State of the Derwent
Year 2003 Report Card

The Derwent Estuary

The Derwent Estuary lies at the heart of the Hobart metropolitan area and is an asset of great natural beauty and diversity. Named after the Celtic word for 'clear water' in 1794, the Derwent is an integral part of Tasmania's cultural, economic and natural heritage. The estuary is an important and productive ecosystem and supports a wide range of habitats and species.

The Iron Pot Light

Approximately 40% of Tasmania's population - 192,000 people - live around the estuary's margins. The Derwent is widely used for recreation, boating, fishing, marine transport and industry. Further upstream, the Derwent River supplies the majority of the region's drinking water supply and is a major source of hydroelectric power.

A number of environmental issues affect the Derwent Estuary, in particular:

- heavy metal contamination;
- introduced marine pests;
- loss of habitat and species;
- occasional faecal contamination of recreational waters;
- depressed oxygen levels and organically enriched sediments;
- elevated nutrient concentrations;
- altered environmental flows and barriers.

Although there have been significant improvements in the treatment of sewage and industrial wastes over the past decade, the Derwent remains a significantly degraded estuary. A strategic and coordinated planning approach across all levels of government, industry and the community is our best hope for a clean and healthy estuary in the future.

Management and restoration

The Derwent Estuary Program (DEP) was established in 1999 as a partnership to restore and protect the Derwent Estuary. The program has been highly successful in bringing together a wide range of stakeholders – first to build a common understanding, vision and management framework – and second to progressively implement this vision through formal partnership agreements and practical actions.

The program was initially designed to address environmental quality issues such as industrial and urban water pollution, contaminated sediments, introduced species and loss of estuarine ecosystems. More recently, foreshore issues have also been included within the program.

In December 2001, our Environmental Management Plan was finalised and endorsed by Tasmania's Premier, the Mayors of Brighton, Clarence, Derwent Valley, Glenorchy, Hobart and Kingborough Councils, and the Commonwealth. A five-year agreement was then signed to progressively implement this plan. In addition to the three levels of government, many other stakeholders participate in and support the DEP, including major industries and utilities, community groups and research institutions.

Key aspects of implementation include environmental monitoring and reporting, coordination of regional activities, and implementation of priority projects such as effluent reuse, stormwater management and wetland conservation.

Derwent Estuary Program

Environmental monitoring and reporting

A fundamental requirement for effective natural resource management is an on-going and reliable source of environmental data.

This principle formed the basis of the Derwent Estuary Monitoring Agreement, signed in August 2000 by the state government, six local councils and three industry/utility partners (Norske Skog Boyer, Pasminco Hobart Smelter and Hobart Water). The signatories agreed to coordinate their independent monitoring programs to provide better information on the estuary as a whole, and to report annually on environmental conditions and trends in the Derwent.

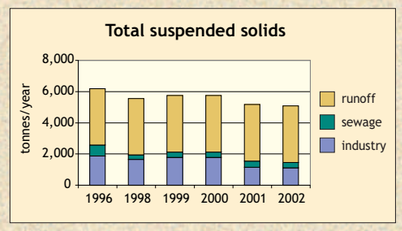
Monitoring Water Quality

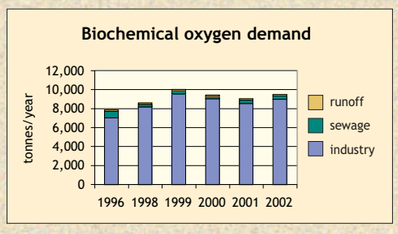
This document represents our third annual 'report card' to the community and summarises monitoring data and other relevant information collected during the year 2002. More detailed information can be accessed in the State of the Derwent technical report, available on our website at **www.derwentriver.tas.gov.au**.

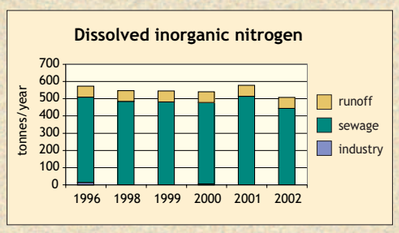
Monitoring activities carried out during 2002 included the following:

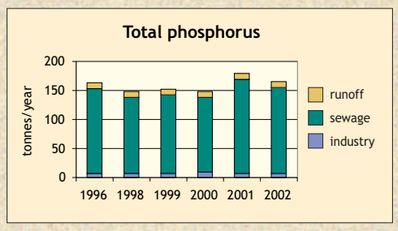
- weekly recreational water quality testing during summer months;
- monthly monitoring of stormwater outfalls and rivulets;
- quarterly estuary water quality monitoring;
- quarterly surveys of 3 seagrass beds;
- annual survey of mercury in flathead and heavy metals in shellfish.

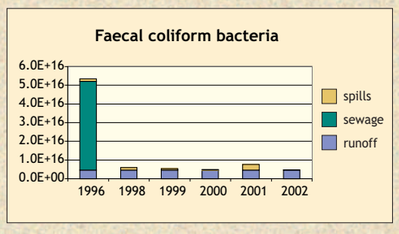
Pollution Sources, Loads and Trends











Pollution enters the Derwent Estuary from a number of sources that are commonly referred to as point sources or diffuse sources.

During 2002, point sources included 10 sewage treatment plants and two large industries (the Norske Skog paper mill and Pasminco Hobart zinc smelter). Diffuse sources included urban runoff, tips and contaminated sites, catchment inputs carried by the Derwent and Jordan rivers, air pollution and wastes associated with shipping, ports and marinas. Some pollutants are also derived from contaminated sediments within the estuary itself.

Contaminants associated with these various sources include pathogens, nutrients, organic matter (measured as biochemical oxygen demand or BOD), wood extractives such as resin acids, silt, litter, and a range of toxicants including heavy metals and hydrocarbons.

A review of the various sources and loads discharged to the Derwent indicates that, during 2002:

- Sewage treatment plants discharged the majority of nutrients;
- Stormwater accounted for the majority of faecal bacteria;
- Pasminco discharged the majority of heavy metals (primarily as groundwater emissions);
- Norske Skog discharged the majority of organic matter and resin acids.

There were some changes in pollutant loads entering the Derwent in 2002 as compared with 2001:

- Continued reductions in heavy metal loads from the Pasminco site;
- Decreased loads of sewage-derived nutrients (10%) and faecal bacteria (50%) due to better treatment plant efficiency and a smaller number of wet-weather overflow events;
- Increased organic loads from the Norske Skog paper mill.

Longer-term trends – since 1996 – indicate a sharp decrease in faecal bacterial loads (>90%) and heavy metal loads (>50%), a decrease in total suspended solid loads (18%) and dissolved inorganic nitrogen (11%), but a slight increase in total phosphorus (1%) and an increase in BOD (21%).

Some significant management actions were completed or initiated in 2002 that are anticipated to have beneficial outcomes:

- Several new stormwater projects in Hobart, Clarence and Derwent Valley;
- Major upgrades of the region's major commercial slipway (Domain) by Hobart Ports Corporation;
- Commencement of an extensive effluent reuse scheme for the Rosny sewage treatment plant;
- Commencement of major sewage treatment upgrades at Collinsvale.

Environmental Flows

In 2002, an initial investigation into environmental flow requirements to maintain the ecological values of the lower Derwent River and upper estuary was completed. Habitat-flow based risk assessments and geomorphological studies were carried out in the river between Meadowbank Dam and New Norfolk, while assessment of the upper estuary was based on existing hydrodynamic and biogeochemical models.

The report investigated both minimum and high flow requirements. Minimum flows were used to evaluate the potential for further water abstractions from the river. It was recommended that although there was some scope for further limited abstractions between May and December, no further water should be taken from the river during summer months. A combination of high and medium flow events was recommended to maintain the channel and provide regular flushing flows to enhance water quality. A number of additional investigations were recommended to further refine these flow requirements.

Derwent Water and Sediment Quality

Is it safe to swim in the Derwent?

Each summer, recreational water quality is measured weekly at about 30 sites around the Derwent (see map on flip side for specific locations). During the 2002/2003 season, a single bacterial indicator was used (enterococci), in line with recently revised international guidelines. Enterococci are now considered to be a more robust indicator of faecal pollution, particularly in coastal waters.

Enterococci levels during the 2002-2003 monitoring season were lower than the previous year, due in part to extremely dry conditions. Most of the major swimming beaches south of the Tasman Bridge met the current primary contact guidelines for enterococci (33 counts/100 ml) for the season as a whole, although the western end of Nutgrove Beach was slightly above the guidelines (38/100 ml), as was the inside corner of Little Sandy Bay Beach (51/100 ml). Bacteria levels at the Regatta Pavilion (cross-Derwent swim site) improved significantly from the previous year, and were within the guidelines, although levels in the nearby Hobart Rivulet remained high.

In the rest of the estuary, only five other sites did not met primary contact guidelines, specifically: Marieville Esplanade (144/100 ml), Connewarre Bay (67/100 ml), Geilston Bay (53/100 ml), Jordan River (40/100 ml) and Elwick Bay (34/100 ml).

Swimming at Sandy Bay Beach

The current NH&MRC (1990) guidelines are being revised to reflect new international standards. A significantly different framework is anticipated in the near future, whereby recreational waters will be assigned a risk category rather than using the current pass/fail system.

Are other indicators of water quality improving or declining?

Long-term data sets for heavy metals suggest significant decreases in water column concentrations of zinc, cadmium and other metals over the past thirty years, but zinc levels at mid-estuary sites are still above recommended ecological guidelines. New Town Bay has shown significant reductions in water column zinc levels since a cut-off wall was installed between the site and the bay in 1997.

Dissolved oxygen levels in the upper estuary have improved since the pulp mill at Boyer implemented primary treatment in 1990, but oxygen levels are still low at depth during summer months and low flow conditions. This is due in part to a natural tendency towards oxygen depletion in the upper reaches of stratified estuaries, combined with the effects of the pulp mill effluent.

Nutrient and chlorophyll *a* data is more difficult to interpret due to a shorter record and high natural variability. Nutrients vary seasonally, with highest values measured in winter months when nutrient-rich, sub-antarctic waters extend to southeastern Tasmania. Levels are generally highest at mid-estuary sites, in bays and at depth, reflecting inputs from sewage treatment plants and sediments. Chlorophyll *a* levels are usually moderate to low. No clear trend is evident over the past 5 years, except in Prince of Wales Bay, where nutrient and chlorophyll levels have doubled.

Are levels of contamination in sediments increasing or decreasing?

Levels of heavy metals and arsenic in Derwent Estuary sediments remain among the highest in Australia (and indeed the world). A recent survey of surface sediment quality indicates that the majority of sediments within the Derwent are fine-grained, organic-rich and significantly exceed sediment quality guidelines for a number of heavy metals, particularly mercury, lead, zinc and cadmium. This undoubtedly impairs the health of estuarine biota and is related to the high heavy metal levels measured in Derwent Estuary shellfish.

Comparisons with historical sediment data from the 1970s and 1990s, together with analyses of long cores collected at a number of sites, indicate that we are starting to see a gradual reduction in metal levels, particularly in some of the most highly contaminated mid-estuary sites.

How long will it take for Derwent Estuary sediments to recover, and are there any economically viable actions we can take to accelerate this process? The Derwent Estuary Program is seeking funding to address these questions in the next few years, with a focus on investigation of heavy metal sources, sinks and processes, delineation of any major 'hot spots' and identification of management options.

New Seafood Safety Guidelines - Revised Mercury Standards

In December 2002, a new Food Standards Code replaced the previous Australia New Zealand Food Authority Guidelines. This new code halves the maximum allowable level of mercury in most fish from 1.0 mg/kg to 0.5 mg/kg. Mercury levels in Derwent Estuary flathead vary somewhat from year to year, but in the 2002 survey, average mercury levels in flathead taken from the area above the Tasman Bridge were slightly above the new guidelines, while levels in fish taken in the southern part of the estuary and Ralphs Bay were slightly below. Concentrations in individual fish ranged from 0.08 mg/kg to 1.0 mg/kg, with about 15% of samples in excess of the recommended standard.

During the coming year, the DEP plans to work with the state, local governments and industry to review and enhance seafood monitoring and communications protocols, in light of the new Food Standards Code. In the meantime, it may be prudent to exercise some caution in consuming flathead caught in the Derwent (particularly by pregnant women and children).

In July 2003, ANZFA announced a further review of this mercury standard (see www.foodstandards.gov.au for details).

Derwent Habitat and Species

Are contaminant levels in seafood increasing or decreasing?

Heavy metals levels in Derwent Estuary shellfish have been monitored by Pasminco Hobart Smelter for 12 years. Levels are well above the national guidelines – particularly for zinc in oysters and lead in mussels – with highest values in the area above the Tasman Bridge, followed by Ralphs Bay and then the Eastern Shore. There is considerable interannual variability in shellfish metal levels, and no clear long-term reductions, despite improved industrial practices in recent years.

Contaminated sediments probably play in important role in this as shellfish live near the sediment-water interface and typically filter about five litres of sediment-laden water each day. ***Shellfish should not be harvested or consumed from any part of the Derwent.***

Pasminco has also monitored mercury levels in Derwent Estuary flathead for the past 21 years. Flathead were selected as a good indicator of mercury levels in fish as they live in the Derwent year-round and are bottom feeders. Levels vary somewhat from year to year, but the long-term trend has been downwards. In recent years, average mercury levels were below the National Food Standards, however, these standards have recently been changed, and some proportion of flathead now do not meet these revised standards (see adjacent Box for discussion).

Is fish and wildlife habitat increasing or declining?

A baseline survey of Derwent Estuary habitats was carried out by the Tasmanian Aquaculture and Fisheries Institute in 2000. This survey showed that most (96%) of the Derwent seafloor is made up of unvegetated, soft muds. There are however, important marcophyte beds (underwater grasses) in the upper estuary, rocky reef habitats in the lower estuary, and some scattered seagrass beds in the middle and lower estuary. Large areas of intertidal flats, with associated salt marshes and wetlands also border the estuary, particularly in Ralphs Bay and above Dogshear Point.

Recent studies of long cores collected at sites in the middle and lower estuary indicate that the Derwent has undergone a major transformation during the past 200 years – sediments have become muddier, increasingly contaminated and scallops, oysters and other large molluscs have vanished from areas in which they were previously abundant.

Despite the historical loss of important habitat and the degradation of sediment quality, the Derwent remains an important and productive ecosystem that still sustains a remarkable diversity of marine and aquatic fauna. Vast numbers of invertebrates and crustaceans, over 150 species of fish and over 80 species of resident and migratory birds live in and around the estuary. Many marine and aquatic mammals also live in or visit the Derwent, including platypus, seals, dolphins and whales.

G.Edgar

Rock Lobster

The critically endangered spotted handfish lives only in the Derwent region, and has been the subject of considerable research and recovery trials during the past five years. In 2002, numbers appear to have increased slightly, due in part to successful deployment of spawning substrate in previous years.

What is the current status of marine pests in the Derwent?

Introduced marine pests (IMPs) pose a serious threat to the overall ecology and native species of the Derwent. Temperate, southern hemisphere estuaries such as the Derwent are susceptible to marine pest invasions from northern temperate areas as they provide comparable conditions for exotic species to thrive, but lack the controls to regulate these populations. Marine pests seem to particularly flourish in the Derwent, taking advantage of the disturbed environment.

In 2002, the Hobart Ports Corporation commissioned Aquenal Pty Ltd to carry out a baseline marine pest survey of the Derwent, focusing on areas most heavily used by commercial and recreational vessels. Seventy species were identified, with the greatest concentrations found in the Hobart docks area. These included 8 'target' pests (as listed by the Australian Ballast Water Management Advisory Council), 35 non-target pests and 27 cryptogenic species (unclear if the species is native or introduced).

A number of species were identified as being of particular concern, as they have invaded natural as well as artificial habitats and are generally abundant and widespread. These include target pests the northern Pacific seastar, Japanese seaweed, toxic dinoflagellate, and Pacific oyster; as well as non-target pests the New Zealand half crab, New Zealand seastar and New Zealand screw shell.

The rice grass eradication program was continued in 2002 by DPIWE's Marine Resources Division with outstanding success. Through careful surveys and treatment, the infested area in the Derwent has been reduced from 1 hectare in 1997 to less than 1 square metre in 2002.

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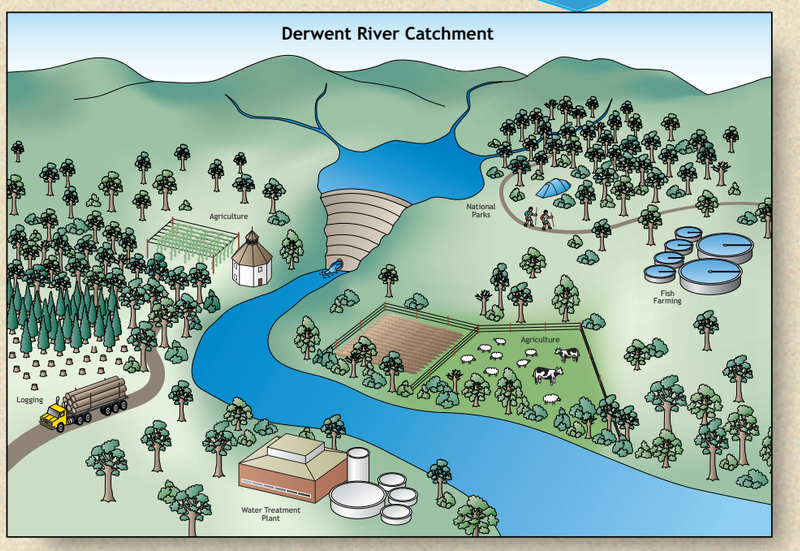
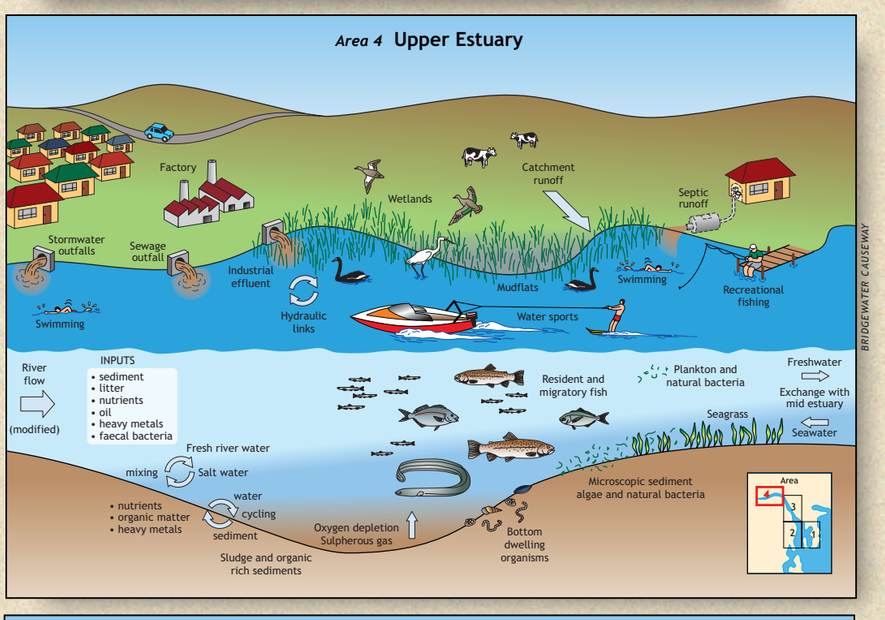
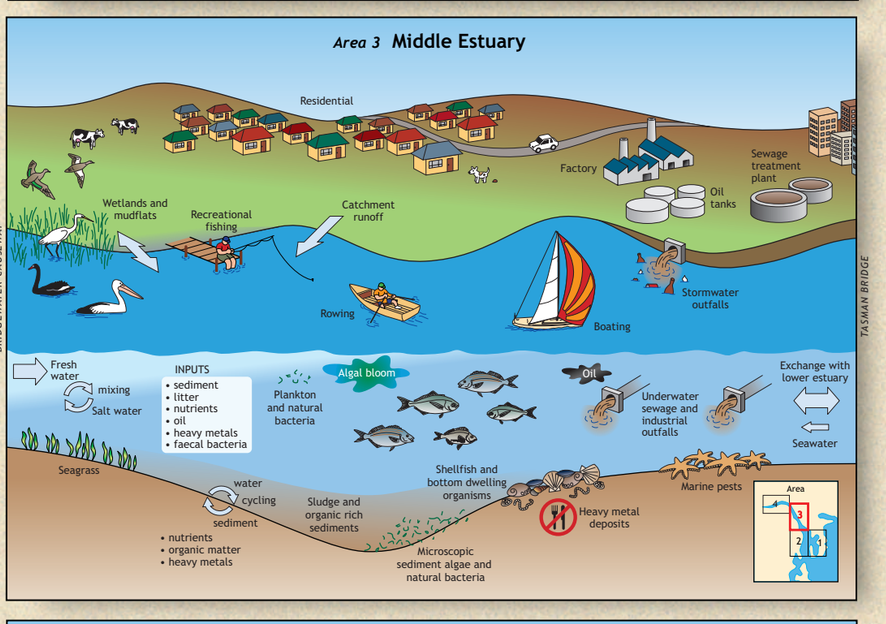
Recent Management Actions, Sampling Sites and Discharge Points

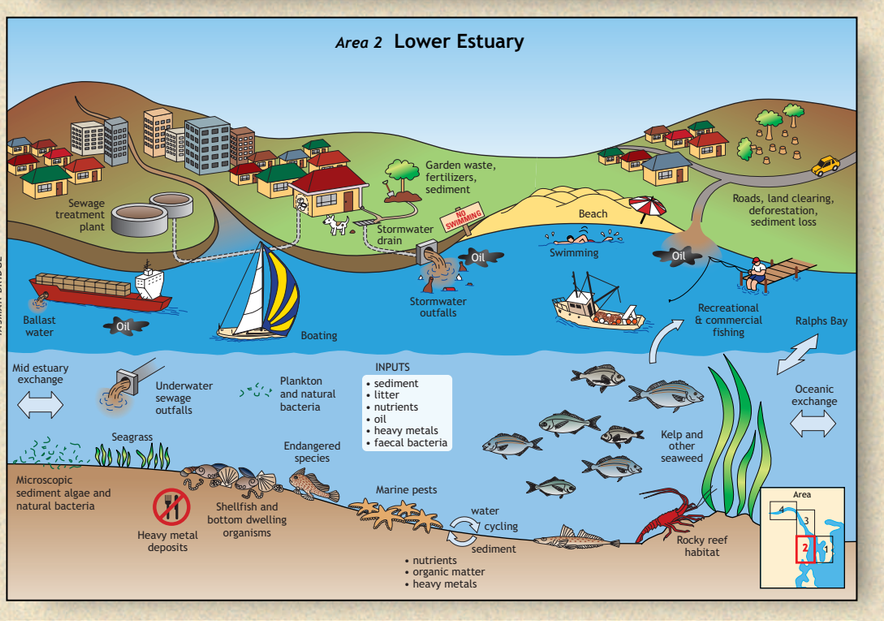
DERWENT CATCHMENT NATURAL RESOURCE MANAGEMENT PLAN

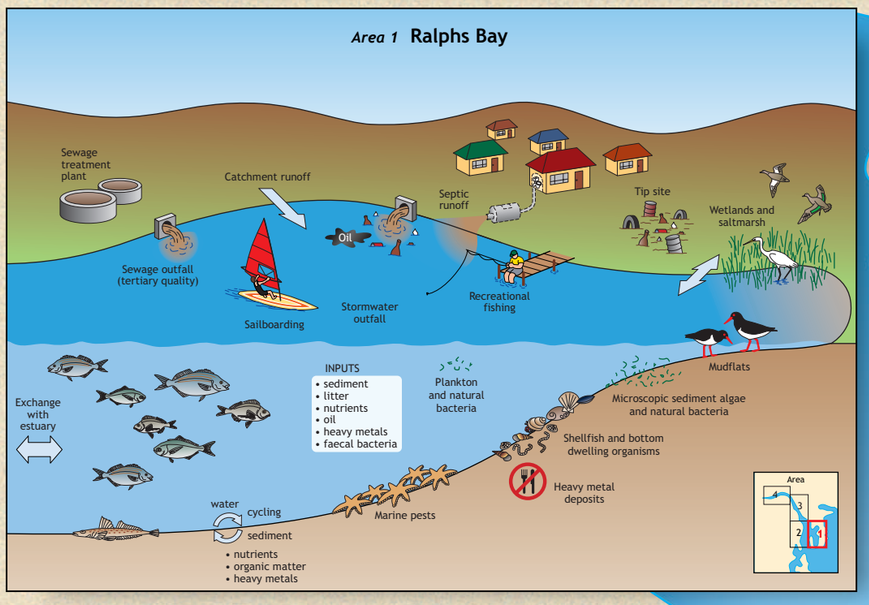
In 2002, the Upper Derwent Valley Landcare Group, together with the Central Highlands Council, released a Natural Resource Management Plan for the the 7600 sq km freshwater Derwent River catchment above New Norfolk. This plan seeks to balance economic development with the protection of natural systems, working in partnership with local government, industry and the whole of the community. The plan includes strategies to manage water supplies for towns, domestic use and river health; native vegetation; rural tree decline; weeds; soil salinity; water quality and riparian vegetation. This project was supported in part through a Natural Heritage Trust grant.











CORNELIAN BAY STUDY

A detailed study of Cornelian Bay was completed in 2002 by scientists at the Tasmanian Fisheries and Aquaculture Institute, with support from the Hobart City Council. Mapping of subtidal habitats revealed that the majority of the bay floor (80%) consists of unvegetated soft sediments. Seagrasses were restricted to small beds with a combined area of around 0.22 km2. Some beds, particularly in the middle part of the bay, were heavily overgrown with epiphitic algae - an indication of high nutrient levels. Twenty-four short sediment cores and two long cores were also collected and analysed for grain size, heavy metals and shell content. The highest metal levels were found in deeper water (>5 m) where the sediments are siltier. Heavy metals concentrations in the nearshore sandy sediments were significantly lower, however mercury (and to a lesser degree lead) levels were in excess of ecosystem protection guidelines.

STORMWATER MANAGEMENT IN HOBART

Since March 2001, the Hobart City Council has expended nearly $700,000 to clean up Hobart's waterways and urban stormwater catchments. Of this amount $340,000 were funds granted by the Commonwealth Government's Natural Heritage Trust Programs, specifically the Riverworks and Coasts and Clean Seas programs. Areas of Hobart targeted have included the Salamanca/Sullivans Cove area, the Central Business District and Hobart Rivulet, Cornelian Bay, Waynes Rivulet in Lower Sandy Bay, and the New Town Rivulet/New Town Bay area. These projects have seen a wide range of solutions applied to stormwater pollution, which is one of the most significant issues in managing Hobart's urban environment.

DOMAIN SLIPYARD WASTE MANAGEMENT PROJECT

The Hobart Ports Domain slipyard is the largest commercial slipyard in southeastern Tasmania, slipping over 400 vessels each year. In 2001, the Hobart Ports Corporation received and matched a $110,000 Natural Heritage Trust grant to prevent slipway generated pollutants from flowing into the Derwent from the site and to implement best-practice management protocols. Project elements have included installation of solid and liquid waste collection systems, a multi-step treatment process to remove metals, paints, thinners, oils and cleaning agents, and improved day-to-day waste management procedures that incorporate training, awareness and signage.

ALTERNATIVE ON-SITE WASTEWATER TREATMENT AND DISPOSAL SYSTEMS

Brighton Council and Envirotech Treatment Systems have recently completed a 3-year trial of alternative domestic wastewater treatment and disposal systems. This project arose due to concerns about the effectiveness of conventional septic tank systems, particularly in areas with clayey and dispersive soils that are prone to tunnel erosion. These soil types are widespread in areas of Brighton (Honeywood and Baskerville) where the trials were conducted. Five different systems were tested incorporating current and new generation technology: the Re-circulating Sand Filter; Pulse-Dosed Aerobic Sand Filter; Extended Aerated Ozonated System; Filtered Septic Tank System and Landscaped Sand Mound. Outcomes - to be presented at a regional workshop - will provide the information needed to select the most effective system for specific site conditions and to maintain it following installation.

MAJOR EFFLUENT REUSE SCHEME IN CLARENCE

Under a new initiative, sewage effluent from Clarence City Council's Rosny Wastewater Treatment Plant is to be re-used for irrigation in the Coal River Valley. The project is a joint $16 million initiative between the Commonwealth Government, Clarence City Council and landowners in the Coal River Valley. The project will include construction of 7 km of rising main, 4.6 km of delivery main and 22 km of reticulation mains to deliver the treated effluent (up to 2.5 billion litres/yr) directly to farm properties. The project may have potential scope to be expanded in the future to include effluent from other areas. Once commissioned, the project will lead to a reduction in nitrogen (up to 70 tonnes/year) and phosphorus (up to 20 tonnes/year) entering the Derwent.

NEW SCRUBBING SYSTEM, DIFFUSER AND DESIGNATED MIXING ZONE - PASMINCO HOBART SMELTER

In 2001, Pasminco Hobart Smelter spent nine million dollars commissioning a new tail gas scrubber to reduce sulphur emissions and installing a new diffuser system to improve the mixing and dilution of effluent discharged to the Derwent. Substantial monitoring was carried out under a number of tidal and environmental flow conditions to determine the behaviour of the effluent plume so as to define a regulatory mixing zone. Ecotoxicity testing was also conducted to determine effects of the effluent upon estuarine organisms. Diffuser effluent was found to have very low toxicity and waters at the edge of the mixing zone was found to be non-toxic to all organisms tested. DPIWE subsequently accepted the mixing zone dimensions as determined by these investigations and Pasminco Hobart Smelter will now be regulated upon this in the future to ensure that protected environmental values in the middle estuary are not compromised.

LAUDERDALE WETLAND PROJECT

In 2002, Clarence completed the design and construction phases of a 5 hectare wetland in the Lauderdale area. The wetland was designed to collect and treat contaminated stormwater from low-lying surrounding areas and consists of ephemeral shallows, a meandering drainage channel and six permanent pools. An irrigation system was also installed to maintain optimum moisture conditions for wetland plants. During the past winter and spring, the revegetation phase has progressed with assistance from the community and TAFE Conservation Certificate students. Enhancement of the wetland's recreational and amenity values is also being planned, including the construction of pathways, bridges and a rotunda, as well as shade-tree planting. This project was supported in part through a Natural Heritage Trust grant.

New Norfolk
New Norfolk
Norske Skog Paper
River
Bridgewater
Bridgewater Causeway
Jordan
Austins Ferry
Old Beach
Claremont
Dogshear Point
Cameron Bay
RIVER
Bowen Bridge
GLENORCHY
East Risdon
Prince Of Wales Bay
Pasminco Hobart Smelter
Moonah
Selfs Point
(outfall at Sandy Bay)
New Town
Lindisfarne
Cornelian Bay
HOBART
Tasman Bridge
Macquarie Point
Rosny
Bellerive
DERWENT
Sandy Bay
Howrah
Sandy Bay
(outfall from Selfs Point)
Tranmere
Rokeby
Rokeby
Taroona
Lauderdale
Taroona
Kingston
Blackmans Bay
Opossum Bay
Blackmans Bay
RALPHS BAY
Tinderbox
South Arm
Iron Pot
Betsey Island
N
0
5
kilometres

Water Quality Monitoring Sites in 2002-03

- Beach Monitoring Site *(enterococci)*
- Ambient Monitoring Site *(temperature, salinity, pH, dissolved oxygen, nutrients, chlorophyll a, metals)*

Sewage Treatment Plant Discharges in 2002-03

- <2500 kL/d
- 2500 - 5000 kL/d
- >5000 kL/d

Industrial Discharges in 2002-03

- >50,000 kL/d

CLARENCE CITY
GLENORCHY CITY Where ideas happen.
DERWENT VALLEY COUNCIL
BRIGHTON COUNCIL
HOBART CITY COUNCIL
KINGBOROUGH COUNCIL
HOBART Water Quality on Tap
Norske Skog Boyer
Natural Heritage Trust Helping Communities Helping Australia A Commonwealth Government Initiative
PASMINCO HOBART SMELTER
Tasmania

TASMAP PRODUCTION
3514/03