the Coromandel Peninsula.

Special note should be made that the Waikato District only has 222 metres of coastal edge on the Hauraki Gulf coastline, all owned by DoC.

they were rated as low deprivation areas and people living in those areas were generally better off financially than those living in non coastal suburbs, especially those living towards the south of the region. The delineation is evident from Figure 14. This reflects the educational and occupational structure of the population living in these areas as well as the high value that is assigned to living near the sea in the Auckland region. The exceptions to this were the Tamaki estuary area (Tamaki and Point England), and the Avondale area which are areas of relatively high socio-economic deprivation.

Figure 14 - Deprivation in the Auckland Region



[23] The deprivation index is a combination of a key range of socio-economic variables and provides an overall score of deprivation in a particular meshblock on a decile of 1 (low deprivation) to 10 (high deprivation). The index measures relativity of one area to others and the variables are:

- Income - People aged 18 to 64 years receiving a means tested benefit.
- Income - People living in equivalised households with income below an income threshold.
- Owned home - People not living in own home.
- Support - People aged < 65 years living in a single parent family.
- Employment - People aged 18 to 64 years unemployed.
- Qualifications - People aged 18 to 64 years without any qualifications.
- Living space - People living in equivalised households below a bedroom occupancy threshold.
- Communications - People with no access to a telephone.
- Transport - People with no access to a car.

4.2.3 Physical changes to our estuaries and harbours: sedimentation

The Gulf's picture postcard character is affected by physical and well and social change. One of the main physical changes to estuaries and harbours is caused by sedimentation and mangrove colonisation.

There have been two major historical sedimentation episodes in Tikapa Moana – the Hauraki Gulf corresponding to the burning of vegetation following the arrival of Polynesian people about 1000 years ago and the felling of mature forest in early European times.

The process of sedimentation (i.e. the suspension, transport and deposition of sediment into coastal environment) affects marine ecology and the natural character of the coast since it alters hydrology, marine vegetation and amenity values. Sedimentation is known to be an on-going issue in most of the Gulf's harbours and estuaries – with severity depending, in large part, on the land use within the corresponding catchment.

The sediment loads of rivers and rates of sediment accumulation in different harbours have been known for some time (and previously reported) and are not regularly measured across the Gulf. There is little new data to report on sediment accumulation rates.

Most recent research has focused instead on developing a more specific understanding the *source* of sediment and on monitoring the *effect* of sediment on the benthic ecology and on mangrove colonisation. Since 2004 work on these aspects has continued at two sites in particular: Mahurangi Harbour and the Firth of Thames (see side bar). Long term ecological health monitoring is also carried out in the central Waitemata Harbour. Research over the period 2001-2006[24] has found that that, while changes in abundance of benthic macrofauna have occurred, they seem unlikely to be associated with either increased or decreased sediment (or contamination).

Detailed sedimentation monitoring programmes

Mahurangi Harbour

ARC has sought to better understand the sources of sediment (both natural and human induced) in the Mahurangi Harbour and to quantify the relative contribution of various sources of sediment. Research undertaken in December 2005[25] used the Compound Specific Isotope (CSI) method (a New Zealand first) to attribute recently deposited sediment back to specific soils within the catchment. In this way research was able to show that:

- The 70% of the catchment area devoted to pastoral farming contributes 15-55% of the soil in the river delta and 10-30% across much of the rest of the Harbour
- The 20% of the catchment in native forest contributes sediment - <30% in the river delta and generally less than 10% elsewhere
- Exotic forestry comprises 8 % of the catchment but contributes 45-80% of sediment in the river delta and 14% across the whole harbour

[24] ARC 2006a

[25] ARC 2006b

- If forestry harvesting on steep land exposes bare soil to a storm event, the proportions of sediment from that source will increase dramatically
- The 4% of the catchment in urban use contributes little to sediment loads
- Most of the sediment load on the Mahurangi Harbour is delivered in a small number of storm events each year.

Firth of Thames

The Firth of Thames is the only Hauraki Gulf coastal area currently monitored under Environment Waikato's Regional Estuary Monitoring Programme (REMP). The REMP monitors estuarine health particularly as it is affected by sedimentation and it is intended that it will eventually expand to cover other estuaries in the Region.

Results from the REMP show that over the period 2001-2006 some benthic macrofauna (bivalves, marine worms, marine snails, crustaceans and other organisms) increased at some of the five Firth of Thames monitoring sites but not at others. Unfortunately it is not possible to identify clear trends from these data. A trend is, however, detectable in the degree of muddiness at monitoring sites with the proportion of mud at most sites increasing from about 1% to about 4% over the five year period.

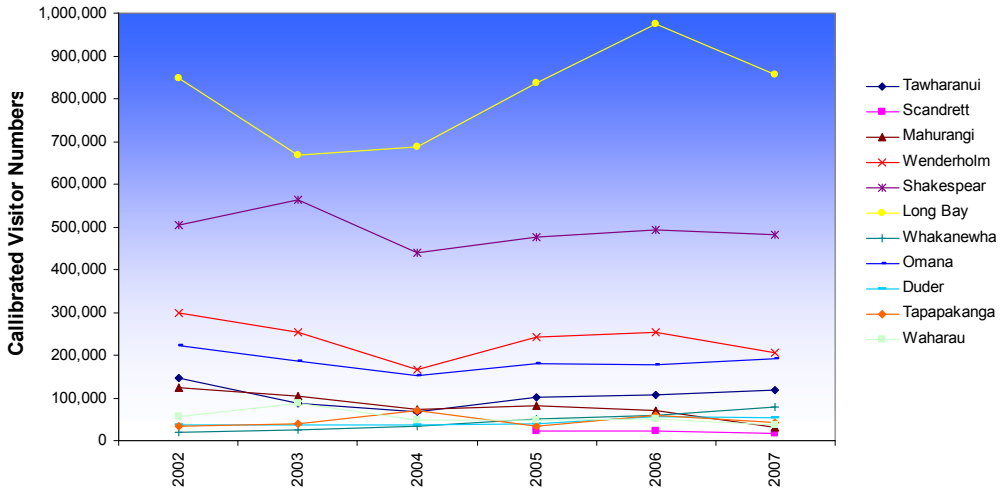
Another study (NIWA, 2006) of mangrove colonisation in the Firth found that mangroves have colonised the Firth at a rate of 20m/yr (or 850 metres seaward over the past 4-5 decades) with mangrove habitat now occupying 600ha of former inter-tidal flat along the 9km of coastline between Waitakaruru and Piako Rivers. That research suggested that the re-suspension of sediment already in the Firth (i.e. sediment released from historic land clearance) is the major source of sediment accumulated by mangroves.

4.2.4 Use of public space

Visitor numbers and population increase place pressure on the Gulf's public spaces. Figure 15, below shows annual visitor numbers to regional parks along the Hauraki Gulf coast.

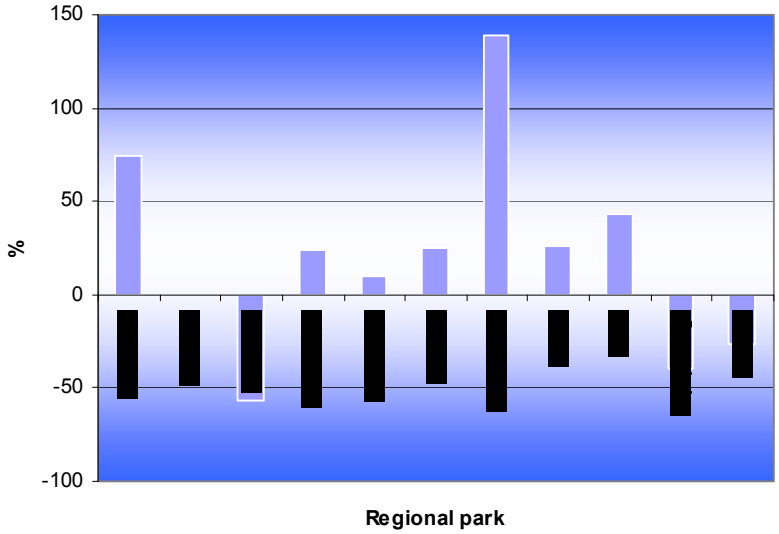
Figure 16 shows the percentage increase in visitor use since the last SER was published.

Figure 15 - Annual visitor numbers to regional parks 2002-2007



Source: ARC

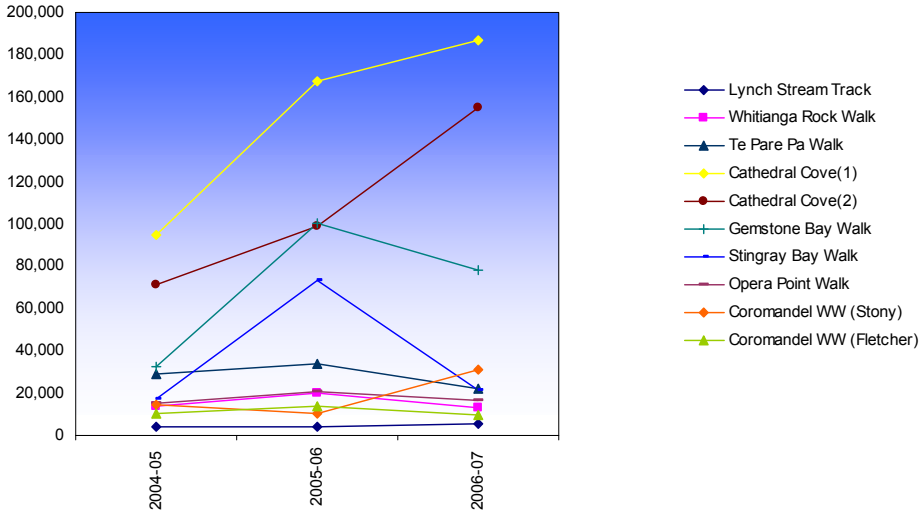
Figure 16 - Percentage change in visitor numbers to regional parks 2004-2007



Source: ARC

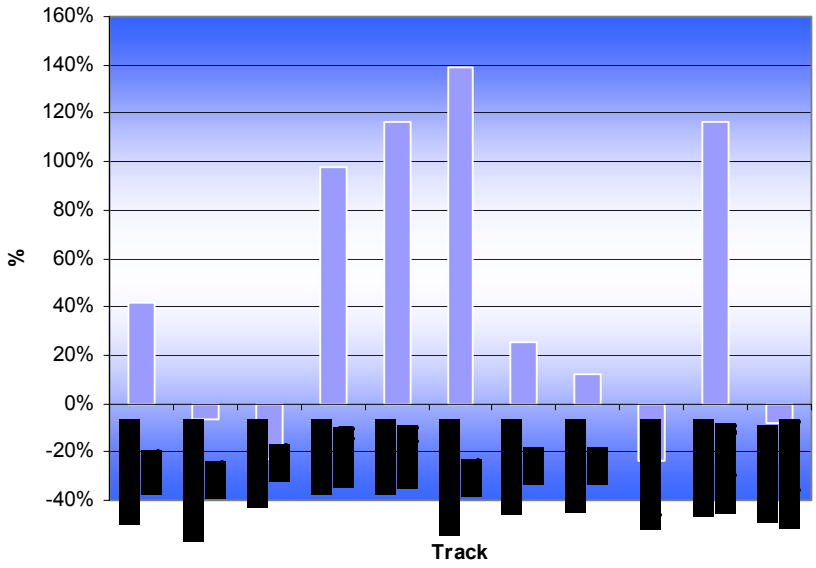
Figure 17 shows the number of people using Department of Conservation tracks on the Coromandel Peninsula. Figure 18 shows the percentage change in track use since 2004.

Figure 17 - Department of Conservation Coromandel track usage 2005-2007



Source: DoC

Figure 18 - Percentage change in track usage: Coromandel 2005-2007



Source: DoC

4.2.5 Camping grounds

The 2004 Report noted that the Coromandel Peninsula had lost eight camping grounds between 2000 and 2003. This is consistent with more recent research (DoC 2006) which noted that the Auckland Coromandel region has experienced the most significant reduction of camping ground of any region in New Zealand with more than 20 closing over the past 10 years (representing one third of the commercial camping grounds on the Coromandel Peninsula). Since 2004, a further two camping grounds have been lost on the Coromandel. In addition, as noted on page 22, consent has also recently been granted to develop the Cooks Beach camping ground for residential purposes. One new camping group has been added.

4.3 Responses

4.3.1 Regulation and planning

- *Land use control*

The management of urban growth across the Auckland region is the subject of the Auckland Regional Growth Strategy. The ARGS is given regulatory effect through the Auckland Regional Policy Statement and district plans. The growth concept promoted by the ARGS is one of containment and intensification within nodes and corridors within the established urban areas (with limited provision for "greenfield" development). The Metropolitan Urban Limit (MUL) plays a key role in this strategy. It is designed to contain rural and coastal sprawl. However as indicated above the MUL appears to be having mixed success, particularly in the northern coastal areas where development pressure is intense.

The Thames-Coromandel District Council, Environment Waikato, Hauraki Whanui and the Department of Conservation have initiated the Coromandel Peninsula Blueprint Project ("the Blueprint Project"). The Blueprint Project is a strategic coastal planning exercise that seeks to develop and agree broad direction for the future growth and development of the Peninsula over the next 50 years. The Coromandel Blueprint Project is a non statutory process but implementation of the Blueprint will be by way of statutory district and regional plans. The Project is about to begin the public consultation stage after an initial information gathering phase.

Thames-Coromandel District Council has recently commissioned a Peninsula-wide landscape assessment to better understand the values present on the Peninsula, their vulnerability and the potential to accommodate growth with least impact on landscape values. The Landscape assessment will feed into the Blueprint Project.

Franklin District Council has also undertaken a number of relevant initiatives including imposing:

- Overnight camping restrictions on the Firth of Thames through the Public Places Bylaw in order to help protect the natural character of the coast
- A District Growth Strategy (which involves directing growth away from sensitive areas into towns and villages)
- A change to its district plan (Plan Change 14) that recognises the "Seabird" Coast and imposes coastal setbacks.

- *Regional council rules*

Both the ARC and EW have regional planning provisions designed to minimise sediment generation arising from land disturbance.

In 2007 the ARC commenced a review of the Auckland Regional Plan: Sediment Control and provisions relating to sediment management in the Auckland Regional Policy Statement (ARPS) and in the Proposed Auckland Regional Plan: Air, Land and Water. The intended outcome of the review is to provide for more adequate protection of significant sensitive receiving environments and to address the cumulative effects of multiple/chronic sediment discharges on freshwater, estuarine and coastal ecosystems. An "issues and options" document is planned to be circulated in October 2009 and subsequent Plan Changes are likely to be notified as part of the ARPS review.

In 2007 the Environment Waikato Regional Plan became operative (in part) bringing into effect rules relating to soil and river bank disturbance. One of the most significant new regional rules relates to stock exclusion from specified "priority 1" waterways. Priority one waterways include 14 Coromandel streams and the stretch of the Waihou River 2km upstream and downstream of saltwater intrusion as well as the upper reaches of the catchment. This rule is designed to address stream bed erosion and associated issues and water quality issues and is therefore relevant to issues raised in Chapter 2 of this report.

- *Mangrove management*

In response to rapid mangrove colonisation and community reaction, the ARC proposed a change to its *Regional Plan: Coastal* in 2007 to provide better guidance on mangrove management, facilitating removal in certain circumstances while

recognising the important role mangroves can play in other circumstances. The ARC Plan Change was accompanied by an extensive review of available knowledge about mangroves (ARC 2007d).

4.3.2 Works, services and support for community initiatives

The local authorities of the Region have a number of projects to assist communities to protect and enhance the natural character of the coast. Three of the more significant initiatives are outlined below.

- *Mahurangi Action plan*

In 2004, the ARC and Rodney District Council initiated the Mahurangi Action plan as a five year community project to respond to concern about the state of the Mahurangi Harbour. The Mahurangi Action Plan promotes a range of measures including fencing and planting, better compliance monitoring, research and investigation and environmental education. As at 2007, the programme had secured 43km of fencing, 200ha of land vulnerable to erosion protected from stock access and the planting of 55,000 native trees.

- *The Peninsula Project*

The Peninsula Project aims to address Coromandel's flooding and erosion issues from the mountains to the sea by integrating three key areas of work - flood protection, river and catchment management, and animal pest control. Environment Waikato, Thames-Coromandel District Council, Department of Conservation and Hauraki Maori Trust Board are working together to carry out this work. Essentially the project involves a range of individual works (such as river bank stabilisation, tree planting, possum control) undertaken by relevant agencies and/or individual landowners with financial assistance. The project also includes a land-use control component with the district council initiating a change to its district plan to introduce provisions to regulate development on identified flood-plains.

- *Whangamata Harbour Plan*

Environment Waikato has supported the Whangamata Community's desire to protect the Whangamata Harbour (and in particular address the issue of mangrove colonisation). A Whangamata Harbour Plan has been prepared in conjunction with regulatory authorities and community groups that recognises the need to take an integrated approach to land and harbour management. This has been supported by a Catchment Management Plan that sets out the specific actions (such as fencing and planting particular high risk areas) to address the sedimentation and flooding issues. Environment Waikato has made funding available (through the Peninsula Project) to assist landowners with this works. A Mangrove Management Options paper has also been prepared for discussion with the community.

4.3.3 Public land purchase and development

The 2004 report recorded 797 hectares of public coastal land acquisition between 2002 and 2004 (boosted by the acquisition of the 564 ha Kaikoura Island). In the period 2004 to 2007 another 83 ha have been acquired.

- The ARC purchased the 178 hectare *Pakiri Regional Park* in late 2005. This park includes 900 meters of sandy coastal foreshore. Pakiri Regional Park is the 25th such park and the 15th on the Hauraki Gulf coastline.
- In December 2006 Ports of Auckland Ltd transferred the ownership of 18 hectares of land at *Wynyard Point* (Tank Farm) to Auckland Regional Holdings. The land and associated assets had "a book value of $300 million". ARH also set up a specialist management company to act as ARH's agent in redeveloping the area. In June 2007 Auckland City Council acquired a further 13 hectares of land and wharves from POAL in the waterfront area for nearly $80 million. A key feature of the redevelopment of Wynyard Point will be a 4.25 hectare headland park which the Auckland Regional Council will jointly own and manage with Auckland City Council. The proposal is for 2.4 km of publicly accessible waterfront, a working fishing wharf, a marine industry area and a marine events precinct as well as a waterfront promenade along Jellicoe St, with new shops, restaurants and bars. ARC and ACC are progressing plan changes to the regional coastal plan and district plan to provide for the redevelopment.
- The ARC has called for action on the redevelopment of Queens Wharf. Consolidating port operations to the east end of the port and opening the central wharves for public access was identified as a future change in the Waterfront Vision 2040 (ARC and ACC 2005). In August 2007 Auckland City Council produced the draft "CBD waterfront masterplan" for public consultation and this also proposed future redevelopment of the central wharves.

▪ *Public camping ground development*

In 2006, the Department of Conservation reacted to the national loss of camping grounds by reviewing "the availability of family-friendly camping opportunities for New Zealanders, particularly in coastal areas". In 2007, in response to that review the Minister of Conservation announced that the Department would make available up to 100 new or expanded camping grounds nationally. Not all of these sites have been revealed but one, an extension to the existing Port Jackson camping ground is, on the Hauraki Gulf Coast. DoC currently has 15 camping sites on the Hauraki coastline (including islands).

4.4 Conclusions

Tikapa Moana - the Hauraki Gulf may still look good on a picture postcard but its character is changing. Land clearance in the distant past (and contemporary land use) still has effects today as sediment is redistributed and mangroves colonising mud flats that have replaced sand and shell banks, valued by wildlife and recreational users.

Development around the coastal fringe continues. The more affluent choose to live around the Hauraki Gulf in Auckland's more desirable suburbs and own an increasing number of holiday homes in Coromandel and north of Auckland, fragmenting green areas and blurring the metropolitan urban limit.

In many cases, regional parks bordering the northern coast are the only buffer to planned developments and are increasingly popular recreational assets. However,

the traditional kiwi holiday is becoming more expensive with rising property values and the loss of small campsites to development.

Several new initiatives aim to address such pressures through better integration and planning, and through continued acquisition of key coastal land. However, the management of recreational assets of the region remains fragmented and the potential of the Hauraki Gulf Marine Park to integrate these remains under-realised.

4.4.1 State of information

Beyond basic demographic and property value information, data on natural and social character of the Gulf is sketchy. There is surprisingly little collated data on physical development rates and patterns around the coastline. The extent to which naturalness of the coast is being preserved or lost is difficult to measure, however, indicators could be developed if there was a commitment to collect and record appropriate data.

4.4.2 Change since 2004

There have been no significant changes since 2004. The changes that are detectable represent a continuation of trends identified in the previous report, namely, greater than national average population and income growth, correspondingly high property price increases and continued development pressure. There are some signs that local authorities are responding with better planning responses but it is too early to say whether these will be effective.

5 A place for our treasures?

5.1 Pressures

As noted in the 2004 Report, Tikapa Moana includes a diverse range of common and rare species and habitats that provide a range of ecological services as well as having commercial and intrinsic values. It is partly because of this rich diversity that the Gulf receives special recognition by way of the Hauraki Gulf Marine Park Act.

The Gulf contains some 350 islands (Lee 1999), islets and rock stacks that have provided a haven for terrestrial and marine species elsewhere ravaged by introduced pests and weeds or by the increasingly heavy footprint of human activity.

A number of islands are nationally important wildlife sanctuaries, such as Tiritiri Matangi, Hauturu and Great Barrier. The Firth of Thames is of international importance providing critical habitat for migratory wading birds.

The Gulf is the global stronghold for species such as Cook's scurvy grass, chevron skink, Cook's petrel and stitchbird. It is also a regional stronghold for several threatened plant and animal species, for example, sand tussock, shore spurge, mistletoes, North Island saddleback, rifleman and kakariki. Some of these species are now restricted to the islands of the Gulf.

Because of its geographic nature there is a unique opportunity to maintain and improve the pest–free or low pest characteristics of the Gulf, and to restore biodiversity that is lost to the islands and catchment.

5.1.1 Habitat modification and disturbance

The main pressure on the Gulf's terrestrial biological diversity stems from the continued loss and modification of habitat as a result of land use change and intensification.

While specific data on habitat disturbance is not gathered (encompassing as it does many small scale effects), the growth in population and dwellings in the coastal environment discussed earlier in this report, will have an impact. This will almost certainly have included incidences of vegetation removal, drainage, sedimentation, increased contaminants, introduction of dogs, cats and other pets that prey or and/or displace native fauna. These were all identified as threats in the 2004 report but no quantification of the scale or incidence of those threats was possible. That situation has not changed.

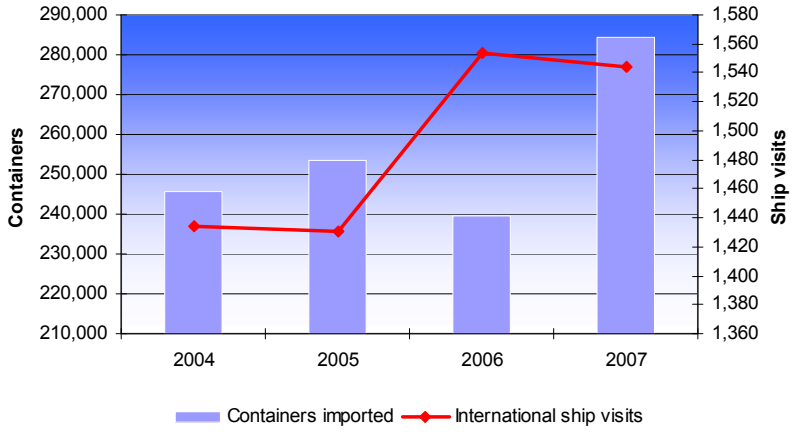
5.1.2 Auckland: New Zealand's portal to the world

Auckland and the Hauraki Gulf continue to be New Zealand's main gateway. The sea and air ports provide important pathways for the introduction of new organisms (both marine and terrestrial) and are major focus of activity for biosecurity agencies.

The risk posed by these gateways is increasing. The number of international visitors arriving at Auckland International Airport in the year ending June 2007 was 6,373,427, an increase 4% on 2005.

Similarly, as shown in Figure 19, although the number of ship visits to the Port of Auckland is down, the number of containers is up from 662,000 for year ending June 2004 to 686,000 for the year ending June 2006. The number of cruise ships alone has increased from 32 in 2004/05 to 73 in 2007/08. Ships visiting Auckland are now larger and faster. This not only increases biosecurity risk but increases the risk of collisions with marine mammals.

Figure 19 - Commercial ship visits to the Port of Auckland (Hauraki Gulf) 2004-2007



Source: MAF Biosecurity (pers comms)

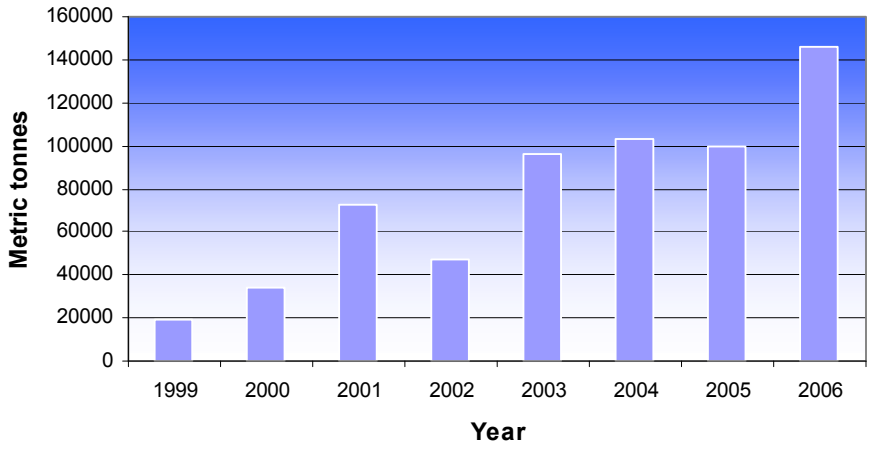
5.1.3 Biosecurity Risks from vessels

Ships planes and their cargoes present a variety of risks to the Gulf's flora and fauna. These include risks to (a) the marine environment from ballast water and from bio-fouling (organisms attached to ships hulls that may dislodge in Auckland harbour) and (b) the terrestrial environment from the hitchhiker organisms (organisms that are present on vessels) and the unintended contents of containers and other cargo.

- *Ballast water and bio-fouling*

MAF Biosecurity monitors the volume of ballast water discharged in Waitemata Harbour. This is shown in Figure 20 below. It is important to note that since 2000 ballast water discharge has been controlled by an Import Health Standard (IHS) requiring exchange of ballast at sea (200 nautical miles from land) so that the ballast discharged at or near the port of destination is not water taken on at the port of origin. Notwithstanding the IHS, ballast water continues to present a risk (although a significantly lower risk) because of the potential for non compliance and/or the risk of some ballast from the port of origin remaining on board after exchange.

Figure 20 - Volume of water discharged on entering Port of Auckland (Waitemata)

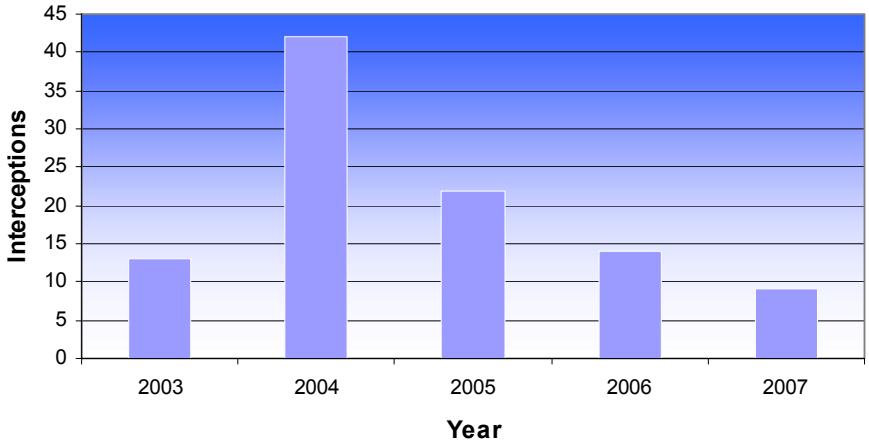


Source: MAF Biosecurity

- *Hitchhiker organisms and containers*

Hitchhiker organisms are organisms found on vessels, not organisms associated with goods or containers. MAF Biosecurity records some data on the interception of such hitchhiker organisms, however, data is not comprehensive. The data shown in Figure 29 below relates only to organisms sent to laboratories for identification. It does not include interceptions of low risk organisms.

Figure 21 - Interceptions of organisms on boats, ships and yachts entering Auckland Harbour



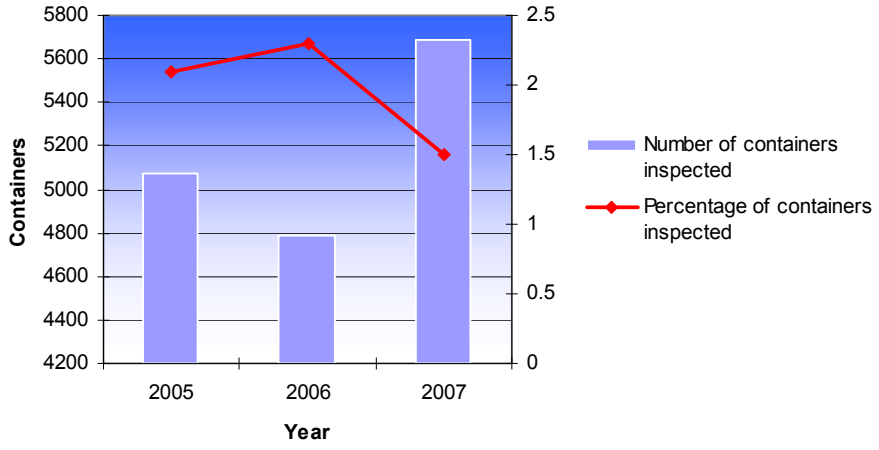
Source: MAF Biosecurity

Of the 87 interceptions on the Port of Auckland since the beginning of 2004, 61 were insects, 16 reptiles, six spiders, three snails, two birds and two frogs.

MAF Biosecurity uses risk profiling to identify the sea containers that are most likely to pose risks to primary production and biodiversity. It then inspects the "high risk" containers. Where inspection finds foreign organisms, containers may

be decontaminated. Unfortunately data on the number of high risk containers that required decontamination is not available. However, data is available on the number of inspections carried out. This is shown in Figure 22 below.

Figure 22 - Containers profiled as high risk/inspected



Source: MAF Biosecurity

5.1.4 Ship Strike

Since 1997 there is thought to be have been 18 recorded whale deaths in the Hauraki Gulf. As it is not always easy to determine cause of death, numbers cannot be given with precision. It is also important to note that there have almost certainly been vessel strikes of whales that have not caused mortality. Table 4 below summarises information on vessel strikes of whales.

Table 4 - Known whale deaths in the Hauraki Gulf 1997-2007

Status	Species	Number
Confirmed strike deaths	Bryde's	2
	Sei	1
Suspected strike deaths	Bryde's	13
	Baleen	1
Possible strike deaths	Bryde's	1
Total		**18**

Source: Marine Conservation Unit, DoC

From 2004 to March 2007 there were six suspected ship strike fatalities - five Bryde's and one baleen (unconfirmed species). Bryde's whales are distributed throughout the inner Hauraki Gulf year round and are frequently found in areas where shipping, ferry and recreational boat traffic is at high density. Stopping vessel strike mortality is unlikely but research being conducted at the University of Auckland may provide insight into management options to minimise this risk to the population.

5.1.5 Marine tourism and other impacts

In 2004 there was just one operator licensed to operate a marine mammal tourism venture on the Hauraki Gulf. That license related to the targeting of Bryde's whales and common dolphins. Bottlenose dolphins are, however, specifically excluded.

Since then the Department of Conservation has licensed a second operator. That permit allows the operator to target common dolphins (Bryde's whale may be encountered on an opportunistic basis). Again, bottlenose dolphins are specifically excluded by the permit.

For commercial reasons the second permit has not been exercised on a full time basis. However, the additional permit has increased the number of possible trips to observe Bryde's whale and common dolphins from two to four per day.

- *Bottlenose dolphins*

The exclusion of bottlenose dolphins from tourism permits is because many of the individual bottlenose dolphins frequenting the Hauraki Gulf are exposed to tourism in Northland (with the major density being in the Bay of Islands) and it has been shown that tourism is having a negative impact on these animals (Constantine 2001; Constantine et al., 2004).

- *Bryde's whales*

There is currently nothing known about the effects of the operator targeting the Bryde's whales or the level of recreational whale-watching on this population. Although, with their distribution being in the more open waters of the Hauraki Gulf it is likely that recreational traffic is less of an issue. With only two whale-watching trips allowed per day, the exposure to the whale-watch operator is minimal. Research on the effect of whale watching (both commercial and recreational) would be useful for future management of this industry.

- *Common dolphins*

A study of tourism impacts on common dolphin (Stockin et al. 2008) revealed foraging and resting bouts were significantly disrupted by tour boat interactions. Results based on just one tour boat operating in the Hauraki Gulf at the time of the study, showed common dolphins also took significantly longer to return back to foraging once they had been disturbed by the tour boats presence. Stockin et al., (2008) showed that common dolphins had an increased tendency to shift their behaviour to socialising and milling in the presence of the tour boat, to the detriment of foraging and resting behaviours. A toxicological assessment of common dolphins from the Hauraki Gulf also revealed this species to be susceptible to inshore pollution. An examination of trace elements, PCBs and organo-chlorine pesticides revealed levels were in line with those previously reported for coastal species such as Hector's dolphins. Incidental by-catch of common dolphins within recreational set-nets has also been identified as a problem within the Hauraki Gulf (Stockin, unpubl. data).

5.2 State

5.2.1 Seabirds

One component of the region's natural history under-emphasised in the 2004 State of the Environment report is the significance of Tikapa Moana – the Hauraki Gulf as a habitat for oceanic (or pelagic) seabirds.

New Zealand has the most diverse seabird community in the world with between 80 and 90 taxa breeding in the region. Of these, nearly half breed nowhere else in the world. Many more visit our waters from across the Southern and Pacific Oceans. In other words, seabirds are a key component of New Zealand's natural heritage, and play a key role in what makes New Zealand special.

The Hauraki Gulf Islands provide a safe breeding ground for many species of seabirds. Twenty taxa are confirmed to breed in the Hauraki Gulf, five of these are local endemics (see below). Importantly the Gulf offers rich feeding grounds for those seabirds which forage across coastal and continental shelf habitats. New research on seabirds feeding further offshore (e.g. Cook's Petrel) highlights the importance of the Hauraki Gulf islands as epicentres for ecological processes that stretch well beyond the boundaries of the Hauraki Gulf. At least 25 seasonal visitors (pelagic seabirds) have been recorded in the Hauraki Gulf area (2002-2008).

The eradication of predators from many islands within the Hauraki Gulf has led to rapid changes in seabird populations. Breeding success of Cook's Petrels on Little Barrier Island climbed from 5% to around 60% after rat (kiore) eradication (Rayner et al, 2007). Increases in abundance and colonisation of new breeding areas have also been observed for White-faced Storm Petrels, Northern Diving Petrels, Little and Fluttering Shearwaters, and Grey-faced Petrels on the Mokohinau Islands following rat eradication in 1990. On Tiritiri Matangi, kiore-free since 1993, Northern Diving Petrels gradually re-colonised the island and now appear to be rapidly increasing in numbers. The rediscovery of an 'extinct bird', the New Zealand Storm Petrel, in 2003 and numerous sightings of these enigmatic little seabirds over five consecutive summers in Hauraki Gulf waters may indicate a species released from predation pressure. This can only be confirmed once its breeding sites are located.

Knowledge about the state of seabird populations in the Hauraki Gulf is limited. It would be improved by systematic island and seabird surveys to locate and plot breeding sites, obtain baseline counts, monitoring to assess trends, and public advocacy about seabirds and their conservation.

Table 5 – Endemic and visiting seabirds in Hauraki Gulf

Seabird species in Hauraki Gulf	Breeding	IUCN rank	Visiting species
Cook's Petrel (*Pterodroma cookii*) **	98% of total population breeds on Little Barrier/Hauturu (2% on Codfish/Whenua Hou). Great Barrier/Aotea colony believed extirpated.	E	Short-tailed Shearwater (*Puffinus tenuirostris*) – breeding Australia.
Pycroft's Petrel (*P. pycrofti*) * **	Poor Knights; Hen/Taranga & Chickens/Marotere; Cuvier; Mercury.	V	Hutton's Shearwater (*P. huttoni*) ** – breeding Kaikoura Ranges (South Island).

Black-winged Petrel (*P. nigripennis*)	Breeding not confirmed although they have been found on Burgess Island (Dec 2004, Jan 2006, Dec 2007); records for Poor Knights, Cuvier.	LC	Kermadec petrel (*Pterodroma neglecta*) – NZ breeding Kermadec Island.
Grey-faced Petrel (*P. [macroptera] gouldi*)	Breeds on majority of offshore islands (more than 2km of the mainland) in the Hauraki Gulf; also Goat/Hawere.	LC	White-necked petrel (*P. cervicalis*) ** - breeding Kermadec Islands.
Buller's Shearwater (*Puffinus bulleri*) * **	Poor Knights only.	V	Mottled petrel (*P. inexpectata*) ** - breeding southern NZ.
Flesh-footed Shearwater (*P. carneipes*)	Hen/Taranga & Chickens/Marotere, Mercury and some Coromandel Islands.	NT	Giant petrel (*Macronectus* sp) - breeding NZ subantarctic.
Fluttering Shearwater (*P. gavia*) **	Poor Knights; Hen/Taranga & Chickens/Marotere; Mokohinau; Tiritiri Matangi & Wooded Island; Channel; Mercury.	LC	Snares Cape Petrel (*Daption capense australe*) ** – breeding NZ subantarctic.
North Island Little Shearwater (*P. assimilis haurakiensis*) * **	Chickens/Marotere; Mokohinau; Mercury.	V	Gibson's albatross (*Diomedia gibsoni*) ** – breeding NZ subantarctic.
Sooty Shearwater (*P. griseus*)	Mokohinau	LC	Antipodean albatross (*D. antipodensis*) ** - breeding NZ subantarctic.
Black (Parkinson's) Petrel (*Procellaria parkinsoni*) * **	Great Barrier/Aotea; Little Barrier/Hauturu	V	Northern royal albatross (*D. sanfordi*) ** - breeding Chatham Islands & Taiaroa Head (South Island).
Fairy Prion (*Pachyptila turtur*)	Poor Knights	LC	White-capped Albatross (*Thalassarche steadi*) ** –breeding NZ subantarctic.
Northern Diving Petrel (*Pelecanoides urinatrix*)	Poor Knights; Hen/Taranga & Chickens/Marotere; Mokohinau; Little Barrier (Lot's Wife); Tiritiri Matangi; Motuora; Channel; Cuvier; Mercury	LC	Salvin's Albatross (*T. salvini*)** – NZ breeding NZ Subantarctic.
NZ White-faced Storm Petrel (*Pelagodroma marina maoriana*) **	Poor Knights; Mokohinau; The Noises; also some Coromandel Islands.	LC	Campbell Albatross (*T. impavida*) ** – breeding NZ subantarctic.
New Zealand Storm Petrel (*Pealeornis maoriana*) * **	Breeding not confirmed, but possible for Hauraki Gulf.	Data Deficient	Black-browed Albatross (*T. melanophris*) – NZ breeding subantarctic
Northern Blue Penguin (*Eudyptula minor iredalei*)	Poor Knights; Hen/Taranga & Chickens/Marotere; Mokohinau; Little Barrier; Tiritiri Matangi; Motuora; Te Haupa; Kawau; Goat/Hawere; Great Barrier/Aotea (incl. offshore islands); Channel; Cuvier; Mercury; and some mainland sites.	NT	Buller's albatross (*T. bulleri*) ** – breeding Snares & Solander Islands.
Australasian Gannet, (*Morus serrator*)	Poor Knights (High Peak and Sugar Loaf Rocks); Maori Rocks (Mokohinau); Mahuki (Broken Islands, Great Barrier); some Coromandel/Thames islands.	LC	Pacific (Northern) Buller's Albatross (*T. (platei)*) ** – breeding Three Kings and Chatham Islands.
Pied Shag (*Phalacrocorax varius*) **	Breeds coastally through the Hauraki Gulf including inshore and offshore islands.	V	Yellow-nosed Albatross (*T. chlororhynchos*) – Indian Ocean subantarctic.
Spotted Shag (*Stictocarbo punctatus punctatus*) **	The Noises; Ponui; Waiheke; and some Coromandel Islands.	LC	Grey Petrel (*Procellaria cinerea*) – NZ subantarctic.
Black-backed Gull (*Larus dominicanus*)	Breeds on some inshore and offshore islands (eg Mokohinau, Tiritiri	LC	Wilson's Storm Petrel (*Oceanites oceanicus*) –

	Matangi);also coastal sites e.g. Miranda.		Antarctica
Red-billed Gull (*L. scopulinus*) **	Breeds on some inshore and offshore islands (eg Mokohinau, Tiritiri Matangi); also coastal sites.	LC	Grey-backed Storm Petrel (*Garrodia nereis*) – NZ breeding Chathams and NZ subantarctic.
White-fronted Tern (*Sterna striata*) **	Breeds on some inshore and offshore islands (eg Mokohinau, Tiritiri Matangi); also coastal sites e.g. Miranda.	V	Grey Ternlet (*Procelsterna cerulea*) - roost on Maori Rocks (Mokohinau Group) from the very end of December (presumably post-breeding Kermadecs) to May; also Poor Knights (High Peak & Sugar Loaf Rocks).
Caspian Tern (*Sterna caspia*)	Breeds in coastal locations (e.g. Mangawhai).	NT	Red-tailed tropicbird (*Phaethon rubricauda roseotincta*) – NZ breeding Kermadec Islands.
NZ Fairy Tern (*S. nereis davisae*) **	Pakiri Beach; Mangawhai Heads; and Waipu Estuary (all mainland sites).	C	Brown skua (*Catharacta lonnbergi*) – NZ breeding southern NZ and NZ subantarctic.
			Arctic skua (*Stercorarius parasiticus*) – breeding northern hemisphere.
			Pomarine Skua (*S. pomarinus*) – breeding northern hemisphere.

***** Hauraki Gulf endemics, ** NZ endemics

C = Critical; E = Endangered; V = Vulnerable; NT = Near Threatened; LC = Least Concern.

5.2.2 Vegetation cover

A measure of the state of vegetation in the Gulf catchment is provided by using the LENZ[26] to determine how much of the original indigenous vegetation cover remains across the Gulf catchment.

Such analysis shows that 283,047 ha (or 35%) is of a land type ("environment") that has <10% of the original vegetation remaining. That land environment is coastal river valley/flood plain with the Hauraki Plains being the main feature. Any remaining vegetation within this land environment would be regarded as acutely threatened.

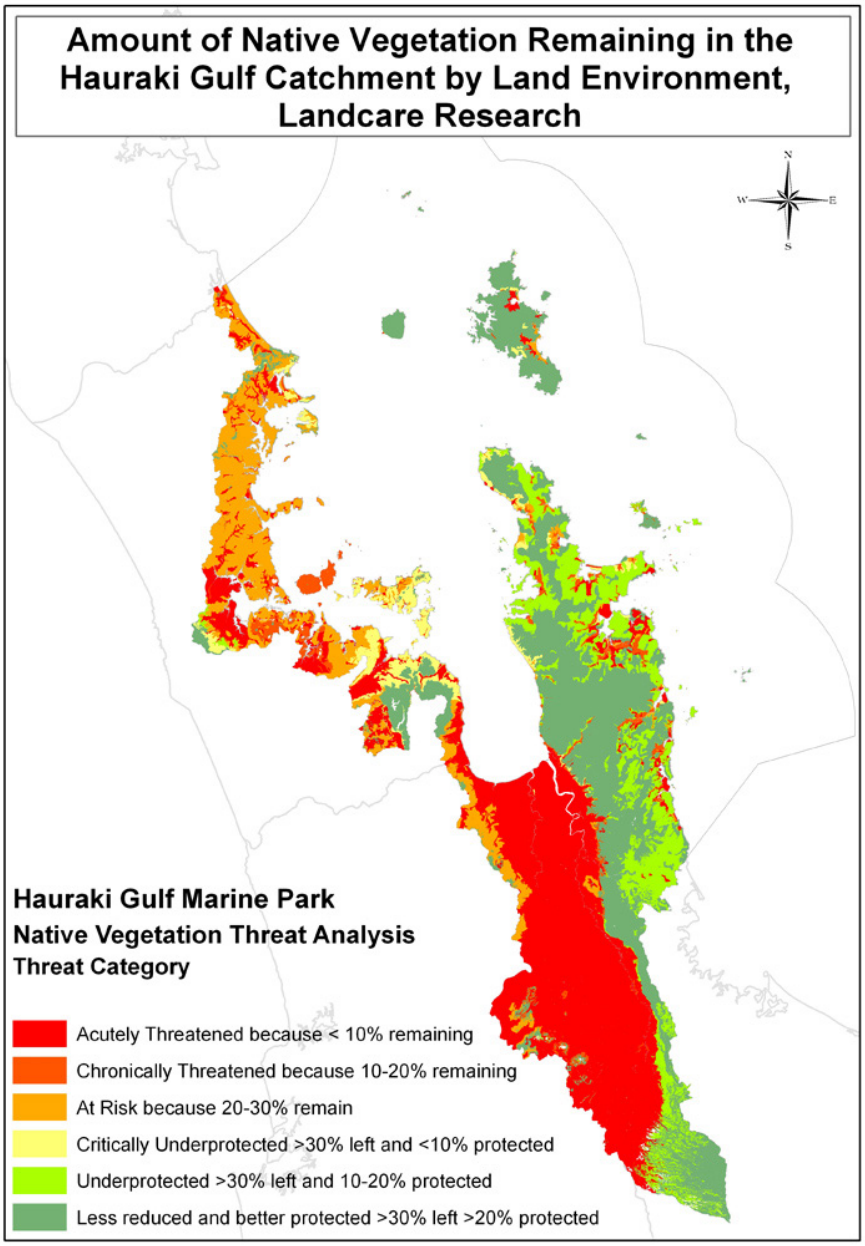
On the other hand, 29% of the Gulf catchment also is of a land environment that has >30% vegetation remaining and at least 20% of that protected. This includes large parts of inland Coromandel Peninsula and Great Barrier Island.

[26] LENZ (Land Environments New Zealand) is a classification system of New Zealand's terrestrial environments. It is a system that allows land to be classified according to its environmental conditions (soils, climate, altitude etc). It is designed for biodiversity management/monitoring since species tend to occur in areas having similar environmental conditions. As a consequence, similar environments tend to support similar groups of plants and animals, provided they have not been substantially modified by human activity. Considering change according to land environments (rather than, say, catchments) can give biodiversity managers a clearer idea of the true state of species and their remaining distribution (relative to where they are likely to have occurred before human modification).

Figure 23 shows these results in map form.

This data was not reported in the 2004 Report but is not thought to have changed markedly since that time.

Figure 23 - Proportion of original vegetation remaining in Auckland catchments of the Hauraki Gulf



5.2.3 Threatened species

The distribution and density of (terrestrial) threatened species across the Auckland part of the Gulf is shown in Figure 24.

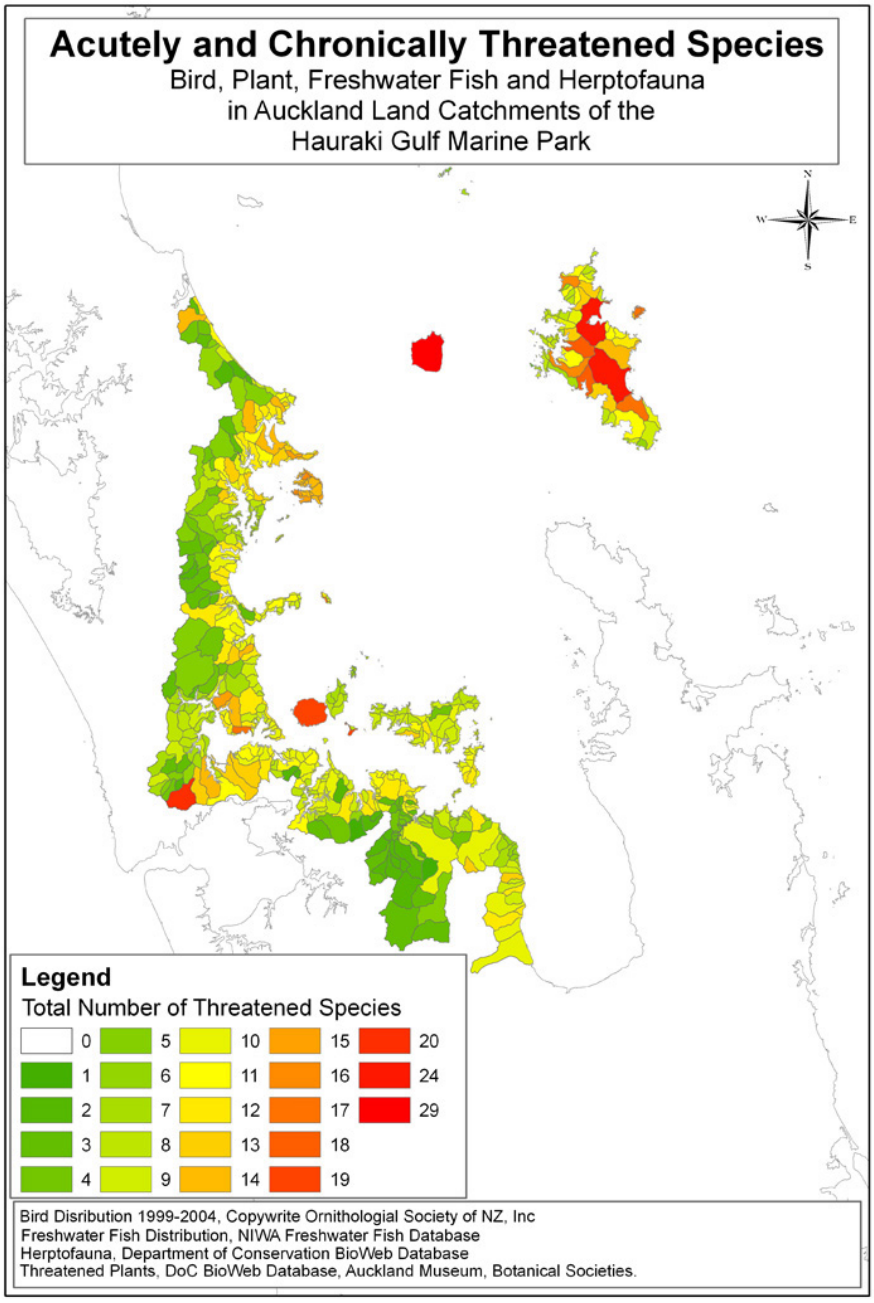
Threatened species are those species identified by the New Zealand Threat Classification System 2005 (Hitchmough et al, 2005).

The figure shows that there are parts of the terrestrial environment of the Gulf (notably Little Barrier/Hauturu and Aotea/Great Barrier islands) that are home to up to 29 threatened species. The figure also shows that in general the further inland, the fewer threatened species are present and underscores the importance of the coastal margin for the maintenance of the Gulf's biodiversity.

It is important to note, however, that the data on threatened species is limited by the number and frequency of surveys carried out and should not be regarded as being definitive but rather reflective of best available information.

This data was not included in the 2004 Report so change in threatened species distribution is not easy to report.

Figure 24 - Threatened species in Hauraki Gulf catchments



5.2.4 State of protected areas

- *Islands and other public reserves*

Much progress has been made on improving the state of the Gulf Islands and other public reserves since the 2004 Report. A brief review of milestones reached is set out in the side bar – Progress on Gulf Island restoration.

Progress on Gulf Island restoration

Little Barrier Island

- Kiore rat eradicated. A resulting increase in various threatened species including native broom, Cooks petrel, Little Barrier Island giant weta and several lizard species have been confirmed to date.

Tiritiri Matangi Island

- Shore skink and Duvaucel's gecko introduced.Tuatara introduced October 2003 now confirmed as breeding and population expanding.
- Populations of critically endangered birds such as takahe, kokako and stitchbird expanding and readily visible to visitors.
- Ongoing weed control programmes resulting in significant decline in weed numbers.

Motuora Island

- Shore skink and Duvaucel's gecko introduced.
- Diving petrel introduced.
- Ongoing weed control programmes resulting in significant decline in weed numbers.

Motuihe Island

- Rat, rabbit and cat eradication completed.
- Threatened plant populations improved as a result (without the rabbits).
- North Island saddleback introduced.
- Ongoing weed control programmes resulting in significant decline in weed numbers.
- Major restoration planting now underway by community restoration group. All stock now removed from the island.

Rangitoto - Motutapu Islands

- Ongoing weed control programmes resulting in significant decline in weed numbers.
- Threatened plant populations improved (Rangitoto) as a result of previous possum and wallaby eradications.
- Major restoration planting now underway on Motutapu.

Mokohinau Islands

- Seabird (petrels and shearwaters) and threatened plant populations improved as a result of previous rat eradication.

Tawharanui Regional Park

- The eradication of mammalian pest at Tawharanui Regional Park has led to self-introduction of bellbirds (regionally threatened), as well as increased numbers of North Island Kaka and shore skinks. Tawaharanui has also had Brown Kiwi, Whitehead, North Island Robin, Forest Gecko, Auckland Green Gecko reintroduced since 2004.

Kaikoura

- Eradication of fallow deer well advanced and eradication of ship rats planned for 2008.

- *Private protected areas*

Local authorities within the Hauraki Gulf catchment use conservation covenants to secure biodiversity outcomes (most typically secured as part of subdivision consents).

There has been little systematic monitoring of the state of these covenants. However, a recent study for the Thames Coromandel District Council (P & R Stewart, 2006) showed that it had secured 206 covenants covering 1293 ha of native vegetation/habitat but that 60% of those covenants are not in a "good" condition. Further on-site assessment suggested that unless management inputs are increased, condition trends for 71% of the 122 "average" and "poor" condition covenants will continue to decline.

By contrast, monitoring by the QE II Trust which now has 83 covenants covering 3680 ha on the Coromandel Peninsula shows 90% of its covenants to be in good condition.

- *Firth of Thames*

The ARC has recently published research on shorebird populations in the Firth of Thames between 1960 and 2005 (ARC 2007f).

That research found substantial change in the coastal bird community over time. The distribution of roosting shore birds has changed over time with some areas formerly holding large numbers now abandoned with some species using those areas suffering declining populations. That change is attributable to the spread of mangroves as discussed in section 4.2.3 of this report. The change in roost usage is particularly noticeable for Wrybills, Golden Plovers, Red Knots and Whimbels. Conversely, Oyster Catchers (particularly the Pied Oyster Catcher) have shown significant increases in numbers, although there is some evidence of decline in recent years. Over the past 45 years one new species (the Spur-Winged Plover) has begun breeding in the Firth (and elsewhere) and has shown rapid increase in numbers. The Banded Dotterel, on the other hand, has been lost as a breeding species from the Firth of Thames.

5.2.5 State of Marine Mammals

- *Bryde's whales*

Bryde's whales are listed as a nationally critical threatened species by DoC (Suisted and Neale 2004). Based on aerial surveys from 1999-2002 the population estimate for Bryde's whales in the greater Hauraki Gulf and Northland region (their main distribution in NZ waters) is around 200 individuals (Baker & Madon 2007). Research on Bryde's whale population biology, distribution and behaviour has been conducted at the University of Auckland since 1995. A photo-identification catalogue of marks on the dorsal fin and backs of 76 whales has found individual variation in the residency times within in the Hauraki Gulf, with some individuals photographed only once and others photographed multiple times over several years (O'Callaghan & Baker 2002; Wiseman in review). Some individuals have been photo-identified in the Whangarei and Bay of Islands region which further adds support to the range of this species including areas outside of the Hauraki Gulf, but the extent of the population range is currently unknown. They have high levels

of haplotype diversity which suggests a genetically robust population (Wiseman in review).

Bryde's whales are the only baleen whale found year round in our coastal waters. Their habitat use within the Hauraki Gulf makes them extremely vulnerable to mortality or injury from vessel strike and their primary diet of small schooling fishes such as saury and pilchards makes them vulnerable to habitat degradation due to over-fishing in Northland and Auckland's coastal waters.

- *Bottlenose dolphins*

Bottlenose dolphins in northern New Zealand are an isolated population from the other New Zealand populations. As noted earlier, they are exposed to high levels of tourism impact due to their coastal habitat use but this has been managed in the Hauraki Gulf region for commercial dolphin-watch tourism. Bottlenose dolphins are infrequently sighted in the Hauraki Gulf although there are reports of them from the inner harbour areas and out to Great Barrier Island. Photo-identification of marks on their dorsal fins has found that the majority of individuals sighted in the Gulf match to a catalogue from the Bay of Islands (curated by the University of Auckland) (Berghan et al. in review). This suggests a single population ranging along the northeastern coast of northern New Zealand with varying degrees of ranging behaviour by individuals within this population (Constantine 2002).

5.2.6 Pest status on Hauraki Gulf Islands

Current status of terrestrial pests on the Hauraki Gulf Island is set out in Table 6.

Table 6 - Terrestrial pests on Hauraki Gulf Islands[27]

Island	Eradicated	Present	Unknown
Browns (Motukorea)	rabbit, mouse, Norway rat		Argentine ant
Goat	ship rat		Argentine ant
Great Barrier (Aotea)	feral goat	Argentine ant, cat, kiore, mouse, pig, rabbit, ship rat,	rainbow skink*
Great Barrier – Kaikoura		fallow deer, pig, ship rat	Argentine ant, cat, mouse, rainbow skink*
Great Barrier – Rakitu	goat, pig	ship rat, kiore	Argentine ant
Great Barrier – others[28]		cat, kiore, mouse, rabbit, ship rat	Argentine ant
Karamuramu		mouse, Norway rat	Argentine ant
Kawau	deer species	cat, ferret, possum, ship rat, stoat, wallaby species	Argentine ant, mouse, Norway rat, rabbit, rainbow skink*, weasel
Little Barrier (Hauturu)	cat, kiore		rainbow skink*
Mokohinau Group	goat, kiore		rainbow skink*
Motuihe	cat, mouse, Norway rat, rabbit		Argentine ant
Motuketekete		feral guinea pig*, mouse	Argentine ant
Motuora			Argentine ant
Moturekareka	goat	mouse	Argentine ant
Moturemu (Kaipara)	mouse, Norway rat		Argentine ant, rainbow skink*
Motutapu	deer species, possum, wallaby species	cat, hedgehog, mouse, rabbit, rainbow skink*, ship rat, stoat	Argentine ant, Norway rat
Noises	Norway rat		Argentine ant

[27] Species marked with an "*" are not declared pests under the Auckland RPMS.

[28] Species present on some, not necessarily all other Great Barrier Islands.

Pakatoa	Norway rat	cat	Argentine ant, rainbow skink*
Pakihi (Sandspit)		mouse, Norway rat	Argentine ant, cat, rainbow skink*
Ponui (Chamberlains)		cat, mouse, Norway rat, ship rat	Argentine ant, rainbow skink*
Rakino	Norway rat	cat	Argentine ant
Rangitoto	deer species, hedgehog, possum, wallaby species	cat, mouse, rabbit, rainbow skink*, ship rat, stoat	Norway rat
Rotoroa		cat, mouse, Norway rat	Argentine ant, pig, rainbow skink*
Tarahiki (Shag)	Norway rat		Argentine ant, rainbow skink*
Te Haupa (Saddle)	Norway rat	mice	Argentine ant, rainbow skink*
Tiritiri Matangi	kiore, rabbit	Argentine ant	
Waiheke		cat, ferret, goat, hedgehog, mouse, Norway rat, pig, rabbit, ship rat, stoat	Argentine ant, rainbow skink*

Source: ARC 2007g

5.2.7 Known marine pest incursions

Comprehensive data on the number and extent of marine pests for the Gulf as a whole is not available. However, in 2003 Biosecurity New Zealand conducted a baseline survey of non indigenous species present in the Port of Auckland (reported in BNZ 2006). That research found 173 species or higher taxa in the Port comprising 114 native species, 13 non-indigenous species, 24 cryptogenic species (those whose geographic origins are uncertain) and 22 species of indeterminate (taxa for which there is insufficient taxonomic or systematic information available to allow identification to a species level).

Two species of non-indigenous marine organisms collected from the Port of Auckland (the bryozoan *Celleporaria sp. 1* and the ascidian *Cnemidocarpa sp.*) have not previously been recorded from New Zealand waters.

Introduced species, their known date and probable means of introduction are set out in Appendix 1.

A follow up survey was carried out in 2006 but the taxonomic work has yet to be completed.

At the time of the original baseline survey none of the introduced species found were listed on the New Zealand register of unwanted organisms. It is known, however, that since the 2003 survey *Undaria pinnatifida* and *Styela clava* have been recorded in the Port (and other) areas. Both these species are listed as unwanted organisms.

5.3 Responses

5.3.1 Protection responses

- *RMA plans*

The Proposed Auckland City District Plan: Hauraki Gulf Islands (2006) addresses biodiversity through a variety of provisions. The proposed plan applies landform based land units to the islands, in particular Great Barrier Island. These landform land units are based on differing ecosystems such as wetland systems, forest and

bush, dune systems and sand flats. The purpose of these land units is to protect and where appropriate enhance the ecosystem diversity while providing for appropriate activities to occur.

The proposed plan also applies additional limitations on some land where there are conservation areas and sites of ecological significance. Prohibited activities in the proposed plan include the introduction, keeping or farming of:

- any new organism (including genetically modified organisms).
- any plant pest species (listed in Appendix 14 – plant pest species).
- the following animal pest species: possums, goats, wallaby, deer, wapiti and mustelids (ferrets, stoats and weasels).

Auckland City Council is currently reviewing its biodiversity plan across the city.

Franklin District Council has introduced additional setbacks on the Seabird Coast as part of Change 14 to its district plan. Franklin District Council has also introduced dog control on the Firth of Thames through the Dog Control Bylaw.

- *Marine reserves*

The 2004 report recorded five marine reserves in the Hauraki Gulf covering a total of 3538 hectares (or 0.3% of the Gulf). No further marine reserves have been added since that time although there are proposals for two further reserves[29].

- The ARC lodged an application for a marine reserve at Tawharanui in April 2007. This proposal would alter the status of the existing Tawharanui Marine Park to a marine reserve and alter its boundaries, creating a reserve of about 400 hectares.
- A proposal by the Department of Conservation for a reserve off the northeast coast of Great Barrier Island was notified in August 2004. This has subsequently been approved by the Minister of Conservation but has yet to receive the necessary concurrent approval by the Minister of Fisheries. At 49,500 hectares the Aotea (Great Barrier) marine reserve would (if approved) be New Zealand's third biggest marine reserve.

- *Marine protected area strategy*

The NZ Biodiversity Strategy 2000 commits the government to having 10% of its marine coastal area protected by 2010. In February 2008 the government released the "Marine Protected Areas classification, protection standard and implementation guidelines." This sets in place a strategic approach to marine protection.

The Hauraki Gulf Marine Park is located within the North East bio-geographic region. The Hauraki Gulf is ear-marked as one of the first regions to be considered under new approach.

[29] Although approved in 2003 (and reported in the 2004 SER), the Te Matuku marine reserve was not formally gazetted until July 2005.

- *Terrestrial protected areas*

The Department of Conservation purchased the 28.7 ha Pollen Island as a scientific reserve in November 2005.

In addition, since 2004, the QEII Trust has registered three covenants (covering 200ha) over private land on the Hauraki Gulf Islands and 15 covenants (covering 682 ha) on the Coromandel Peninsula.

5.3.2 Conservation management responses

- *Pest management*

The ARC has recently proposed a new regional pest management strategy (RPMS) which will become operative following the resolution of one outstanding appeal. The new RPMS continues to provide for the Hauraki Gulf Controlled Area (HGCA)[30] which the ARC first declared under the Biosecurity Act in 1999[31].

Within the HGCA (that part of the Hauraki Gulf Marine Park within the ARC's jurisdiction) no person may transport, move, or distribute listed species into or between islands. Furthermore, any person intending to transport buildings into or within the HGCA must give appropriate notice so that the building may be inspected.

Environment Waikato has prohibited the movement of pests listed in its RPMS into or from one place to another place within the Hauraki Gulf Marine Park and is committed to working with the ARC with publicity regarding pest movement in the Gulf and the provision of signage at wharves and other access points.

In accordance with the RPMS and the HGCA requirements a number of plant and animal pest control programmes have been or are being carried out on islands in the Hauraki Gulf by the ARC, other agencies, or in joint projects. These include:

(a) an ARC inspection service for all buildings being transported into the Gulf, to prevent movement of pests (as outlined above)

(b) an ARC/Auckland City funded eradication of all animal pests on Rakino and the Noises Islands

(c) ARC-led rhamnus control programmes on Waiheke, Rakino, and the Noises Islands, and on key mainland coastal sites. DoC-led rhamnus control programmes on Motuihe, Browns, Rangitoto and Motutapu Islands

(d) a DoC species-led weed control work on Little Barrier Island (e.g. for pampas grass, wild ginger, woolly nightshade, *Smilax*)

(e) an ARC funded pest plant control programme for key mainland coastal sites, to minimise spread of pests onto offshore islands

(f) a Memorandum of Understanding between ARC and DoC for pest control on Great Barrier Island, including:

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[30] The RPMS signals ARC's intention to expand the scope of the HGCA and develop a Hauraki Gulf Controlled area Biosecurity Plan to enhance biosecurity protection for the islands.

[31] The ARC will formally re-notify the controlled area once the outstanding appeal has been resolved.

i. site-led pest plant control work

ii. a feral goat eradication programme (now complete)

iii. contingency actions for a range of pests, including a mustelid and Norway rat prevention programme.

A DoC project to make Rangitoto and Motutapu pest free will begin in June 2008 after initial investigations into the project feasibility proved positive. The combined island area (3800 hectares) would make Rangitoto/Motutapu the largest animal pest-free habitat in the Gulf and allow for reintroduction of threatened species.

- *Community group-led restoration*

There are over 260 community groups in the Auckland Region engaged in environmental care work. Their activities include tree planting, pest control, coast care, water quality testing, species monitoring, and community education. Some of these groups are specifically focused on the restoration of the biodiversity of the Hauraki Gulf. Other groups do not have a core focus on Gulf restoration but periodically undertake activities that benefit the Gulf, such as beach clean-ups, or riparian planting and pest control in the catchment. These groups are supported by the local and regional council members of the Hauraki Gulf Forum.

The following groups work in partnership with DoC specifically on island restoration.

- *Little Barrier Island (Hauturu) Supporters Trust* - set up in 1997 to provide support towards Little Barrier Island (Hauturu) achieving its full potential as a wildlife sanctuary of international importance.
- *Motuihe Trust* - established in 2003 is leading the restoration of Motuihe Island.
- *Motukaikoura Trust* - is responsible for Kaikoura Island's ecosystem restoration, accommodation, events and volunteer days.
- *Motuora Restoration Trust* - set up in 1995 with a view to restoring the native forest habitat by planting native trees grown from seed collected on the island.
- *Motutapu Restoration Trust* - formed in 1994 aims to protect, maintain, restore and interpret the cultural and natural landscape of Motutapu.
- *Supporters of Tiritiri Matangi* – a volunteer conservation group, founded in 1988 to restore the island of Tiritiri Matangi and establish an open sanctuary.

5.3.3 Biosecurity research and surveillance

MAF Biosecurity has been undertaking a research project on vessel bio-fouling as a vector for the introduction of non indigenous marine species to New Zealand. The study has involved inspecting 10% of all vessels arriving in New Zealand to develop a better understanding of risk. The first stage (of recreational yachts) is due to be released shortly. MAF Biosecurity is also considering development of an import health standard to improve control over hull fouling risk from yachts.

In addition to the comprehensive port survey, MAF Biosecurity has a marine surveillance programme and is about to let a contract for surveillance of eight unwanted organisms (two of which are already in Auckland harbours) and four recently introduced species (none of which thought to be in Auckland). This

programme will survey 10 locations nationwide. Two of those locations are in Auckland (being the Port/Viaduct Harbour and the recreational marinas).

MAF Biosecurity is also currently working on a suite of measures to respond to some negative findings of the Audit Office on the profiling and inspecting of containers and the recording of relevant information.

5.3.4 Marine mammal research

Research on the distribution of Bryde's whales in the northern Hauraki Gulf was initiated by an MSc student at the University of Auckland in late 2007 and will provide information on the density of whales outside of the inner Gulf area. Data collected from aerial surveys in the northern Gulf will be combined with data collected from the whale-watch operator's boat and independent boat surveys to create a Geographical Information System (GIS) of whale distribution and environmental parameters that may influence their habitat use.

Currently there is research on the ranging behaviour and habitat use of bottlenose dolphins in the Hauraki Gulf being conducted by the University of Auckland.

Since 2002, Massey University has been undertaking a long-term study of common dolphins in the Hauraki Gulf. Aspects of research undertaken to date include; taxonomy, demographics, behavioural ecology, diet and life history. Common dolphin occur year-round in the Hauraki Gulf (Stockin et al., in press) and the region has been identified as both an important feeding (Stockin et al., in press) and nursery area for common dolphins (Schaffar-Delaney, 2004). Research examining the foraging ecology of this species suggests common dolphins adopt various foraging strategies and feed in association with Bryde's whales and Australasian gannets (Burgess, 2006). Additional research conducted also revealed morphological variation (Stockin & Visser, 2005) and human impacts associated with this species in the Hauraki Gulf. To date, impacts associated with tourism (Stockin et al., 2008) and pollution (Stockin et al., 2007) have both been identified for common dolphins in this region. Research in progress is currently examining the population size and site fidelity of common dolphins within the Hauraki Gulf.

5.4 Conclusions

Tikapa Moana – the Hauraki Gulf is a place for our treasures. It contains large numbers of threatened native plants, animals and ecosystems and the islands of the Gulf provide an excellent conservation opportunity to restore habitats and ecosystems in a pest free environment.

However, the Gulf and its catchment is also a place where huge loss of biological treasures has occurred historically and where the nature of the coastal margin is still exposed to physical and ecological modification. As a major sea and air gateway to New Zealand, it is also a place exposed to continual risk from introduced pests and constant vigilance is required to keep our treasures safe.

Conservation work carried out on the Gulf Islands and on intensively managed mainland sites appears to be yielding encouraging signs with self reintroductions (between islands and from islands to the mainland) occurring and population recovery (particularly of seabirds) complementing a programme of official translocations.

This work is aided hugely by the high level of community interest in conservation and island restoration in particular.

However, many challenges remain. Capturing the ecological potential of two of the larger islands – Rangitoto-Motutapu and Great Barrier Island – has still to be realised. The protection and good stewardship of fragments of vegetation on private land needs to be assured. Understanding of marine mammals and the measures necessary to maintain healthy populations has still to be improved. Reducing risk of marine pests, improving surveillance and incursion response will also need on-going attention.

5.4.1 State of information

While there is considerable information on aspects of biodiversity in parts of the Gulf, there is no overall assessment available of the diversity and health of species and habitats in the Gulf or whether that is increasing or declining. While that problem is not peculiar to the Hauraki Gulf more could be done to design and monitor Gulf-relevant biodiversity indicators.

5.4.2 Changes since 2004

Given the absence of robust, repeatable indicator information, it has not been possible to quantify changes to the Gulf's biodiversity since 2004. Available information suggests mixed progress but much remains unknown.

6 Enough for everyone?

6.1 Pressures

Globally, human consumption of fish tripled between 1962 and 2004 and increased from 96.9 million tonnes in 2000 to an estimated 105.6 million tonnes in 2005 - the most recent confirmed data available (FOA, 2006). Total fish demand (including non food uses) increased from 131.1 million tonnes in 2000 to 141.6 million tonnes over the same period.

Capture fisheries (i.e. fish caught in the wild) have not been able to keep pace with world demand (and population increase) with production effectively stagnating since the late 1980s. Over the past 25 years aquaculture has played an increasing role in meeting world demand for food fish. Aquaculture now amounts to around 45% of global fish production.

In 2004 the FOA noted that the demand for fish as a human food may reach around 180 million tonnes by 2030. Given that capture fisheries appear to be at or near (and in some cases have already exceeded) production limits, aquaculture looks set to play an even greater role in the future.

In New Zealand, fisheries have followed similar path to the global trend. While seafood exports are now worth around $1.35 billion (from 481,000 tonnes of capture fish and 144 tonnes of farmed fish) overall there has been little recent growth in capture fisheries. Aquaculture is clearly the fastest growing sector of the seafood industry with 11.7% average annual growth by volume over the 20 years to 2005. While most of this growth feeds the export market, research carried out for the Seafood Industry Council found that almost half (45%) of all New Zealander's eat seafood at least once a week and 88% at least once month.

The Government has recognised the global economic opportunity provided by aquaculture and has recently announced a five point plan to grow the aquaculture industry (including supporting regional councils planning for aquaculture and promoting Māori involvement in the industry). The aquaculture industry has itself developed a strategic plan aimed to grow the industry to $1 billion by 2025 (it is currently worth approximately $300 million).

6.1.1 Fisheries

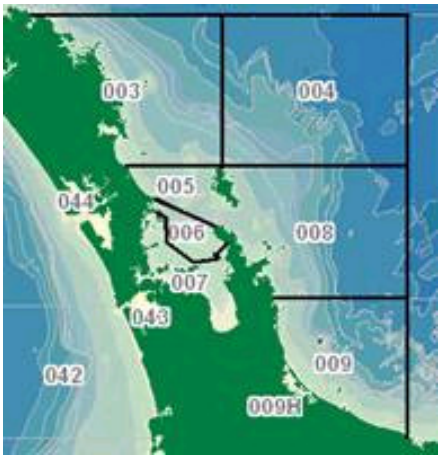
- *Fisheries management and reporting*

Most fisheries in New Zealand are managed under the quota management system (QMS). New Zealand's waters are divided into areas known as quota management areas (QMAs). For each QMA total harvest limits (Total Allowable Catch or TAC) are set for each species. This is the total amount that can be harvested in the QMA. For example, for snapper, the Hauraki Gulf is within quota management area SNA 1 which extends from North Cape to Cape Runaway. The TAC for SNA 1 is 7550 tonnes of which the commercial sector is allocated 4500 tonnes. The remaining 3000 tonnes is allocated to the non-commercial sector (2550 tonnes) and "other fisheries related mortality" (450 tonnes).

A complicating issue for reporting fisheries information is that QMAs are significantly larger than the Hauraki Gulf Marine Park.

However, the QMS requires all commercial catch to be reported on smaller areas referred to as statistical areas. These are generally the finest scale of harvest analysis available. Again the boundaries of these do not align to the boundaries of the Hauraki Gulf Marine Park. Figure 25 shows the fisheries statistical areas that fall within (in whole or part) the Hauraki Gulf Marine Park.

Figure 25 - Fisheries statistical areas

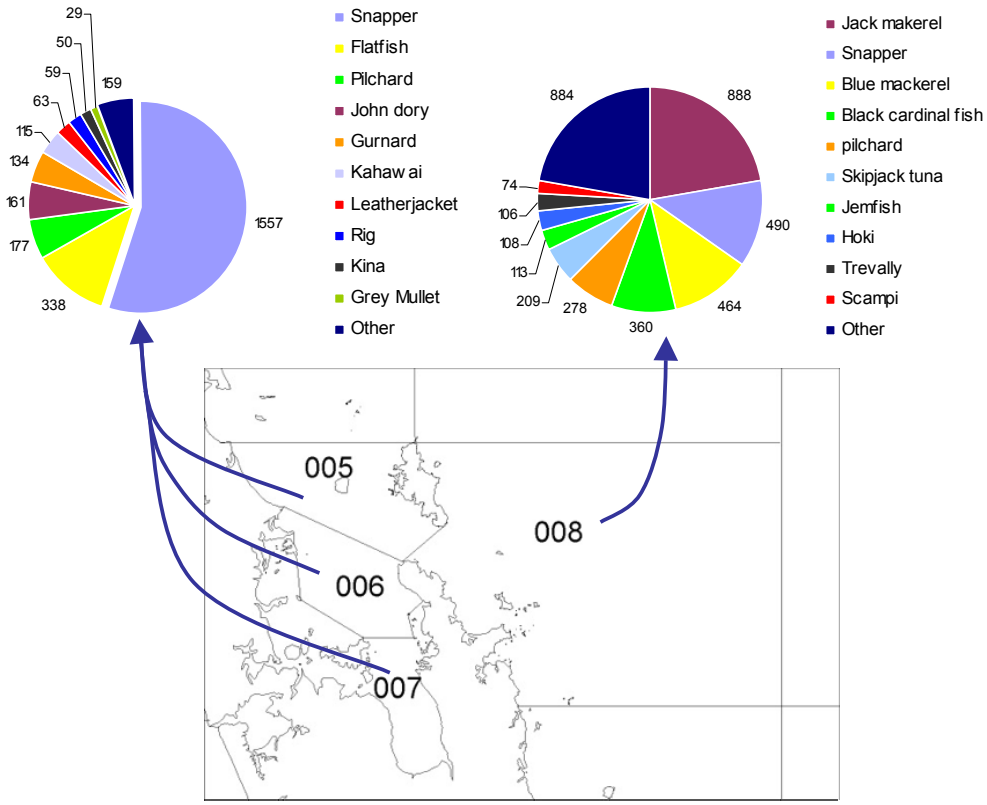


- *Commercial fin fish catch*

The Fisheries Act requires fisheries to be managed "at or above a level that can produce the maximum sustainable yield". The maximum sustainable yield (MSY) is a theoretical level. The MSY is the largest average annual yield (catch) that can be produced over a prolonged period of time whilst maintaining the fisheries productive capacity. The MSY differs for different species depending on their productivity (number of eggs, growth rate etc). For snapper, the current approach estimates that the MSY is achieved with a fish biomass of about 23% of the pre-fished stock (as derived from the base case model).

To achieve this target, the population characteristics of the fishery tend towards more smaller, younger fish which have higher growth rates. Whilst such a population characteristic may suit some sectors, there is a growing interest from the recreational sector to manage for more and larger fish.

Figure 26 - Average landings (Tonnes) of main commercial finfish species 2004/05 - 2006/07



Source: Ministry of Fisheries

- *Recreational take*

The 2004 Report noted that the recreational take of snapper from the Gulf (excluding the east coast of Coromandel) was 830 tonnes for the 2000/01 year. This was based on a phone and diary survey. Some concern has been expressed at the accuracy of the results.

In 2003/04 and 2004/05, the Ministry of Fisheries contracted NIWA to update and improve recreational fishing estimates by using aerial over-flights and boat ramp surveys to estimate of the recreational catch of snapper, kahawai and kingfish.

The aerial over-flights only counted stationary craft. The 2003/04 survey looked at that part of the Hauraki Gulf from Cape Rodney to Kennedy Bay on Coromandel Peninsula. The 2004/05 survey covered the whole of Quota Management Area 1 (QMA1) - the area from North Cape to Cape Runaway. Within this area, recreational harvest was summarised into three areas, East Northland, the Hauraki Gulf (the same area as the 2003/04 survey) and the Bay of Plenty.

Table 7 provides the estimated recreational catch derived for the Hauraki Gulf (Cape Rodney to Kennedy Bay).

The authors of the report comment that they believe the estimates for snapper are a reliable estimate of recreational harvest, that the estimates for kahawai are less reliable due to the prevalence of fishing from moving vessels and shore based fishing and

that the estimate for kingfish is likely to be less reliable again and should be treated cautiously (Hartill et al, 2007).

Table 7- Estimated recreational harvest of snapper, kahawai and kingfish for the area from Cape Rodney to Kennedy Bay

Species	Estimated Harvest (tonnes) for the Hauraki Gulf 2003/04	Estimated harvest (tonnes) for the Hauraki Gulf 2004/05	Estimated Harvest (tonnes) for Quota Management Area 1 2004/05	Percentage of the 2004/05 QMA1 catch taken in the Hauraki Gulf
Snapper	1334	1345	2419	56%
Kahawai		95	530	18%
Kingfish		2.34	39	6%

Source: Ministry of Fisheries

There is no reliable information on the number of recreational fishers active in the Hauraki Gulf. However, research suggests (Colmar Brunton, 2007) that nationally, around one in four New Zealanders fish recreationally at least twice a year. It is likely that the figure is similar in the Hauraki Gulf.

The area referred to as the Hauraki Gulf in the recreational fishing survey is largely the same as statistical areas 006 and 007 combined. The average annual commercial take for that area for the years 2003/04 to 2006/07 was 994 tonnes. The NIWA recreational survey suggests the recreational take for this area is 1345 tonnes. In other words, in the inner Hauraki Gulf waters (i.e. areas 005 and 006) the recreational take may be 35% more than the commercial take.

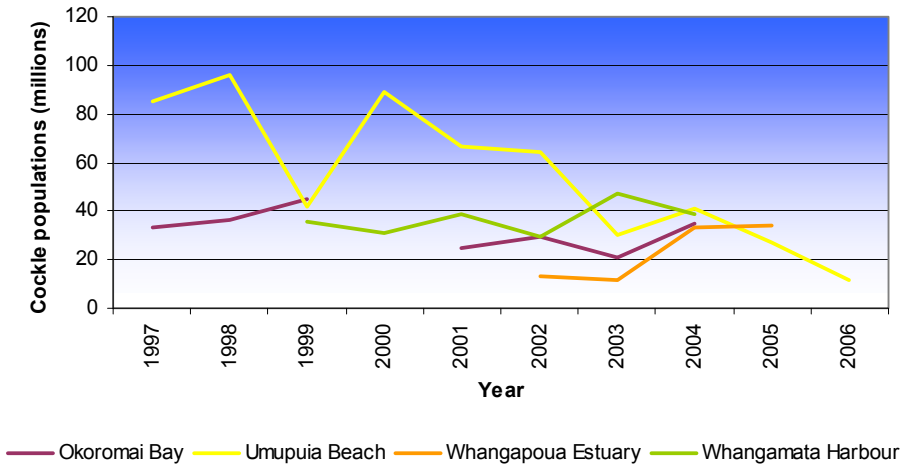
- *Shellfish*

MFish monitors shellfish at a number of Hauraki Gulf locations. Trend data for cockles (*Austrovenus stutchburyi*) is available for Okoromai Bay, Umupuia Beach, Whangapoua and Whatamata[32]. The data, set out in Figure 27, clearly show the Umupuia is suffering a steady decline in cockle population with the number of cockles declining from 96 million a decade ago to 12 million in 2006. The populations of cockles in other areas do not show a clear pattern over the monitoring period.

The density of cockles at Umupuia has dropped at an even greater rate from 320 per square metre in 1998 to just 32 per square metre in 2006. The data provides a strong indication that current harvest levels are unsustainable. MFish reports that shellfishers often show a low level of compliance with regulations and that this is particularly the case in the Auckland Coromandel area where bag limits are already reduced below those of the general regulations that otherwise apply. Compliance staff regularly report people with excess bag limits at Umupuia Beach.

[32] Shellfish surveys undertaken by the Hauraki Gulf Forum also monitor the cockle population at Umupuia Beach however the data record is of insufficient duration to provide population trends.

Figure 27 - Cockle populations at selected Hauraki Gulf sites 1997-2006



Source: Ministry of Fisheries

Short term change in shellfish (cockles and pipis) at other monitored locations is shown in Table 8. It shows an increase in pipi populations at all three monitored sites. There was no change to cockle populations at Whangateau, Tairua or Kawakawa Bay and decline (as discussed above) at Umupuia, Whangamata and Okoromai. Such short term population change cannot, however, be regarded as indicative of a trend.

Table 8 - Gulf Shellfish - short term population change 2004-2006

Location	Population (millions)	
	2004	**2006**
Whangateau cockles	249.04	289.97
Whangateau Harbour pipi	1.45	11.84
Okoromai Bay cockles	34.53	19.58
Umupuia Beach cockles	41.28	11.59
Kawakawa Bay cockles	91.4	86.4
Tairua Harbour cockles	30.66	32.7
Tairua Harbour pipi	3.89	8.4
Whangamata Harbour cockles	40.48	32.62
Whangamata Harbour cockles	2.45	3.3

Source: Ministry of Fisheries

6.1.2 Aquaculture

On Auckland's eastern (Hauraki) coast, there are around 242 hectares of established marine farms. In 2000-2001 the ARC received applications for the use of a further 6680 hectares of marine space for aquaculture in the Hauraki Gulf. (Most of this was in the Firth of Thames). The vast majority of those applications were, however, unable to be processed due to a national moratorium imposed pending a review of the aquaculture management regime. A proposal by the ARC to provide further Aquaculture Management Areas (AMAs) was put on hold in 2006. Three applications in the Gulf notified before the moratorium were able to be processed.

One of these (a mussel farm at Great Barrier) was declined and two other spat catching ventures in the Firth of Thames have been put on hold at the applicant's request.

As no new Aquaculture Management Areas (AMAs) have been introduced since 2004[33], and the three proposals not caught by the moratorium have not proceeded, there has been no new marine farming within the Auckland Region. Nevertheless, as evidenced by the applications received and currently "on hold" there is clearly on-going interest in expansion of the industry.

In the Waikato, while no new marine space has been allocated to aquaculture, more of the previously approved Wilson Bay (Area A) zone has been developed since the 2004. Between 120 and 170 hectares are still undeveloped in Area A. Area B (comprising an additional 520 hectares) of the Wilson Bay zone currently also remains undeveloped although applications for spat catching have been lodged over the entire space. This area is caught by the national moratorium meaning that the applications cannot be processed until the interim AMA process of the Aquaculture Reform Act has been completed. This is expected to occur early in 2009.

In both the Auckland and Waikato parts of the Gulf there is known to be keen interest within the aquaculture sector to grow the Hauraki aquaculture industry from its traditional reliance on mussels and oysters to finfish (e.g. kingfish) although there is little scope of this within existing coastal plans. (Note, EW is taking steps to address this – see section 6.3.3).

6.1.3 Moorings

A 2006 ARC-commissioned study of moorings (Beca 2006) found that the demand for moorings within the inner Waitamata Harbour Moorings Management Areas (MMAs) has reduced over the 1995 to 2006 period (by perhaps as much as 1472). The reduction in the number of moorings has been attributed to marina berths and dry stack facilities becoming available.

However, the number of mooring sites off the Rodney coast (including, in particular, Kawau Island), Waiheke Island, Rakino Island and Great Barrier Island has grown over the same period and pressure for coastal space for moorings and marinas is predicted to grow in these areas as adjacent land is further subdivided. The 2004 report noted that there were 929 moorings in the Rodney coastal area. By December 2007 this had risen to 993.

Over the 1998 to 2006 period just 19 applications for new moorings were received by the ARC. The 2006 study found that between 4300 and 4450 moorings are authorised within the Auckland part of the Gulf. However, it also found that between 385 and 560 moorings (11% -15% of all moorings) are currently unauthorised (i.e. they have been developed without appropriate consent). The majority (325-440) of those are in the Waiheke/Rakino area.

The 2004 Hauraki Gulf State of the Environment Report noted that boat ownership had been maintained at about 16% of households for the past 30 years. The most recent survey data (ARC, 2006c) found boat ownership to be around 15%. This suggests that the number of boats appears to be increasing proportional to

[33] This is to be expected given that the national moratorium was not lifted until 2005 and any new AMAs after that could only be introduced after lengthy and complex plan change processes.

population growth. As population grows the number of boats can also be expected to grow and with it demand for "in water" boat storage.

Moorings within the Waikato part of the Gulf has remained fairly steady with 770 reported in 2004 and 775 recorded in 2007.

6.1.4 Differing world views

For many Māori, disposal of human remains at sea is inconsistent with their tikanga (customary practices). Disposal of cremation ash at sea is not against the law, and is a practice with significant meaning for other cultural groups marking a loved one's passing. How these apparently opposing beliefs about appropriate use of public space can be reconciled is yet to be explored, but has been identified as an issue by the HGF.

6.2 State of the Gulf's resources

6.2.1 Fisheries

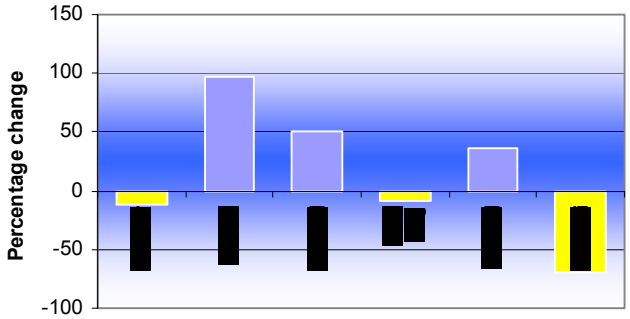
One measure of the state of fisheries is the catch per unit effort (CPUE). This is a measure of how many fishing hours is required to catch a given amount of fish. If, over time more effort is required to catch fish (i.e. the CPUE decreases), then it is a reasonable assumption that the state of that stock is deteriorating (conversely if the CPUE increases it suggests that stocks are improving).

Some CPUE data (for rock lobster) was included in the 2004 report, however, no more recent data is available.

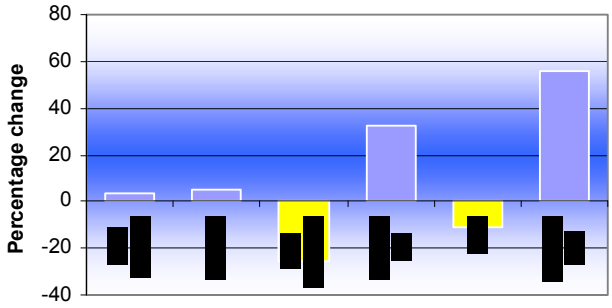
A comparison of catch and determination of the percentage of change in the catch of certain species may provide some insight into the fisheries of the Hauraki Gulf. Figure 28 sets out change in the three year average catch of the main species (comparing the 2000/01-2003/04 period to the 2004/05-2006/07 period). It shows reduction in the snapper, John Dory and, most significantly, kahawai catch in the inner Gulf areas (and increases in the average flatfish, pilchard and gurnard catch). In the area east of Great Barrier and Coromandel the blue mackerel and hoki catch was down with the skipjack tuna and cardinal fish catch up. Care needs to be had in interpreting these figures as there are many potential reasons for this change, from availability issues, to shift in effort, market demand and weather.

Figure 28 - Change in catch of main species (2000/01-2003/04 average: 2004/05-2006/07 average)

Areas 005,006,007



Area 008



6.2.2 Aquaculture space

As noted above there has been no new aquaculture developed in the Auckland part of the Gulf since 2004. In the Waikato portion of the Firth of Thames 70-120 hectares have been added all within areas earmarked for aquaculture prior to 2004.

6.3 Responses

6.3.1 Actions under the fisheries legislation

There have been no changes to the controls on commercial fishing methods and no changes to the daily bag limits set for recreational fishers since 2004. However there have been some changes to the operation of the QMS (as detailed below).

- *New introductions to the quota management system*

Although the QMS was introduced in 1989, MFish has continued to bring additional species under the management system. In the period between the first Hauraki Gulf State of the Environment Report being published in March 2004 and now, MFish has added an additional 22 shellfish species to the QMS. Whilst all these species occur in the Hauraki Gulf, for most there are no established commercial fisheries within the Hauraki Gulf.

Kahawai were also introduced to the Quota Management System in 2004. In doing so the Minister set the Total Allowable Catch and the various allocations for the customary, recreational and commercial sectors. After receiving new information, these were reviewed in 2005. The recreational sector representatives were unhappy with the Minister's 2005 decision and sought a judicial review.

The Court found that the Minister had erred in three areas:

- In fixing the TACC the Minister did not give proper regard to the economic and cultural wellbeing of people.
- The Minister failed to take proper account of sections 7 and 8 of the Hauraki Gulf Marine Park Act.
- The Minister failed without giving proper reasons to consider advice from MFish to review the bag limits for recreational fishers.

The Ministry accepted these findings however, other parties have appealed the decision. The case was heard in the Court of Appeal in February 2008. The decision was not available at the time of writing this report.

- *Sustainability reviews*

In order to ensure that fisheries harvest is sustainable, MFish undertakes regular reviews of the harvest limits of species. As referred to above the QMAs for species are significantly larger than the Hauraki Gulf Marine Park (see Appendix 2). Eleven species have been reviewed in the period since the 2004 Report, three had had the TAC increased, five deceased and three were left unchanged. Details are provided in Appendix 2.

- *Fisheries plans*

There are seven fisheries plans currently proposed or in development for areas within (or partly within) the Hauraki Gulf Marine Park.

Fisheries plans are an initiative to set the future direction (goals and objectives) for specific fisheries. Once goals and objectives have been determined, management programmes will be developed. The Ministry of Fisheries is working with stakeholders; commercial, recreational, customary and environmental interests, to develop the fisheries plans set out in Table 9.

Table 9 - Fisheries plans within (or partly within) the Hauraki Gulf Marine Park

Fisheries Plan	Species covered	Area of Plan	Progress
Northland Scallops	New Zealand scallop	Ahipara to Cape Rodney	Commenced 2007/08
Coromandel Scallops	New Zealand scallop	Cape Rodney to Maketu	Draft plan
North East Fin Fish	Inshore fin fish species	North Cape to Cape Runaway	To be commenced
North East Shellfish	Shellfish, excluding paua and rock lobster	North Cape to Cape Runaway	To be commenced
Rock Lobster	Rock lobster and packhorse crayfish	Te Arai Point to east Cape	To be commenced
Highly migratory species	Tuna, marlins, swordfish	New Zealand Exclusive economic Zone	Commenced 2007/08

Source: Ministry of Fisheries

- *Enforcement*

Table 10 shows the results of compliance efforts in enforcing fisheries regulations in the region over the past three years.

Table 10 - Ministry of Fisheries Compliance Actions in the Hauraki Gulf 2004/05 to 2006/07

Season	Compliance Decision	Commercial	Non-Commercial
2004-05	Infringement Notice	4	140
	Prosecute	1	78
	Warning	28	427
	Total 2004-05	**33**	**645**
2005-06	Infringement Notice	10	145
	Prosecute	2	61
	Warning	44	297
	Total 2005-06	**56**	**503**
2006-07	Infringement Notice	6	158

	Prosecute	6	67
	Warning	34	299
	Total 2006-07	**46**	**524**

Source: Ministry of Fisheries

- *Māori traditional non-commercial fisheries initiatives within the Hauraki Gulf*

The Treaty of Waitangi (Fisheries Claim) Settlement Act 1992 requires the Minister of Fisheries to develop mechanisms for the management of Māori non-commercial fishing rights In order to provide for these rights, the Fisheries Act contains a number of mechanisms to enable Māori to exercise and manage their traditional non-commercial fisheries.

In terms of traditional non-commercial fishing, the main legislative mechanisms are contained within the Fisheries Act 1996, Fisheries (Amateur Fishing) Regulations 1986 and the Fisheries (Kaimoana Customary Fishing) Regulations 1998.

These tools are available to Māori, however, they are yet to be implemented within the Gulf. Table 11 provides a summary of the implementation of these mechanisms with the Hauraki Gulf Marine Park. The table shows that for many Māori these have not been a priority at this time. However, Māori interest in these mechanisms is increasing.

Table 11 - Māori tradition non-commercial fisheries initiatives within the Hauraki Gulf Marine Park

Mechanism	Purpose	Hauraki Gulf context
Regulation 27 or 27A	Enable exercising of traditional non-commercial fishing rights as provided by Regulation 27 and 27A	Appointments made
Taiapure – local fishery	Areas of the sea set aside in recognition of rangatiratanga and of the right secured in relation to fisheries by Article II of the Treaty of Waitangi. Regulations may be established to managed non-commercial fishing.	None established
Section 186A Temporary Closures	Support rāhui by closing areas or restricting harvest methods for up to 2 year	No current S186A temporary closures
Tangata Kaitiaki/ Tiaki	Tangata Kaitiaki/ Tiaki authorise customary fishing within their rohe moana	None appointed
Gazetted Rohe Moana	Establish area over which Tangata Kaitiak/ Tiaki have authority	None established. Some applications being processed
Mataitai Reserves	Areas where tangata whenua manage non-commercial fishing by making bylaws	None established

Source: Ministry of Fisheries

6.3.2 Shellfish monitoring

- *Ministry of Fisheries shellfish monitoring*

The Ministry for Fisheries has been monitoring shellfish at various sites around the Hauraki Gulf for more than a decade. The results of that monitoring are reported in the chart and tables above.

- *Community shellfish monitoring*

The community shellfish monitoring project brings the partners in the Hauraki Gulf Forum together with community groups, schools and iwi to monitor inter-tidal

shellfish on sandy beaches. The purpose of the project is to enable communities to contribute meaningfully towards an improved understanding of the state of inter-tidal shellfish resources and biodiversity in the Hauraki Gulf Marine Park. Such an understanding will help provide a basis for sustainable resource management. Beaches that are subject to monitoring programmes are given in Table 12.

Resources to support the programme currently being developed include a flyer, shellfish field identification guide, a teacher's resource kit and database.

Table 12 - Community shellfish monitoring

Location	Community organisation	Supporting organisation
Whangateau Harbour, - Lews Bay, Rodney	Whangateau Harbour Care	ARC
Whangateau Harbour, - Causeway, Rodney	Whangateau Harbour Care	ARC
Umupuia Beach, Manukau City	Maraetai Beach School, Umupuia Marae	ARC and Manukau City Council
Kawakawa Bay – West, Manukau City	Clevedon School,	ARC and Manukau City Council
Kawakawa Bay – East, Manukau City	Edmund Hillary Intermediate, Papakura Marae Previously also supported by: Weka Watch, Te Puru Sea Scouts, Pohutukawa Coast Community Association, and corporate volunteers	ARC and Manukau City Council
Beachlands, Manukau City	Beachlands School	ARC and Manukau City Council
Schoolhouse Bay, Mahurangi Harbour, Rodney District	Mahurangi College	ARC through the Mahurangi Action Plan
Okahu Bay, Auckland	Ngati Whatua	ARC
Te Matuku Marine Reserve, Waiheke Island	Te Huruhi School, Waiheke High School, Forest and Bird	DoC
Cockle Bay, Manukau City	Chinese Conservation Education Trust.	DoC and Manukau City Council
Whangapoua Harbour, Great Barrier	Okiwa School, Kaitoki School, Mulberry Grove School	DoC
Mercury Bay, Coromandel	Mercury Bay School	Environment Waikato

Source: Ministry of Fisheries

Data gathered by the community shellfish monitoring programme has not been used in the preparation of Figure 27 or Table 8 as in most cases the data record is not long enough for trend analysis. It is expected that future state of the environment reports will make fuller use of community shellfish monitoring data.

6.3.3 Coastal planning

- *Auckland*

In July 2006 the ARC resolved, in principle, to change its approach to managing aquaculture. The approach endorsed in March 2008 uses the new aquaculture planning tools provided by the 2005 aquaculture law reform. These are the "invited private plan change" (IPPC) process and excluded areas (where invitations for IPPCs cannot be issued).

The IPPC process involves the ARC first changing its coastal plan to establish a suitable policy framework to guide assessment of IPPC (as well as conventional plans change) applications to establish AMAs, then inviting IPPCs outside of declared Excluded Areas. This differs from the previous (2002) approach where the ARC notified its own coastal plan variations to propose AMAs.

The new policy framework would also include rules guiding assessment of applications for marine farming consents inside any new AMAs once they were established.

Auckland City Council applied to the ARC in 2005 for a private plan change to the Regional Plan Coastal that aimed at addressing local mooring and anchorage issues at Rakino Island by amending the number of moorings permitted within the existing mooring management area at Sandy Bay from 20 to 30. The plan change also sought to introduce new mooring management areas at two other locations by the island, Home Bay and Woody Bay, comprising space for 20 moorings and 30 moorings respectively. After considering public submissions on the plan change (633 of which opposed the plan change), the ARC decided to accept the increased moorings at Sandy Bay but reject the proposal for further mooring management areas at Home Bay and Woody Bay.

- *Waikato*

Under the current provisions of the Environment Waikato's Regional Coastal Plan this space with AMAs can only be used for shellfish farming. Environment Waikato is considering a plan change to allow other types of aquaculture, including fish farming, in the existing marine farms.) This change is expected to be publicly notified in 2008.

6.4 Conclusions

In pre-European times Tikapa Maoana was regarded as a pataka or food basket by the iwi which lived around its shores. To many Māori, the notion of tikapa moana as a pataka continues in contemporary life.

The snapper fishery is by far the most important fishery within the Gulf. Whilst no new information on the status of the fishery has been produced since the last report, anecdotal information suggests the population re-build projections, as reported in the 2004 report, are likely to be continuing.

There are tensions between the need to achieve a maximum sustainable yield for fisheries and the outcomes sought by the differing sectors. This is particularly the case in fisheries that are highly valued by the commercial and non-commercial sectors.

These tensions are being expressed in a court challenge to the allocation of kahawai. A 2006 Court decision rejected an allocation proposal for Kahawai finding in favour of the recreational value of kahawai *within* the Hauraki Gulf This decision is subject to further legal challenge. Whilst the outcome of this was not available at the time of writing, the decision will provide guidance for future fisheries management in the Hauraki Gulf.

What is known, is that demand for fisheries resources is growing, whether this be through increased population, desire or need, and that fisheries resources, in

particular intertidal shellfish resources close to major population centres are unlikely to be able to satisfy this demand.

The Ministry of Fisheries is developing fisheries plans to address these issues. However, no fisheries plans are as yet complete.

There are also tensions between the use of coastal space for competing interests: fishing, aquaculture, boat mooring as well as intrinsic values of open seascapes.

There is not enough resource to satisfy everyone and MFish and regional councils face difficult decisions often based on incomplete scientific information, management at incompatible scales and contested views of the sustainability of environmental resources.

6.4.1 State if information

Reporting of fisheries information is challenging due to the misalignment between the boundaries of the Hauraki Gulf Marine Park, quota management areas and fisheries statistical areas. This could be overcome in part by a consistent reporting regime.

Whilst new information has been provided to characterise the recreational fishery, and community shellfish monitoring will improve our understanding of shellfish resources, the availability of good robust information poses some challenges.

These information issues have been highlighted by a recent publication (Peart 2007) published by the Environmental Defence Society.

> *"The spatial scale of the fisheries area managed by MFish is much larger than the spatial scale of coastal management under the RMA or marine protection management undertaken by DoC. This makes is difficult for fisheries management to interface with the other management regimes."*
>
> *'Most of the information gathered by MFish relates to fish stocks and not the marine environment within which they are located.'*

The book, based on a detailed study into the management of the Hauraki Gulf and Kaipara Harbour, contains a series of recommendations to deliver effective and integrated coastal management at a regional level.

6.4.2 Change since 2004

It is clear that there has been significant change in the species composition of the commercial take. The recreational snapper take has increased and, unlike the period immediately prior to the 2004 Report there has been little new aquaculture development and none in the Auckland area of the Hauraki Gulf.

7 Links to the past?

7.1 Pressures

7.1.1 Māori view of heritage

Māori cultural heritage associated with Tikapa Moana is far more comprehensive than specific sites. Māori whakapapa (genealogical) links show Māori connections going back in time to all things in the creation: back to Rangi and Papa, Earth and Sky, and ultimately back to Io Matua (Supreme Being). Maintaining these links remain relevant and active today and influences the ways in which Māori interact with their natural world, because it is the maintenance of these links that not only ensures a well stocked pataka kai, but also ensures sustainable natural resources. The intensity and significance of maintaining these links can be seen in Māori art, waiata, chants, crafts, stories, names, events, as well as in specific sites, and is ongoing rather than fixed at a particular point in history.

Focusing heritage protection just on sites and historical remains can ignore this rich history that has not left a mark but provides links to ancestors and which gives a sense of place, purpose and spiritual fulfilment. To tangata whenua the entirety of Tikapa Moana and associated coast is an inter-connected, cultural/historical/ spiritual living experience. Failing to acknowledge the heritage importance of Tikapa Moana as a whole, fragments the management of Tikapa Moana and paves the way for degradation.

7.1.2 Heritage sites

In the 2004 State of the Environment Report the distinction between individual sites and the landscapes in which they are contained was discussed. Heritage management is evolving to include recognition of the bigger picture which Māori have tried to instil but this has yet to be generally provided for in planning instruments in the Gulf. This chapter assesses the state of heritage in Tikapa Moana only on a site-related basis, using the information available. The 2003 amendment to the RMA which included a definition of historic heritage in terms of cultural landscapes, and the requirement to recognise and provide for historic heritage as a matter of national priority, gives a statutory basis for development of planning provisions for cultural landscapes.

Tangata whenua are often not effectively involved in cultural heritage decision-making processes around Tikapa Moana, denying them their rights and responsibilities as kai-tiaki. Māori values pertaining to heritage - its assessment and management - are often not clearly identified or utilised by agencies with management responsibilities in Tikapa Moana.

Community awareness and respect for tangata whenua values for their cultural heritage are necessary for effective heritage protection and opportunities for education about the cultural heritage of tangata whenua are often missed.

The 2004 SER described how the majority of archaeological and other cultural heritage sites of the Gulf are clustered around the coastal margin of both the mainland and off shore islands.

Development around this coastal margin is therefore the major pressure involving as it does earthworks, re-contouring and other disturbance to the land and soil. The general trends in coastal population and dwelling growth around the Gulf (as well as forestry and other land use change) has been discussed elsewhere in this report (particularly in chapters 2 and 3).

7.1.3 Historic Place Trust Authorities

An indication of the affect of urbanisation and other land use change is provided by the number applications received by the Historic Places Trust (HPT) for "authorities" under the Historic Places Act (HPA) to destroy, damage or modify an archaeological (pre 1900) site within the Hauraki Gulf Catchment[34].

Authorities granted under the HPA may relate to one of three categories: section 18 authorities (for archaeological investigations), section 11 authorities (to modify or destroy and known archaeological sites); and section 12 authorities (to modify or destroy unspecified sites within a general area).

Between June 2004 and July 2007, the HPT received 133 applications for all types of authorities. All but one of these applications was granted by the HPT (although several were withdrawn).

The distribution of those applications across the three year period is shown in Figure 29. HTP report that a slightly longer time series would show a more marked increase in authorisations.

The granting of an authority does not mean that an archaeological site was destroyed. Unfortunately, the HPT database does not allow the outcome of an authority (i.e. whether a site was destroyed or modified) to be easily reported. It is possible that a single authority led to multiple sites being destroyed but it is also possible that no site was destroyed (if, for example, a site was suspected to exist but subsequent disturbance found no evidence). While analysis on the HPT data took account of these possibilities, the number of authorities is a crude measure[35].

However, the ARC has undertaken some analysis as part of the maintenance of its Cultural Heritage Inventory. That work shows that between 2004 and 2007, across the Auckland region as a whole, 23 archaeological sites were destroyed and 319 modified or damaged. It is estimated that at least 75% of these would be in the coastal areas of the Gulf catchment.

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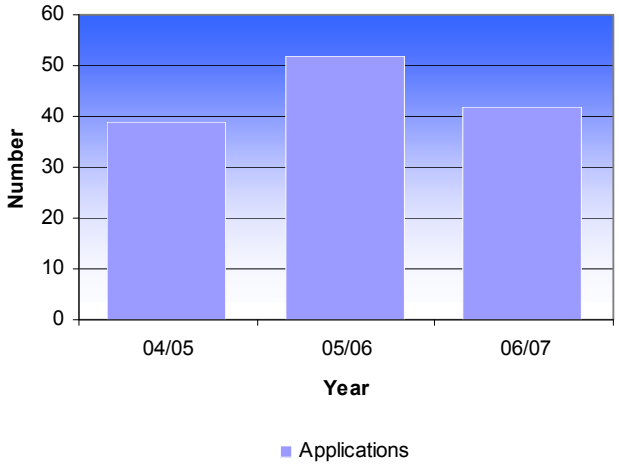
[34] While the data reported here relate to sites within the Hauraki Gulf catchment, the overwhelming majority of applications relate to coastal or near coastal sites. Almost all applications for inland sites relate to forestry operations.

[35] It should also be noted the number of authorities, while providing some indication of disturbance to *sites*, does not provide a good picture of the loss or modification to an archaeological *landscape* - an aspect of heritage that is relevant under the RMA.

Figure 29 - Applications to the Historic Places Trust for authority to modify or destroy an archaeological site within the Hauraki Gulf Catchment



Source: Historic Places Trust authorities data base

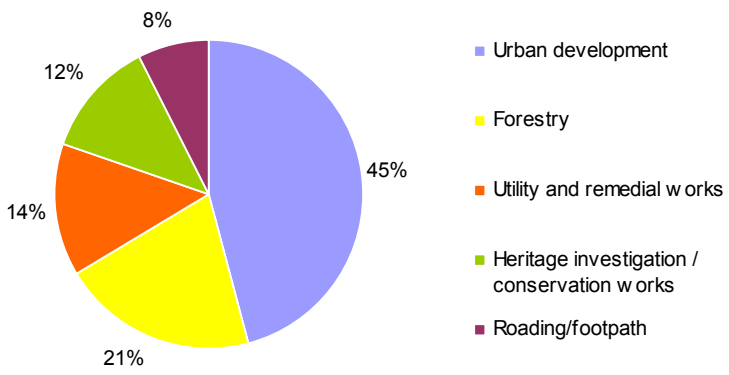
7.1.4 Causes of modification and destruction

The reasons why "authorities" to destroy, damage or modify archaeological sites around the Gulf were sought generally fall into five categories.

General urban development (residential, commercial, recreation etc) large and small, was the main reason behind applications with almost half of the applicants being involved in some form of urban development (including rural residential development). The next most common reason for an application related to the desire to fell trees and/or develop tracks as part of exotic forest operations. The development/maintenance or upgrading of utilities (such stormwater and waste water projects or the construction of seawalls) or the need to avoid or remedy hazards common was another common reason. Proposed archaeological investigations (under section 18) and conservation/restoration work was the reason behind about 12% of applications.

The main drivers for proposals to destroy, damage or modify archaeological sites are illustrated by Figure 30.

Figure 30 - Causes of archaeological site disturbance (2004-2007)



Source Historic Places Trust authorities data base

7.1.5 Pressures on other cultural heritage

The HPT data only relates to archaeological sites. There are many other cultural heritage sites which are recognised by district plans. From time to time territorial authorities receive applications to modify or destroy sites scheduled in district plans. Unfortunately the number of such applications received, and the outcome of those applications is information that is not easily extracted from local authority databases and consequently cannot be reported here.

There will also be heritage sites that are not scheduled in district plans and which are modified or destroyed as part of land use practices or land use change (which may or may not require consent for a territorial authority). There is currently no way of reporting on that loss or damage.

7.2 State of the Gulf's resources

The ARC's Cultural Heritage Inventory (CHI) provides the best record of the extent of heritage across Auckland Region. It aggregates and updates data from a range of sources into one integrated database.

As at December 2007 the ARC Cultural Heritage Inventory has records for 7498 sites within the Hauraki Gulf Catchment. This includes:

- 5198 recorded archaeological sites
- 1364 historic buildings and structures
- 462 sites with historic maritime associations within the coastal marine area
- 405 botanical heritage sites
- 69 reported historic sites

Information on the *condition* of these sites is more difficult to obtain. With so many sites on the register it is not feasible for the condition of all sites to be regularly

surveyed. As reported earlier, it is known that authorities have been granted for the modification of 319 sites since 2004.

There is no Waikato equivalent of Auckland's CHI. However, Figure 31 below sets out the number of sites scheduled and plans and on the HTP Register in the Waikato territorial authorities that fall predominantly within the Gulf Catchment.

Figure 31 - Scheduled and registered historic heritage and wahi tapu sites within Waikato part of Gulf catchment

Territorial authority	HPT registered sites	Sites scheduled in district Plans
Thames Coromandel District	171	92 in Coromandel, 64 in Thames
Matamata-Piako District	48	165
Hauraki District	28	84 (+364 archaeological sites not protected by the plan itself)

All of Hauraki and Matamata-Paiko District HPT registered sites are well inland.

7.3 Responses

- *Inventories and data management*

The ARC Heritage Programmes group has made further progress with the systematic recording of historic heritage around the coastline of the Auckland Region. The long term aim of this project is to complete a survey of the entire coastline of the region, recording archaeological sites and maritime places and structures of heritage value in the coastal marine area. A prioritised programme of systematic area surveys and thematic studies (coast defence, boatsheds, shipwrecks) has been undertaken over the last seven years with assistance from volunteers, iwi and Department of Conservation staff. During the summer of 2007-8, the Matakana Harbour and coastline to the north was completed. The information gathered during surveys is added to the ARC's Cultural Heritage Inventory (CHI) and is used by the ARC and local authorities to assess the effects of resource consent applications on historic heritage.

The ARC's Cultural Heritage Inventory (CHI) discussed in the 2004 SER continues grow and improve. The CHI now has records for 15,528 historic heritage sites (including 9872 recorded archaeological sites). However it is estimated that only 29.5% of the region has been systematically surveyed and assessed for cultural heritage sites and places. By comparison, in 2000 there were approximately 12,300 sites recorded in the CHI and an estimated 17% of the region had been surveyed. The number of inventoried sites is growing at about 3% per year.

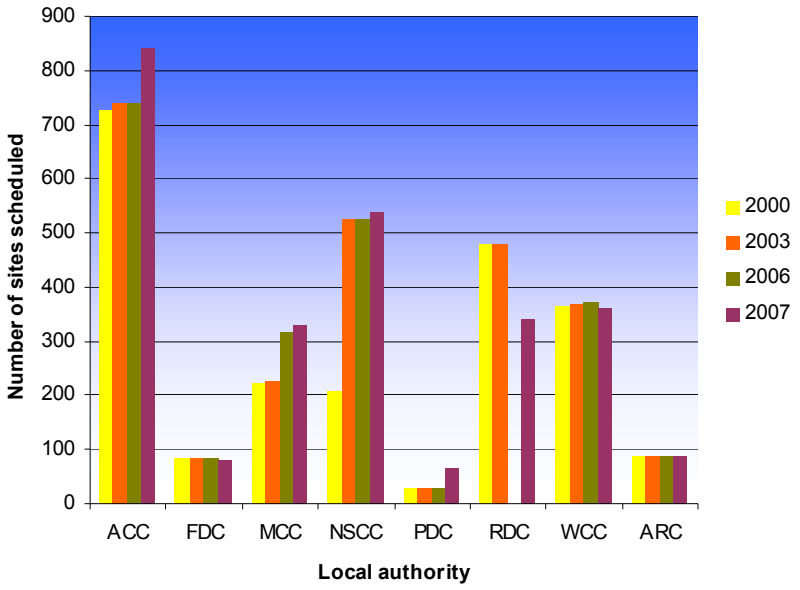
In addition, the ARC holds microfiche copies of around 20,000 old Marine Department plans, some dating back to the 1860s. This collection is one of two surviving copies of these plans, the other being held by the Wellington Museum of City and Sea. The ARC Cultural Heritage team receives requests from around the country for copies of plans, but providing these from aperture cards has been difficult now that microfiche printers have become obsolete. The entire collection has now been digitised to make sharing of this information much easier, and copies will be provided to the Auckland Maritime Museum, Wellington Museum of City

and Sea, National Archives and other regional councils. Gaps in the two collections will be filled as opportunities arise.

- *Regulatory Responses*

There have been changes in the number of sites recognised for protection in district and regional plans since 2004. Although information on changes to scheduled sites within the Hauraki Catchment is not available, changes in the sites scheduled within the Auckland region provides a useful proxy as an estimated 75% of the Regional heritage sites are within the Gulf Catchment. Figure 32, below, shows the number of sites recognised in district and regional plans by local authorities. Overall 109 more sites are recognised in plans in 2007 than were recognised in 2003. The most significant positive change[36] has occurred in Auckland City which now recognises 103 more sites than it did in 2003. This is a result of the Proposed Hauraki Gulf Islands Plan 2006 which scheduled a further 132 archaeological sites and 22 other heritage sites.

Figure 32 - Cultural heritage in the Auckland region scheduled in statutory plans 2000-2007



Source: ARC 2007e

- *Other strategies*

Apart from the work on-going with the Auckland CHI and the plan reviews and changes to update schedules (Rodney and Auckland City), little other heritage related work has been carried out by Forum members. Franklin District Council has, however, recently released a Heritage Strategy consultation document and is about to commission a cultural values assessment for the Kaiaua-Wharekawa area

[36] Figure 15 also shows an apparent significant reduction in scheduled sites in Rodney District. However, it appears that this may be a result of a change criteria applied to qualifying sites rather than the district plans reducing the number of scheduled sites. Rodney District Council reports a net increase of five scheduled sites as a result of decisions taken on its district plan.

to provide an overview of Ngati Paoa and Ngati Whanaunga values, concerns and issues.

- *Heritage planning guidelines*

The 2004 Report identified a lack of consistent effects based planning for cultural heritage across the Gulf. A paper setting out guidelines for effects based heritage planning was presented to the Forum in March 2007. To initiate a co-ordinated approach to this planning, it has been agreed that the Forum facilitate a workshop for the Gulf's heritage managers.

7.4 Conclusions

There is a huge legacy of cultural heritage in and around the Hauraki Gulf. The question is: are we maintaining those links with the past?

There is a high level of authorities granted by the HTP for modification of archaeological sites and this trend is probably growing (although this may be related to an increasing awareness of statutory requirements). The main driver for authorities to disturb such sites is urban development with forestry a significant secondary driver

Little is known about the trends associated with other (non archaeological) cultural heritage sites within the Gulf and its catchment.

There is on-going work to improve, and make more comprehensive, existing databases. Local authorities are generally adding to inventories of protected sites over time.

All this is occurring against a back drop of a resurgent Māori culture, increasingly asserting and applying its views and knowledge to the definition and management of the environment. There is greater recognition and use of matauranga Māori (use of traditional place names, legends and local histories) as a living part of our daily lives. However, it is not clear that this is being complemented by appropriate protection of sites and spiritual associations.

More needs to be done to change the focus of heritage assessment and management away from specific sites *to the comprehensive reality of Tikapa Moana with its connections to all things from the sky to the core of the Earth.* Tangata whenua need to be empowered to have a greater recognition and influence in the management of heritage in Tikapa Moana.

7.4.1 State of information

Information on cultural heritage within the Gulf and its catchment is generally poor. To extract even general information on the Gulf from the HPT database requires manual searching and detailed information requires review of individual files.

The CHI is an excellent resource but as with the HPT database is not designed to easily provide data for the Hauraki Gulf and of course it does not extend to the Waikato region.

Similarly, local authorities, which regulate the modification of cultural heritage do not, it seems, record data in a way that allows information to be easily extracted. None were able to provide basic data for this report on the number of applications received for modification to scheduled sites within the Gulf.

7.4.2 Change since 2004

It is not possible to comment on changes since 2004 and the 2004 report did not provide a quantitative baseline for comparison.

8 Forces beyond our control?

8.1 Pressures

The 2004 Report identified the Gulf at risk from five main natural hazards: coastal erosion, coastal flooding, extreme weather events (such as cyclones), change in sea level and tsunami. To this could have been added volcanic eruption.

The main hazard profile remains over time. What may change is:

- probability of hazards occurring (and potential severity of those hazards when they occur); and
- exposure to risk. That is, the scale of potential consequences from a specific event (e.g. number of people or amount of investment that might be affected by a hazard of an event of a given scale).

Hazards can be grouped into *climatic* (cyclones, storms, hurricanes, droughts, floods, temperature extremes); *biological* (epidemic or pandemic disease, new and virulent species); and *geological* (earthquake, tsunamis, volcanoes and landslide).

A driving force behind changes to the probability of severity of a climatic and biological hazard is climate change.

The driving force behind change to risk exposure is development pressure and the propensity for public and private investment to be made in high hazard risk locations. The trend towards greater coastal development is discussed elsewhere in this report.

8.1.1 Climate change

In 2007 the Intergovernmental Panel on Climate Change (IPCC) released its Fourth Assessment Report (IPCC, 2007). The Fourth Assessment Report (AR4) expressed greater confidence about many of the findings more tentatively expressed in earlier assessment reports. In particular AR4 notes:

- The warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level.
- Observational evidence from all continents and most oceans shows that many natural systems are being affected by regional climate changes, particularly temperature increases.
- Most observed increase in global-averaged temperatures since the mid-20th century is very like due to the observed increase in anthropogenic GHG concentrations.
- Continued GHG emissions at or above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would very likely be larger than those observed during the 20th century.

- Anthropogenic warming and sea level rise would continue for centuries due to the time scales associated with climate processes and feedbacks, even if GHG concentrations were to be stabilised.

While there is now higher confidence than in the Third Assessment Report in projected patterns of warming and other regional scale features there is still considerable uncertainty about the rate and extent of change and the localised impacts.

A study of climate change and natural hazards in Auckland (ARC et al 2006) noted that global climate models project that this century New Zealand is likely to warm by about two-thirds of the global mean temperature change. This is largely because its climate is controlled by the South Pacific and Southern Ocean which respond only slowly to global temperature changes (MfE 2001).

Given the Hauraki Gulf's geography, impacts will likely be different to other parts of New Zealand. According to NIWA (MfE 2004) towards 2080 Auckland could experience:

- A temperature increase between 0.6 and 3.8 degrees Celsius
- Drier springs and wetter summers
- More evaporation, and more frequent heavy rain events
- More frequent westerly winds
- A possible change to a more El Niño [37]- like average state.

The most likely scenario for sea level rise would see levels increase between 0.14m and 0.18m (relative to 1990 levels) by 2050 and between 0.31 and 0.49m by 2100.

Potential impacts on the Gulf from such climatic changes could include:

- Stress on *biodiversity and marine and terrestrial ecosystems* – from (a) the creation of a more viable habitat (including warmer sea temperature) for subtropical and tropical pests and diseases; (b) increased rates of physical change to estuarine and near shore systems and increased near shore turbidity caused by increased sedimentation, increased risk of wildfire.
- Stress on *water quality/quantity* – from contamination caused by stormwater or salt water intrusion, increased evapotranspiration (particularly over summer), reduced assimilation capacity, increased demand for abstraction.
- More *people and property* (including infrastructure) at risk from greater and more frequent flooding, storm surge, cyclones and coastal erosion.

At the global level there is also much concern about ocean acidification and the impacts continued acidification will have on marine shell-forming organisms and dependent species. While there is little known about the degree of acidification likely in the waters of the Hauraki Gulf, it is possible that long term acidification could impact negatively on shellfish/kaimoana.

[37] In El Niño years, New Zealand tends to experience stronger or more frequent winds from the west in summer, often leading to drought in east coast areas and more rain in the west. In winter the winds tend to be more from the south, bringing colder conditions to both the land and the surrounding ocean. In spring and autumn southwesterlies tend to be stronger or more frequent, providing a mix of summer and winter effects (NIWA website)

8.1.2 Climate change and Māori

Tangata whenua relate to the natural world (te taioa) through their whakapapa to, and respect for, the earth, sea and winds personified as Papatuanuku, Tangaroa and Tawhirimatea. Climate change is a reality which must be accepted, and has had negative impacts on the relationships and connections with this whakapapa. The Forum has agreed that matauranga Māori and kaitiakitanga should be integrated into its responses to environmental issues. The Forum's tangata whenua members can contribute to informing climate change responses through traditional methods, and in doing so help re-establish those essential connections.

Further, it has been recognised through consultation with Māori over climate change issues there are some potential policy implementations which impact inequitably on Māori.

8.2 State of the Gulf's resources

While it is not possible to identify the state of hazards, it is possible to calculate the current and projected risk of events occurring. Risk may change over time as better knowledge is gained on risk factors. It is also possible to determine the risk exposure.

8.2.1 Risk projections

The risk of natural hazards is affected by climate change. Figure 33 sets out the current risk of a natural hazard event in Auckland. The probability of climatic hazards takes account of the likely climate change outlined above.

Significantly, Figure 33 identifies the average recurrence interval for drought as once every five years by the late 2080s. The existing recurrence interval is once in 20 years.

Figure 33 - Probability of a Hazard Event in Auckland

Hazard	Probability in any one year	Probability in a 50 year period	
		%	1 chance in….
Earthquake			
Magnitude 6.0 earthquake 20km east of Auckland city	1 chance in 2000	2.5	1 chance in 40
Volcanic eruption			
Eruption from the Auckland Volcanic Field[38]	1 chance in 1000	4.9	1 chance in 20
Distant eruption from volcano like Mt Taranaki – 0.1km of magma erupted	Somewhere between 1 chance in 50 and 1 chance in 300	15-63	Somewhere between 1 chance in 7 and 1 chance in 2
Tropical cyclone			
140 kph wind gusts; 250-500 mm rain over 3 days atmospheric pressure =970hPa	1 chance in 100	39	1 chance in 3
Rain induced slope instability			
Based on 100 year cyclone event	1 chance in 1000	39	1 chance in 3

[38] Return period based on 20 events in the lat 20,000 years

Tsunami			
Large tsunami – wave height >5m	1 chance in 1000		1 chance in 20
Storm surge			
Total wave run-up Waitemata harbour of about 4.5m above mean sea level	1 chance in 100	39	1 chance in 3
Drought			
200 return period drought will provide the water supply system with 335,000m^3 of water per day	1 chance in 200	22	1 chance in 5

Source: ARC et al, 2006

8.2.2 Exposure to risk

Exposure to risk changes as development occurs in hazard prone areas. In the context of sea level rise, hazard prone areas may be any low lying coastal areas.

Environment Waikato monitors the number of properties on the Coromandel's eastern sandy beaches at risk from coastal erosion. Although the monitoring has not been updated in recent years the latest reported results show that there were a greater number of properties at risk (670) in 2004 than were at risk in 1995 (590).

A 2002 assessment of the Coromandel sandy shoreline showed that 35% of the shore was at risk and this was predicted to increase to 53% by 2100 based on a possible 0.5m sea level rise (which is at the top end of current predictions).

Another EW study found that within the Waikato part of the HGF catchment, there are 10,743 properties within or partly within the flood hazard lines, totalling 65,635 ha (out of a total catchment of 1,166,414 ha). This will include properties subject to river flooding rather than just coastal inundation.

8.3 Responses

8.3.1 Hazards planning

All territorial authorities have provisions in district plans relating to managing coastal hazard risk. Since 2004 three local authorities have initiated review of those provisions.

- Rodney District has notified Variation 61 to its District Plan. The variation addresses the risk of inundation and flooding in urban coastal areas. In essence the variation:
  - Provides a map overlay identifying the parts of the high and medium intensity residential zones along Rodney's East Coast, which are at risk of flooding due to coastal inundation.
  - Requires that high and medium density within identified "at risk" areas obtain resource consent to ensure that the form, location and design of intensive development addresses the level of hazard. The variation does not affect single dwellings.
- Franklin District Council has advanced Plan Change 14 which includes a new 60m coastal setback provision in the Seabird Coast Management Area (the Kaiaua coast area). Franklin is also preparing a Natural Hazards Plan Change.
- Thames Coromandel District Council (TCDC) is also about to notify a change to its District Plan that will refine existing provisions (setback controls for

erosion prone beaches) based on better technical assessment of risk and flood risk modelling for 14 of the Peninsula's flood prone catchments.

- Auckland City Council has reviewed its coastal hazard provisions for the Gulf Islands as part of the Proposed Hauraki Gulf Island Section of the District Plan. The Operative Plan only controls hazards that have been identified on the maps and listed in the hazards register. The Proposed Plan, which has a separate part of the Plan to address natural hazards, controls specific and general hazards. For example, there is flood prone land and erosion risk zones identified on the maps as well as there being general 'catch all' controls for natural hazard areas such as dune systems, steeply sloped land and coastal margins.

8.3.2 Works and other programmes

TCDC is working with EW and DoC on the Peninsula Project (see section 4.3.2). The Thames Coast Project[39], is a component of the Peninsula Project and has involved works and services in and around five western Coromandel coastal settlements. These works include stream channel protection works, flood control works (such as flood banks and bridge and culvert upgrades), land purchase and retiring of at risk properties.

8.3.3 Site specific hazard work

Several local authorities are working to identify solutions to specific high risk coastal hazards. These include:

- Auckland City working on response to coastal erosion risk at Onetangi Beach and Kennedy Point (both on Waiheke Island).
- TCDC is working with a group of Cooks Beach (eastern Coromandel peninsula) beach front property owners to resolve on-going erosion risk. TCDC and EW have researched options to protect private and public values.

8.3.4 Research

The ARC has commissioned a study to identify areas susceptible to coastal erosion on a regional basis. The study has yet to be released.

ARC and EW (in partnership with North and Bay of Plenty regional councils) have been involved in a project designed to confirm the existence of tsunami hazards on the East Coast over time. Through looking at past events an understanding has been gained about the likely size and source of future of events. The research has laid the foundation for mitigation planning.

Following from the above research, EW and TCDC instigated a programme in 2007 involving modelling and mapping tsunami inundation in Mercury Bay – an area identified as high risk from the previous work. The project will assess three other priority east coast settlements over the next three years.

In 2005, Rodney District Council commissioned a study of potential sea levels due to storms and climate change along Rodney's east coast. The study identified parts of the eastern coastal settlements including Waiwera, Orewa and Red Beach as areas that are subject to the risk of coastal inundation and flooding in a very severe

[39] Prioritisation of the Thames Coast followed extreme event and consequent damage associated with the 2002 weather bomb and the 2003 Easter Flood. The steep short catchments of the western Peninsula make its settlement particularly vulnerable to flooding.

storm event. This study led to the variation to the District Plan as discussed above.

Auckland City Council is currently commissioning a study to get specific data and predictions on rainfall, sea level rise, storm surge and inundations for the Auckland City area.

Manukau City Council has completed studies of sea level rise and rainfall intensity which will be used to update Engineering Quality Standards.

EW and TCDC have jointly undertaken a detailed assessment of the flood hazards for each of the five priority communities (Tararu, Te Puru, Waiomu/Pohue, Tapu and Coromandel township as part of the Thames Coast Project.

8.3.5 Climate change mitigation

Both regional councils and five of the nine city territorial authorities which are members of the Forum are members of the Communities for Climate Protection – New Zealand (CCP-NZ) programme. CCP-NZ is a programme that aims to support local authorities to inventory corporate and community greenhouse gas emissions, set emission reduction targets and take action to meet those targets.

Environment Waikato released a Draft Energy Strategy working document in 2007 and is working towards a final strategy in 2008. The strategy emphasises the facilitation of renewable energy and the need for energy efficiency.

The local authorities of the Auckland Region have prepared an *Auckland Sustainability Framework* which recognises the changes Auckland is likely to face over the next 100 years (including climate change). It sets a direction for long term planning to respond to these changes by focusing on developing a resilient region that can adapt to change by building strong communities and robust ecological systems, and designing flexibility into the economy, infrastructure and buildings.

8.4 Conclusions

Climate change is one issue that could have dramatic consequences for the people of Tikapa moana - the Hauraki Gulf.

Certainly climate change may have implications for the incidence and/or impact of a number of natural hazards which will affect the natural environment, biodiversity and public infrastructure as well as people and their property. There will be additional cultural impacts for Māori.

Although information is improving, there is still considerable uncertainty about what, where and how much will be affected. It is clear, however, that the risk of climate related hazards is likely to increase.

Are these forces beyond our control? To some extent they are but there are things we can do. We can be prepared for one, and local authorities of the Gulf all have civil defence and emergency management responsibilities that mean there should be effective responses when extreme events occur. We can also make sensible decisions about what we choose to put in the path of potential hazards.

On this score too, local authorities have an important role in land use control and there are signs that the increasing risk is being recognised in statutory plans. However, there is also evidence that some of this work may be too late for some.

The increasing number of properties in "at risk" areas does suggest that in at least some places we have yet to grasp the true extent of current and future hazard risk.

8.4.1 State of information

Whilst there is a lot of general information about hazard risk there is a lack of specific information about what our "on the ground" exposure to risk is and how that is changing over time. While the results of several one-off studies are reported here, there is no ability to report on trends over time reflecting an absence of regular systematic monitoring. Although there may be some community sensitivity about the disclosure of hazard information, developing a hazard risk indicator(s) should be a priority for the next state of the environment report.

8.4.2 Change since 2004

Because of the lack of regular monitoring, the change in risk exposure since 2004 is unknown.

References

ARC 2007a, Marine Receiving Environment Stormwater Contaminants: Status Report 2007, ARC Technical Publication No. 333.

ARC 2007b, Contaminant Monitoring in Shellfish, Results of the 2005 Shellfish Contaminant Monitoring Programme, ARC Technical Publication No. 332.

ARC 2007c, River Water Quality, State and Trends in the Auckland Region, ARC Technical Publication No. 336.

ARC 2007d, The New Zealand Mangrove: Review of the Current State of Knowledge.

ARC 2007e, State of Cultural Heritage in the Auckland Region 2007 (unpublished ARC working paper, July 2007.

ARC 2007f, Population Biology and Foraging Ecology of Waders in the Firth of Thames – Update 2007, ARC Technical Publication No. 347.

ARC 2007g, Proposed Auckland Regional Pest Management Strategy 2007-2012 (June 18 2007 Revision).

ARC 2006a, Central Waitemata Harbour Ecological Monitoring: 2000-2006, ARC Technical Publication No. 314.

ARC 2006b, Sediment Source Mapping in Mahurangi Harbour, ARC Technical Publication 321.

ARC 2006c, Environmental Awareness Survey 2005/06, ARC, Social and Economic Research and Monitoring Team, November 2006.

ARC 2006d, Stream, Lake & Coastal Water Quality January-December 2004, ARC Technical Publication 266.

ARC and ACC 2005, Auckland Waterfront, Vision 2040.

ARC et al 2006, Forces Shaping the 21st Century: Climate Change/Natural Hazards.

Baker, A.L. and Madon, B. (2007) Bryde's whales (*Balaenoptera* cf. *brydei* Olsen 1913) in the Hauraki Gulf and northeastern New Zealand waters. *Science and Technical Publishing,* Department of Conservation, Wellington

Beca 2006, Moorings Position Paper, April 2006.

BNZ 2006, Port of Auckland Baseline survey for non indigenous marine species (research programme ZBS 2000/045), Biosecurity New Zealand Technical Paper No: 2005/08.

Burgess, E. A. (2006). Foraging ecology of common dolphins (Delphinus sp.) in the Hauraki Gulf, New Zealand. Institute of Natural Resources (p. 143). Auckland, New Zealand: Massey University, 143 pp.

Constantine, R. (2001) Increased avoidance of swimmers by wild bottlenose dolphins (*Tursiops truncatus*) due to long-term exposure to swim-with-dolphin tourism. *Marine Mammal Science*, 17:689-702.

Constantine, R. (2002) The behavioural ecology of the bottlenose dolphins (*Tursiops truncatus*) of northeastern New Zealand: A population exposed to tourism.

PhD Thesis, School of Biological Sciences, The University of Auckland, New Zealand.

Constantine R, Brunton DH & Dennis T (2004) Dolphin-watching tour boats change bottlenose dolphin (*Tursiops truncatus*) behaviour. *Biological Conservation*, 117:299-307.

Colmar Brunton 2007, Omnibus Recreational Fishing Survey (for the Seafood industry Council), March 2007.

DoC 2006, Review of Camping Opportunities in New Zealand, Report to the Minister of Conservation.

EW, 2007, Potential for Reducing Nutrient Loads from the Catchments of Shallow Lakes in the Waikato Region, Environment Waikato Technical Report 2006/54.

EW 2007a, Trace Elements in Sediments of the Lower Eastern Coast of the Firth of Thames, Environment Waikato Technical Report 2007/03.

EW 2007b Regional Rivers Water Quality Monitoring Programme: Data Report 2006. Environment Waikato technical report 2007/12.

FAO 2006, The Sate of World Fisheries and Aquaculture 2006, Food and Agriculture Organisation of the United Nations.

Hartill, R Bian, H Armiger, M Vaughan, N Rush, 2007, Recreational Marine harvest estimates of snapper, kahawai, kingfish in QMA1 2004/05, NZ Fisheries Assessment report 2007/26.

Hitchmough, R., Bull, L,. and Cromarty, P.(compilers), New Zealand Threat Classification System 2005, Science and Technical Publishing, Department of Conservation.

IPCC 2007, Fourth Assessment Report, Climate Change 2007: Synthesis Report

Lee, M, 1999, Biota of Seven Islets off Waiheke Island, Inner Hauraki Gulf, published in Tane 37 99-136 (1999)

Metrowater, 2007a, Auckland Waterways, Issue 9, January 2007.

Metrowater, 2007b, Asset Management Plan July 2007 to June 2027, Metrowater.

MfE, 2001, Climate Change Impacts on New Zealand, Ministry for the Environment and New Zealand Climate Change Office.

MfE 2005, Wai Ora: Report of the Sustainable Water Programme of Action Consultation Hui.

NIWA, 2006, Mangrove-habitat Expansion and Sedimentation, Southern Firth of Thames Progress report, July 2006, NIWA/Environment Waikato.

NIWA, 2005, Forecasts of Possible Phytoplankton Responses to elevated riverine Nitrogen Delivery into the Southern Firth of Thames. NIWA client report, November 2005.

O'Callaghan, T.M. and Baker, C. (2002) Summer cetacean community, with particular reference to Bryde's whales, in the Hauraki Gulf, New Zealand. *Science Internal Series 55*, Department of Conservation, Wellington

Peart, 2007, Beyond the Tide: Integrating the Management of New Zealand's Coasts.

Rayner, M.J., Hauber, M.E., Clout, M.N. (2007). Breeding habitat of the Cook's Petrel (*Pterodroma cookii*) on Little Barrier (Hauturu): implications for the conservation of a New Zealand endemic. *Emu*, 107, 59-69

Rayner, M.J., Hauber, M.E., Clout, M.N., Bury, S.J., & Phillips, R.A. (ms). Foraging ecology of the Cook's petrel during the austral breeding season: a comparison of two populations

Stewart P and R 2006, Review of Thames Coromandel District Council Conservation Covenants 1998 to 2006.

Schaffar-Delaney, A. (2004). Female reproductive strategies and mother-calf relationships of common dolphins (Delphinus delphis) in the Hauraki Gulf, New Zealand. Zoology (p. 221): Massey University, New Zealand, 221 pp.

Stockin, K. A., & Visser, I. N. (2005). Anomalously pigmented common dolphins (Delphinus sp.) off northern New Zealand. Aquatic Mammals, 31(1), 43-51.

Stockin, K. A., Lusseau, D., Binedell, V., Wiseman, N., & Orams, M. B. (2008). Tourism affects the behavioural budget of the common dolphin (Delphinus sp.) in the Hauraki Gulf, New Zealand. Marine Ecology Progress Series, 355, 287-295

Stockin, K. A., Pierce, G. J., Binedell, V., Wiseman, N., & Orams, M. B. (in press). Factors affecting the occurrence and demographics of common dolphins (Delphinus sp.) in the Hauraki Gulf, New Zealand. Aquatic Mammals.

Stockin, K. A., Law, R. J., Duignan, P. J., Jones, G. W., Porter, L. J., Mirimin, L., Meynier, L., & Orams, M. B. (2007). Trace elements, PCBs and organochlorine pesticides in New Zealand common dolphins (Delphinus delphis). The Science of the Total Environment, 387, 333 - 345.

Suisted, R. & Neale, D. (2004) Department of Conservation Marine Mammal Action Plan for 2005-2010. Department of Conservation, Wellington.

Appendix 1 – Non indigenous species recorded from the Port of Auckland[40]

Phylum, Class	Order	Family	Genus and species	Probable means of introduct-ion	Date of introduction or detection (d)
Annelida					
Polychaeta	Sabellida	Serpulidae	*Hydroides elegans*	H or B	Pre-1952
Bryozoa					
Gymnolaemata	Cheilostomata	Bugulidae	*Bugula flabellata*	H	Pre- 1949
Gymnolaemata	Cheilostomata	Bugulidae	*Bugula neritina*	H	1949
Gymnolaemata	Cheilostomata	Lepraliellidae	*Celleporaria* sp.1 (NR)	H	Nov, 2002 (d)
Gymnolaemata	Ctenostomata	Nolellidae	*Anguinella palmata*	H	1960
Cnidaria					
Hydrozoa	Hydroida	Campanulariidae	Obelia longissima	H	Pre- 1928
Hydrozoa	Hydroida	Pennariidae	Pennaria disticha	H	Pre-1928
Crustacea					
Malacostraca	Brachyura	Portunidae	Charybdis japonica	H or B	Sep. 2000 (d)
Mollusca					
Bivalvia	Ostreoida	Ostreidae	Crassostrea gigas	H	1961
Bivalvia	Veneroida	Semelidae	Theora lubrica	B	1971
Porifera					
Demospongiae	Halisarcida	Halisarcidae	Halisarca dujardini	H or B	Pre-1973
Urochordata					
Ascidiacea	Stolidobranchia	Styelidae	Cnemidocarpa sp. (NR)	H	Dec 2001 (d)
Vertebrata					
Actinopterygii	Perciformes	Gobiidae	Arenigobius bifrenatus	B	1998(d)

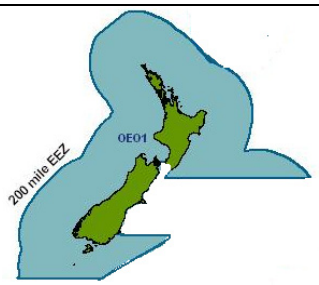
Source: BNZ, 2006

Note: "NR" denotes new record meaning not previously recorded.

[40] "H" demotes hull and "B" ballast.

Appendix 2 - Changes to the Total Allowable Catch for species caught in the Hauraki Gulf

Stock	Year	Area covered	Old TAC (tonnes)	New TAC (tonnes)
School shark 1 (SCH 1)	2007		668 (TACC)	893(TAC)* 689 (TACC)
Tarakihi 1 (TAR 1)	2007		1959	2029
Orange roughy 1 (ORH 1)	2007		1470	914#
Hoki 1 (HOK1)	2007		101040	91040

Oreo 1 (OEO 1)	2007		5033	2500
Short finned eels (SFE 20 and 21 LFE 20)	2007		(SFE 20) 211 (SFE 21) 210	148 181
Long finned eels (LFE 20 and LFE21)	2007	Same as short finned eels	(FHE 20) 67 (LFE 64)	30 60
Orange roughy 1 (ORH1)	2006	See above	1470	1470
Sea perch 1(SPE 1)	2006		20	35
Orange roughy 1 (ORH1)	2006	See above	1470	1470
Alfonsino 1(BYX 1)	2006		300	300

* TAC set for the first time

Subject to judicial review

There was no change in the TAC for species not listed in the above table