

Changes in urban environments

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EPA 769/09: This information sheet is part of a series of Fact Sheets on the Adelaide coastal waters and the findings of the Adelaide Coastal Waters Study (ACWS).

Introduction

Since European settlement in the 1830s, the Adelaide plains and Adelaide's coastal environment have been subject to considerable change and pressure from a continually increasing population. In recent years there has been growing community concern about the effects of coastal and catchment development on the marine environment. Increases in stormwater flows and waste from wastewater treatment plants (WWTPs) have also been of concern. Nutrients and other pollutants introduced to Adelaide's nearshore waters from urban and rural runoff, WWTPs and some industrial sources have been found by the Adelaide Coastal Waters Study (ACWS) to have had a negative impact on Adelaide's nearshore marine environment, including the loss of over 5,000 hectares of seagrass.

Historical catchment changes

When Adelaide was selected by Colonel William Light for South Australia's state capital in 1836 there was a wide belt of coastal dunes and wide sandy beaches stretching to the north and south of Glenelg. From Seacliff to Outer Harbor there was a 30 km stretch of sand dunes broken only by the Patawalonga Creek at Glenelg. The Torrens River flowed into a series of swamps lying behind the coastal dunes and drained both north and south to the sea through the Patawalonga Creek and Port River system. The stretch of sand dunes comprised two or more parallel ridges each about 70 to 100 metres wide separated by narrow depressions or swales, consequently very little surface catchment runoff would have reached the coastline.



Image 1 Glenelg foreshore 1837



Image 2 Glenelg foreshore 2009

Initial coastal development was concentrated at sites of landings and safe anchorages such as Largs Bay, Semaphore, Grange, Henley and Glenelg. There was limited direct linkage between these settlements in a north-south direction, but all areas were quickly connected to the city square by roads, railways and tramways. Early coastal development was by expansion of the isolated coastal nodes.

By the 1920s the coastal towns of Henley and Grange, and Semaphore and Largs Bay had expanded to such a size that they began to merge into two separate linear coastal developments. Glenelg expanded toward Brighton, which had by then developed into a further coastal node. This pattern of coastal growth continued until World War II. The post-war period has seen infill development of the Adelaide plains and metropolitan coast as residents have had increased levels of mobility with the use of the family car.

In the 1950s the coastal swamps were drained and a network of concrete stormwater drains, such as that for Sturt River, was established. These concrete channels reduce the risk of flood and are capable of delivering significant volumes of water from urbanised catchments to the marine environment swiftly during large rainfall events. These changes set the scene for the 1960s and 1970s, when loss of seagrass along the Adelaide metropolitan coastline started to be noticed.



Image 3 Sturt River south (left) and north of Sturt Road (right)

Impacts of changes in urban environments

Increases in stormwater flows

With increasing urban development over the Adelaide plains since European settlement there has been a related increase in sealed surfaces, such as roads, pavements and roofs (Image 4 and 5). These surfaces prevent rainfall from soaking into the ground, resulting in greater volumes of stormwater being sent down drains and into the marine environment. Stormwater is often high in organic waste such as animal faeces, green waste (lawn clippings and leaves) and nutrients. Stormwater also transports industrial runoff as well as rubber, oil and heavy metals from our roads and motor vehicles into our watercourses and the marine environment.



**Image 4 Adelaide, South Australia,
North Terrace 1841**



Image 5 Adelaide 2009

Inputs from wastewater treatment plants

The Glenelg, Bolivar, Port Adelaide and Christies Beach wastewater treatment plants have for many years discharged nutrient-rich wastewater into the marine environment. Until 1993, sewage sludge was also discharged to the sea from the Glenelg and Port Adelaide plants. SA Water implemented its environment improvement program (EIP) between 2002 and 2004, resulting in substantial improvements to wastewater treatment processes and included the decommissioning of the Port Adelaide plant. The ACWS findings however indicate that nutrient levels of discharged water need to be further decreased. Refer to Information Sheet No. 5 *Inputs to Coastal Waters* (2009) for more detailed information.

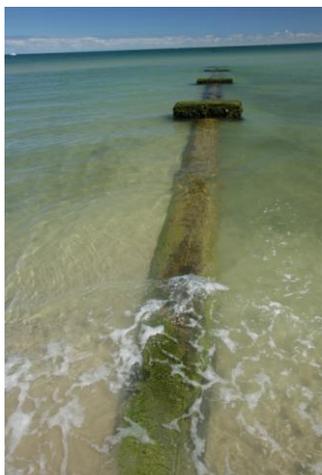


Image 6 Glenelg sewage outlet



Image 7 Glenelg WWTP

Inputs from industrial sources

Penrice Soda Holdings was established in the late 1930s and uses Solvay processes to produce soda ash for products ranging from glass containers to washing powder. Sodium bicarbonate is also produced for use in applications as diverse as animal feed, food and pharmaceuticals. The processes used to make these products produce high loads of sediment and ammonia which have been previously discharged to the Port River. In recent years Penrice Soda Holdings has improved plant management processes and made use of a sediment settling pond which has led to the recovery of large amounts of ammonia and sediment resulting on significant reductions to the volume discharges to the Port River. Refer to Information Sheet No. 5 *Inputs to Coastal Waters* (2009) for more detailed information.



Image 8 Penrice Soda Holdings works (left) and discharges to Port River (right)

Water quality

The water quality and ecology of Adelaide's metropolitan beaches and coastal waters have been and continue to be impacted by the discharges of industrial waste, treated effluent and stormwater from the changes to Adelaide's urban environment. Findings from the ACWS confirm that the loss of seagrass along Adelaide's metropolitan coastline since 1935 has roughly mirrored Adelaide's growth in urban population. The ACWS also confirms that high volumes of nutrient

rich and turbid inputs to Adelaide's coastal waters in the past and present are the most likely cause of loss of seagrasses along the Adelaide coastline.

Concerns about Adelaide's coastal water quality

Pollution of marine and estuarine habitats can compromise their environmental values, ie those features of the coast important to the community. Pollutants can enter these habitats from diffuse runoff in urban and rural catchments as well as point source discharges from industries and WWTPs. Pollutants in marine waters can also come from aquaculture, shipping, fishing, boating and other recreational activities.

The main water quality problems for Adelaide's coastal waters relate to loss of seagrass and the degradation of sub-tidal reefs. These seagrass and reef ecosystems are sensitive to increases in nutrients and sediments in the water. A loss of these habitats will result in lower marine biodiversity, reduced productivity and smaller fish populations. Loss of seagrass also means less protection for our beaches from wave action and more mobile sediments. Replenishing these sediments requires expensive and often disruptive intervention by coastal managers (eg sand carting and dumping).



Image 9 Sand carting at Glenelg beach



Image 10 Sand carting at Glenelg Beach

What is being done to improve coastal water quality?

The following actions are currently being undertaken to deliver improvements in water quality for Adelaide's coastal waters:

- SA Water is continuing to decrease nutrients in the water discharged from metropolitan WWTPs.
- The Adelaide and Mount Lofty Ranges Natural Resource Management Board is continuing to undertake work across the metropolitan catchments that will reduce stormwater volumes and contaminants.
- The EPA has introduced the *Environment Protection (Water Quality) Policy 2003* and codes of practice to decrease pollution especially from diffuse sources.
- The ACWS has 14 recommendations resulting from the study; of which five are about the reduction of inputs to coastal waters.
- The EPA completed the Port Waterways Water Quality Improvement Plan in 2008 which focused on water quality within the Port waterways.
- The EPA is currently developing the draft Adelaide Coastal Water Quality Improvement Plan.
- Many proactive councils around Adelaide are already using or investigating options for stormwater reuse (ie City of Salisbury and City of Onkaparinga).
- SA Water currently supplies recycled water for irrigation from its Bolivar and Christies Beach WWTPs and are currently undertaking the Glenelg to Adelaide Park Lands Recycled Water Project to utilise recycled water from its Glenelg WWTP.

How can we reduce the impact of our urban environment?

The Adelaide coastal waters have been the receiving environment for waste and polluted water over a long time. Slowing or reversing the effects of historical and ongoing pollution will take many years. However, everyone can take action to reduce pollution and improve water quality for Adelaide's coastal waters.

We can begin by improving the quality of our wastewater. This requires being mindful of what we put down our drains. Items such as solvents, oils, paints, varnish, thinners, paint strippers, pesticides, poisons, fertilisers and acids should be disposed of responsibly. We can also help by avoiding unnecessary use of cleaning products and ensure compostable material such as food scraps do not go down the kitchen sink.

Secondly, we can improve stormwater quality by being mindful of our garden activities. Fertilisers, pesticides and herbicides should be used sparingly as rainfall can carry these chemicals into the stormwater drain or your local waterway. It is also important for pet owners to clean up after their pets so faeces do not enter the stormwater system. Bucket washing cars on grassy areas instead of the driveway will further help to reduce water pollution as will sweeping up and composting organic matter. Installing rain water tanks will also help by reducing the volume of stormwater entering Adelaide's coastal waters.

References

Environment Protection Authority 1998, *Changes in Seagrass Coverage and Links to Water Quality off the Adelaide Metropolitan Coastline*, EPA, Adelaide.

—2003, *Ambient Water Quality Monitoring of the Gulf St Vincent Metropolitan Coastal Waters Report No.2: 1995–2002*, EPA, Adelaide.

—2008, 'Coasts and Seas', *State of the Environment Report 2008 for South Australia*, EPA, Adelaide, <www.epa.sa.gov.au>.

Pattiaratchi C, Newgard J and Hollings B 2007, *Physical oceanographic studies of Adelaide coastal waters using high resolution modelling, in-situ observations and satellite techniques—Sub Task 2 Final Technical Report*, ACWS Technical Report No. 20, prepared for the Adelaide Coastal Waters Study Steering Committee, School of Environmental Systems Engineering, The University of Western Australia, Perth.

Acknowledgments

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Useful websites

Environment Protection Authority (SA) Water quality pages <www.epa.sa.gov.au/water_quality.html>

Coast and Marine website <www.environment.sa.gov.au/coasts/index.html>

South Australian State of the Environment Report 2008 <www.epa.sa.gov.au/soe>

Images

- 1 Glenelg foreshore 1837, courtesy of City of Holdfast Bay.
- 2 Glenelg foreshore 2009, EPA.
- 3 Sturt River (concrete stormwater drain), EPA.
- 4 Hitchen J., Adelaide, South Australia, North Terrace, PIC S1182 LOC 1698 PIC U1225 NK249 LOC 1699. Original copy owned by the National Library of Australia.
- 5 Adelaide 2009 (detail of larger image), courtesy of SATC.
- 6 Glenelg Sewage Outlet, EPA.
- 7 Glenelg WWTP, courtesy DEH.
- 8 Penrice Soda Holdings works and discharges to the Port River, EPA.
- 9 Sand Carting at Glenelg Beach, EPA.
- 10 Sand Carting at Glenelg Beach, courtesy of Waterwatch Adelaide and Mount Lofty Ranges.

Disclaimer

This publication is a guide only and does not necessarily provide adequate information in relation to every situation. This publication seeks to explain your possible obligations in a helpful and accessible way. In doing so, however, some detail may not be captured. It is important, therefore, that you seek information from the EPA itself regarding your possible obligations and, where appropriate, that you seek your own legal advice.

Further information

Legislation

Legislation may be viewed on the Internet at: <www.parliament.sa.gov.au/dbsearch/legsearch.htm>

Copies of legislation are available for purchase from:

Government Information Centre	Telephone:	13 23 24
Lands Titles Office, 101 Grenfell Street	Fax:	(08) 8204 1909
Adelaide SA 5000	Internet:	< shop.service.sa.gov.au >

For general information please contact:

Environment Protection Authority	Telephone:	(08) 8204 2004
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