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# How robust is the environmental impact assessment process in South Australia? Behind the scenes of the Adelaide seawater desalination project

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ABSTRACT

This work tests the robustness of policies and procedures designed to protect South Australia's marine environment through a case study of the Adelaide Desalination Plant—the most expensive (~A$1.8 billion) infrastructure project in South Australia's history. Although this project has been subject to an Environmental Impact Assessment (EIA)—the highest level of assessment in Australia—on inspection it appears that the current operating licence for the desalination brine discharge breaches Government approval conditions and ignores the collective expert scientific advice of the project's Environmental Impact Statement (EIS). Hence, the EIA process in South Australia for this project is flawed. Improvements could be made to the South Australian system by including the requirements for operating licences as an integral part of the EIA.



## 1. Introduction

Following a period of prolonged drought in Australia (2003–2009), and with predictions of a drying climate, state governments have actively pursued alternatives to natural water sources (rain and river) to augment and guarantee potable supply for several Australian capital cities. One of the most popular but controversial alternative supply sources is desalination. Most Australian capital cities have recently constructed or are in the process of constructing seawater desalination plants. This response is in keeping with worldwide trends; water scarcity has promoted development of alternative water sources with desalination a common option [1]. The Arabian Gulf, the Mediterranean and Red Seas, coastal China, California and Australia are referred to as centres of desalination 'activity' [2].

Due to the scale of building construction associated with desalination plants and the potential for their environmental impact, such major developments tend to undergo the most stringent of pre-approval assessment. There are legally constituted approvals processes for major developments in Australia: the Environmental Impact Assessment (EIA). There is an internationally recognised process for EIA but the legislative and administrative nuances in a particular place affect how this process translates into practice. One of the weaknesses of EIA is follow-up or post decision monitoring [3]. This paper uses a recently approved South Australian major development, the Adelaide Desalination Plant (designed to reduce reliance on the River Murray and augment the city of Adelaide's water supply), to assess the adequacy of the EIA process towards protecting the local coastal environment.

EIA in South Australia is legislated under Section 46 of the *Development Act 1993*. Depending on the scale of a proposed development there are three possible levels of assessment, the *Environmental Impact Statement* (EIS) the *Public Environment Report* (PER) and the *Development Report* (DR) [3]. The Adelaide Desalination Plant was assessed at the highest level triggering the requirement for an EIS. The South Australian EIA system requires that at least one public meeting accompany an EIS to explain the development proposal and an invitation for public comment on the report (the EIS). In South Australia, the Planning Minister makes the declaration that a development proposal is of 'major environmental, social or economic importance', thus triggering the EIA process. Once such a declaration is made, the decision-making process follows the standard steps of data gathering, reporting and assessment. Much of the data gathering and reporting is undertaken by the proponent. After public comments have been acknowledged and addressed, the proponent submits the appropriately amended final EIS to the Planning Minister for assessment. The quality of proponent reports is assessed by the relevant government agency administering the EIA process (currently the State Department of Planning and Local Government). The Minister is provided with an Assessment Report for authorisation [3]. This phase of the process does not allow for further external input; there may continue to be behind-the-scenes negotiations,

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such as condition setting, between the government and the proponent. In South Australia the Governor (effectively the State Cabinet) makes the final decision. A nuance of the South Australian system is that the Governor's decision is final; there are no rights of appeal [3]. The Federal Government can intervene in the South Australian EIA process if a development proposal triggers the Australian Government *Environmental Protection and Biodiversity Act (EPBC 1999)* over matters of 'national environmental significance'. After governmental approval, and hence after the pre-decision phase of EIA, certain activities, such as the functioning of seawater desalination plants, are made subject to an operating licence, which is negotiated between the plant's operators and the state's Environmental Protection Authority.

Using the Adelaide desalination project as a case study this paper addresses the important question as to whether or not the final operating licence of the desalination plant reflects the recommendations made in the EIS. Discrepancies between EIS recommendations and licence conditions would shed doubt into the proper functioning and robustness of South Australia's EIA process, especially for post decision follow-up.

## 2. The Adelaide desalination project: background and approval process

### 2.1. Desalination plant details

The Adelaide Desalination Plant became operational in late 2011. In 2009, a government announcement was made that the originally proposed 50 GL annual output would be doubled; at full capacity the plant can produce 100 GL of drinking water per year, corresponding to approximately 270 ML per day. The Adelaide plant has been constructed at Port Stanvac, Lonsdale, South Australia, about 20 km south of the city. Adelaide is situated on the eastern shore of Gulf St. Vincent (Fig. 1). AdelaideAqua, the plant's operator, will complete the commissioning of the 50 GL plant (135 ML/d) mid-year 2012. The upgrade to 100 GL will not be complete until the end of the 2012.

Similar to other major Australian seawater desalination plants, the Adelaide plant uses reverse osmosis technology (a filtering technique) to attain fresh water from seawater. Seawater is pushed under high pressure through membranes. This enables water molecules to pass but blocks molecules of salt. Hence, this process separates seawater into two new solutions: freshwater and hypersaline brine, commonly referred to as 'desalination brine'. Of the seawater that feeds the process, a plant recovery efficiency of 50% implies that half the seawater is converted into freshwater, whereas the other half attains twice the salt concentration, or salinity. Typical recovery efficiencies range between 25% and 50%. The desalination brine is typically discharged back into the sea, together with other chemical bi-products of the desalination process such as antiscalents. Marine discharge of desalination brine is the most common and "cheapest" option for handling the unwanted desalination brine.

### 2.2. Marine impacts and environmental legislation

Desalination brine is heavier than seawater. The most immediate environmental hazard associated with desalination brine discharges is the formation of so-called 'brine underflows' [4]. This flow is associated is the formation of a thin layer of hypersaline water spreading along the seafloor and becoming depleted in dissolved oxygen. For example, marked reductions in dissolved oxygen levels have been observed in vicinity of the outlet of Australia's first desalination plant in Cockburn Sound, Western Australia [5].

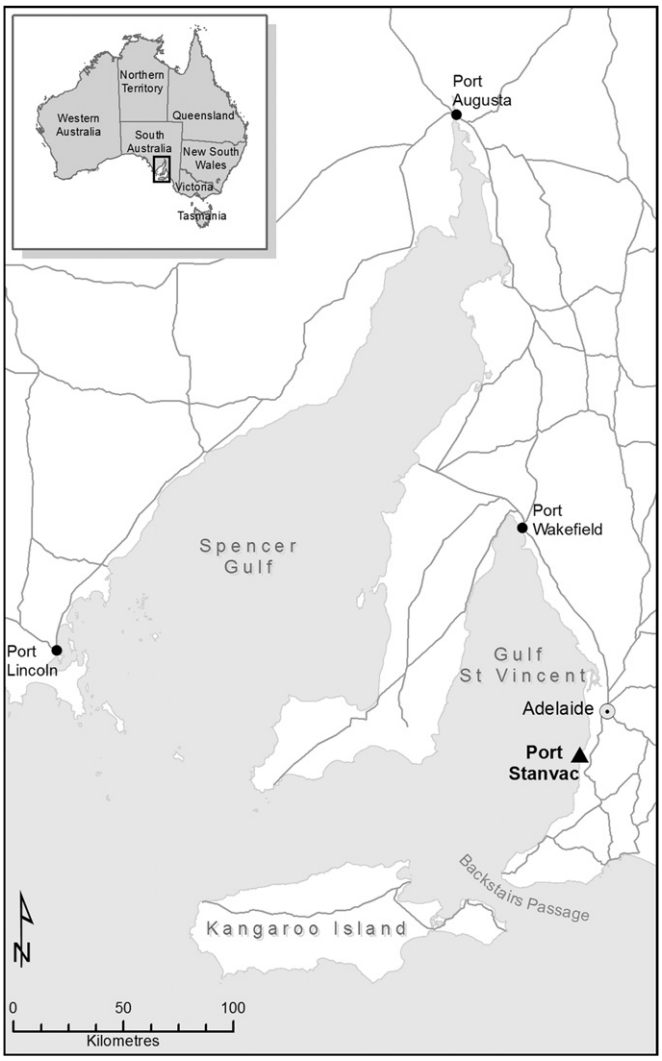


**Fig. 1.** The Gulf St. Vincent region indicating the location of the Adelaide Desalination Plant near Port Stanvac.

Modern discharge technology consists of multiple ports located above the seabed through which the desalination brine is injected into the ambient water column. This process, being similar to that of fountains, facilitates the initial mixing of desalination brine with ambient seawater. The mixing product, still being denser than the ambient water, tends to fall back to the seabed at some distance from the discharge ports. Dilution is a measure of how much ambient seawater is mixed with the brine concentrate and the chemical contaminants it contains. A higher dilution generally implies less adverse marine impacts.

The Environmental Protection (Water Quality) Policy 2003 is subordinate legislation supporting the *Environment Protection Act 1993*. The policy provides for the development of environmental values and water quality objectives for South Australian waters. The policy outlines additional regulations for point source and diffuse pollution to ensure achievement of water quality objectives. According to this legislation, marine pollution from a point-source discharge is permitted within a horizontal distance of 100 m, being referred to as the 'mixing zone'. This implies that there should be no or only little adverse marine impacts at the edge of this mixing zone. For desalination discharges, this defines a certain minimum dilution requirement at the edge of the mixing zone, also called 'safe dilution value' or 'species protection trigger value' (SPTV). For point source pollution, such as desalination