# Background report for the Adelaide Coastal Water Quality Improvement Plan

## Report 8 Reasonable assurance statement for the Adelaide Coastal Water Quality Improvement Plan

**Note that this report was prepared as information provided to the Australian Government to meet reporting requirements on the development of the draft Adelaide Coastal Water Quality Improvement Plan (ACWQIP). The content of this report was developed in 2008 and does not necessarily reflect current views of the South Australian Government or current government policy.**

This document has been reviewed and updated following the release of the Water for Good Plan and the completion of Penrice Soda Products Environmental Improvement Plan to 2010.

## Aim

This Reasonable Assurance Statement (RAS) seeks to provide stakeholders with a high degree of confidence that if the Adelaide Coastal Water Quality Improvement Plan (ACWQIP) is implemented, the load target it is aiming for will be achieved.

## Scope

The RAS considers how certain we are about:

a our knowledge of the response of the system to pollutant loads,

b the effectiveness of proposed interventions to achieve load reductions

c the adoption of proposed interventions, in terms of timing and extent. To account for uncertainty—in the spirit of the precautionary principle—this may require high levels of adoption of key interventions.

## Response of the system to pollutant loads

There is considerable guidance for the preparation of the RAS through extensive technical and scientific work undertaken for the Adelaide Coastal Waters Study (ACWS). So, while there is considerable diversity in the receiving environments, there is also good information about the likely effect of any changes to inputs to the system.

The ecosystems of Adelaide's coastal waters show response to changes in nutrient loads in different ways. These responses depend on whether the load is increasing or decreasing, and to what extent the system has been previously impacted.

Prior to European settlement, we understand that the nutrient levels were low and land-sourced inputs were irregular. With these changes, seagrass showed the response that is now understood to be fairly typical of like systems—it gradually disappeared. The ACWS has shown that the loss of seagrass from the Adelaide metropolitan coast occurred as human populations rose, but lagged behind this by eight years or so (Wilkinson *et al* 2005).

With the development of the Adelaide metropolitan area, the frequency and volume of stormwater inputs increased and suspended solids, coloured dissolved organic matter (CDOM), and other pollutants also increased.

It is expected that if nutrient levels drop sufficiently, further seagrass loss will be curtailed. As nutrients continue to reduce to the levels nominated in the ACWS, seagrass recovery is likely to be seen—first in areas of offshore loss, then closer to the near shore area. Inward progression of seagrass meadows—the 'blue line approaching the shore' will be hindered by the higher energy of this area and the presence of increased concentrations of suspended solids and CDOM reducing light.

With nutrient reductions, a corresponding reduction in suspended solids and CDOM entering the nearshore and being re-suspended there by coastal dredging would also be required; firstly to improve the amenity of Adelaide's coast and later, to allow the return of inshore seagrass.

With actions to minimise the ingress of suspended solids and CDOM to and through the nearshore, the amenity improvement would be quick to follow, possibly only a matter of months. The return of seagrass to the nearshore would be a long-term process, estimates of up to 100 years have been offered by researchers.

In order to increase the speed of recovery of seagrass, it is likely that the present research and trials into methods of replanting seagrass will be continued, with replacement of seagrass from this process likely, provided that nutrients can be reduced to sustainable levels.

### Nutrient Targets

The nutrient targets in the ACWQIP are derived from specific research into the ecology of seagrass and investigation of the levels of discharge to Adelaide's coastal waters. This work has taken account of a range of uncertainties in arriving at the load requirements for discharges to Adelaide's coast. In developing targets, the actual nutrient levels able to be sustained in the different ACWS zones have not been ascertained, but rather a proportional decrease in discharge, based on the levels of 2003 have been used.

While this approach will result in levels that are consistent overall with the best information available, it has the obvious flaw that individual discharges may need to be reduced by a different amount to that given by merely proportioning the available nitrogen load.

While it is clear that individual discharges will need to have site-specific studies to confirm the actual portion of the assimilative capacity of Adelaide's coast they consume, there is some additional information that can assist. The related Port Waterways WQIP looked only at the Port River and Barker Inlet system and used a water quality modelling approach to arrive at discharge loads for nitrogen. This earlier, site-specific work provided targets for nitrogen loads to this area that are entirely consistent with those that derive from consideration of the ACWS—covering a high proportion of the total nitrogen loads to Adelaide's coast.

Additionally, in the case of the wastewater treatment plant nitrogen loads, a model of upgrade is developing where treatment capacity is enhanced through capital works to ensure that a reuse ready effluent is produced, and that reuse of wastewater results in further substantial reductions in nitrogen discharge—likely to increase as demand for water grows in future.

This offers considerable flexibility in future as, provided that upgrades result in a reliable performance for wastewater treatment plants, increases in reuse and/or minimal enhancements in treatment can further reduce nitrogen discharges in line with best available information.

### Suspended solids, CDOM Targets

The effect of these discharges is currently focused on amenity issues, and will be until seagrass recovery allows these pollutants to interact with the ecosystem on a regular basis.

Monitoring will provide the information about how the amenity of Adelaide's coastal waters is improving over time, along with feedback from the community.

Given the nature of the Adelaide catchment and the occasional short periods of high flow produced from it, there will be episodes of poor water quality from high flow episodes for some time.

With site-specific studies needed to account for final proportions of the available nitrogen discharge to Adelaide's coast the approach adopted for the ACWQIP is to accept that a proportional approach to nitrogen load allowance is likely to provide a suitable 'glide path' to guide stakeholders in developing programs to reduce loads discharged to Adelaide's coast.

## Discharges

### Nitrogen

Penrice Soda Holdings contributed the highest single amount of nitrogen to Adelaide's coast in 2003, with an estimated 1,000 tonnes per year from its Osborne plant.

As part of their response to the development of the Port Waterways WQIP, Penrice have completed a program to reduce their nitrogen discharge to a maximum of 575 tonnes per year by 2010. Penrice also aims to achieve a discharge of 250 tonnes of nitrogen by 2030.  The company continues to progressively reduce its nitrogen loads to the Port River, albeit at

a slower annual rate - and are undertaking a research and development program to ensure that they develop technology to achieve their long term nitrogen target.

Penrice have provided a formal commitment to achieve a discharge load reduction consistent with that of the ACWQIP. Penrice's success with achieving an ambitious nitrogen reduction to 2010, along with active further reductions being pursued provides a good level of confidence that they will achieve their long term nitrogen targets by 2030.

SA Water decreased the amount of nitrogen discharged from WWTPs during the time of the development of the ACWS and have moved to incorporate its findings in their future planning for wastewater treatment capacity.

The redesign of the Christies Beach WWTP takes the ACWS targets into account, expecting that reuse will provide a sustainable reduction in nitrogen load to a level consistent with information from the ACWS.

Reuse of wastewater is being progressed at the other WWTPs - Bolivar and Glenelg, as opportunities present.

The Water for Good strategy provides for the development of both stormwater and wastewater master plans for South Australia. As these are developed there is scope to achieve a far more integrated approach to the reuse of water for Adelaide. Provided that the ACWS targets are taken into account in the development of these master plans, the current success in reusing wastewater is likely to continue, and be sustainable in the longer term.

SA Water accepts the ACWS targets. Similar to Penrice Soda Products, SA Water has been working hard over the last 20 years to reduce their loads of nitrogen discharged to Adelaide's coast. Their financial and governance contributions to the ACWS and the ACWQIP underpin their interest in establishing clear long term targets for their wastewater treatment plants. SA Water has also been innovative in their development of re-use options including making treated effluent available to growers at Virginia and businesses in the Adelaide City.

While the increasing population of Adelaide presents a further challenge to SA Water, their long track record of positive achievement for South Australia provides a high degree of assurance that discharge loads will progressively reduce to achieve the ACWS recommended levels.

**Suspended solids/CDOM**

The main coordinator of this effort is the AMLR NRM Board. A long-term aim is the reduction of stormwater flows to the coast by 75% in 20 years. It is expected that this outcome would be consistent with a 50% reduction in suspended solids and a considerable decrease in the load of CDOM to Adelaide's coastal waters

Once suspended solids and CDOM reach Adelaide's coast, they remain in the active beach zone, moving north along the coast and continuing the process of slowly filling Gulf St Vincent. During this time, these materials are regularly re-suspended by wave action and during coastal dredging. They are the major contributors to the impaired amenity of Adelaide's coast.

The AMLR NRM Board has some projects to be undertaken and estimate that these will contribute to about a 5% reduction in the flow of stormwater to the coast.

Given that major parts of the implementation of the reduction of suspended solids and CDOM are not yet in place, there is not yet a high assurance that the long-term aims of the AMLR NRM Board will be realised.

## Targets set for the ACWQIP

The targets set for the ACWQIP (detailed in Chapter 6 of the ACWQIP Part A) are as follows:

**Source targets:**

- Penrice Soda Products—Nitrogen load from 820 tonnes per year to 575 tonnes per year by 2010, to 250 tonnes per year by 2030

- SA Water—Nitrogen load to reduce to 300 tonnes per year
- catchment—about 5% decrease in suspended solids and CDOM loads
- atmospheric—No increase
- regional groundwater—No increase.

## Background

### *Nitrogen*

With the bulk of the nitrogen for the Adelaide coast coming from two sources, the success of the plan is largely dependent on these sources achieving substantial reductions in their nitrogen discharges.

Stormwater also contains about 6% of the nitrogen load to Adelaide's coast. This is expected to reduce in line with reductions in suspended solids

#### Penrice Soda Holdings

For the Adelaide's coastal waters to achieve a water quality that is consistent with community expectations, Penrice needs to achieve a nitrogen discharge load of 200 tonnes per year. The target of 250 tonnes represents a load reduction that Penrice are committed to in the longer term with the application of best available technology. Penrice would like to reduce these even lower to lower the cost of lost ammonia but are unable to provide a firm commitment to achieve this prior to further development of options through their research program.

The EP Act provides for a number of ways of managing point source discharges like Penrice. An environment improvement program (EIP) is a document where a licensee is able to set out a works program aimed at resolving an area of their activities that is causing harm to the environment. On the basis of the work undertaken to develop the Port Waterways WQIP, the EPA has previously negotiated an EIP with Penrice Soda Products to achieve the interim (575 tonne) discharge load in 2010.

An EIP is legally binding on Penrice and company officers have a clearly defined liability and reporting requirements, with regular assessment and review of progress. The EIP is a publicly available document.

There is, therefore, a high level of assurance that Penrice Soda Products will achieve its interim target for the WQIP.

#### SA Water

For Adelaide's coastal waters to achieve a water quality that is consistent with stakeholder expectations, SA Water needs to achieve a total nitrogen discharge load under 300 tonnes per year from its three plants:

- Bolivar WWTP—Currently 477 tonnes per year (previously given a target of 100 tonnes per year through the Port Waterways WQIP)
- Glenelg WWTP—Increased reuse potential through the completion of the Glenelg to Parklands Re-cycled Water Project
- Christies WWTP—Currently being redeveloped.

SA Water have undertaken a major capital development of their wastewater treatment in the last 10 years, having spent over $200 m to remove the discharge from the Port Adelaide WWTP and redirect the sewage to an upgraded Bolivar facility that comprises a low salinity plant that emits a water quality suitable for irrigation and a high salinity plant. The effect of this work has been to reduce nitrogen discharges by 1,034 tonnes per year between 1998 and 2003. This occurred immediately prior to the development of the Port Waterways WQIP.

Given the above and the need for further work to other WWTPs as a result of findings of the ACWS, further major capital works at the Bolivar WWTP is not proposed within the initial ACWQIP period.

Increasing the amount of reuse of the Bolivar wastewater is a likely area of load reduction from the Bolivar WWTP. SA Water are constantly seeking to expand the amount of reuse effluent taken up and with the current shortage of water available to South Australia, further uptake of this water is likely.

An impediment to further reuse is the disparate nature of wastewater reuse proposals, where individual proposals are each considered on their own merits. This makes it difficult to provide for the infrastructure costs to be met for any single proposal. There is an opportunity for a market-focused strategy to be developed for the reuse of wastewater across Adelaide. The development of a wastewater master plan under the Water for Good Plan offers an opportunity to provide this level of integration.

As reuse demand is outside of SA Water sphere of control, they are unable to offer a numerical target for nutrient load reduction at this point in time. In the short term however, the rebuilding of the Christies Beach WWTP and the expected reuse from the Glenelg WWTP will reduce the summer flows from the plants with a high degree of assurance. With the demand for water increasing, and the value that can be added to South Australia's economy from the use of this water there can be a good level of assurance that the ACWS recommended levels will be achieved in the longer term.

**Suspended solids and CDOM**

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With the formulation of the AMLR NRM Board, existing functions of the former catchment water management boards were integrated. Existing programs to minimise the load of pollutants from the catchment have largely been retained, and the AMLR NRM Board is developing further programs with this aim.

While these programs are likely to be effective within the ACWQIP period, there is also likely to be considerable further development of the urbanised parts of Adelaide's catchment over this period. This will result in further increases in stormwater flows and their resultant suspended solids, CDOM and nitrogen loads nitrogen loads to Adelaide's coastal waters.

A project to identify and require appropriate targets for the implementation of water sensitive urban design (WSUD) in new developments in metropolitan Adelaide has been funded by the Australian Government. This is likely to result in reductions of suspended solids, CDOM, nitrogen loads and other pollutants in coming years.

**Atmospheric**

Atmospheric sourced nutrients are derived mainly from automobiles. With improvements in engine technology and the increasing cost of petroleum products, the nutrient load from this source is highly likely to reduce.

The target is likely to be achieved.

**Regional groundwater**

The flow of regional groundwater and the materials contained in it only change over long timeframes.

Change during the period of the ACWQIP is unlikely.

## References

Wilkinson J, White N, Smythe L, Hutson J, Bestland E, Simmons C, Lamontagne S and Fallowfield H 2005,*Volumes of inputs, their concentrations and loads received by Adelaide metropolitan coastal waters*, ACWSTechnical Report No. 18, prepared for the Adelaide Coastal Waters Study Steering Committee, September2005, Flinders Centre for Coastal and Catchment Environments, Flinders University of SA.