



Air quality 2006/07

Key points:

- The region had low air pollution levels, with just three nights in Masterton (winter 2006) when high pollution was recorded and one night in Wainuiomata (winter 2007).
- Particulate matter (PM₁₀) was the only pollutant to exceed the national environmental standards for air quality.
- Pollution levels are worst during cold, clear and calm weather when contaminants may build up in air within valleys.
- Domestic fires are the main contributors to air pollution in winter.

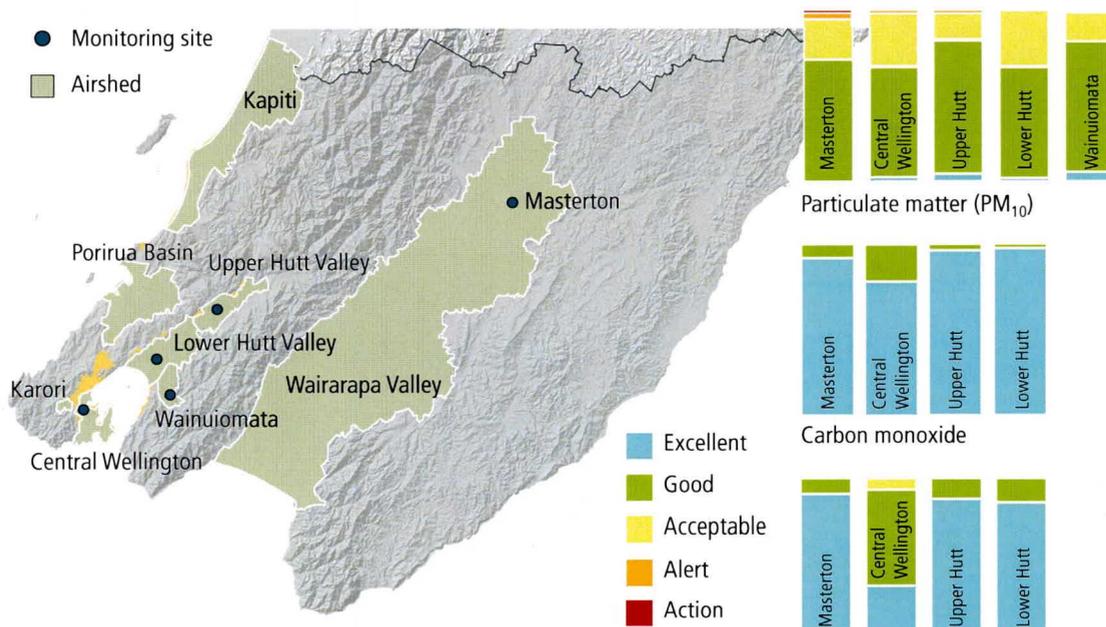
What happened during the year?

Monitoring programme

Greater Wellington monitors the real-time concentrations in air of three key pollutants - particulate matter (PM₁₀), carbon monoxide and nitrogen dioxide - at five permanent stations and two mobile road-side stations. If levels of these pollutants are too high, people's health can suffer. The effects range from respiratory irritation to premature death for people with existing heart and lung disease. The monitoring results are compared with national environmental standards and guidelines that are designed to protect those who are particularly vulnerable to the effects of air pollution, such as children and the elderly.

Regional air quality in 2006

The quality of our region's air is shown in the bar graphs below. These graphs show the proportion of the 2006 year that air pollution levels fall into a particular air quality category. The five colour categories grade air pollution levels according to their relative health risk to people. The lowest level of risk is "excellent" (blue) where the contaminant concentrations are less than 10 percent of the limit set by the national environmental standards. The highest level of risk is "action" (red) where the contaminant concentrations exceed the limit set by the national environmental standards. Greater Wellington's long-term target is to achieve air quality that is "acceptable" or better. This means contaminant concentrations must be less than 66% of the national environmental standards.



The bar graphs show how much time during 2006 contaminant levels fell into five different air quality categories that grade pollution levels according to their relative health risk. The lowest level of risk is "excellent" and the highest level of risk is "action" which also means that the national environmental standard for a contaminant has been exceeded.

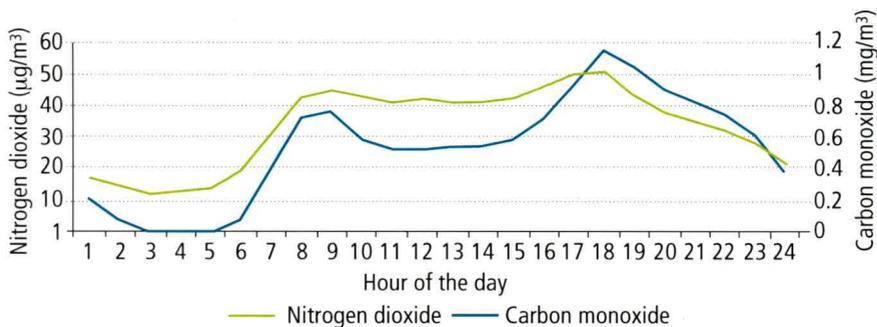
Pollution levels in the region were low in the 2006 calendar year. Carbon monoxide and nitrogen dioxide levels measured across the region were mostly "excellent". As expected, the level of nitrogen dioxide at the central Wellington monitoring site was higher than at the other monitoring sites but was still mostly "good" (between 10 percent and 33 percent of the national environmental standard).

There were 15 days in Masterton, two days in Upper Hutt and in Wellington central, and one day in Lower Hutt where air quality failed to meet "acceptable" levels for particulate matter (PM₁₀).

Roadside air quality

Vehicle exhaust fumes contain pollutants that, in sufficient concentrations, can harm people's health. Greater Wellington has a permanent monitoring station at the corner of Vivian and Victoria Streets in central Wellington. Temporary stations are currently set-up beside State Highway 2 at Melling Bridge in Lower Hutt and at Ngauranga Gorge in Wellington.

Although levels of carbon monoxide and nitrogen dioxide are higher than at the residential sites we monitor, the air quality measured in 2006 is well within the national environmental standards and does not pose a risk to people's health.



This graph shows a full year of data for two pollutants averaged hour by hour at the central Wellington roadside monitoring station during 2006. Concentrations of carbon monoxide and nitrogen dioxide have noticeable peaks during the morning and afternoon rush hours, when traffic volumes and congestion are highest.

What is Greater Wellington doing?

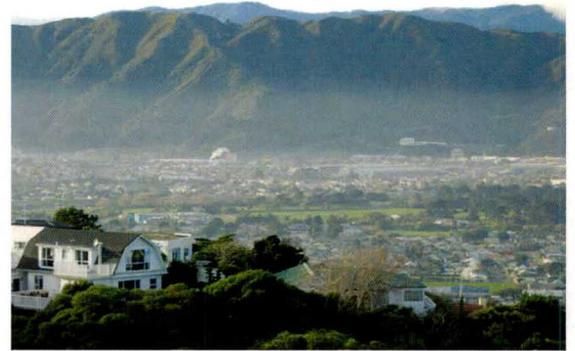
- **Monitoring.** We have a network of air quality monitoring stations around the region that track air pollution levels. The network includes permanent air quality monitoring stations in central Wellington, Lower Hutt, Upper Hutt, Wainuiomata and Masterton, and two mobile monitoring stations to monitor roadside air quality. We expanded this network into Tawa (Porirua airshed) and Karori in 2007.
- **Education.** We are working with school children through our Take Action programme to educate them about the effects of the way we live on air quality and what they can do to reduce air pollution.

What can you do?

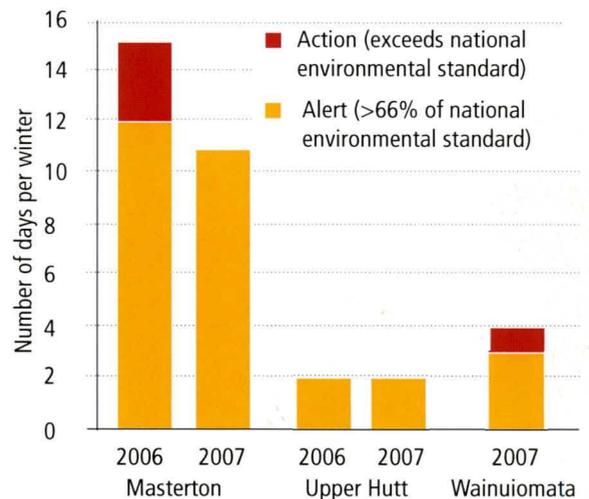
- Keep your vehicle tuned and serviced to reduce polluting smoke and fumes.
- Insulate your house effectively and burn only clean, dry wood in your fireplace. After starting the fire, leave the air controls open for at least half an hour to help the wood burn well and build up a good temperature.
- Don't burn rubbish - in the fireplace or outside. Send paper and plastic for recycling and compost green waste.

Wintertime particulate pollution

Masterton, Upper Hutt and Wainuiomata are susceptible to particulate pollution arising from domestic woodburning fires on still, cold and clear evenings. Smoke containing particulate matter (PM₁₀) builds up in valleys and is not dispersed until the following morning when the ground heats up and the air starts to circulate.



Lower Hutt the morning after. Although the smoke pollution from the night before is reducing visibility, the levels of particulate matter (PM₁₀) on this winter morning in July 2007 were in the "acceptable" category and met the national environmental standard.



This graph shows the number of days during the last two winters where particulate matter (PM₁₀) concentrations were at the "alert" or "action" level and so failed to meet Greater Wellington's long-term target of having "acceptable" air quality or better. During the 2007 winter there was one day in Wainuiomata where PM₁₀ levels reached the "action" level and exceeded the national environmental standard. No continuous data were available for Wainuiomata during the 2006 winter.

More information

Some of the information in this card is a summary of the 2006 annual air quality monitoring report, which is available on our website at www.gw.govt.nz/envreports.

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Rainfall and river flows 2006/07

Key points:

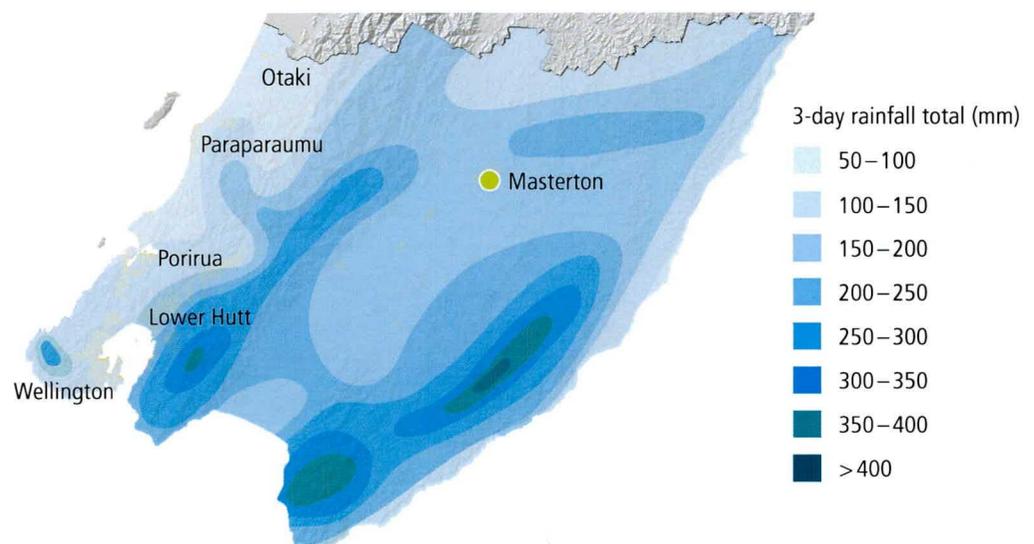
- Storms during July 2006 resulted in the Ruamahanga floodway system operating for a record length of time and very high levels in Lake Wairarapa.
- Autumn 2007 was unusually dry throughout the region; it was the second driest autumn in 118 years of record in Wainuiomata, and many places had less than half the long-term average rainfall for autumn.
- The Wairarapa plains and eastern Wairarapa hills had particularly low rainfall in autumn and soil moisture in these areas remained well below average right through until late June 2007.

What happened in 2006/07?

Floods of July 2006

The 2006/07 year got off to a very wet start, with two storms in quick succession in July 2006 resulting in flooding in parts of the Wairarapa (see photo in *Natural hazards* report card). More than 300 mm of rain fell over 72 hours between 4th and 7th July in the eastern Wairarapa hills, Aorangi Range and Orongorongo Range (see map). Severe surface flooding occurred on the Wairarapa plains and there were very high river flows in many of the region's rivers including the Wainuiomata, Mangaroa, Ruamahanga and eastern Wairarapa rivers.

The July floods were unusual because of their long duration. The Ruamahanga floodways operated for about 64 hours (nearly three days) which makes it the longest flood through the floodway system. As a result, Lake Wairarapa (which receives flow from the floodways) reached 12.2 metres, its highest level since the diversion scheme was completed in the mid-1970s.



Rainfall from 9am on 4 July to 9am on 7 July 2006. The map shows that the areas of highest rainfall were the south eastern Wairarapa hills, Aorangi Range, and Orongorongo Range. See the *Natural hazards* report card for a photo of the Gladstone area in flood after this rainfall event.

From floods to droughts

Following the wet start, there was a relatively dry summer, after which the weather got even drier with rainfall in autumn (March to May) less than half the long-term average for the season in many parts of the region. May was particularly dry, with only 8 mm of rainfall in the eastern Wairarapa hills and 6.6 mm in Masterton – about 10% of May's average rainfall. In the Wainuiomata catchment it was the second driest autumn in 118 years of record, the driest being autumn 2001.

The areas that were particularly hard-hit by the autumn drought were the Wairarapa plains and eastern Wairarapa hills. Greater Wellington's monitoring records show that soil moisture in these areas remained well below average right through until the end of June 2007.

New technology for measuring river flow

Greater Wellington has recently purchased two Acoustic Doppler Current Profilers (ADCP) for measuring river flow. The ADCP units are mounted on small flotation devices and use wireless technology to communicate with a computer. The main advantage of this is that when flows are too high and dangerous to wade through, but are not high enough to use more traditional flood gauging gear, they can still be measured accurately. Accurate river flow measurements are vital for flood analysis.



A Greater Wellington staff member testing the new river flow measurement equipment on the Otaki River.

What is Greater Wellington doing?

- Monitoring rainfall, river flows and lake levels at over 70 automatic recording stations across the region. In 2006/07 we installed two new rain gauges (one in Paekakariki and one near Martinborough) and three new stream flow monitoring stations (in the Mawaihakona, Mangatarere, and Parkvale streams). The rain gauges help with flood warning, while stream flow monitoring helps us manage the water resources during times of low flow.
- Operating a flood warning system, which involves monitoring river levels, forecasting flood peaks, and issuing warnings to people who may be affected.
- Operating an automated warning system that notifies Greater Wellington staff when river flow conditions have been low enough for long enough to encourage potentially toxic cyanobacteria (blue-green algae) to proliferate.
- Checking compliance with resource consents to take water from rivers and streams, and issuing water restrictions when appropriate.

Investigating instream flow requirements

Greater Wellington has an on-going programme of investigating the flow requirements for sustaining river ecosystems and other instream values of rivers. The information gained from these investigations is used to set minimum flows in the Regional Freshwater Plan. Resource consents for taking water from rivers usually have a condition requiring the consent holder to cut back on their abstraction when river flows approach a "minimum flow", so that ecological and sometimes recreational values of the river are protected.

This year, we began a study of the suitability of the minimum flow policy for the Lower Ruamahanga River. A preliminary report produced in March found that the river has very high value for recreation and aquatic ecology, but these values are threatened at times by low river flows and poor water quality. Additional investigations since then have been to collect continuous water quality data to identify links between river flows and water quality, and study how aquatic habitat is affected by changes in river flow.



Greater Wellington staff members measuring flow and hydraulic characteristics of the Lower Ruamahanga River. This information is fed into a model which calculates how fish habitat is affected by changes in river flow.

What can you do?

Conserve water by watering your garden deeply once or twice a week during dry spells, rather than watering lightly every day. This encourages deeper-growing roots, making the plants more able to survive drought. You can also check our website to see how much rainfall there has been in your area.

More information

Some of the information in this card is a summary of the more detailed 2006/07 annual hydrology monitoring report which is on our website at www.gw.govt.nz/envreports.

Current river flow, lake level and rainfall data, along with other environmental monitoring data, are posted on our website: www.gw.govt.nz. 'Quick links' to river levels or rainfall are on the right hand side of the main page. This information is updated frequently throughout the day.

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Groundwater 2006/07

Key points:

- A wetter than average spring in 2006 led to high groundwater levels in shallow aquifers, particularly in the Wairarapa.
- Deeper confined aquifers showed some recovery after the wet spring but many had record low levels in late autumn.
- An unusually dry autumn with associated abstraction reduced groundwater levels in shallow aquifers to below average levels.
- Routine groundwater quality monitoring of 71 bores identified high nitrate levels in four bores, while bacteria were detected in nine.
- Low levels of pesticides were detected in two of 17 bores tested in late 2006.

What happened in 2006/07?

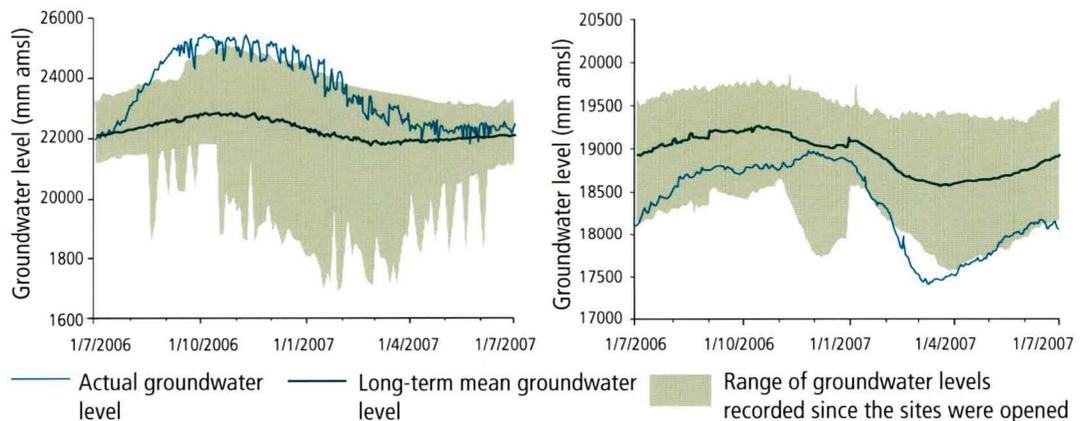
Groundwater quantity

In 2006, a wet spring resulted in higher than average recharge to rainfall-fed aquifers, particularly in the Wairarapa. This led to high groundwater levels in shallow aquifers, with many aquifers reaching record highs. In contrast, autumn 2007 was drier than average. This resulted in high water levels falling back to average or below average.

Deeper confined aquifers on the Kapiti Coast and in the Wairarapa did not respond as strongly to these weather extremes. While they recovered to average levels after the wet spring, they generally fell back to below average later in the year, reflecting abstraction pressures and long term effects of reduced recharge over the last decade.

Monitoring bore S27/0571 at Martinborough, Wairarapa

Monitoring bore S25/5208 at Te Horo, Kapiti



Groundwater levels in the shallow aquifer around Martinborough (left) reached record highs after above average rainfall recharge over spring. In contrast, the deep confined aquifer in the Te Horo area (right) had below average levels throughout the year, some the lowest on record. This is shown by the blue line dropping below the grey shaded area, which shows the lowest groundwater levels recorded since monitoring began. Next year Greater Wellington plans to investigate the effects of changing groundwater levels on a wetland system in the Te Horo area.



Construction of a new saline intrusion monitoring bore in early 2007 at McEwan Park in Petone. The completed bore will supplement the existing monitoring network and help safeguard the Waiwhetu Aquifer in Lower Hutt. Saline intrusion can occur when an aquifer flows into the sea (such as in Lower Hutt) and too much fresh groundwater is pumped from the aquifer allowing sea water to move inland. Seawater contaminates water in aquifers, making it unsuitable for drinking. Good groundwater management and monitoring can help reduce the risk of saline intrusion occurring.

Groundwater quality

During 2006/07, Greater Wellington monitored groundwater quality every three months at 71 sites across the region. Water samples were tested for a range of physical, chemical and microbiological parameters including faecal bacteria, nutrients and metals.

Last year's sampling results revealed nine samples (from four irrigation bores in Kapiti and the Wairarapa) with high nitrate levels and 12 samples (from nine sites in Kapiti, Wairarapa and Wainuiomata) with bacteria levels above detection. No sites had high levels of both nitrate and bacteria. The highest nitrate-nitrogen concentration recorded was 12.3 mg/L (the drinking water standard is 11.3 mg/L), and the highest *E. coli* bacteria count recorded was 2,800 cfu/100ml from a bore in Wainuiomata, indicating contamination from sewage, farm effluent or wildlife. Water with any *E. coli* in it is unsuitable for drinking.

In addition to routine monitoring, some specific groundwater quality investigations carried out last year were:

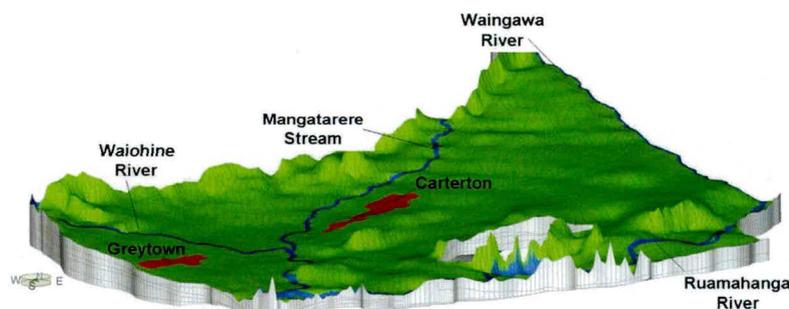
- Monitoring the effects of on-site wastewater system discharges on groundwater quality at Flat Point and Riversdale in the eastern Wairarapa. The groundwater aquifers in these areas are shallow and considered to be at risk of contamination, especially at Riversdale.
- Monitoring nitrate levels in 48 bores in the Carterton, Matarawa and south Featherston areas. This survey took place over the 2006-07 summer, and found elevated nitrate levels, but only one result exceeded the national drinking water standard.
- Monitoring pesticides in 17 bores across the region. Very low levels were found in two bores, with nothing detected in any of the others.

Wairarapa groundwater model

The increase in demand for groundwater in the Wairarapa Valley for irrigation (from around 200,000 cubic metres per day in 1996 to over 400,000 cubic metres in 2005) prompted Greater Wellington to undertake a comprehensive study of the Wairarapa groundwater system. Phase one of the project, which was completed in December 2006, was to develop a model to define key recharge areas, groundwater flow directions and groundwater discharge areas.

Phase two is now underway and involves refining the model to simulate groundwater flows under current and projected abstraction demands. To help with Phase two, a groundwater meter survey (water use) was carried out, along with river flow gaugings and numerous computer-based exercises such as the development of a rainfall recharge model.

When completed, the model will help us to identify areas that cannot sustain any more abstractions, or where existing allocations are too high or too low. This is particularly important for the sustainable management of the groundwater resource and so that streams, springs and wetlands connected to shallow groundwater don't dry up.



A three dimensional view of the first of three detailed modelling areas between Greytown and the Waingawa River in the Wairarapa. The picture outlines the land surface and a stretched thickness of the aquifer system being modelled.

What is Greater Wellington doing?

- Monitoring groundwater quality at quarterly intervals at 71 sites across the region to check long-term changes in water quality.
- Monitoring groundwater levels at 128 sites across the region.
- Targeted monitoring of nitrate levels in the areas of the region most vulnerable to contamination.
- Developing a groundwater model of the Wairarapa Valley to improve our understanding and management of this large groundwater resource.
- Establishing groundwater monitoring sites around key surface water systems such as rivers, streams, springs and wetlands.
- Installing equipment in new monitoring wells along the Petone foreshore to monitor saline intrusion in the Waiwhetu aquifer in Lower Hutt.

What can you do?

- If you have your own bore for a domestic water supply, get the water tested regularly, we suggest annually. Greater Wellington staff can advise on how to get the water tested.
- Apply for resource consents before drilling any bore, and if you wish to take more than 20,000 litres of water per day.

More information

Some of the information in this card is a summary of the 2006/07 annual groundwater monitoring report which is available on our website at www.gw.govt.nz/envreports. If you would like to know more about groundwater, visit our website at www.gw.govt.nz or contact:

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Harbours, estuaries and beaches 2006/07

Key points:

- The Wairarapa coast has a wide range of coastal shoreline habitats, most having 'low' or 'low to moderate' ecological vulnerability.
- Preliminary results from a survey of sediments from the Wellington Harbour sea floor showed elevated lead and mercury levels at some sites.
- A survey of Wellington Harbour's sea floor revealed 102 animal species, mostly native crustaceans, molluscs and worms.

What happened in 2006/07?

Coastal habitat surveys

In December 2006, we surveyed all major coastal shoreline habitat types along 217 km of Wairarapa coast from the Owahanga River estuary (north of Castlepoint) to Baring Head on the Wainuiomata coast. The rocky shores, sandy beaches, dunes, gravel berms and estuaries provide a wide range of habitats for coastal species. We wanted to find out the existing condition of these habitats, and their susceptibility to adverse effects from such things as erosion, nutrient enrichment and habitat loss.

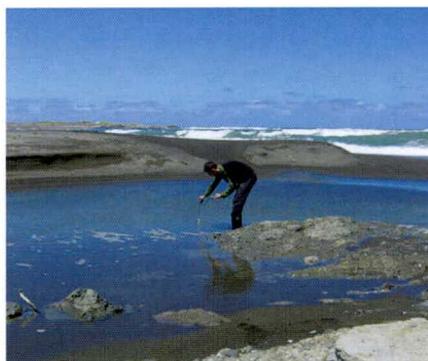
The rocky shores in the north have soft rock types like sandstone that species like molluscs live on, while around Cape Palliser and Baring Head the harder greywacke rocks are covered in bull-kelp and support a wide range of species.

Flat sandy beaches and steep gravel beaches are both relatively common. The mid beach areas provide the best habitat and species living there rely on organic matter from the sea.

The most extensive duneland areas are at Mataikona, Castlepoint, Riversdale, Ureti Point, Flat Point, Tora and Whiterock. Most "backdunes" have been converted to agriculture and are now grazed, and the foredunes are dominated by the introduced marram grass. Only Whatarangi and Te Humenga Point at Cape Palliser were dominated by the native sand-binders spinifex and pingao.

As well as 60 to 70 small river mouth estuaries, the Wairarapa coast has 12 river mouth lagoons, one shallow coastal estuary (Lake Onoke) and one tidal river estuary (Whareama River). The high wave energy and significant long-shore drift of the Wairarapa coast cause sand or gravel barriers to build up at many river mouths, and sometimes small brackish lagoons form on the river side of those barriers. Most Wairarapa estuaries are short and narrow so provide limited ecological habitat.

Most of the coastal habitats surveyed rated in the 'low' or 'low to moderate' classes for ecological vulnerability. The major issues identified were loss of habitat and biodiversity from sea level rise associated with climate change, coastal erosion, impacts on sediment and water quality from land use intensification (e.g., Lake Onoke), and invasion of marram grass.



Checking salinity at the mouth of the Otarei River on the south eastern Wairarapa Coast.



Many river estuaries on the eastern Wairarapa coast are extremely susceptible to water and sediment quality degradation when the river mouths are blocked. This is the case for the Rerewhakaaitu River (pictured). The closing of the river mouths is a natural process – in high river flows, the mouths are reconnected with the sea and are flushed clean.

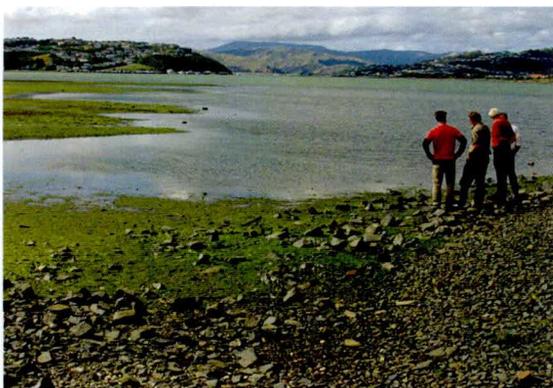
Porirua Harbour risk assessment

In April 2007, Greater Wellington and Porirua City Council commissioned a review of the key issues and risks to the health of the Porirua Harbour system, including areas where further investigations or research may be required. The review confirmed that the key risks to the health of the harbour are high inputs of sediment, poor sediment quality, nuisance growths of macroalgae (such as sea lettuce), microbiological contamination, and habitat loss.

The effects and extent of these risks are not well understood and so a range of monitoring was recommended, incorporating:

- broadscale mapping of the existing inter-tidal sediment and vegetation types, including eel grass and salt marsh beds as well as macroalgal density;
- installation of sedimentation plates to measure sedimentation rates on an annual basis; and
- fine-scale monitoring of selected sediment condition indicators such as heavy metals, organic matter, sediment grain size and macroinvertebrate abundance and diversity.

This monitoring is set to commence later in 2007.



Assessing the coverage of sea lettuce (*Ulva* sp.) and eelgrass (*Zostera* spp.) growing on the inter-tidal flats at the southern end of the Onepoto Arm of the Porirua Harbour. Sea lettuce, although edible, is often an indicator of nutrient enrichment. Eelgrass favours muddy areas and forms beds important for sediment deposition and stabilisation, as a place for some algae and invertebrates to live, and as nursery grounds for many species of fish and shellfish.

More information

The information in this card is a summary of the more detailed 2006/07 annual coastal monitoring report, which is available on our website at www.gw.govt.nz/envreports.

For any other information, please contact:

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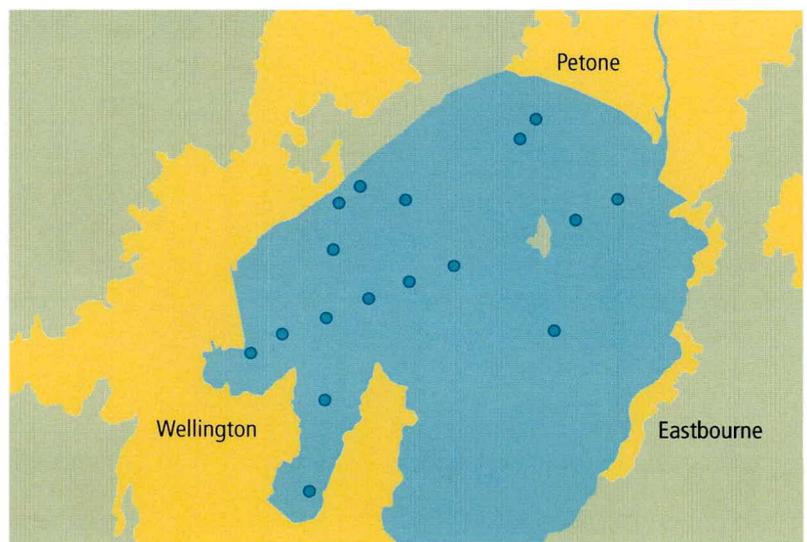
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Wellington Harbour sediment quality investigation

During October and November 2006, samples of harbour sediment and benthic fauna – animals that live on or in the sea floor – were collected from 17 locations in Wellington Harbour. This was the first comprehensive survey of sediment quality in over 20 years, and provides an up-to-date picture of contaminant levels and the animals that live on or in the sediment.

The sediment samples are being analysed for contaminants commonly found in stormwater and industrial discharges, such as heavy metals, organochlorine pesticides, polycyclic aromatic hydrocarbons, and organotin compounds. Preliminary metal results indicate a number of sites had lead and mercury concentrations above the national sediment quality guidelines.

Polychaetes (annelid worms), crustaceans, bivalve molluscs and nemerteans (ribbon worms) were the most common of the 102 species of benthic animals found. Of these, all were native except one, the bivalve *Theora lubrica*.



These 17 sites in Wellington Harbour were sampled for sediment and benthic fauna (animals that live on or in the sea floor) over October-November 2006. At each site, scuba divers collected 25 sediment cores and 8 benthic fauna cores.

What is Greater Wellington doing?

- Periodically monitoring sediment quality and ecological health in sensitive receiving environments such as the Porirua Harbour.
- Preparing a coastal monitoring strategy that addresses monitoring requirements relating to such things as coastal water and sediment quality, ecological health and contaminants in shellfish flesh.
- Supporting eleven care groups working on improving dunes, beaches, estuaries and a coastal escarpment.

What can you do?

Save the drain for rain. Stormwater drains go from the roadside directly to streams or the coast. Never put paint, oil or any other waste into stormwater drains. Paints (oil and water-based) and thinners are toxic to aquatic life, and discolour streams and coastal water.



Pollution control 2006/07

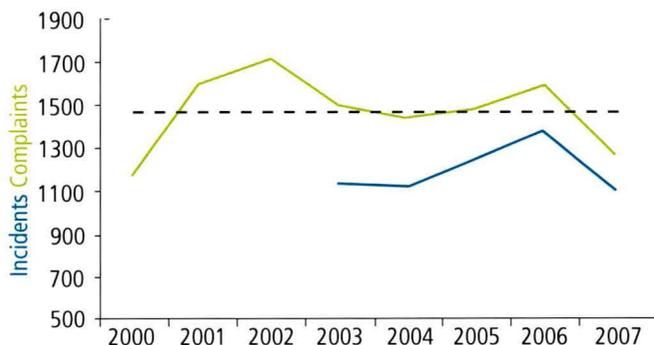
Key points:

- Environmental incidents were down 20% from last year, with odour showing the biggest decrease.
- Enforcement action was up 21% from last year.

Incident response

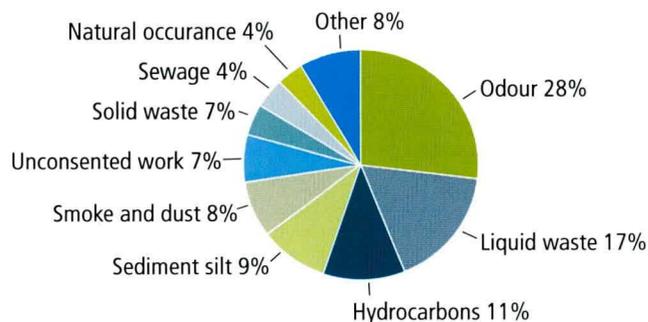
During the 2006/07 financial year, we responded to 1,264 complaints about 1,106 environmental incidents (some incidents, like odour, prompted more than one complaint). This was a significant decrease from the 1,579 complaints about 1,368 incidents last year. An "environmental incident" is an activity that should be authorised under the Resource Management Act 1991, such as discharging a contaminant to the environment, taking damming or diverting water, or disturbing the bed of a river or the coastal marine area.

Environmental incidents in the Wellington region



There was a 20 percent reduction in both complaints and environmental incidents from those reported to our Pollution Hotline in 2005/06. Objectionable odour affecting neighbours still makes up the largest proportion of reported incidents, though is less than previous years.

The decrease in odour complaints is attributed to continued odour control improvements at key source sites including the sewage treatment plant at Moa Point, the landfill, composting plant and sewage sludge de-watering plant at Careys Gully in Wellington, and Taylor Preston's meat processing plant in Wellington.



Significant incidents

The following environmental incidents were deemed significant because of their potentially high impact on the environment. Some led to enforcement action.

In August 2006 a large slip in Kelson, Hutt City, caused a sewer main to break and discharge raw sewage into a local creek. Remedial action was taken to divert sewage away from the stream and back into another branch of the sewer network. A sign was put up at the discharge point in the stream where the clean-up operation took place, and water quality monitoring set up to check when there were no longer any effects of the sewage on the stream.

A Featherston landowner was issued an abatement notice for two unauthorised discharges of dairy shed effluent which entered a tributary of the Tauherenikau River, and another for dumping a truckload of demolition materials into old oxidation ponds on his property. He received two infringement fines of \$750 each for these offences.

An engineering consultancy in charge of a large subdivision site in Newlands, Wellington was responsible for sediment laden water discharging to the Porirua Stream in breach of resource consent conditions, and for illegally filling in two unnamed tributaries of the Porirua Stream. It received a \$750 infringement fine for the illegal discharge and a \$500 infringement fine for the illegal reclamations.

Two people were each issued an abatement notice requiring them to stop the illegal disposal of tyres – one to land and another into a stream. Both were asked to remove the tyres by mid December 2006 but both failed to do so and were each issued an infringement notice for \$750 on 13 March 2007.

Prosecutions

Tenga Pickering Contracting Ltd and Tonkin & Taylor Ltd were charged in July 2006 for discharging sediment laden water from a large sediment pond at Silverstream Landfill into Hulls Creek and the Hutt River in January 2006.

Charges were withdrawn against Tonkin & Taylor, while Tenga Pickering Contracting Ltd was convicted on two charges after pleading guilty, and the Environment Court agreed to restitution offered by both parties of \$10,000. The restitution amount, to be managed by Greater Wellington, will be used for environmental enhancement works in the Hulls Creek and Hutt River area.

Burrell Demolition Ltd and Alex Burrell were charged in November 2005 for the unauthorised laying of a pipe in a tributary of Owhiro Stream at C&D Landfill, in Wellington in August 2005. Charges were withdrawn against Alex Burrell, while Burrell Demolition Ltd was convicted on four charges and fined \$6,000 after pleading guilty on 12 February 2007; costs of \$3,125 were awarded to Greater Wellington. The Environment Court took into account the deliberateness of the works and considered that a strong deterrent was required to discourage other operators from taking a similar approach.

Brooklyn Holdings Ltd and Lance James were charged in May 2006 for the unauthorised discharge of sediments to the Owhiro Stream, Brooklyn Wellington in December 2005. Charges were withdrawn against Lance James, while Brooklyn Holdings Ltd was convicted after pleading guilty on 6 November 2007. He was fined \$2,000 and costs of \$5,000 were awarded to Greater Wellington.



A complaint in early January 2007 alerted us to this chicken waste which had been dumped down a gully on Terawhiti Station in Makara, Wellington. The waste appears to have killed all vegetation in its path and may have been dumped there over a long period of time. After extensive investigation, we laid eight charges against four parties on 4 May 2007 for the unconsented disposal of the waste to land. This case is yet to be heard by the Environment Court.

Summary of action taken for non-compliant activities

Type of action	2006-07	2005-06	2004-05	2003-04
Advisory notices	48	58	61	68
Infringement notices	41	44	21	19
Abatement notices	30	24	26	12
Enforcement orders	4	0	2	1
Prosecutions	7	0	0	3
Total enforcement (excludes advisory notices)	82	68	49	35

What is Greater Wellington doing?

Our *Take Charge* pollution prevention team assessed industrial and commercial sites in Paraparaumu for their compliance with the Resource Management Act 1991, and began a new area assessment in Grenada North, around the Takapu stream. We also carried out eight audits for the EnviroSmart Programme, which helps businesses find ways of reducing energy, water use and waste generation.

Greater Wellington organised the collection of 1.25 tonnes of agrichemicals from the Wairarapa. These have now been sent for disposal.

What can you do?

If you notice a pollution incident or an activity that you suspect does not comply with the Resource Management Act, call Greater Wellington's pollution hotline on 0800 496 734. This is a 24-hour service and our duty officer will respond within the hour on most occasions.

More information

If you want more information about how to avoid, reduce or respond to pollution, ring a member of our pollution control team on 04 384 5708 in Wellington, 06 378 2484 in Masterton, or ring 0800 496 734.



River and stream health 2006/07

Key points:

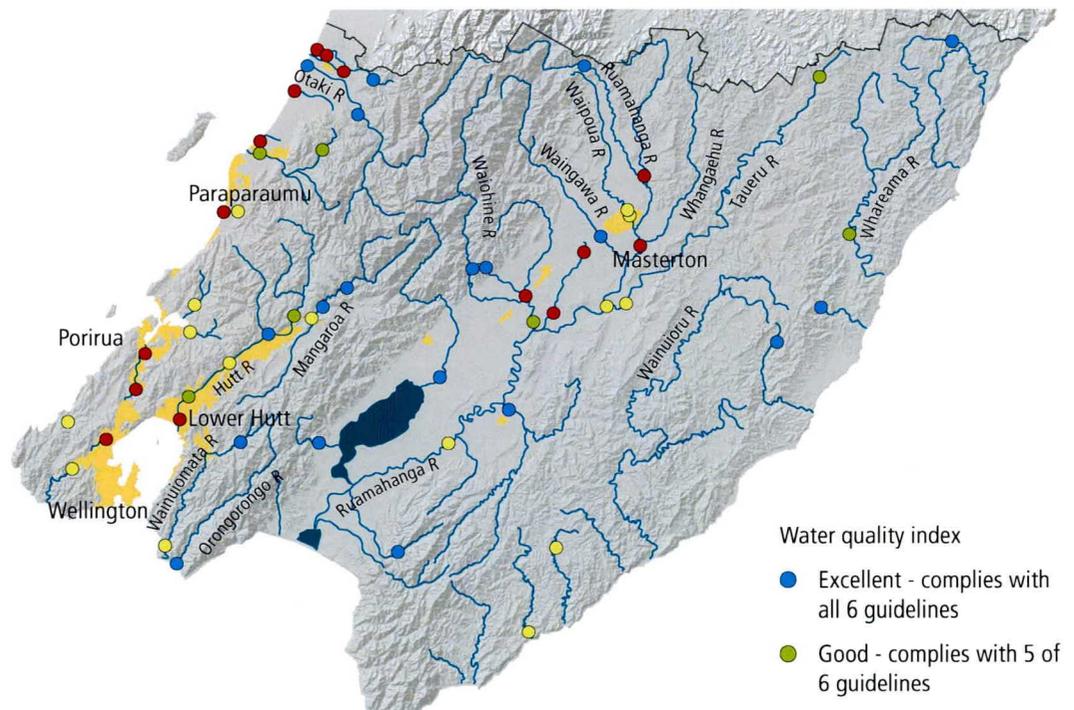
- Twenty six of 56 river and stream sites routinely monitored over 2006/07 had excellent or good water quality.
- Water quality was poorest in urban streams and in the lower reaches of rivers and streams draining agricultural catchments.
- Work has started on an urban stream management strategy and workshops were held promoting the values of small streams.

What happened in 2006/07?

Water quality monitoring

Nineteen of the 56 river and stream sites we monitored during 2006/07 had excellent water quality and complied with guidelines for all six water quality indicators we use to measure overall stream health. Seven sites exceeded the guideline value for just one indicator. As with previous years, the sites with good water quality generally flow through areas with little or no human influence in catchments where the majority of the land is covered in indigenous forest or scrub. These are sites on rivers flowing out of the Aorangi, Tararua and Rimutaka ranges and include the Otaki, Waikanae, Waingawa and Tauherenikau rivers, and the upper reaches of the Waitohu, Hutt, Wainuiomata, Waiohine and Ruamahanga rivers.

Once out of the ranges, the influence of agricultural and urban land uses cause a marked decline in water quality. The indicator that failed the guideline most commonly was *Escherichia coli* bacteria (28 sites failed), followed by water clarity (26 sites failed) and dissolved reactive phosphorus (23 sites failed). Sites with poor water quality include the Mangaone, Mangapouri, Ngarara and Mangatarere streams, and the Whangaehu River.



- Water quality index
- Excellent - complies with all 6 guidelines
 - Good - complies with 5 of 6 guidelines
 - Fair - complies with 3 or 4 of 6 guidelines
 - Poor - complies with 2 or less of 6 guidelines

The level of compliance with guidelines for six key water quality indicators (water clarity, dissolved oxygen, dissolved reactive phosphorus, nitrite-nitrate nitrogen, ammoniacal nitrogen and *Escherichia coli*) gives us an overall picture of water quality in the region's rivers and streams. The water quality index ratings shown here are based on monthly data collected between July 2006 and June 2007.



Hulls Creek, a small tributary of the Hutt River, is one of many streams in the region with a community-led rehabilitation programme in place. The excellent riparian vegetation pictured (left) was planted by the Silverstream Care Group, who also organised a fish pass in the lower reaches to allow native fish to swim up the creek from the Hutt River. Unfortunately, habitat is not ideal in some parts of the creek, with stretches that flow through Heretaunga and Silverstream confined within a concrete channel (right). Channelisation and piping are common modifications to many urban streams in the Wellington region and these modifications are still occurring in some parts of the Hulls Creek catchment.



Fish can be useful indicators of the life supporting capacity of water bodies. We use a model (point, click, fish) to predict what sort of streams various fish species are likely to be in. Every year we undertake fish surveys to gather more information about the distribution of fish and check the results against the model. The upland bully (pictured) is a common native fish found in rivers and streams throughout the Wellington region. Unlike many other native species, the upland bully is reasonably resilient and is even found in rivers and streams in urban and agricultural areas where water and habitat quality are no longer good enough for more sensitive native fish species like the redfin bully or banded kokopu.

Urban and small stream management

We have started work on an urban stream management strategy using data from ecological and habitat surveys of urban streams completed over the last couple of years. The streams will be categorised in terms of their ecological health, with stream protection and rehabilitation strategies identified for each category.

In June, Greater Wellington ran a small streams workshop for consultants and staff from city and district councils. Demand to fill in, pipe, or realign small streams to make way for urban development has been increasing over the last decade, with particular pressure coming on the Porirua Stream catchment between Johnsonville and Porirua Harbour. The aims of the workshop were to improve people's understanding of the ecology and values of small streams and to encourage good practices, particularly in relation to works in streams.

Stormwater investigations and action plan

Greater Wellington continued with its stormwater investigations during 2006/07, focusing on changes in stream water quality during "first flush" rain events. The information from these investigations, together with other investigations such as stream and harbour sediment quality studies (see *Harbours, estuaries and beaches* report card), has shown that stormwater may be having more than minor effects on some streams and the coast. Greater Wellington has been working with the region's city and district councils to prepare a stormwater action plan that sets out agreed actions for each council to take over 2007/08. This plan will be reviewed annually.

What is Greater Wellington doing?

- Monitoring stream and river health at 56 sites around the region.
- Monitoring stream health and bank stability above and below three riparian planting projects to see what stream improvements happen as the plants become established.
- Helping Biosecurity NZ monitor selected river sites for the presence of the invasive freshwater alga, didymo (*Didymosphenia geminata*). No didymo was detected in the region, and at the time of writing was present only in the South Island.
- Investigating stormwater quality and working with city and district councils to implement an action plan to improve stormwater management in the region.
- Providing advice to landowners about streamside management. In 12 high quality catchments we provide plants to landowners who have fenced off streams. Email riparian@gw.govt.nz or visit www.gw.govt.nz/streams if you'd like to know more.
- Supporting 22 care groups working on improving streamside and wetland environments around the region. New groups to start in 2006/07 include the Makaracarpas, who are planting alongside the Makara Estuary in Wellington, and Waihora Watch, who are extending the bush alongside the Waihora Stream near Martinborough.

What can you do?

- Keep stock, especially cattle and deer, out of rivers and streams.
- Don't pour paint, chemicals or any other waste into stormwater drains, rivers or streams.
- Join Greater Wellington's "Be the Difference" programme and learn some easy steps to help the environment for generations to come, with cleaner streams and less waste. Sign up on-line at www.bethedifference.gw.govt.nz, phone 0800 496 734, or write to Be the Difference, PO Box 11646, Wellington.

More information

Some of the information in this card is a summary of the 2006/07 annual freshwater quality monitoring report which is available on our website at www.gw.govt.nz/envreports. If you would like to know more about river and stream health, visit our website or contact:

Alton Perrie (Environmental Scientist, Water Quality – Masterton office)

Phone: 06 378 2484, email: alton.perrie@gw.govt.nz

Summer Warr (Environmental Scientist, Water Quality – Wellington office)

Phone: 04 384 5708, email: summer.warr@gw.govt.nz

Soil health and contamination 2006/07

Key points:

- Most of the soil sites (19 out of 24) tested last year had at least one soil quality indicator outside the target range for their land use, although in the majority of instances this can be rectified through appropriate management.
- Market garden soils are continuing to lose soil organic matter, and dairy farm soils still suffer from compaction.
- Work is continuing on the planned excavation of contaminated sediments from the Waiwhetu Stream in Lower Hutt.

What happened in 2006/07?

Soil quality

Greater Wellington's soil quality monitoring programme started in 2001 and covers 118 sites on land used for arable cropping, horticulture, market gardens, pasture and indigenous vegetation. Around a quarter of the 118 sites are sampled each year. Last year we re-sampled 13 market garden sites and 11 dairy sites that were first sampled in 2004. Soil quality was assessed using a set of seven chemical, physical and biological properties that target the dynamic aspects of soil health (things like soil structure, and carbon and nutrient content), rather than land-use capability, contamination, or erosion. This time samples were also analysed for metals such as arsenic, cadmium, chromium, copper, nickel, lead and zinc. These are the main findings:

- Nineteen of the 24 sites sampled had at least one indicator outside the target range for its land use (market garden or dairying), with five sites outside the target range for three or more soil characteristics.
- Soils used for market gardening continue to fail targets for available phosphorus (Olsen P) (10 out of 13 sites failed) and for organic matter (5 out of 13 sites failed).
- Soils under dairy farms continue to show soil compaction (6 of 11 sites had low macroporosity), and evidence of increasing nitrogen.

The high nutrient levels combined with compacted soils increases the risk of nutrient and sediment-rich run-off contaminating nearby streams. There are land management practices that can be used to reduce high nutrient levels in soils, and even soil compaction. Greater Wellington will inform landowners and farmers about the trends we have found so that they can adopt techniques or measures to increase soil quality and safeguard the productivity of the soil.



Some market garden soils have high levels of phosphorus and are continuing to lose soil organic matter. This same situation was observed when we sampled these soils in 2004.

Poplars and willows are used by many hill country farmers in the Wairarapa to stabilise erosion prone land. They can be established relatively easily, are cost effective and can be planted in the presence of grazing animals. Without them, more soil would have washed off this farm near Masterton during the July 2006 storms that hit the property. Eroded hill sides can take more than 30 or 40 years to recover to 80% of their uneroded pasture production potential.





Forest harvesting – Bideford, Wairarapa. Forestry is probably the best productive use of land in some of the eastern Wairarapa hill country. This is particularly so where the land has potential for severe erosion or lacks the fertility to sustain pastoral farming. The environmental code of practice for forestry has guidance about how to manage the environmental effects of forestry. The Regional Soil Plan controls vegetation clearance and 673 hectares were cleared in accordance with the plan last year.

Soil conservation

Greater Wellington works with landowners to help control erosion, particularly in the Wairarapa hill country. Erosion control is achieved through the preparation of individual farm plans and the implementation of an annual works programme. Last year we helped 152 landowners plant 24,200 poplars and willows on 345 hectares of erosion-prone pasture land. A further 42 hectares were established in conservation woodlots, and 1.1 kilometres of shelterbelts were established to decrease the effects of wind erosion on alluvial soils within the Wairarapa valley.

What is Greater Wellington doing?

- Sampling and testing soils to understand the quality of soils across the region.
- Regulating large-scale vegetation removal and soil disturbance on erosion-prone land. District and city councils control vegetation removal and soil disturbance on all other land.
- Providing advice to landowners and subsidising tree planting, so they can reduce erosion on their land.
- Maintaining, with the assistance of city and district councils, a database of sites in the region known or thought to be contaminated (e.g., sheep dips, landfills).
- Leading the Waiwhetu Stream sediment clean-up project.

What can you do?

- Test your soil fertility before adding fertilisers so that you only add what's needed for the crops.
- Plant trees on erosion-prone land to promote soil conservation and provide shelter and shade for stock.
- Take hazardous waste like old paint and used oil to the hazardous waste collection facility at the landfill or to the household hazardous waste collection run by your city or district council.



Heavy metals and other contaminants bound to the sediments of the Waiwhetu streambed are a legacy of industrial waste that was discharged to the stream for fifty years until 1978 when a trade waste sewer was installed.

Waiwhetu Stream clean-up

The lower reaches of the Waiwhetu Stream in Lower Hutt are well known for their high levels of contamination. Up to 15,000 cubic metres of sediment in the bed of the stream is contaminated with heavy metals to the extent that it qualifies as a “contaminated site”.

Since 2003, Greater Wellington and Hutt City Council, with support from the Ministry for the Environment’s Contaminated Sites Remediation Fund, have been examining ways of cleaning up the stream. Removing the sediment and taking it to a secure landfill has been identified as the most suitable clean-up method and planning has commenced for this complicated project.

If the work proceeds, the estimated cost of approximately \$6,000,000 will be jointly funded by Greater Wellington, Hutt City Council and the Ministry for the Environment.

More information

If you would like to know more about soil monitoring or land management, visit our website at www.gw.govt.nz or contact:

Paul Sorensen (Environmental Scientist, Land and Water Contamination - Wellington office)

Phone: 04 384 5708, email: paul.sorensen@gw.govt.nz

Dave Cameron (Manager, Land Management - Masterton office)

Phone: 06 378 2484, email: dave.cameron@gw.govt.nz

Natural hazards 2006/07

Key points:

- A tsunami struck the capital on 3 April, 2007.
- Landslides, triggered by months of rain, damaged and destroyed houses in Lower Hutt, Eastbourne, and Oriental Parade in Wellington.
- Prolonged rain in July flooded farms and roads in Wairarapa.
- Autumn drought in the Wairarapa caused concern for farmers.

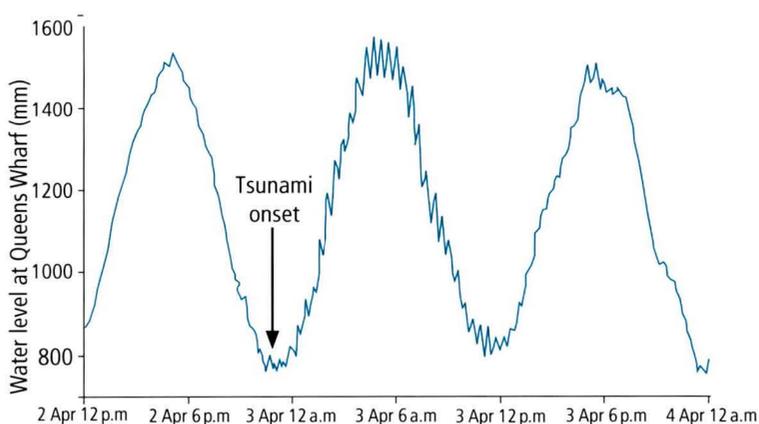
What is a natural hazard?

A natural hazard is any natural process (e.g. flood, earthquake, tsunami, landslide, drought) that can adversely affect human life or property. Importantly, these processes do not on their own constitute a hazard; they become hazardous when they have the potential to affect our communities.

The Wellington region has one of the most physically diverse environments in New Zealand and, with the exception of volcanic and geothermal activity, is subject to the full range of natural hazards experienced in New Zealand.

Tsunami

With over 500 km of shoreline, the Wellington region is at risk from tsunami from almost all directions, with Wairarapa most at risk and Kapiti least at risk. On 2 April this year, a magnitude 8.1 earthquake near the Solomon Islands generated a large, locally destructive tsunami. The earthquake was big enough to be felt in New Zealand and 1.1 metre waves generated by the tsunami were recorded on the West Coast of the South Island. In Wellington Harbour and on the Kapiti Coast, the wave was much smaller, at around 0.2 m, but still big enough to be detected by the sea level gauges on Kapiti Island and Queens Wharf (see graph).



Tide gauge record from Queens Wharf showing the tsunami as it was recorded in Wellington Harbour. The tsunami, with an amplitude of around 0.1-0.2 m can be seen fluctuating on top of the tide from just before midnight on 2 April. The tsunami was generated at 8.40 am that morning and took some 15 hours to reach Wellington. Water levels in the harbour were disturbed for over 12 hours.

Earthquake

On average about 400 earthquakes occur in the Wellington region every single year, but most are too small to be noticed. In the past 12 months, 37 earthquakes were felt in the region, but there were no reports of serious damage. Nine of these earthquakes were moderate sized (magnitude 5-5.9) and one, which had an epicentre over 1100 km northeast of Wellington, was strong (magnitude 6.5). This earthquake occurred near Macauley Island on the Pacific-Australia Plate boundary half way between New Zealand and Tonga and that it was felt here indicates how connected New Zealand is to the 'Pacific Ring of Fire'.

The most widely felt earthquake was a magnitude 5.0 event that occurred just before midnight on 15 September, 2006. The earthquake was generated by a rupture on the Wairau Fault, 40 km northwest of Wellington in the northern part of Cook Strait. It was felt strongly in the Porirua and Kapiti areas that were closest to the epicentre.

This fault generated another widely reported earthquake on 7 February, 2007. With a magnitude of 4.8, this earthquake had a similar depth and location, and – although about five months apart - the second event may have been triggered by the first event.

Interestingly, one of the “earthquakes” felt in the past year was generated by a large blast at the Horokiwi Quarry on March 2. The tremor measured an impressive 2.0 on the Richter Scale.

Flooding

Flooding is the most frequently occurring and costly natural hazard to affect the Wellington region, but last year was relatively quiet in terms of flood hazards. This is despite a very wet winter and spring, that brought regular southerly storms, northwest gales and rain for six months from July 2006 to January 2007.

On November 30, heavy overnight rain in the western catchments of the Tararua Range caused a small flood in the Hutt River the following morning. The flooding closed Block Road at Melling bridge and inundated cars in the Riverbank carpark. A larger flood in the Hutt River on 18 November was not such a significant hazard because the flood peak occurred at midnight and did not affect cars in the car park.

Landslip

Whilst the wet winter and spring did not cause serious flooding, it did trigger numerous landslips around the region from July to November, causing road closures, evacuations and damage to property and infrastructure. All the main access roads into Wellington were closed at some stage, many repeatedly.

On 20 July, a house in Eastbourne was completely destroyed leading to the evacuation of 20 houses below the slip. Eastbourne was affected again in Labour weekend on 23 October, when a house was badly damaged by a debris flow that also blocked Eastbourne’s only access road overnight.

In August, a large slip in the hill suburb of Kelson occurred after ground was saturated by months of rain and a suspected broken sewer main (see picture). Sewage from the broken pipe also contaminated the local stream (for more information, see the Pollution Control report card). Continued rain over following days led to continued slipping and eventually a house, garage and sleep-out were destroyed and a further four houses were left in danger of damage.

Houses in Wellington’s hill suburbs were damaged and one in Te Aro was knocked off its foundations by a slip after heavy rain on 26 August. A passenger train on the Johnsonville line was derailed and SH 1 was blocked at Paekakariki. The Paekakariki Hill Road was closed by numerous slips that took over two months to clear.

And finally, a dry rock and debris flow behind an apartment block on Oriental Parade on 16 August badly damaged the lowest unit in the apartment block. It was not habitable until the slip was stabilised several months later.

Drought

After a very wet spring, El Niño conditions brought an extended dry summer and autumn to the region. The Wairarapa was particularly affected by drought conditions that persisted until June. Drinking water had to be trucked in to many rural residents and the wildfire risk was extreme.



Two storms in early July caused widespread surface flooding in the Wairarapa. The Gladstone pub and some haybales, visible at the top centre of the photo, are two important resources to have escaped flood water. The river at the top of the photo is the Ruamahanga. For more information on this flood event, see the *Rainfall and river flows* report card.



A large slope failure in Vista Grove, Kelson, Lower Hutt on 8 August 2006 generated nationwide media coverage. Four houses still remain threatened by the slip.

More information

Check out our online database of natural hazards in the Wellington region at www.gw.govt.nz/hazards

We have also prepared a number of fact sheets about the natural hazards that affect our region. They are a great way to learn more about hazards and what you can do to prepare for them. Read them online at www.gw.govt.nz/em/hazard.htm.

Alternatively, you can email hazards@gw.govt.nz or phone 04 384 5708 to order a set or if you have any further questions about natural hazards.



Recreational water quality 2006/07

Key points:

- Coastal water quality was suitable for swimming on all sampling occasions at 46 of the 76 beaches monitored during the 2006/07 bathing season.
- River water quality was suitable for swimming on all sampling occasions at four of the 20 swimming spots monitored weekly during the 2006/07 bathing season.
- Water quality, especially in rivers, was most likely to be unsuitable for swimming during and shortly after rain.
- Some rivers were affected by blue-green algae.

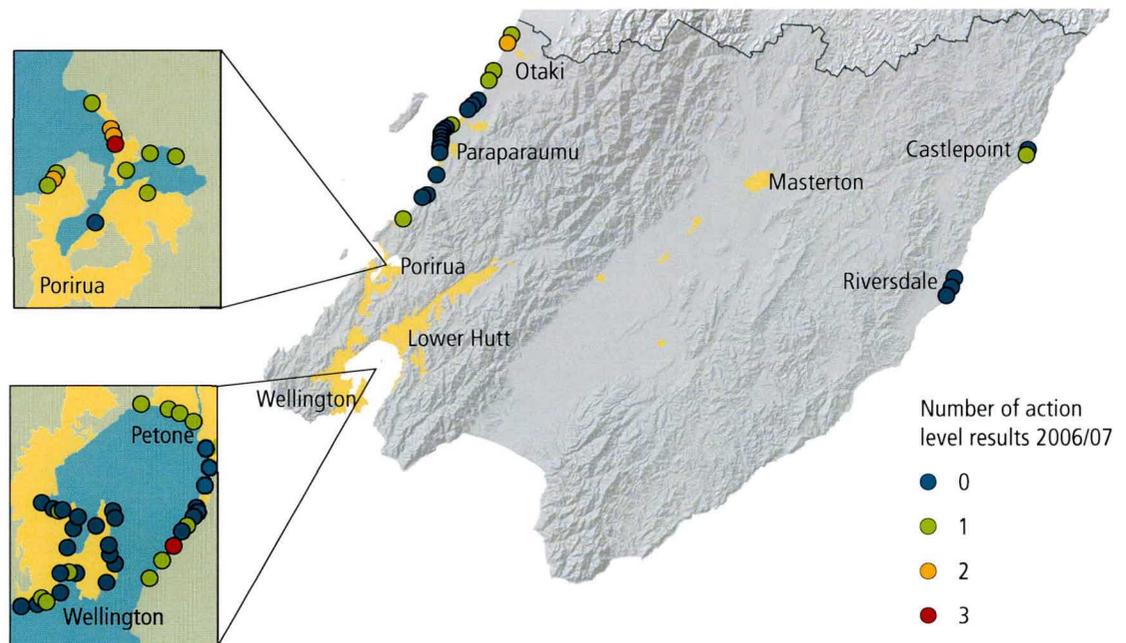
What happened in 2006/07?

Coastal water

Recreational water quality was very good at most beaches throughout the bathing season last summer. Although 30 of the 76 sites monitored exceeded the “action” guideline for coastal water indicator bacteria (280 enterococci /100mL), 24 of them exceeded the guideline only once. Two sites – South Beach at Plimmerton and Robinson Bay in Eastbourne – exceeded the “action” level on more than two occasions. Health warning signs were erected at bathing sites around Pauatahanui Inlet in late December 2006 because follow-up sampling results showed that bacteria levels were still high.

In all, there were 38 instances where sites exceeded the “action” guideline, eight fewer than the 2005/06 summer. More than two thirds of these coincided with at least 10 mm of rainfall in the three days prior to sampling, with more than a third associated with 10 mm or more of rainfall in the 24 hours prior to sampling.

At some bathing sites, elevated bacteria levels were thought to be caused by sediment re-suspension (from high wave energies and/or strong winds), or poor water quality in rivers and streams flowing into the coast. When a major lahar flowed down the Whangaehu River from Mount Ruapehu on 18 March, vast amounts of rotting leaves and other debris were discharged to coastal waters south of Wanganui. Two days later the effects were seen on the Kapiti Coast with all monitoring sites along Otaki and Te Horo beaches exceeding the action guideline. For three of these four sites, it was the only time the guideline was exceeded all summer.



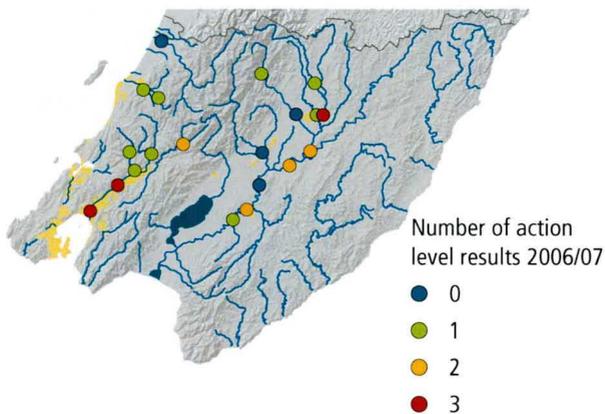
Summary of compliance with the recreational water quality guidelines for 76 marine bathing sites monitored over the 2006/07 summer. For up-to-date results about bathing water quality, check our website at <http://www.gw.govt.nz/on-the-beaches> during summer.

Fresh water

Sixteen of the 20 freshwater sites monitored weekly last summer exceeded the "action" guideline for freshwater indicator bacteria (550 *E. coli*/100 mL). Nine sites exceeded the guideline once and four sites exceeded the guideline twice. The Hutt River at both Silverstream and Boulcott exceeded the "action" guideline three times, while the Ruamahanga River at Te Ore Ore exceeded the guideline on five occasions.

Almost 90% of the cases where freshwater sites exceeded the "action" guideline coincided with at least 10 mm of rainfall in the three days before sampling. Rainfall events cause high bacteria levels to be washed into rivers and streams via urban and agricultural runoff, and also stir up contaminated stream sediment.

Thick growths of cyanobacteria (blue-green algae) were observed on the beds of the Otaki, Waikanae, Hutt, Waipoua and Ruamahanga rivers in February 2007. Some cyanobacteria produce toxins that can harm people and animals, with dogs most at-risk because of their higher likelihood of eating algae. Health warning signs were put up in Kapiti and a general region-wide warning was issued by Regional Public Health in February.



Summary of compliance with the recreational water quality guidelines for 20 freshwater bathing sites monitored weekly over the 2006/07 summer. Just two sites on the Hutt River exceeded the action guideline more than twice.

How do we tell you if it is safe to swim?

Greater Wellington uses the national microbiological water quality guidelines "traffic light" system to let people know whether water is suitable for swimming, surfing, and other recreational activities.

Green (surveillance) for go – sampling indicates a low health risk.

Amber (alert) for caution – sampling indicates the health risk has increased, but is still within an acceptable range.

Red (action) for stop – sampling indicates the water poses an unacceptable health risk.

Will I get sick if I swim?

Last August, Greater Wellington released *Will I Get Sick if I Swim?* This report grades the suitability of each of our bathing sites for contact recreation, from very poor to very good, based on microbiological risk factors (e.g., stormwater outfalls, stock access) and the results of five years of water quality monitoring. The key findings show:

- The majority (87%) of the region's coastal sites have a grade of "good" or "fair", indicating that they are suitable for swimming most of the time. Four sites are "very good" (Camp Bay in Eastbourne, Breaker Bay and Princess Bay in Wellington, and Riversdale South in the Wairarapa).
- Water quality at most of our popular river swimming sites is heavily influenced by runoff from rural or urban land following rainfall, with 17 out of 23 sites receiving "poor" or "very poor" grades as a result.

Hataitai Beach in Wellington City. All routine weekly samples collected from this site last summer complied with the surveillance level (<140 enterococci per 100 mL) of the national bathing water quality guidelines. Despite these good results, Hataitai Beach currently has a suitability for recreation grade of "fair", which indicates it is generally satisfactory for swimming but water quality can be affected by stormwater, particularly after heavy rain.



What is Greater Wellington doing?

Together with city and district councils, Greater Wellington monitors and reports on:

- The suitability of water quality for recreation at 76 coastal sites and 20 freshwater sites around the region. Water is sampled weekly from 1 November to 31 March (the "bathing season") and the results are assessed against the national recreational water quality guidelines so that we can advise people whether or not, from a public health perspective, the water is suitable for swimming and other forms of contact recreation.
- The suitability of water quality for recreational shellfish gathering at six coastal locations.

What can you do?

Keep stock, especially cattle and deer, out of rivers and streams to prevent fouling of the water.

More information

The information in this card is a summary of the annual recreational water quality report which is available on our website at www.gw.govt.nz/envreports. If you would like more information about recreational water quality, visit our website at www.gw.govt.nz/on-the-beaches or contact:

Summer Warr (Environmental Scientist, Water Quality)

Phone: 04 384 5708, email: summer.warr@gw.govt.nz