Adelaide Coastal Waters

Information Sheet No. 5

Inputs to coastal waters

Issued August 2009

EPA 771/09: This information sheet is part of a series of Fact Sheets on the Adelaide coastal waters and findings of the Adelaide Coastal Waters Study (ACWS).

Introduction

Over the years, there has been growing concern over the quality and quantity of water inputs to the marine environment adjacent to Adelaide's metropolitan area.

Large volumes of freshwater, nutrients, suspended sediments and other pollutants have been introduced to Adelaide's nearshore waters from urban and rural runoff, wastewater treatment plants (WWTPs) and some industrial sources. These inputs have resulted in reduced water quality with increased nutrients and turbidity. Findings from the Adelaide Coastal Waters Study (ACWS) indicate that nutrient rich and turbid inputs to Adelaide's coastal waters are the main causes for the loss of seagrass along the Adelaide coastline. High levels of suspended sediments transported by stormwater inflows to Adelaide's nearshore waters are responsible for impaired recreational water quality following high rainfall events.

Image 1 Major discharge of stormwater from the Torrens River into Adelaide's coastal waters on 25 October 2005

Historical context

Prior to European settlement

Adelaide's coastal waters were once pristine. The pattern of catchment outflows in the Adelaide region was dominated by winter runoff. This runoff was largely intercepted by the wetlands of the Adelaide plains which once spanned an area from Glenelg to Port Adelaide, outflows from the Port River would have been very infrequent. It is estimated that 70% of wetlands in South Australia have been lost since European settlement.

Prior to European settlement, loads of nutrients and sediments to coastal waters would have been minimal. This is because South Australia has soils naturally low in nutrients and areas formerly covered in native vegetation would have acted as a natural filter as runoff passed through. Flows would have been characteristically high in coloured organic material.

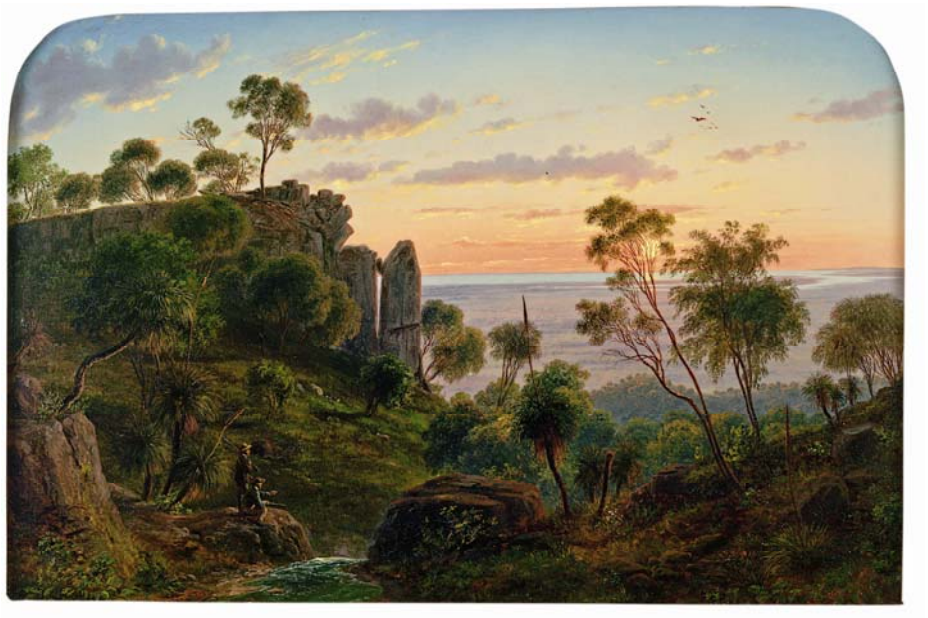

Image 2 Scenery in the Mount Lofty Ranges, near Adelaide, and a View of the Gulf of St Vincent, South Australia

The impact of these inputs to coastal waters would have been small and intermittent. This left the marine environment relatively intact and undisturbed by inputs of freshwater, nutrients and other pollutants. Water quality in Adelaide's nearshore zone would have been similar to that found in the rest of Gulf St Vincent and seagrasses would have been abundant in the shallow waters along the coast.

Historical changes

Before the 1930s there were relatively few freshwater inputs to Adelaide's coastal waters. Coastal degradation caused by discharges of industrial waste, wastewater and stormwater was first noted in the 1940s. Later during the 1970s, a peak period of degradation occurred with significant loss of seagrass which mirrored the increases in development and discharges associated with population increase.

Since the 1940s there have been a number of changes to the Adelaide region that have impacted on coastal water quality. These changes include the draining of Adelaide's coastal swamps and construction of a network of stormwater drains with concrete channels (Image 3), the diversion of the River Torrens and more recently the construction of the Barcoo Outlet. This has resulted in a significantly increased volume of highly turbid, coloured, nutrient rich water being delivered to the coast. Refer to Adelaide Coastal Waters Information Sheet 3 *Changes in Urban Environments* (2009) for more detailed information.

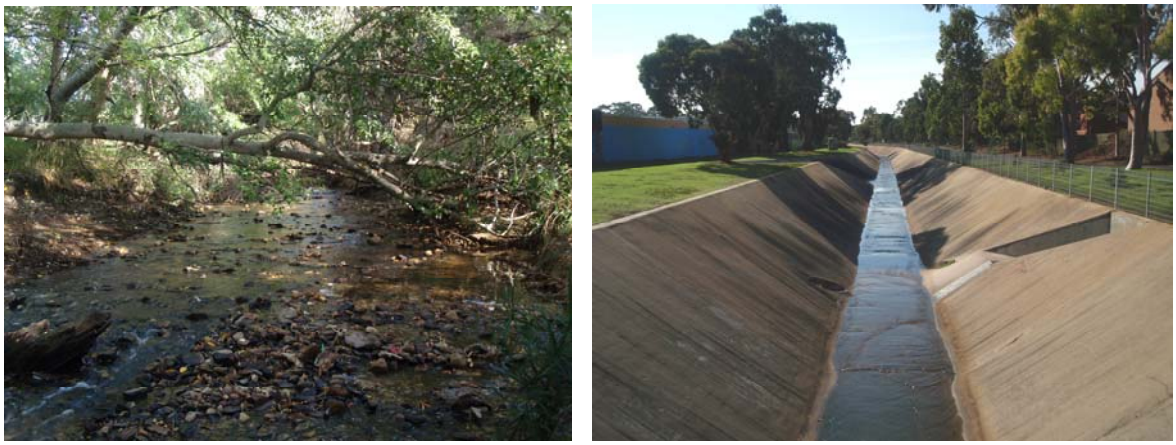

Image 3 Sturt River south and north of Sturt Road

WWTPs have added to the loads of suspended solids, nutrients, freshwater and other contaminants entering Adelaide's coastal waters. Between 1961 and 1993 sludge material from the Glenelg and Port Adelaide facilities was piped offshore. There it was left to disperse and settle under the action of currents, tides and other physical processes.

Ongoing discharges from industries such as Penrice Soda Holdings also release suspended solids and nutrients into our coastal waters. Industrial discharges have contributed towards the historical decline in water quality within the Port River and have also impacted the water quality of Adelaide's coastal waters.

Recent efforts of placing trash racks and sediment traps on stormwater outlets has resulted in mostly fine sediment entering the nearshore waters. Wind, water currents and dredging mobilise these fine sediments causing an increase in turbidity and consequently decreased water quality for the marine environment and recreation.

Current inputs

Adelaide's coastal zone extends from Pt Gawler to Sellicks Beach and receives inputs from a variety of 'point' and 'diffuse' sources. A point source is a discharge or outflow which enters a waterway from an identifiable location. Point source discharges can include those from industrial discharges, WWTPs, rivers, streams, creeks and drains. A diffuse source discharge enters a waterway at a number of locations rather than at one identifiable source. Diffuse source discharges include urban and agricultural runoff as well as inflows from groundwater and from atmospheric deposition.

Image 4 Point source inputs to Adelaide's coastal zone

About 391 GL of water enters the Adelaide coastal waters from Port Gawler to Sellicks Beach annually through wetfall, stormwater, WWTPs and groundwater (Table 1). Wetfall represents rainfall which falls directly onto water (ie oceans, rivers, creeks, lakes and dams) as opposed to stormwater, WWTP discharges and groundwater which flow over or through other matter before reaching Adelaide's coastal waters. Dryfall in Table 1 refers to the nutrients and suspended solids (particulates) deposited directly onto Adelaide's coastal waters as dust.

The very low concentration of nitrogen and other trace constituents in rainwater means that wetfall is an insignificant source of nitrogen when compared to land-based inputs. The wetfall input accounts for around 30 tonnes (1%) of nitrogen annually and dryfall contributes less than 1% of total nitrogen. Of the estimated 2,453 tonnes of nitrogen entering the coastal zone (Table 1), 90% is derived from the WWTPs and Penrice Soda Holdings (49% and 41% respectively). Nutrient and sediment loads from the WWTPs are as follows:

- Bolivar 65% (including diverted material from Port Adelaide).
- Glenelg 23%.
- Christies Beach 12%.

Dryfall deposition contributes a significant component (18%) of the solids input to the coastal waters with an annual load of nearly 2,000 tonnes from this source.

Table 1 A summary of 2001 to 2003 annual inputs into Adelaide's coastal waters

Source	Flow GL/ year	Nutrients (Total N) Tonnes/ year	Suspended Solids Tonnes/ year
Wetfall	213 (54%)	32.8 (1%)	NA
Stormwater	114 (29%)	150.7 (6%)	6906 (67%)
WWTPs	62 (16%)	1204.2 (49%)	1579 (15%)
Groundwater	2 (1%)	50.0 (2%)	NA
Dryfall	NA	15.3 (<1%)	1852 (18%)
Penrice	NA	1000.0 (41%)	NA
Total	**391**	**2453**	**10337**

Source: Information from ACWS, Tech. Report No. 18 and ACWS Final Report Vol. 1

Despite these inputs, the current overall water quality of Adelaide's coastal waters is moderate for ecosystem health and remains suitable for bathing as well as other recreational activities. Seagrass loss however is still being experienced. The EPA runs a program which regularly monitors ambient water quality and the suitability of Adelaide's waters for recreational activities. Water quality describes the condition of a water body and its related suitability for different purposes. More information on water quality is available on the EPA water quality webpages at <www.epa.sa.gov.au>.

The ACWS has found that nutrient-rich discharges and turbid inputs have had the greatest impact on Adelaide's coastal water quality and the health of seagrass.

Recommendations from the Adelaide Coastal Waters Study

The ACWS provided 14 recommendations aimed at reducing inputs of nutrients, turbidity and colour in stormwater and wastewater to metropolitan coastal waters. It was found that present nutrient enrichment levels are sufficient to cause seagrass loss. This is compounded by increased inflows of turbid and coloured stormwater as well as catchment runoff. Management actions need to work towards improved environmental outcomes by reducing inputs to Adelaide's coastal waters.

The first five recommendations of the ACWS relate to the reduction of inputs.

Recommendation #1

As a matter of priority, steps must be taken to reduce the volumes of wastewater, stormwater and industrial inputs into Adelaide's coastal environment. This should be done within the context of an overarching strategy designed to remediate and protect the metropolitan coastal ecosystem.

Recommendation #2

The total load of nitrogen discharged to the marine environment should be reduced to around 600 tonnes per annum (representing a 75% reduction from the 2003 value of 2,400 tonnes).

Recommendation #3

Commensurate with efforts to reduce the nitrogen load, steps should be taken to progressively reduce the load of particulate matter discharged to the marine environment. A 50% load reduction (from 2003 levels) would be sufficient to maintain adequate light levels above seagrass beds for most of the time. The reduced sediment load would also contribute to improved water quality and aesthetics.

Recommendation #4

To assist in the improvement of the optical qualities of Adelaide's coastal waters, steps should be taken to reduce the amount of CDOM (coloured dissolved organic matter) in waters discharged by rivers, creeks and stormwater drains.

Recommendation #5

While the available data suggests that toxicant levels in Adelaide's coastal waters pose no significant environmental risk, loads from point sources such as the Port River, WWTPs, and drains should continue to be reduced. Routine monitoring of toxicant loads and concentrations should be undertaken every 3-5 years.

References

Environment Protection Authority 2008, 'Coasts and Seas', State of the Environment Report 2008 for South Australia, EPA, Adelaide.

Fox DR, Batley GE, Blackburn D, Bone Y, Bryars S, Cheshire A, Collings G, Ellis D, Fairweather P, Fallowfield H, Harris G, Henderson B, Kampf J, Nayar S, Pattiaratchi C, Petrusevics P, Townsend M, Westphalen G and Wilkinson J 2007, *Adelaide Coastal Waters Study: Final Report Volume 1 – Study Findings*, Final Report prepared for the Adelaide Coastal Water Study Steering Committee.

Wilkinson J, White N, Smythe L., Hutson J, Bestland E, Simmons G, Lamontage S, and Fallowfield H, 2005 *Volumes of inputs, their concentrations and loads received by Adelaide metropolitan coastal waters*, ACWS Technical Report No. 18 prepared for the Adelaide Coastal Water Study Steering Committee, September 2005. Flinders Centre for Coastal and Catchment Environments, Flinders University of SA.

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>

CSIRO Adelaide Coastal Waters Study pages <www.clw.csiro.au/acws/.html>

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

Images

1 Major discharge of stormwater from the Torrens River into Adelaide's coastal waters on 25 October 2005, courtesy Simon Bryars, DEH.

2 Eugene von GUÉRARD, 'Australia, 1811–1901', Scenery in the Mount Lofty Ranges, near Adelaide, and a View of the Gulf of St Vincent, South Australia, c.1860, Melbourne, oil on board, 29.2 x 45.1 cm, Acquired from Foster's Group Limited 2006, Art Gallery of South Australia, Adelaide.

3 Sturt River south of Sturt Road (left) and Sturt River north of Sturt Road (right), EPA.

4 Point source inputs to Adelaide's coastal zone, EPA.

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 at: <www.legislation.sa.gov.au>

Copies of legislation are available for purchase from:

Service SA Government Legislation Outlet	Telephone:	13 23 24
Adelaide Service SA Centre	Fax:	(08) 8204 1909
108 North Terrace	Internet:	<shop.service.sa.gov.au>
Adelaide SA 5000		

For general information please contact:

Environment Protection Authority	Telephone:	(08) 8204 2004
GPO Box 2607	Facsimile:	(08) 8124 4670
Adelaide SA 5001	Freecall (country):	1800 623 445
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	Email:	<epainfo@epa.sa.gov.au>