

## Monitoring

Monitoring of the water quality is ongoing. In addition to the programme which involves volunteers, Christchurch City Council (CCC) and Environment Canterbury (ECan) monitor water quality for ecosystem health and resource consent conditions. They measure oxygen content, temperature, pH, suspended sediments, turbidity (water clarity), nutrient concentrations, toxic organic chemicals, trace metals and a range of other substances and water conditions. By continuing to monitor water quality, the councils can identify long-term changes and compare water quality to guideline values. A key aim is to identify the mix of nutrients coming from rivers, drains, and other sources and to see how they affect water quality.

## About the Avon-Heathcote Estuary Ihutai Trust

In 2002 the Avon-Heathcote Estuary Ihutai Trust was formed in response to requests for a community-based group to act in the Estuary's long-term interests. The members of the Trust include committed individuals and volunteers, representatives from CCC, ECan, tangata whenua and other agencies.

The Trust's vision and goals are set out in the Ihutai Management Plan 2004. This is a non-statutory plan (ie it is not legally binding) based on the principle of Integrated Environmental Management. IEM emphasises a systematic effort to understand linkages between ecosystems, resources and people.

A key goal for the Trust is to help communities to work together to restore healthy ecosystems. This could mean more fish in the Estuary and an end to long-standing problems with macroalgae. The Trust promotes wise management of the Estuary to protect it from encroachment, retain unique vistas and make it a safe and accessible place for a range of recreational activities.

## Further Information and Links

### Water Quality for Swimming

[www.ecan.govt.nz/our+environment/water/swimmingwaterquality](http://www.ecan.govt.nz/our+environment/water/swimmingwaterquality)

### Water Quality

[www.mfe.govt.nz/publications/water](http://www.mfe.govt.nz/publications/water)

### Avon-Heathcote Estuary Ihutai Trust

[www.estuary.org.nz](http://www.estuary.org.nz)

## Let's Clean Up Our Act

The Avon-Heathcote Estuary/Ihutai is a unique and precious feature of our landscape. Some significant progress has been made to improve its water quality, but there is a lot more that can be done to reduce the level of contamination. A long term goal is to make the Estuary's water safe for swimming and for mahinga kai. Everyone in the Estuary's catchment has an impact on water quality – and everyone can contribute to restoring the health of this sensitive ecosystem.

## Protecting our Estuary

There are some immediate actions we can all take:

- Household waste disposal – avoid using a kitchen waste disposal unit (wastemaster or garbage grinder). Turn your kitchen scraps into compost instead
- Household cleaners – consider natural cleaners and disinfectants including baking soda, vinegar and eucalyptus oils
- Car washing – wash your car over grass to reduce run-off of detergents to the stormwater system
- Stormwater and sewerage connections – check to ensure your connections function independently
- Laundry detergents – avoid products with high phosphorus content, for “softening” water. Christchurch water is naturally soft
- Bathroom products – limit the use of shampoos and cleansers
- Dog waste – clean up after your pet to reduce faecal contamination
- Motorists – check your car for leaks and have them fixed promptly
- Reduce your impact – find out more from groups such as Sustainable Living: [www.sustainableliving.org.nz](http://www.sustainableliving.org.nz)
- Pollution – report pollution to the 24 hour Pollution Hotline (03) 366 4663 or 0800 76 55 88

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# Avon-Heathcote Estuary/Ihutai our estuary and its Water Quality 2007



## Our Estuary

The Avon-Heathcote Estuary/Ihutai is the largest semi-enclosed shallow estuary in Canterbury and remains one of New Zealand's most important coastal wetlands.

At around 700 hectares the Estuary is relatively small, but it has a very special place within Christchurch and the city's lifestyle. It is well known as an internationally important habitat for migratory birds, and it is an important recreational playground and educational resource. It was once highly valued for mahinga kai (food gathering).

## Contamination: Where does it Come From?

Like all wetlands the Estuary filters the water that flows into it, mainly from the Avon and Heathcote Rivers, and has been badly affected by human activities. The various contaminants pose a threat to the food chain, which includes plants, animals and people.

**Avon and Heathcote Rivers** – the Avon River has a mainly urban and residential catchment covering 85 sq km. The Heathcote's catchment is more mixed, including rural and industrial areas, covering 104 sq km. Until the 1960s the Heathcote was used for disposal of wastewater from factories, abattoirs, a wool scour, fellmongery and various manufacturers. These types of wastewater discharges are now carefully controlled. However, a considerable load of contaminants enters the rivers from stormwater outlets and other smaller and less obvious sources.

**Disposal of Treated Sewage** – Wastewater has been treated at the Christchurch Wastewater Treatment Plant (CWTP) at Bromley for more than 100 years, initially by spreading on pasture and later in a series of septic tanks which filtered through sand dunes. In 1962 the city built the current wastewater treatment plant, which includes wastewater screening, trickling filters, clarifiers and a series of oxidation ponds which enable pathogens to be treated by exposure to ultraviolet light. The plant has been upgraded and extended a number of times. The twice-daily release of treated wastewater to the Estuary is a major source of nutrients, especially ammonia-nitrogen. When the ocean pipeline is operating this source of contaminants will be removed from the Estuary.

**Toe drains** – the oxidation ponds at the CWTP are surrounded by narrow drainage channels. The channels are there to collect and contain seepage from the ponds, along with surface water run-off. The southern toe drain is pumped back into the ponds – the northern toe drain will be pumped into the ponds from 2008.

**City Outfall Drain** – the wide drain alongside Linwood Avenue discharges surface water run-off and stormwater.

The Estuary is a place where different environments meet:

- The terrestrial environment - dominated by human activities
- The aquatic environment - a transition zone between freshwater and seawater and what lives in it
- The benthic environment - the bed of the Estuary with its channels, extensive mudflats and diversity of plants and animals.

**Stormwater outlets** – there are nearly 70 stormwater outlets around the perimeter of the Estuary, plus numerous small drainage pipes from surrounding properties. Stormwater contains nitrogen and phosphorous compounds, micro-organisms, metals, persistent organic pollutants and sediments. In urbanised catchments the source of these contaminants includes soils, fertilisers, roading materials, detergents, cars, animal faeces, roof run-off, plant material and sewage overflows.

**Nutrients in sediments** – nutrients accumulate naturally through settlement and degradation of organic material such as algae. These nutrients can be released into the water through natural processes.

**Birds** – bird faeces are a natural source of nutrients. The Estuary provides a habitat for more than 100 species of birds, some in large numbers, and so their contribution to the nutrient load can be significant. Bird faeces also add micro-organisms which can be harmful to human and animal health.

## Faecal and Microbial Pollution

Faecal and microbial pollution contains pathogens (disease-causing organisms) such as campylobacter, salmonella, giardia, cryptosporidium and viruses. These can cause diarrhoea and cold and flu-like symptoms. Pathogens can enter waterways through untreated sewage discharges, leaky pipes, septic tanks, stormwater and rural run-off. Swimming in water contaminated by pathogens can cause gastro-intestinal illnesses (various "tummy bugs"), respiratory illnesses and infections of the ear and eye. This can also happen through other forms of contact with the water, such as kayaking or windsurfing.

To determine the likelihood of pathogens being present in the water, the concentrations of indicator bacteria (*Escherichia coli* [*E. coli*] in freshwater and enterococci in sea water) are measured. The higher the concentrations of indicator bacteria, the greater the likelihood of pathogens being present.

Over the summer months water samples are collected weekly by volunteers at seven sites in the Estuary and from a number of sites outside of the Estuary. The concentration of *E. coli* and enterococci are measured in each sample collected in the Estuary. The weekly enterococci results can be seen at: [www.ecan.govt.nz/our+environment/water/swimmingwaterquality](http://www.ecan.govt.nz/our+environment/water/swimmingwaterquality)

At the end of the summer each site is given a grading for its suitability for recreation (SFRG) using methods in the Microbiological Water Quality Guidelines produced by the Ministry for the Environment (MfE) and the Ministry of Health. The overall SFRG is calculated from two components: the last three to five years of indicator bacteria concentrations; and a measure of the risk of faecal contamination.

There are five grades (SFRGs):

**Very Good** – Considered satisfactory for swimming at all times.

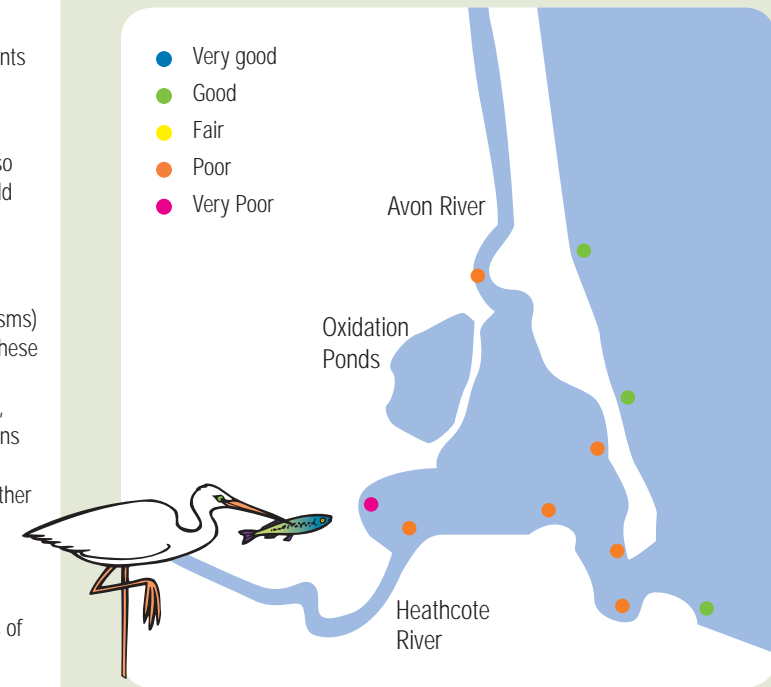
**Good** – Satisfactory for swimming most of the time.

**Fair** – Generally satisfactory for swimming, though there are potential sources of faecal material.

**Poor** – Generally not suitable for swimming. Swimming should be avoided, particularly by the very young, the very old and those with compromised immunity.

**Very Poor** – Avoid swimming, as there are direct discharges of faecal material. There is permanent signage at the site.

## Suitability for Recreation Grade - 2006-07



## Is it Safe to Swim in the Estuary?

No. At all sites in the Estuary the present risk of faecal contamination is high, due to the discharge of treated sewage into the Estuary. The risk is lower for windsurfers, kayakers and sailors unless they fall in. When treated sewage is no longer discharged into the Estuary the risk measure may change.

## Is it Safe to Eat the Shellfish?

No – the level of faecal and microbial contamination in the Estuary means shellfish are not suitable for human consumption.

# Avon-Heathcote Estuary/Ihutai

## our estuary

### and its Water Quality

#### 2007

The Christchurch Wastewater Treatment Plant discharges treated wastewater twice a day – on each high tide. In summer, when recreational use of the Estuary is high, there is no day-time discharge.



### What is the State of the Estuary's Ecosystem?

For many years the health of the Estuary ecosystem became steadily worse. One of the areas of concern is the level of nutrients that continue to enter the Estuary from a wide range of sources.

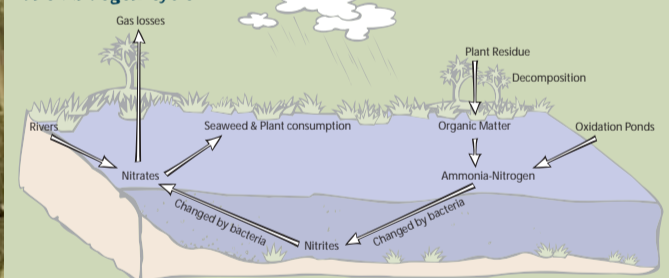
Nutrients are essential building blocks for healthy aquatic communities. Excess nutrients stimulate the growth of aquatic plants and algae which can out-compete other aquatic species and smother the habitat. If nutrient levels become very high the water becomes "eutrophic", meaning it is unable to support aquatic life at all.

There are two nutrients of particular concern:

**Phosphorus** - this nutrient almost always occurs in waters as phosphates. Phosphates can occur in solution, in particles or debris, or in the bodies of aquatic organisms such as fish and invertebrates. Excess phosphate, from laundry detergents, sewage, industrial wastes and agricultural drainage, can cause aquatic plants to grow to nuisance levels.

**Nitrogen** - the forms of nitrogen of greatest interest for water quality are nitrate, nitrite and ammonia-nitrogen, which are commonly measured together as dissolved inorganic nitrogen. These forms of nitrogen can convert to other forms and are part of the Nitrogen Cycle. For fish and other aquatic life, high ammonia-nitrogen concentrations are toxic.

### The Nitrogen Cycle



There are high concentrations of nutrients in the water at sites close to the larger nutrient sources. The highest nitrate-nitrite concentrations occur at the mouths of the Avon and Heathcote rivers. Ammonia-nitrogen and phosphorus are most concentrated at sites closest to the oxidation ponds.

Nutrient concentrations fluctuate with the seasons, rainfall, biological and hydrological processes of the Estuary. They tend to be lower during late spring-summer and higher in autumn.

Nutrient concentrations have increased significantly since sampling began in the 1950s. Concentrations have increased two or three-fold over time at some sites, and up to eight-fold at Shag Rock. These increases largely reflect the discharge of treated wastewater from the oxidation ponds and the increase in wastewater volumes as the city has grown.

The impact on the Estuary system varies from site to site. In some areas concentrations of ammonia-nitrogen in the water are potentially toxic to estuarine life. For example, at Pleasant Point Yacht Club, Pleasant Point Jetty, Sandy Point, and Mt Pleasant Yacht Club ammonia-nitrogen has reached concentrations that could be toxic to a significant number of aquatic species.

The construction of the ocean outfall for treated wastewater is expected to reduce the Estuary's nutrient loadings considerably. However many sources of contaminants will remain, including heavily contaminated stormwater.

**Metals and Persistent Organic Pollutants** - Metals such as copper, chromium, nickel, lead and zinc enter the Estuary in stormwater and from industrial and household sources. High concentrations of metals in water and sediments are potentially toxic. Persistent organic pollutants include polycyclic aromatic hydrocarbons (PAHs) from coal tar, fuel and oil; polychlorinated biphenyls (PCBs) found in electrical substations and transformers, and pesticides and herbicides. Christchurch's stormwater run-off is high in PAHs from the coal tar used to pave roads until the 1980s.

Heavy metals and persistent organic pollutants have a tendency to accumulate in sediments and in animals further up the food chain. The sediment in the Avon and Heathcote rivers is particularly high in PAHs which, while not directly impacting on water quality, can affect the food chain. A recent study has recommended further investigations to assess heavy metals and other contaminants in the Avon and Heathcote rivers during storms.

**Sedimentation** - Sediment from construction sites and run-off from rural and residential areas of the Port Hills is damaging for the Avon and Heathcote rivers and the Estuary. Sediment covers the beds of the rivers and the bottom of the Estuary, which alters the aquatic habitat. The main source of sediment is the Heathcote River, followed by the Avon River.

**Macroalgae** - Green and red algae often grow rapidly on the Estuary mudflats in summer, to the point of becoming a nuisance. Blooms of the green sea lettuce are not fully understood, but tend to follow mild winters and are more likely to occur when nutrient levels are high.

When algae becomes thick it can form dense mats that smother other species. It can also cause the water and sediments to be depleted of oxygen, and when the algae rots it creates foul smells and a build-up of the gas hydrogen sulphide.

**Fish Life** - Thirty four fish species have been recorded in the Estuary and the abundance of some - including sand flounder and red cod - appears to have declined during the past 50 years. There is evidence to suggest that the abundance of several species has been affected by commercial and recreational fishing. However several non-commercial species such as globefish have also declined, suggesting water quality may be a factor in overall species abundance.

**Life in and on the Mudflats** - Routine studies show that there is a diversity and abundance of animals living on and in the mudflats. The animal communities that are present have changed little over recent years. Cockles and other shellfish are abundant in various parts of the Estuary. The health of these animals at the lower end of the food chain is extremely important because of the effect on the health of other animals, fish, birds and humans.