



# Southern Seawater Desalination Project

## Environmental Scoping Document

Final

January 2008



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Project Number:

Document Number:

N-CWO1781

CDMS XXXXXX

N-CWO1783

File JT1 2007 07426 Vol 1

### Document History

Report	Version	Prepared by	Reviewed by
Southern Seawater Desalination Project – Draft Environmental Scoping Document.	Draft for Internal Review October 2007.	S. Brown and F. Faskel	N. Churchill – Project Management J. Stansfield – Project Management M. Oliver - Project Management J. Goullee – Project Management S. Hawkins – Project Management J. Cole - Environment Branch J. Madin – Project Management D. Luketina – Environment Branch
Southern Seawater Desalination Project – Draft Environmental Scoping Document	Draft for peer review November		M. Bailey – Oceanica K. Lane - ENV
Southern Seawater Desalination Project –Final Environmental Scoping Document	Final for EPA endorsement (post-public review)		S. Hawkins – Project Management J. Madin – Project Management

Cover Photograph of Binningup Beach: S Hawkins



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## Glossary

AFFA	Department of Agriculture, Fisheries and Forestry (Commonwealth)
AASS	Actual Acid Sulphate Soils
ACMC	Aboriginal Cultural Materials Committee
ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ASS	Acid Sulphate Soil
BOM	Bureau of Meteorology
CALM	Department of Conservation and Land Management (now DEC)
CBH	Co-operative Bulk Handling Pty Ltd
CCW	Conservation Category Wetland
CTD	Conductivity Temperature Depth
d	day
DEC	Department of Environment and Conservation (formerly CALM and DoE)
DEH	(formerly) Department of Environment and Heritage (Commonwealth - now DEW)
DEW	Department of the Environment, Water, Heritage and the Arts (Commonwealth – formerly DEH – Department of Environment and Heritage)
DIA	Department of Indigenous Affairs
DMA	Decision Making Authority
DN1200	Pipeline with a diameter of 1200mm
DN1800	Pipeline with a diameter of 1800mm
DN2400	Pipeline with a diameter of 2400mm
DOCEP	Department of Consumer and Employment Protection
DoE	Department of Environment
DoIR	Department of Industry and Resources
DLI	(formerly) Department of Land Information (now Landgate)
DPC	Department of the Premier and Cabinet
DPI	Department for Planning and Infrastructure (previously MfP)
DRF	Declared Rare Flora
EIA	Environmental Impact Assessment
EP Act	Environmental Protection Act 1986
EPA	Environmental Protection Authority
EPA SU	Environmental Protection Authority Service Unit
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999

	(Commonwealth)
EPP Lake	Lake protected under the Environmental Protection (Swan Coastal Plains) Lakes Policy (1992)
ERA	Economic Regulatory Authority
ERD	Energy Recovery Device
ERMP	Environmental Review and Management Program
ESA	Environmentally Sensitive Area
ESD	Environmental Scoping Document
EQO	Environmental Quality Objective
GL	Gigalitre (1 billion litres)
GL/yr	Gigalitre per year
ha	Hectares
IWSS	Integrated Water Supply Scheme (Water Corporation)
km	kilometres
kV	kilovolt
LEPA	Low Ecological Protection Area
LoA	Level of Assessment ( EPA)
m	metres
ML	Megalitres (one million litres)
ML/d	Megalitres per day
m/s	metres per second
MSCL	Mild Steel Cement Lined (pipeline)
MfP	Ministry for Planning (now Department for Planning and Infrastructure)
mm	millimetres
MRS	Metropolitan Regional Scheme
MW	Megawatts (of energy)
PER	Public Environmental Review
PSDP	Perth Seawater Desalination Plant (Kwinana)
RO	Reverse Osmosis
SSDP	Southern Seawater Desalination Plant
SWIN	South West Integrated Network (Western Power)
SWY	Southwest Yarragadee Aquifer Groundwater Source
TEC	Threatened Ecological Community
WA	Western Australia
WAPC	Western Australian Planning Commission

WWTP            Wastewater Treatment Plant (Water Corporation)  
yr                Year

## Executive Summary

Declining rainfall has reduced stream flow into public water supply dams by two thirds over the past thirty years. Specifically, the past seven years have been the driest on record in the South-west of Western Australia. Consequently, in planning for Western Australia's water future, the Water Corporation has adopted the *Security through Diversity* strategy. This involves developing a broad range of innovative water sources to secure our water supplies and reduce water demand, even in times of drought. These strategies will be supported by a strong focus on efficient water consumption.

Seawater desalination is a climate independent, proven technology capable of delivering large quantities of potable water. With current uncertainty regarding future climate, desalination provides a robust source option for the Integrated Water Supply Scheme (IWSS).

The Water Corporation (the proponent for the proposal) referred the proposed Southern Seawater Desalination Plant (SSDP) at Taranto Road, Binningup to the Environmental Protection Authority (EPA) for assessment under Section 38 of the *Environmental Protection Act* (1986) in July 2007. Figure 1 shows the general location of the proposed plant and pipelines, Figure 2 depicts the proposed site boundaries and pipeline route and Figure 3 shows a detailed site map for the proposed plant. The level of assessment was set as a Public Environmental Review (PER), with a 6 week public comment period. This was increased after appeals (on the level of assessment) to 8 weeks.

The aim of this Environmental Scoping Document (ESD) is to outline the work, studies, and management plans required to enable detailed environmental assessment of the SSDP proposal during the PER phase of assessment. The purpose of this ESD is not to present the findings of an assessment, but rather to outline the assessments which are proposed. At the draft ESD stage, the public was invited to comment on the studies proposed and the management plans suggested for a two week period beginning on the 26<sup>th</sup> November 2007. 16 submissions were received and a response to these submissions has been prepared as a separate document.

A more detailed assessment of the environment and potential impacts will follow in the PER document, which will be assessed by the EPA.

Key infrastructure requirements of the proposal are:

- a seawater intake structure (for an ultimate plant capacity of 100 GL/yr);
- a seawater supply pipeline, which feeds into a seawater pump station (both for an ultimate plant capacity of 100 GL/yr);
- a minimum 50GL/yr, maximum 100GL/yr reverse osmosis desalination plant (including pre-treatment and post-treatment facilities) powered by renewable energy;

- a brine discharge pipeline and diffuser array in the ocean (for an ultimate plant capacity of 100 GL/yr);
- approximately 30km of 1400mm diameter buried pipeline (this is sufficient for the ultimate 100 GL/yr plant capacity) from the plant to a summit tank (minimum 25ML, ultimately 4 x 25ML) north east of Harvey;
- approximately 2km of 1400mm diameter pipeline to deliver the water from the summit tank in Harvey into the Stirling-Harvey Trunk main; and
- a regulating valve on the delivery main.

## **1 Purpose of Environmental Scoping Document**

The purpose of this ESD is to scope the work required to prepare the environmental impact assessment documentation (Public Environmental Review, or PER), rather than to present the findings of an assessment. The Water Corporation has prepared the ESD in accordance with the EPA's *Guide to preparing an environmental scoping document*. The Water Corporation voluntarily made the ESD available for a two week period for the public to comment on the studies proposed and the management plans suggested, concurrently with the EPA review of the draft ESD. The ESD will then be submitted to the EPA for finalisation and approval.

The results of the completed studies and specific management plans will be detailed in the PER document and the community will have an eight week public period (expected in the first half of 2008) to make a submission on the content of the PER and the proposed management plans. Hard copies of the PER will be made available at local libraries for community members to take, as well as being posted on the Water Corporation's website.

This ESD contains the following information:

- Purpose of document
- Identification of proponent
- Summary description of the proposal
- Alternative options considered
- Basis for justifying proposal and selecting preferred option
- Regional setting of proposal
- Summary of potential environmental (including cumulative) impacts, their significance and possible management responses
- Proposed studies and investigations (Scope of Works)
- Key environmental factors and principles for this proposal
- Applicable legislation
- Community and other stakeholder consultation programme
- Project and assessment schedule
- Peer review
- Study team
- References

## **2 Identification of Proponent**

The proponent for the proposed SSDP project is the Water Corporation, established under the *Water Corporation Act* (1995). The Water Corporation provides world-class water, wastewater, drainage and irrigation services to the city of Perth and hundreds of Western Australian towns and communities spread over 2.5 million km<sup>2</sup>. The Water

Corporation is committed to supplying West Australians with water that is safe to drink and that complies with directions on drinking water quality made by the Minister for Health. These directions are based on the guidelines of the National Health and Medical Research Council, which reviews public health issues within Australia. The Water Corporation continuously monitors and assesses the quality of drinking water supplied and makes improvements as required to meet these health guidelines.

#### Proponent Details

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### 3 Summary description of proposal

Declining rainfall has reduced stream flow into public water supply dams by two thirds over the past thirty years. Specifically, the past seven years have been the driest on record in the South-west of Western Australia. Consequently, in planning for Western Australia's water future, the Water Corporation has adopted the *Security through Diversity* strategy. This involves developing a broad range of innovative water sources to secure our water supplies, even in times of drought. These strategies will be supported by a strong focus on efficient water consumption.

Seawater desalination is a climate independent, proven technology capable of delivering large quantities of potable water. With current uncertainty regarding future climate, desalination provides a robust, climate-independent source option for the Integrated Water Supply Scheme (IWSS).

The Water Corporation (as the proponent for the proposal) referred the proposed SSDP at Taranto Road, Binningup to the Environmental Protection Authority for assessment under Section 38 of the *Environmental Protection Act* (1986) in July 2007. Figure 1 shows the general location of the proposed plant and pipelines, Figure 2 depicts the

proposed site boundaries and pipeline route and Figure 3 shows a detailed site map for the proposed plant.

The level of assessment was set as a PER, with a 6 week public comment period. Five appeals against the level of assessment set by the EPA were received by the Appeals Convenor and responded to by the Water Corporation. The appeals were upheld in part, to the extent that the level of assessment remained at PER with the public comment period increased to 8 weeks.

Key infrastructure requirements of the proposal are:

- a seawater intake structure (for an ultimate plant capacity of 100 GL/yr);
- a seawater supply pipeline, which feeds into a seawater pump station (for an ultimate plant capacity of 100 GL/yr);
- a minimum 50GL/yr, maximum 100GL/yr reverse osmosis desalination plant (including pre-treatment and post-treatment facilities) powered by renewable energy;
- a brine discharge pipeline and diffuser array in the ocean (for an ultimate plant capacity of 100 GL/yr);
- approximately 30km of 1400mm diameter buried pipeline (sufficient for the ultimate 100 GL/yr plant capacity) from the plant to a summit tank (minimum 25ML, ultimately 4 x 25ML) north east of Harvey;
- approximately 3km of 1400mm diameter pipeline to deliver the water from the summit tank in Harvey into the Stirling-Harvey Trunk main; and
- a regulating valve on the delivery main.

#### **4 Alternative options considered**

Data obtained from the Bureau of Meteorology (BOM) 2007 show that in the past seven years, Perth has experienced 21% less rainfall than the long-term average, resulting in 64% less runoff into dams and similarly placing groundwater sources under threat. Under the eight year climate and stream flow regime, the average yield of existing sources of supply to the IWSS was estimated at 256GL/yr. This comprises 136GL/yr from surface water sources and 120GL/yr from groundwater sources. The theoretical, unrestricted demand for 2004/5 was estimated at 289GL/yr. To continue to supply a similar demand at the planned level of reliability (1-in-200 year probability of total sprinkler ban), 318GL/yr of source capacity is required.

Current sources of supply to the IWSS fall approximately 60GL/yr short of this requirement. The shortfall in source capacity is currently being met by additional abstraction from the Gnangara groundwater source. Significant water savings have also been achieved through the implementation of two sprinkler days per week, which have assisted in the management of the water supply situation over the period since 2001. However, an additional 50GL/yr (approximately) of source capacity will be required to

reinstate the demand/supply balance, and provide for projected growth in demand until 2014/15.

The Water Corporation's approach to meet future water supplies is to adopt a secure and diverse range of sources. *Security through Diversity* is the Water Corporation's multi-faceted strategy for water supply and demand management into the future.

The Water Corporation is actively pursuing the following initiatives to augment the current water supply:

- new groundwater sources;
- seawater desalination;
- new surface water sources;
- water trading (with other water providers/Harvey Water);
- catchment management (Wungong Dam catchment thinning trials);
- water recycling and reclamation (including groundwater replenishment with highly treated wastewater); and
- demand management.

The proposed SSDP is one component of the *Security through Diversity* strategy currently being implemented. Seawater desalination is a proven technology, capable of delivering large quantities of water, independent of climate. With uncertainty regarding future climate and stream flows, seawater desalination provides a reliable, climate independent source option.

#### **4.1 Alternative Water Sources Considered**

##### **4.1.1 South West Yarragadee**

The South West Yarragadee groundwater aquifer is a significant water resource in the south-west region of the State. As such it has been the subject of a detailed investigation by the Water Corporation which commenced in 2002. Investigation and regulatory approval processes associated with the Water Corporation's proposal to abstract 45GL/yr from the South West Yarragadee aquifer were shelved by the State Government in 2007, in favour of the development of a new desalination source.

##### **4.1.2 Water Trading**

A significant share of surface water resources are allocated to the irrigation industry. The Water Corporation estimates that by piping water that currently flows in open channels in the Harvey and Waroona Irrigation network, therefore preventing seepage and evaporation losses, 17GL/yr of water has been made available for trade.

#### **4.1.3 Kimberley Water**

In December 2004 the State Government established a panel of experts to assess and examine proposals to bring water from the Kimberley to Perth (Department of Premier and Cabinet, 2006). The panel reviewed various proposals and the main finding was that transporting water from the Kimberley to Perth was not efficient as:

The cost of Kimberley water is not currently competitive with other potential sources;

Transporting water by canal would have the greatest environmental impacts and hold the greatest risks for providing a reliable water supply; and

Transporting the water to Perth using super tankers would cost on average \$6.7/kL and transport via canal equates to \$20.5/kL. Current water sources' costs are between 80c and \$1.20/kL.

#### **4.1.4 Catchment Management**

Catchment management aims at increasing runoff into dams through decreasing the density of catchment vegetation. The Water Corporation's Wungong catchment trial commenced in late 2005 for a period of 12 years, and is predicted to increase runoff into the dam by 25%. The outcomes of this analysis will guide the extension of the catchment management program into other public drinking water supply catchments.

#### **4.1.5 Eglinton, Yanchep and Gingin Groundwater**

Eglinton, Gingin and Yanchep groundwater sources are located within the Northern Perth Basin in the Gingin Groundwater area. The Northern Perth Basin contains significant, mainly fresh to brackish, groundwater resources currently used for a variety of horticultural and mining purposes. Land use in these areas is highly diverse but has recently come under considerable pressure from sprawling urban residential developments, placing uncertainty on development of this resource.

#### **4.1.6 Wellington Dam**

The use of water from Wellington Dam is currently constrained by catchment salinisation. The Collie River Salinity Recovery Project (first phase) was launched on 3 August 2005. The project is designed to reduce salinity levels, with a long-term goal of making the water suitable for drinking by 2015 (Gallop 2005). The Water Corporation's ability to access a larger share of this resource for the IWSS will be linked closely to management of this, and allocation issues.

#### **4.1.7 Esperance to Goldfields Pipeline**

A report that reviewed the cost of supplying bulk drinking water to the Goldfields was released on 30 June 2005 (ERA 2005). The report indicates that supplying water to Kalgoorlie via an Esperance pipeline is not the most appropriate method of supply, in

terms of economic costing. Despite this, the Water Corporation will continue to assess the role of the Esperance to Goldfields Pipeline in source development planning.

#### **4.1.8 Water Recycling**

While water recycling has been undertaken in regional areas of Western Australia for many years, large scale use of recycled water in the metropolitan area has been limited due to ongoing health and environmental investigations.

The State Water Strategy has set a target of reusing 20 per cent of treated waste water sources by 2012. To achieve this the Water Corporation has developed a number of recycling projects, including:

The Groundwater Replenishment Trial project, which is a trial of adding recycled treated wastewater to underground aquifers under controlled conditions. The water can be withdrawn at a later date, or used as a barrier to reduce water table decline and prevent saltwater or other contaminants from entering the aquifer;

The Kwinana Water Reclamation Plant, which treats about 24 million litres a day of secondary treated wastewater from the Woodman Point wastewater treatment plant. The resulting high quality industrial grade water is then supplied to industry in place of scheme and bore water; and

The McGillivray Oval Irrigation Project, where secondary treated wastewater from the Subiaco Wastewater Treatment Plant is used to water sports ovals. In many regional areas this is also common.

#### **4.2 Alternative sites and pipeline routes considered**

A new desalination plant cannot be developed on the site of the recently constructed Perth Seawater Desalination Plant (in Kwinana) due to limited land area. There are no other potentially suitable sites in the vicinity of the metropolitan area which meet the requirement of access to the coast and within close proximity to the IWSS.

In 2005 the Water Corporation referred a proposal for a seawater desalination plant containing three potential sites (two at East Rockingham and one at Port Kennedy) to the EPA. The Port Kennedy site is a Water Corporation owned wastewater treatment plant site. The proposal for a desalination plant at Port Kennedy included a number of potential intake and outlet points located at Secret Harbour Bay, Golden Bay, Bridport Point and Becher Bay. These, on average, are approximately 7 km from the proposed plant site.

The two potential plant sites identified in East Rockingham are owned by the Water Corporation. The proposed outlet point would be located at Point Peron and two potential intake points were identified on Cockburn Sound in Rockingham. Pump

stations would be required on the beach at the intake point to draw in seawater and send it to the plant.

The East Rockingham/Port Kennedy proposal was given a PER level of assessment which was raised on appeal to an Environmental Review and Management Program (ERMP). At the same time as the appeal was determined, the then Minister for the Environment announced that for environmental and social reasons, the proposed plant would not be located at Port Kennedy. The Water Corporation has withdrawn this proposal from the EPA assessment process.

Investigations of the coastal strip from Jurien Bay to Bunbury to identify potential desalination plant sites began in 2006 (Water Corporation, 2007). Desktop studies were undertaken to identify possible locations, and further engineering and environmental assessments carried out on some of the potentially feasible options. Initial studies included environmental constraints assessments, as well as consideration of social and technical factors. The requirement of the investigation was to identify potential locations that could sustain the intake and brine discharge from a 50 GL/yr desalination plant with potential to increase to 100 GL/yr per year in the future. Potential desalination plant sites were identified on the basis of the following characteristics:

- be close to the ocean;
- easy integration into the IWSS;
- access to a suitable power source;
- be environmentally compatible, with minimal environmentally sensitive areas;
- be at least 10ha (for the first 50 GL/yr component) in size to accommodate plant components;
- available buffers required for chlorination facilities;
- compatible surrounding land uses (industrial, rural, park and recreation); and
- ideally, be Water Corporation owned.

Environmental considerations (taken into account in the selection of potential sites) included:

- Land immediately adjacent to Marine Conservation Reserves;
- Land immediately adjacent to estuarine environments;
- Land immediately adjacent to river mouth environments;
- Land immediately adjacent to Fish Habitat Protection Areas (FHPAs);
- Land immediately adjacent to waters with potential for fouling;
- Land immediately adjacent to marine areas of Aboriginal significance;
- Land immediately adjacent to known and protected shipwrecks;

- Land included in a reserved National Park, Nature Reserve, Conservation Park, State Forest or Regional Park (collectively referred to within this document as 'Reserves');
- Land and waters declared to be protected under the Ramsar Convention;
- Land declared to be protected under the *Environment Protection (Swan Coastal Plains Lakes) Policy 1992* (referred to as EPP lakes);
- Land declared as a Conservation Category Wetland (CCW);
- Land declared in the Directory of Important Wetlands (DI Wetlands);
- Land declared as the location and buffer of Threatened Ecological Communities (TECs);
- Land known to include Declared Rare Flora (DRF) or be known to support Threatened or Endangered Fauna;
- Land declared for protection under Bush Forever;
- Land declared for conservation under the Systems Conservation Reservations, namely Systems 5 and 6;
- Land recognised by the Department of Environment and Conservation as an Environmentally Sensitive Area (ESA);
- Land identified as being of World, National or Commonwealth Heritage value;
- Protected sites on the Register of the National Estate (RNE);
- Land identified as a Registered Site on the Aboriginal Site Register under the *Aboriginal Heritage Act 1972*;
- Land zoned 'Urban' or 'Urban Deferred' under a Region or Town Planning Scheme; and
- Land used for military training.

The selection of the pipeline route up to the storage tanks north of Harvey was based on an initial desktop constraints mapping exercise which included environmental, soils and heritage issues. A landowner workshop was held in September 2007 to determine the social impacts of the potential pipeline route and consultation with the Shire of Harvey on the pipeline route options has been ongoing. As a result of all these inputs a preferred pipeline route has been selected, based on environmental and social impact minimisation. Further impact assessment (flora, fauna, soils, and social) studies along the proposed pipeline route will be presented and discussed in the PER.

## **5 Basis for justifying proposal and selection proposed option**

Seawater desalination is a climate independent, proven technology capable of delivering large quantities of potable water. With current uncertainty regarding future climate, the proposed desalination plant provides the only robust, climate-independent source option capable of providing the required quantity of potable water for the IWSS in the time available, even with other demand management strategies in place.

Potential sites for a desalination plant north of Perth have been ruled out for the time being due to the difficulty in connecting to and integrating the IWSS (and upgrades required to existing IWSS infrastructure) and other utilities' infrastructure such as power and communications. Such sites will continue to be considered in future planning for subsequent desalination plants.

Suitable locations immediately south of Perth are limited because of the extensive ecologically significant wetland systems along the coastline. The Taranto Road, Binningup site is the only site identified which is available south of Perth which satisfied the criteria listed in section 4. Preliminary environmental investigations indicate favourable marine bathymetry and coastal processes for dispersion of the brine.

An independent review has confirmed the Water Corporation's assessment that locating the SSDP at the Kemerton Industrial Park would result in significantly increased environmental risks, increased energy consumption, higher operating costs and an additional capital cost of between \$100 and \$200 million.

## **6 Regional setting of proposal**

### **6.1 Physical Environment**

#### **6.1.1 Geology, landscape and landform**

The superficial landscape formations consist of sand, limestone, silt and clay. The three main landform units along the coast are the Quindalup Dune, Vasse and Spearwood Dune Systems. Binningup is situated on the Swan Coastal Plain, formed by shoreline and coastal dune deposits extending from the Darling Scarp to the Indian Ocean. The sediments that underlie this coastal area comprise superficial Leederville and Cockleshell Gully Formations (Deeney, 1989).

Due to the high permeability of the sandy soils of the proposed plant site, there is very little natural surface runoff or drainage, with the exception of the south-eastern corner of Lot 8. Along the pipeline route, in the low-lying terrain east of coastal areas, constructed drainage has alleviated seasonal flooding or water logging conditions. The drainage system conveys runoff, from agricultural land and road runoff, into the Harvey River Diversion Drain that discharges to the ocean near Myalup. The Harvey River Diversion Drain is the main surface water feature in the study area. The proposed plant site is located in the catchment of the Harvey River Diversion Drain.

#### **6.1.2 Oceanography**

The offshore physical oceanographic pattern along the Perth coast is driven by wind, tides, density gradients and offshore currents (Pearce 1992). Waves consist of swell waves that radiate into the coast from distant storms in the Indian and Southern Oceans together with wind waves generated by local meteorological and wind conditions, such

as a sea breeze or a local winter storms. The mean annual deepwater wave height is 2 – 3m. The tidal regime is mixed, mainly diurnal with a range of approximately 0.5m. Regional coastal currents generally correlate with wind and wave direction, tending northward in summer and are more variable but generally southward in winter.

### **6.1.3 Bathymetry**

The area is characterised by simple offshore bathymetry. This area is unique in that the shore is oriented approximately north–south, with the distinct absence of well-developed offshore limestone reefs. Thus the west-facing shores are fully exposed to the wind, wave, and current regime of the Rottneest Shelf (Harris *et al* 2005). It is expected that due to the bathymetry and oceanography of the proposed brine diffuser location, mixing conditions will be extremely favourable and the brine will disperse rapidly.

## **6.2 Ecological Environment**

### **6.2.1 Terrestrial Flora and Vegetation**

Preliminary field investigations of the proposed site and a nominal pipe route (although the intention has always been to consult widely with affected landowners prior to final pipe route selection) were undertaken in spring 2006 by an expert botanist. The assessment methods and standards used can be found in Section 3.3.1 of that report. An outline of the findings is below (360 Environmental, 2007):

270 species of native flowering plants and 1 native cycad (the Zamia Palm, *Macrozamia riedlei*) and 1 fern (*Pteridium esculentum*) were recorded from the survey area. In addition, 67 weed species were recorded from the Survey Area. Of the native flowering species recorded, 98 were monocotyledons and 172 were dicotyledons.

No DRF species were recorded on the proposed plant site or nominal pipe route corridor during this survey. 3 Priority flora species were recorded during the survey: *Acacia semitrullata* (P3), *Caladenia speciosa* (P4) and *Eucalyptus rudis* subsp. *cratyantha* (P4).

While there are no TECs in the survey area, the vegetation has value because of the presence of tuart vegetation units, the diversity of the peppermint woodlands, the transitional stand of Banksia-peppermint woodland and the fact that less than 15 percent of the Quindalup Complex, Bassendean Complex – central and south and Karrakatta Complex – central and south is in secure tenure.

The overall vegetation conservation value of the main natural stands of bushland in the survey area ranges between Moderately High and High, based on the Trudgeon classification method. A second, level 2 flora and fauna survey was conducted in the spring of 2007 and the results will be included in the PER. The management of impacts on this vegetation will be discussed in the PER document.

### 6.2.2 Weeds

Areas where endemic vegetation is intact are more resistant to weed invasion, when compared to areas that have been disturbed. Weed species tend to compete with and destroy areas of native vegetation. 67 weed species were recorded within the survey area during the 2006 Spring Botanical Survey (360 Environmental 2007). A Declared Plant is a weed that has been "Declared" under the *Agriculture and Related Resources Protection Act 1976*.

Declared Plants occurring within the survey area include:

- *Zantedeschia aethiopica* (Arum Lily).
- *Asparagus asparagoides* (Bridal Creeper).
- *Rubus sp.* (Blackberry).
- *Gomphocarpus fruticosus* (Cotton Bush); and
- *Solanum linnaeanum* (Apple of Sodom).

Management of impacts on these Declared Plants occurring within the project area will be discussed in the PER document.

### 6.2.3 Terrestrial Fauna

Species of protected fauna are classified under the *Wildlife Conservation Act* (1950) when they are in danger of extinction, rare or need special protection. The DEC maintains databases on threatened species. A recent search of the database indicates that there are no species of Threatened or Priority Fauna recorded on the proposed plant site or potential pipeline route.

It should be noted that fauna are mobile and the information provided should therefore be regarded as an indication only of the threatened fauna that may be present.

Preliminary field investigations were undertaken in spring 2006 by an expert zoologist.

An outline of the findings is below:

- Evidence of the presence of the protected Western Ringtail Possum (*Pseudocheirus occidentalis*) and the Priority listed (P4) Southern Brown Bandicoot or Quenda (*Isoodon obesulus fusciventer*) was found during the field surveys. The Western Ringtail Possum is listed as Vulnerable under both the *Environment Protection and Biodiversity Conservation Act* (1999) and the *Wildlife Conservation Act* (1950).
- Only one reptile that could potentially occur in the survey area, the Carpet Python (*Morelia spilota imbricata*) is listed on any Rare, Threatened or Vulnerable species list.
- Other significant fauna occurring, or potentially occurring, in the Binningup project region and as listed federally under the EPBC Act, includes two Vulnerable, one Endangered species and one species believed to be locally extinct. Carnaby's Cockatoo (*Calyptrorhynchus latirostris*), Baudin's Cockatoo (*Calyptrorhynchus*

*baudinii*) and the Chuditch (*Dasyurus geoffroii*) are listed under the *Wildlife Conservation Act* 1950 and are predicted to occur within the surveyed areas. Carnaby's Cockatoo is listed as Endangered under the EPBC Act and Vulnerable under the *Wildlife Conservation Act* 1950. Baudin's Cockatoo is listed as Vulnerable under both the Commonwealth and State Acts and, while more common in the Darling Range, could be observed occasionally in the survey area. The Chuditch is listed as Vulnerable under both the Commonwealth and State Acts.

- The Forest Red Tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) is believed to be locally extinct in the area however small flocks have been observed at Keysbrook and Capel (Ninox, unpublished data). Therefore, it is predicted that this species may occur in the survey area. Regardless of condition, any remnant vegetation is of some value to vertebrate fauna and has habitat importance. Therefore several recommendations will be focused on avoiding and minimising clearing and subsequent habitat loss. A second, level 2 flora and fauna survey was conducted in spring 2007 and the results will be included in the PER. The management of terrestrial flora and fauna will be discussed in detail in the PER.

#### **6.2.4 Marine Ecology**

Offshore from the proposed plant site, areas of limestone protrude through the sandy veneer in several places but are not considered sufficiently prominent to influence sedimentation (Western Australian Planning Commission, 1999). The benthic environment is expected to provide a poor habitat for flora and fauna, low species diversity and abundance, however comprehensive mapping studies to examine the marine ecology will be undertaken throughout 2007 and results of these studies will be further discussed in the PER.

#### **6.2.5 Subterranean Biota**

The construction and operation of the desalination plant and associated pipelines will not involve extensive dewatering, will not cause groundwater recharge above what would naturally occur and will not involve extensive ground excavation. Therefore, the Water Corporation submits that the proposal is unlikely to have a significant affect on any subterranean fauna if present and detailed investigations for subterranean fauna are not proposed.

#### **6.2.6 Marine Conservation Areas**

There are no Marine Nature Reserves, Marine Parks or Marine Management Areas in the proposal area. There is one Marine Conservation Area earmarked for protection as a Marine Conservation Reserve 8km south of the proposal area at the northern extent of the Leschenault Estuary, however this is not impacted by the proposal.

### **6.2.7 Terrestrial Conservation Areas**

The State's main conservation reserves are National Parks, Conservation Parks, Nature Reserves and State Forests. These are vested with the Conservation Commission of Western Australia, and managed by the DEC and the Forest Products Commission.

There are no known or proposed National Parks, Conservation Parks, Nature Reserves or Regional Parks impacted by the proposal.

State Forests are managed by the DEC for recreation and nature conservation, to protect water catchments and to provide for sustainable resource use (e.g. timber production). The Myalup State Forest pine plantation is in the proposal area, however the proposed pipe route traverses cleared land within this plantation and does not involve the removal of any plantation timber. A small amount of native vegetation may need to be cleared and this will be quantified in the PER.

### **6.2.8 Hydrology and wetlands**

Due to the high permeability of the sandy soils in the project study area, there is very little natural surface runoff or drainage. Along the proposed pipeline route, in the low-lying terrain of coastal areas, constructed drainage has alleviated seasonal flooding or water logging conditions. The drainage system conveys runoff, into the Harvey River Diversion Drain that discharges to the ocean near Myalup. This Drain is the main surface water feature in the study area. The proposed plant site is in the catchment of this drain.

Lake Preston and the Leschenault Estuary are the two main wetland systems in the region, however are unaffected by the proposal. There is a small portion of a Conservation Category Wetland which extends into the southern part of Lot 8, however the wetland has been highly modified and degraded. An assessment of the environmental values of this and wetlands adjacent to the proposed pipeline route (in private property) will be conducted and included in the PER.

## **6.3 Social Environment**

### **6.3.1 Population**

There are two town sites located near the proposed plant site – Binningup (approximately 800m south) and Myalup (approximately 1.5 km north). Binningup has a population of approximately 900 and Myalup has a population of approximately 190 (Shire of Harvey 2006).

### **6.3.2 Recreation**

Recreational facilities are available at Myalup, Binningup and Buffalo Beach – the three major recreation nodes along the study coastal area. The Shire of Harvey Coastal

Management Plan indicates that the main recreational activities in Binningup are swimming, fishing and walking (Shire of Harvey, 2006).

The use of four-wheel-drive vehicles, off-road vehicles, trail bikes and quad bikes on the local beaches and sand dunes is a popular activity. The Shire of Harvey has provided vehicle access points to the beach at Myalup and Binningup. Vehicles are generally encouraged to drive along the beach between the high and low water marks and avoid the dunes (Shire of Harvey 2006). The foredune environment has sustained degradation due to off-road vehicle usage.

### **6.3.3 Land Use**

There are a number of land uses in the region. Inland areas consist of largely agricultural land uses and coastal areas are largely residential. A chain of limestone quarries run parallel to the coast between the ocean and the agricultural zones and a large pine plantation in State Forest is nearby. According to the Greater Bunbury Regional Scheme the land use zones that will be intersected by the implementation of the proposal are rural, public purposes and state forest (WAPC 2002).

The location being proposed for the SSDP is partially within the existing Binningup Wastewater Treatment Plant (WWTP) site at Lots 32, 33 and part Lot 8 Taranto Road Binningup. Lots 32 and 33 are currently reserved for 'Public Utilities' under the draft Greater Bunbury Regional Scheme. The WWTP on Lots 32 and 33 is a pond based treatment plant and treats only wastewater from the Binningup town site. Where technically possible (from an engineering and geotechnical perspective) the use of the cleared land on Lot 8 for the siting of major parts of the SSDP will be maximised to avoid vegetation clearing elsewhere on Lots 32, 33 and 8. Lot 8 is a partially cleared limestone quarry and is at the time of preparation of this document in the process of being purchased by the Water Corporation. Final maximum plant footprint will be included in the PER document for assessment by the EPA.

The proposed location for the pipeline route to the summit tank(s) near Harvey has been the subject of consultation with affected landowners, the Shire of Harvey and the Department of Environment and Conservation. The pipe route will use roads and cleared agricultural land as a preference, with some (approximately 7 ha) of native vegetation being impacted.

### **6.3.4 Marine Use**

#### **Commercial Fishery**

Commercial activities in the area include the South West Beach Seine Fishery which targets bait-fish such as whitebait and bluebait. This fishery is a beach-based netting fishery and is limited to the coast immediately off the beach. This fishery requires four-wheel-drive access to the local beaches. Construction will require temporary closure of this beach for 12-18 months, with access to the beach maintained at Binningup and

Myalup. The fishery stretches from Cape Naturaliste to Cape Bouvard. Preliminary discussions with the WA Department of Fisheries have been held and they have indicated no concerns with the proposal as the inlet/outlet works for the proposed plant are not in a nursery area. A literature review of marine larval studies completed in the Binningup region will be undertaken and included in the PER.

### **Recreational Fishery**

Low lying, offshore limestone rocky outcrops are used frequently by recreational fishers during the western rock lobster (*Panulirus cygnus*) season which runs from 15 November to 30 June each year. Discussions with RecFishWest, the recreational fishers' representative body, and representatives from the local fishing club are planned to be held shortly.

#### **6.3.5 Aboriginal Heritage**

Objects and places hold special significance to Aboriginal people, reflecting a deep and lasting relationship with the land. Traces of the past - former camp sites, rock paintings, initiation grounds, burial or massacre sites, artefacts - all retain deep meaning to Aboriginal people who guard and protect them to maintain their links with their ancestors. Foredunes are known to be traditional burial grounds in this region.

The *Aboriginal Heritage Act 1972*, administered by the Department of Indigenous Affairs (DIA), has provisions to protect objects and places of Aboriginal significance. The DIA maintains a database of previously recognised places and objects that are of Aboriginal significance. A search of the database has been conducted and places and objects listed in the general area have been identified. None of these sites will be impacted on by the proposal. Further archaeological surveys of the proposed SSDP site and pipe route will be undertaken prior to ground disturbing activities in consultation with the DIA and local claimant groups. Prior approval from the Minister for Aboriginal Affairs, under Section 18 of the *Aboriginal Heritage Act 1972* will be obtained if necessary.

#### **6.3.6 Non-Aboriginal Heritage and Culture**

##### **Shipwrecks**

Under the *Maritime Archaeology Act 1973* it is an offence to in any way alter, remove, destroy, damage, or in any way deal with, or assume the possession, custody or control of, any maritime archaeological site, ship or relic without the consent.

There are a number of shipwrecks off the Bunbury coast, however there are no shipwrecks recorded in the Binningup area (M. McCarthy [WA Maritime Museum] 2006 pers. comm.). The Water Corporation will consult further with the Western Australian Maritime Museum to ensure this proposal complies with the legislation relating to historic shipwrecks.

## **7 Summary of potential environmental (including cumulative) impacts, their significance and possible management responses**

Table 1 summarises the Corporation's assessment of significance of each environmental impact by classing each impact as a Key or Applicable factor for the EPA's assessment. The management of the Key factors (these require a fuller assessment than Applicable factors) will be discussed in detail in the PER document. Section 9 further describes Key factors and principles for assessment of them in the context of this proposal.

Where management plans are proposed to be developed and implemented as a management response to potential impacts, these plans will be included in the PER for public and regulator input prior to final approval.

**Table 1 - Potential Environmental Impacts**

	<b>Factor</b>	<b>EPA's Environmental Objective</b>	<b>Potential Impacts</b>	<b>Additional Investigations</b>	<b>Proposed Management</b>	<b>Guidance &amp; Standards/ Decision making bodies and advisory groups</b>	<b>Environmental Significance</b>
Over-Arching Principles	Biodiversity	<p>Maintain abundance, diversity, geographic distribution and productivity of life forms through the avoidance or management of adverse impacts and improvement in knowledge.</p> <p>To avoid adverse impacts on biological diversity, comprising the different plants and animals and the ecosystems they form, at the levels of genetic, species and ecosystem diversity.</p> <p>To comply with the Environmental Protection Act (1986) and the Environment Protection and Biodiversity Conservation Act (1999).</p>	<p>Vegetation clearing.</p> <p>Removal of ecological links.</p> <p>Reduction in fauna habitat.</p> <p>Weed invasion.</p> <p>Dieback disease spread through native vegetation areas.</p>	<p>Complete detailed biological surveys commenced in Spring 2006 identifying:</p> <p>Threatened Ecological Communities (TECs)</p> <p>Declared Rare and Endangered Flora and Fauna</p> <p>Priority Flora</p> <p>Weeds</p> <p>Dieback mapping</p>	<p>Retention of recognised ecological communities at levels that are below 30% of original extent.</p> <p>Protect TECs.</p> <p>Minimise clearing where practicable.</p> <p>Dieback hygiene plan included in the Construction Environmental Management Plan.</p>	<p>EPA Position 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection.</p> <p>EPASU</p> <p>DEC</p>	<p>Considered a key environmental factor for PER.</p>
	Sustainability	<p>To use, conserve and enhance the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.</p> <p>To ensure, as far as practicable, that the proposal meets or is consistent with the sustainability principles in the National Strategy for Ecologically Sustainable Development.</p>	<p>Emissions of greenhouse gases from power supply (depending on power source – see separate entry for greenhouse gas impacts).</p> <p>Possible disruption of marine habitats from the seawater concentrate and filter backwash returned to the ocean.</p> <p>Possible reduction in community amenity</p>	<p>Prepare a sustainability statement for the project including an assessment of environmental, social and economic sustainability (triple bottom line).</p>	<p>Designing an effective diffuser to ensure sufficient dispersion.</p> <p>Investigate opportunities to protect and enhance the vegetation on Lots 32, 33 and part Lot 8.</p>	<p>National Strategy for Ecologically Sustainable Development.</p> <p>Hope for the Future: The Western Australian State Sustainability Strategy ( Department of the Premier and Cabinet [DPC] 2003).</p> <p>EPA Guidance 55. Implementing Best Practice in proposals submitted to the EIA process.</p> <p>EPASU</p> <p>DEC</p>	<p>Considered a key environmental factor for PER.</p>

Factor	EPA's Environmental Objective	Potential Impacts	Additional Investigations	Proposed Management	Guidance & Standards/ Decision making bodies and advisory groups	Environmental Significance
Terrestrial flora and vegetation (including Threatened Ecological Communities [TEC])	To maintain abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels through avoidance or management of adverse impacts and improvement in knowledge.  Avoid, minimise or mitigate any likely adverse impacts, direct or indirect on regionally significant bushland, and System 6 areas.	Footprints of approximately (total remnant vegetation impacts unknown until plant layout and pipe route is finalised): 20ha for plant. 5ha for construction laydown (to be rehabilitated after construction). Approximately 77ha for potable water pipeline route from plant to IWSS connection. Most of the route is within roads or cleared farmland, with approximately 5-7ha of native vegetation clearing estimated.  No DRF or TECs present on the site or pipe corridor. Weed invasion following clearing. Dewatering impacts for buried pipe construction.	Undertake a desktop review of local and regional vegetation and flora. Undertake detailed baseline studies to identify existing flora species and vegetation communities for proposed plant sites and proposed pipeline routes commencing spring 2005 and to determine the total area of remnant vegetation that exists onsite and along pipelines. Investigate location and pipeline routes to avoid or minimise disturbance to flora and vegetation communities Identify possible rehabilitation plan and offsets for any unavoidable clearing.	Reduce area to be cleared by minimising plant footprint and optimising layout to minimise impact on high value vegetation.  Develop and implement a Construction Environmental Management Plan, specifying Vegetation and Flora Management, Revegetation Management, and Weed Management. Develop and agree environmental offsets.	EPA Position 2 – Environmental Protection of Native vegetation in Western Australia.  EPA Position 3 – Terrestrial Biological Surveys as an Element of Biodiversity Protection.  EPA Position 9 – Environmental Offsets  EPA Guidance 19- Environmental Offsets  EPA Guidance 10: Level of Assessment for proposals affecting natural areas within the System 6 region and Swan Coastal Plain portion of the System 1 Region.  EPA Guidance 51: Terrestrial flora and vegetation surveys for EIA in WA.  EPA Guidance 33: Draft environmental guidance for planning and development.  EPASU DEC	Considered a key environmental factor for assessment in the PER.
Terrestrial Flora and Vegetation – Declared Rare Flora, Priority Flora and flora of conservation significance	To protect declared rare and priority flora consistent with the <i>Wildlife Conservation Act 1950</i> .  Protect other flora species of conservation significance.	Footprints of approximately (total remnant vegetation impacts unknown until plant layout and pipe route is finalised): 20ha for plant plus 5ha for construction laydown. Approximately 77ha for potable water pipeline route from plant to IWSS connection. Most of the route is within roads or cleared farmland, with approximately 5-7ha of native vegetation clearing estimated.  No DRF or TECs present on the site or pipe corridor. Weed invasion following clearing. Dewatering impacts for buried pipe construction.	Undertake a desktop review of local and regional vegetation and flora. Undertake level 1 and 2 studies to identify any DRF and other species of conservation significance for proposed plant sites and proposed pipeline routes. Provide preliminary plant layout and pipeline routes to avoid or minimise loss of vegetation. Investigate environmental offsets.	Reduce area to be cleared by minimising plant footprint and optimising layout to minimise impact on high value vegetation.  Develop and implement a Construction Environmental Management Plan, specifying Vegetation and Flora Management, Revegetation Management, and Weed Management. Develop and agree environmental offsets.	EPA Position 3 – General Requirements for Terrestrial Biological Surveys.  EPA Position 9 – Environmental Offsets  EPA Guidance 19- Environmental Offsets  EPA Guidance 33: Draft environmental guidance for planning and development  EPASU DEC	Considered a key environmental factor for PER.

Factor	EPA's Environmental Objective	Potential Impacts	Additional Investigations	Proposed Management	Guidance & Standards/ Decision making bodies and advisory groups	Environmental Significance
Terrestrial Fauna	To maintain abundance, diversity, geographic distribution and productivity of fauna at species levels through avoidance or management of adverse impacts and improvement in knowledge.	Possible disturbance to nesting sites / burrows from clearing.  Reduction in habitat from clearing.  Possible interruption to habitat corridors from clearing.  Noise and lighting affecting fauna movements.	Undertake a desktop review of local and regional fauna.  Undertake field surveys in spring for plant sites and pipeline routes.	Prepare and implement a Construction Environmental Management Plan, detailing Fauna Management.  Reduce area impacted by clearing by minimising plant footprint and optimising layout to minimise impact on high value vegetation.  If significant habitat is reduced, enhance or protect partially degraded habitat in adjacent areas.	EPA Guidance 56: Terrestrial Fauna surveys for EIA in WA.  EPA Position 2 – Environmental Protection of Native Vegetation in Western Australia.  EPA Position 3 – General Requirements for Terrestrial Biological Surveys.  EPASU  DEC	Considered a key environmental factor for PER.
Specially Protected Fauna –  Migratory birds, Specially Protected Fauna, Priority Fauna, endemic fauna, threatened fauna	To protect specially protected (threatened) fauna consistent with the <i>Wildlife Conservation Act</i> 1950.	Loss of habitat on which significant fauna rely.	Undertake a desktop review of local and regional fauna.  Undertake field Level 2 fauna surveys in spring for plant sites and pipeline routes.  Determine if any threatened fauna are likely to be affected by the plant and associated works.	Plant locations and pipe routes designed to avoid significant fauna habitats.  If disturbance is unavoidable provide habitat or undertake translocations in consultation with DEC.  Prepare and implement a Construction Environmental Management Plan, detailing Fauna Management.  Minimise clearing habitat on which significant fauna rely.  Develop and agree environmental offsets.	EPA Guidance 56: Terrestrial Fauna surveys for EIA in WA.  EPA Position 2 – Environmental Protection of Native vegetation in Western Australia.  EPA Position 3 – General Requirements for Terrestrial Biological Surveys.  EPA Guidance 33: Draft environmental guidance for planning and development.  EPASU  DEC	Considered a key environmental factor for PER.
Subterranean Fauna	Maintain integrity, ecological functions and environmental values of karst ecosystems.  To maintain abundance, diversity, geographic distribution and productivity of subterranean fauna	Dewatering and excavation of karst environments.	Identify any significant karst environments in project area. If present identify risk posed by dewatering.	Preliminary onshore geotechnical investigations and drilling (to 60m) indicate that there are no karst formations at the location of the proposed seawater pumpstation (the only site infrastructure requiring dewatering). For the pipeline construction any dewatering which may be required will be of a temporary and localised nature, therefore no significant impact on karst formations (or stygofauna) is expected. The Water Corporation will seek advice from the WA Museum to confirm this.	EPA Guidance 54: Consideration of subterranean fauna in groundwater and caves during environmental assessment in Western Australia.  EPASU  DEC	Only considered an applicable environmental factor if significant karst environments are identified.

Factor	EPA's Environmental Objective	Potential Impacts	Additional Investigations	Proposed Management	Guidance & Standards/ Decision making bodies and advisory groups	Environmental Significance
Marine Flora (Benthic Habitat)	<p>Maintain the ecological function, abundance, species diversity and geographic distribution of benthic habitat in order to protect ecosystem health.</p> <p>To protect marine flora consistent with the <i>Wildlife Conservation Act 1950</i>.</p>	<p>Temporary loss of benthic primary producer habitat due to preparation of seabed for buried pipeline laying and associated activities (eg: moorings, jetties, groynes).</p> <p>Possible temporary short-term impacts on habitat health due to turbidity generated during construction.</p> <p>Potential for habitat health impacts/losses resulting from elevated salinity in the vicinity of the brine discharge.</p>	<p>Undertake a desktop review of existing information on local benthic communities.</p> <p>Undertake a benthic habitat mapping survey.</p> <p>Undertake baseline surveys within vicinity of proposed intake and outlet facilities of benthic communities and sediment quality.</p> <p>Salinity dispersion model to determine risk posed by seawater concentrate on benthic communities.</p> <p>Undertake a study and modelling of cumulative impacts of discharge to the marine environment.</p> <p>Design marine pipeline route options to avoid or minimise disturbance to marine flora and habitat.</p>	<p>Final location of the intake and outlet structures and pipe routes minimise impacts on sensitive marine communities, including seagrass meadows.</p> <p>Development and implementation of a Construction Environmental Management Plan, detailing management of water quality for marine construction.</p> <p>Impacts of construction to be controlled by restricting working width to only that reasonably necessary.</p>	<p>EPA Perth Coastal Waters Environmental Values and Objectives.</p> <p>EPA Guidance 29: Benthic Primary Producer Habitat Protection for Western Australia's Marine Environment.</p> <p>EPASU</p> <p>DEC</p>	<p>Considered a key environmental factor for PER.</p>
Marine Fauna	<p>Maintain the ecological function, abundance, species diversity and geographic distribution of marine fauna in order to protect ecosystem health, in accordance with the values and objectives identified in Perth Coastal Waters Environmental Values and Objectives.</p> <p>To protect marine fauna consistent with the <i>Wildlife Conservation Act 1950</i>.</p>	<p>Construction will temporarily impact localised habitat.</p> <p>Construction of the seawater intake and brine discharge diffuser pipelines may impact on behaviour of cetaceans (dolphins and whales).</p> <p>Operation of seawater intake structure may present a localised hazard to fauna.</p> <p>Operation of brine outlet diffuser may present a localised impact to resident fauna, within the mixing zone.</p>	<p>Identify Specially Protected and Priority Fauna and protected migratory species.</p> <p>Establish a biota baseline.</p> <p>Bio-monitoring via mussel deployment</p> <p>Determine if any threatened species are likely to be affected by the desalination discharge or associated marine infrastructure.</p> <p>Study and modelling on cumulative impacts of discharge to the marine environment.</p> <p>Design seawater intake and brine outlet diffuser to minimise impact on resident fauna.</p> <p>Undertake literature review of studies of marine larval nurseries in Binningup area.</p>	<p>Final location of the intake and outlet structures and pipe routes avoid sensitive marine communities.</p> <p>Design the seawater intake and brine outlet diffuser structures to minimise operational impact on fauna.</p> <p>Impacts of construction to be controlled by restricting working width to only that reasonably necessary.</p> <p>Implementation of Construction Environmental Management Plan to manage impacts on cetaceans.</p>	<p>EPA Guidance 29: Benthic Primary Producer Habitat Protection for Western Australia's Marine Environment.</p> <p>Perth Coastal Water Environmental Values and Objectives.</p> <p>EPASU</p> <p>DEC</p> <p>Department of Fisheries</p>	<p>Considered an applicable environmental factor for PER.</p>

	Factor	EPA's Environmental Objective	Potential Impacts	Additional Investigations	Proposed Management	Guidance & Standards/ Decision making bodies and advisory groups	Environmental Significance
Terrestrial - Physical	Landscape and Landform	To maintain landscape and landform integrity, ecological functions and environmental values.	Landform modification resulting in altered local:  Surface stability  Erosion potential  Drainage	Geotechnical survey including:  A desktop review of regional geology  Site investigations, with a particular emphasis on engineering design to avoid and/or minimise impacts.	Manage surface stability, erosion potential, drainage control requirements for roads and access tracks and rehabilitation issues through engineering design of plant and surroundings.  Rehabilitation of disturbed areas not required for permanent structures.  Implementation of Construction Environmental Management Plan to manage impacts	DEC Water Quality Protection Note: Roads in Sensitive Environments.  WA Planning Commission Statement of Planning Policy No. 2.  EPA Guidance 33: Draft environmental guidance for planning and development  EPASU  DEC	Considered an applicable environmental factor for PER.
	Acid Sulphate Soils (ASS)	Minimise the risk to the environment resulting from ASS.	Potential exposure of ASS by excavation and dewatering (note: there is a much greater potential for ASS on the pipeline route than for the plant site).	Field survey for ASS	Develop and implement a Construction Environmental Management Plan, detailing dewatering management.	DEC Acid Sulfate Soils Guideline Series.  WAPC Bulletin No. 64.  EPASU  DEC  WAPC	Considered an applicable environmental factor for PER.
	Groundwater and Surface Waterways	To maintain waterway integrity, ecological function and environmental values.  To maintain the quantity and quality of water so that existing and potential environmental values, including ecosystem function, are protected.  To ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	Temporary watertable drawdown from dewatering to enable construction.  Waterways only expected to be temporarily affected during pipe burial.	Undertake a wetland study to characterise and define the presence of existing ground and surface water levels of nearby wetlands, including assessment of groundwater contours if any infrastructure is located within 200m of a conservation category wetland.	Design plant location to avoid high water table and ASS.  Bed and bank permits will be obtained from the Department of Water where applicable.  Develop and implement a Construction Environmental Management Plan, detailing dewatering management.	Implementation Framework for Western Australia for the Australian and New Zealand.  Guidelines for Fresh and Marine Water Quality and Water Quality Monitoring and Reporting.  EPA Guidance 33: Draft environmental guidance for planning and development.  EPASU  DEC  DOW	Considered an applicable environmental factor for PER.

Factor	EPA's Environmental Objective	Potential Impacts	Additional Investigations	Proposed Management	Guidance & Standards/ Decision making bodies and advisory groups	Environmental Significance
Wetlands	<p>To protect the environmental values and functions of wetlands in the project area.</p> <p>To protect, sustain and, where possible, restore the biological diversity of wetland habitats in the project area.</p> <p>To protect the environmental quality of the wetland ecosystems of the project area through sound management.</p>	<p>Potential for wetlands and their buffers to be temporarily disturbed during pipe burial.</p> <p>Wetlands only expected to be temporarily affected during pipe burial. A highly degraded conservation category wetland partially extends into the southern tip of Lot 8 (with an area of less than 0.5 ha).</p> <p>Loss of wetland and dryland vegetation and fauna habitat.</p> <p>Hydrological impacts.</p> <p>Changes in geomorphology.</p> <p>Alteration of stratigraphy.</p> <p>Acid sulphate soils.</p>	<p>Undertake baseline studies to identify wetlands throughout the project area.</p> <p>Assess the potential impacts on wetlands and dependent vegetation, including hydrological linkages and potential impacts to systems of wetlands, as a result of development activities.</p> <p>Undertake wetland study if infrastructure is located within 200m of a Conservation Category Wetland.</p>	<p>Pipeline routes to avoid wetlands and their buffers where practicable.</p> <p>Fully protect CCWs and their buffers.</p> <p>Protect and manage buffers between other wetlands and proposed project areas, including installation of fencing and other barriers to prevent access.</p> <p>Develop and implement a Construction Environmental Management Plan, detailing dewatering management.</p>	<p>EPA Position 4: Environmental Protection of Wetlands.</p> <p>WAPC, 1999 Coastal and Lakelands Planning Strategy – Dawesville – Binningup</p> <p>Shire of Harvey, 2006. Coastal Management Plan.</p> <p>EPA Guidance 33: Draft environmental guidance for planning and development.</p> <p>Environmental Protection (Swan Coastal Plain Lakes) Policy 1992</p> <p>EPA Position 9 – Environmental Offsets</p> <p>EPA Guidance 19- Environmental Offsets</p> <p>EPASU</p> <p>DEC</p> <p>DOW</p>	<p>Considered a key environmental factor for PER.</p>
Stormwater	<p>To protect the built environment from flooding and waterlogging.</p> <p>To maintain the total water cycle balance within the project areas relative to the pre-development conditions.</p> <p>To retain natural drainage systems where practicable and protect ecosystem health.</p>	<p>Flooding of buildings and adjacent areas.</p> <p>Excessive drainage into protected wetlands.</p> <p>Interruption of local water flows.</p>	<p>Determine predicted volumes of stormwater based on site design.</p> <p>Investigation of storage and reuse options.</p>	<p>Safe passage of excess runoff from large rainfall events towards (non EPP) watercourses and wetlands.</p> <p>Development and implementation of a Construction Environmental Management Plan, detailing Stormwater Management.</p> <p>Plant design to cope with a 1:100 Annual Recurrence Interval Storm Event.</p>	<p>DEC Stormwater Management Manual for Western Australia.</p> <p>Australian Guidelines for Urban Stormwater Management (ARMCANZ/ANZECC 2000).</p> <p>Local government requirements.</p> <p>EPASU</p> <p>DEC</p> <p>Shire of Harvey</p>	<p>Considered an applicable environmental factor for PER.</p>

Factor	EPA's Environmental Objective	Potential Impacts	Additional Investigations	Proposed Management	Guidance & Standards/ Decision making bodies and advisory groups	Environmental Significance
Marine Bathymetry (including coastal processes)	To maintain seascape and landform integrity, ecological functions and environmental values. Ensure the development does not significantly impact on coastal processes.	Construction of the intake and outlet will necessitate some disturbance and potentially temporary or small-scale permanent modification as a result of: Excavation and burial across the beach and dune, with subsequent rehabilitation. Excavation to an adequate depth and burial across the surf zone, so that the pipeline does not interfere with coastal processes; Potential for underwater blasting.	Determine detailed bathymetry of the project area via a bathymetric survey. Undertake baseline beach profiling study to assist in re-instatement. Undertake a refraction (geotechnical) study to determine subsurface geology. Current/long-shore drift study using an Acoustic Doppler Current Profile to study currents and coastal processes in order to determine the potential impacts from pipeline installation and any dredging on the coastal processes (including long-shore sediment processes, current movements and oceanic processes).	The Water Corporation will select preferred methods for pipeline installation to minimise impacts on marine processes. Rehabilitation to follow excavation and burial of pipelines across the beach and dunes. Blasting is not the preferred construction technique, however if blasting is necessary, an underwater blasting procedure will be developed such that any impacts on marine environment are minimised. Development and implementation of a Construction Environmental Management Plan. Regular pipeline inspections and maintenance as required.	EPA Guidance 29: Benthic Primary Producer Habitat Protection for Western Australia's Marine Environment. EPA Perth Coastal Waters Environmental Values and Objectives. WA Planning Commission Statement of Planning Policy no. 2.6 EPA Guidance 33: Draft environmental guidance for planning and development. WAPC Development Control Policy 6.1: Country Coastal Planning Policy. EPASU DEC Department of Fisheries	Considered a key environmental factor for assessment in the PER.
Marine dilution and dispersion (hydrodynamics)	To ensure that the brine discharge is sufficiently dispersed so that there are no impacts on hydrodynamic processes outside of the Low Ecological Protecting Area (LEPA) resulting from the operation of the brine outlet facilities.	Brine dispersion impacting on water quality.	Implement a hydrodynamic model to characterise the likely dilution, advection, and far-field dispersion of the seawater concentrate from the proposed ocean outlet. Conduct a dye dispersion test and/or drogue study to confirm far-field mixing. Study and modelling on cumulative impacts of brine discharge to the marine environment. Investigate a variety of intake and outlet locations considering both environmental and engineering aspects. Investigate diffuser designs.	Develop and implement an operational Environmental Management Plan, covering marine dilution and dispersion. Intake and outlet located in environments with sufficient energy to enable discharge dispersion. Altering diffuser design to achieve required mixing.	EPA Perth Coastal Waters Environmental Values and Objectives. EPASU DEC Department of Fisheries	Considered a key environmental factor for assessment in the PER.

Factor	EPA's Environmental Objective	Potential Impacts	Additional Investigations	Proposed Management	Guidance & Standards/ Decision making bodies and advisory groups	Environmental Significance
Air Quality - Greenhouse Gas Emissions	<p>Ensure that potential greenhouse gas emissions generated by the proposal are adequately addressed in the planning/design and operation of projects and that:</p> <p>best practice is applied to maximise energy efficiency; and</p> <p>a renewable energy source is used and/or appropriate offsets are implemented.</p> <p>Ensure that emissions to air do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.</p> <p>Achieve the corporate goal of organisational carbon neutrality by 2030.</p>	<p>Nil, as the plant's energy requirements will be purchased from renewable sources, and no greenhouse gases or emissions to air will occur at the plant.</p>	<p>Investigate the feasibility of 20% of the plant's power requirements being sourced from unproven technologies (with 80% from proven renewable technologies), to encourage their development. If this is not possible, 100% of the power will be sourced from conventional renewables.</p>	<p>The plant's energy requirements will be purchased from renewable sources.</p> <p>Energy efficiency will be an important factor in the plant design.</p>	<p>EPA Guidance 12: Minimising Greenhouse gas Emissions.</p> <p>EPA Guidance 15: Emissions of Oxides of Nitrogen from Gas Turbines.</p> <p>EPA Guidance 33: Draft environmental guidance for planning and development.</p> <p>EPASU</p> <p>DEC</p>	<p>Considered an applicable environmental factor for the PER.</p>
Air Quality - Particulate Matter (Dust)	<p>Protect the surrounding land users such that dust and emissions of particulate matter will not adversely impact upon welfare and amenity or cause health problems.</p>	<p>Localised temporary airborne dust and associated settlement during construction.</p>	<p>Identification and management of potential dust sources.</p>	<p>Reduce potential dust sources during construction by minimising clearing, thus minimising exposed surfaces.</p> <p>Rehabilitation of disturbed areas.</p> <p>Investigate and implement dust management measures such as watering and other dust suppressants.</p> <p>Development and implementation of a Construction Environmental Management Plan outlining management of dust.</p>	<p>EPA Guidance 18: Prevention of Air Quality Impacts from Land Development Sites.</p> <p>EPA Guidance 33: Draft environmental guidance for planning and development.</p> <p>EPASU</p> <p>DEC</p>	<p>Considered an applicable environmental factor for the PER.</p>

Factor	EPA's Environmental Objective	Potential Impacts	Additional Investigations	Proposed Management	Guidance & Standards/ Decision making bodies and advisory groups	Environmental Significance
Marine Water Quality and Sediment Quality	Maintain the overall marine water and sediment quality. Protect objectives defined in ANZECC water and sediment quality guidelines.	Construction activities temporarily increasing local turbidity. Discharge of brine to ocean altering local water quality. Discharge of chemicals used in the plant processes may adversely alter local water and sediment quality. Possible cumulative impacts in the marine environment from this proposal in conjunction with a number of existing disposal streams.	Undertake Baseline Water and Sediment Quality Surveys. Undertake ecotoxicity studies using the discharge from the existing Perth Seawater Desalination Plant. In consultation with the EPASU, define a Low Ecological Protection Area (LEPA) and predict concentrations of substances in the brine at the boundary of the LEPA.	Minimising operational area during construction. Development and implementation of a Construction Environmental Management Plan. Outlet located and designed to ensure water quality is not significantly affected by discharge. Water quality based on existing background water quality and ecotoxicity requirements being met within the LEPA boundary. Develop and implement an operational Environmental Management Plan, covering marine dilution and dispersion.	Australian and New Zealand Water and Sediment Quality Guidelines. Australia for the Australian and New Zealand Guidelines for Fresh and Marine Water Quality and Water Quality Monitoring and Reporting. EPA Perth Coastal Waters Environmental Values and Objectives. EPA Guidance 29: Benthic Primary Producer Habitat Protection for Western Australia's Marine Environment. EPA Guidance 33: Draft environmental guidance for planning and development. EPASU DEC Department of Fisheries	Considered a key environmental factors for assessment in the PER.
Audible Amenity (Noise and Vibration) - Plant and Pipe Construction	To protect the amenity of the community from noise/vibration impacts associated with the development of land by ensuring compliance with Environmental Protection (Noise) Regulations and other acceptable standards. To avoid unnecessary adverse impacts on the natural environment, including endemic fauna.	Localised intermittent construction noise and vibration – heavy machinery, traffic, fabrication, reversing beepers affecting amenity at nearby premises.	Identify noise and vibration sensitive premises in the area.	Develop and implement a Construction Environmental Management Plan for all potential construction methods, detailing Noise and Vibration Management. Adherence to Australian Standard for construction and building site noise. Maintenance of noise buffers for the plant site. Consultation with nearby residents during proposal assessment.	EPA Guidance 8: Environmental Noise Australian Standard AS 2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites Environmental Protection (Noise) Regulations 1997. EPASU DEC	Considered an applicable environmental factor for assessment in the PER.
Audible Amenity (Noise and Vibration) - Plant Operation	To protect the amenity of nearby residents from noise/vibration impacts resulting from operation. Comply with Environmental Protection (Noise) Regulations.	Ongoing localised continuous operational noise and vibration affecting amenity at nearby premises.	Noise report by qualified acoustic professional including noise modelling to demonstrate that requirements of the Environmental Protection (Noise) Regulations can be met during operation. Investigate plant design and engineering controls for noise and vibration attenuation.	Plant design to incorporate engineering noise and vibration attenuation controls, including buffer design.	EPA Guidance 8: Environmental Noise Environmental Protection (Noise) Regulations 1997. EPASU DEC	Considered a key environmental factor for assessment in the PER.

	Factor	EPA's Environmental Objective	Potential Impacts	Additional Investigations	Proposed Management	Guidance & Standards/ Decision making bodies and advisory groups	Environmental Significance
	Waste Management	To maintain the integrity, ecological function and values of the environment and to ensure that emissions do not adversely affect health, welfare and amenity of people and land uses.  Manage wastes in accordance with the Waste Hierarchy.  All reasonable and practical measures to be taken to minimise generation of wastes and discharge into the environment.	Indirect impacts from day-to-day workplace waste.  Sludge disposal to landfill.	Minimise the amount of sludge generated by reducing the amount of drifting organisms which end up in the treatment processes.	No on-site waste disposal.  Construction waste management will be addressed in the Construction Environmental Management Plan.	Department of Environment Landfill Waste Classification and Waste Definitions 1996.  State Strategic direction for waste management in Western Australia.  EPASU  DEC	Considered as an applicable environmental factor for assessment in the PER.
Social	Indigenous Heritage and Native Title	Ensure changes to the biophysical environment do not adversely affect indigenous historical or cultural heritage sites.  Ensure project is compliant with the <i>Aboriginal Heritage Act 1972</i> and the <i>Native Title Act 1993</i> .	Disturbance of sites of indigenous significance.  Possibility of uncovering unlisted material during construction.	Identify indigenous cultural and heritage sites of significance through archaeological and ethnographic surveys of the project area and through consultation with the Gnaala Karla Booja Native Title claimant group, the DIA and the SWALSC	Demonstrate that any concerns raised by indigenous people will be adequately managed and this process is communicated to the relevant indigenous people.  Avoid disturbance to identified heritage sites.  Submit section 18 (of Aboriginal Heritage Act) applications as required.	EPA Guidance 41: Assessment of Aboriginal Heritage  ATSIC Consulting Citizens: Engaging with Aboriginal Western Australia.  EPA Guidance 33: Draft environmental guidance for planning and development.  EPASU  DIA	Considered applicable environmental factors for assessment in the PER.
	Non-indigenous Heritage	Ensure changes to the biophysical environment do not adversely affect historical or cultural associations and comply with relevant heritage legislation.  Comply with Heritage of Western Australia Act (1990) .  Comply with <i>Maritime Archaeology Act (1973)</i> .	Disturbance of sites of non-indigenous significance.  Possibility of uncovering unlisted material during construction.  Potential impact from discharge on marine shipwrecks, however initial investigations show no shipwrecks in the region.	Identify sites in project area on world, national, state and municipal heritage registers.  Benthic marine studies are expected to provide additional confirmation of no shipwrecks in the region.	Compliance with Heritage of Western Australia Act (1990).  Avoid disturbance to identified heritage sites.	WA Heritage Council's Caring for Your Community's Heritage.  Shire of Harvey Heritage Advisory Committee.  EPA Guidance 33: Draft environmental guidance for planning and development.  EPASU	Considered an applicable environmental factor for assessment in the PER.
	Visual Amenity	Ensure that visual amenity is considered and measures are adopted to reduce adverse visual impacts on the surrounding environment are as low as reasonably practical.	Impacting the amenity of the current landscape / streetscape. The proposed maximum height of the tallest structure (the lime storage towers) is 18m. The reverse osmosis buildings will be approximately 14m tall.  Lighting impacts (both construction and operational phases).	Investigate building locations and designs that are of appropriate scale, climate sensitive and utilise architectural styles, construction materials and colours that reflect local character and are harmonious with surroundings.  Viewshed modelling will be developed, including lighting.  Liaise with the community, the Shire of Harvey and stakeholders on layout.	Rehabilitate disturbed areas towards natural state.  Pipelines buried where practicable.  Make use of natural landscape features to conceal infrastructure.  Incorporate landscape design techniques during plant design, such as planting, choice of textures and colours, breaking solid lines.	Local Government Regulations.  EPA Guidance 33: Draft environmental guidance for planning and development.  EPASU  Shire of Harvey	Considered an applicable environmental factor for assessment in the PER.

Factor	EPA's Environmental Objective	Potential Impacts	Additional Investigations	Proposed Management	Guidance & Standards/ Decision making bodies and advisory groups	Environmental Significance
Recreation	To ensure that existing and planned recreational uses of the environment are not compromised.	<p>Temporary and localised restriction of access by vessel and to beach from construction of marine facilities.</p> <p>Temporary and localised restriction of access to land during burial of pipelines.</p> <p>Permanent restriction of access to Lots 32, 33 and part Lot 8.</p>	<p>Determination of current recreational uses at the plant site, pipe routes and intake and outlet locations.</p> <p>Review of potential impacts to existing recreational uses including access to the coast and other recreational areas.</p>	<p>Consultation with relevant management agencies and user groups to assist with the evaluation of management strategies to mitigate impacts.</p> <p>Staging construction activities which restrict beach access and/or provide alternative access.</p> <p>Ongoing management of vehicles in local dune system on Water Corporation owned site.</p>	<p>DoE Interim Industry Guide to Community Involvement.</p> <p>EPA Guidance 33: Draft environmental guidance for planning and development.</p> <p>EPASU</p>	<p>Considered an applicable environmental factor for assessment in the PER.</p>
Public Safety and Risk	To ensure public risk associated with construction and operation of the proposal is as low as is reasonably achievable.	<p>Potential for chlorine and other chemicals to escape.</p> <p>Potential public safety risks at construction sites.</p> <p>Explosives and dangerous goods storage.</p> <p>Construction traffic impacts.</p>	<p>Investigate appropriate location and buffer for chemicals storage.</p>	<p>Locate chemical storage facilities with appropriate buffer.</p> <p>Development of a Construction Environmental Management Plan, detailing hazardous materials management and public safety measures such as temporary restriction on access.</p> <p>Ensure compliance with Dangerous Good Regulations and Australian Standard AS 3780 (The Storage and Handling of Corrosive Substances).</p>	<p>Australian Standard AS 3780: The storage and handling of hazardous chemical materials.</p> <p>WAPC: Statement of Planning Policy 4.1 State Industrial Buffer Policy</p> <p>EPA Guidance 33: Draft environmental guidance for planning and development.</p> <p>EPA Position 2 – Environmental Protection of Native vegetation in Western Australia.</p> <p>EPA Position 3 – General Requirements for Terrestrial Biological Surveys.</p> <p>EPASU</p>	<p>Considered an applicable environmental factor for assessment in the PER.</p>

## **8 Proposed studies and investigations (Scope of Works)**

Table 1 (in section 7) provides a summary of potential impacts and proposed studies associated with those predicted impacts. Section 9 also provides a detailed description of the proposed marine investigations.

## **9 Key environmental factors and principles for this proposal**

The Water Corporation, in planning and implementing the proposed SSDP, will adopt the principles of environmental protection enunciated in section 4A of the Environmental Protection Act 1986 (EP Act) and expanded upon in EPA Position Statement No. 7 (EPA 2004), specifically the:

- precautionary principle;
- principle of intergenerational equity;
- principle of the conservation of biological diversity and ecological integrity;
- principles relating to improved valuation, pricing and incentive mechanisms; and
- principles of waste minimisation.

### **9.1 Aspects and Potential Impacts**

It is proposed that the principles of environmental protection provide the framework for specifically addressing:

- The case for establishing a climate-independent water source for the Perth Metropolitan region;
- The imperative for site selection given that seawater desalination is the proposed water source;
- Marine discharge as the preferred and only viable method for long-term brine disposal, subject to ongoing studies establishing environmental acceptability; and
- The requirement for and role of an ocean outlet as a necessary and environmentally-responsible element of the proposal.

Principles of environmental protection (as summarised in Table 2) as relevant to other specific factors discussed in subsequent sections will also be addressed.

### **9.2 Guidance to Assessment**

The EPA has issued several policies to which the Water Corporation will refer in investigating and reporting on aspects of this proposal relating to the principles of environmental protection. These are listed in Table 1.

In 2003 the *Environmental Protection Act* (1986) was amended to include the principles outlined in Table 2. These principles have been integrated within the SSDP proposal.

**Table 2 - Principles of Environmental Protection**

Principles of Environmental Protection	Relevant	If yes, consideration
<p>The Precautionary Principle.</p> <p>Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.</p> <p>In application of this precautionary principle, decisions should be guided by—</p> <p>(a) careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and</p> <p>(b) an assessment of the risk – weighted consequences of various options.</p>	Yes	<p>Investigations will be undertaken to provide information regarding the expected environmental impacts of the seawater concentrate discharge stream.</p> <p>Available literature will be reviewed and used together with field data and plume dispersion modelling to predict likely physical and ecological responses associated with the proposed brine disposal. The PSDP has been operating since November 2006 and no measurable impacts have occurred. A monitoring and adaptive management program will be proposed in the Environmental Review to track physical and ecological responses to the brine discharge.</p> <p>In addition, mitigation measures will be proposed as well as opportunities for environmental offsets if EPA objectives can not be met.</p> <p>A risk assessment framework of the various options will be developed, with the results of this assessment to be discussed in the PER.</p>
<p>Principle of Intergenerational Equity.</p> <p>The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations</p>	Yes	<p>It is considered that this proposal can be developed to not adversely impact on the environment for future generations. The proposal itself is being proposed as one component of Water Corporation's drought response strategy - 'Security through Diversity'. This is a long-term initiative (to 2050) to ensure water sources are developed to meet future water demands. SSDP is being developed as a continuous, reliable supply for present and future residential and industrial users that is independent of climate. Other diverse water sources are being developed simultaneously to SSDP.</p>
<p>Principle of the conservation of biological diversity and ecological integrity.</p> <p>Conservation of biological diversity and ecological integrity should be a fundamental consideration.</p>	Yes	<p>While there will be an impact on the ecosystem within the terrestrial footprint of the plant, pipeline routes and marine Low Ecological Protection Area, the biodiversity and ecological integrity of the region will be maintained.</p> <p>Terrestrial and marine flora, fauna and habitat surveys will be conducted to support this.</p> <p>Permanently disturbed areas will be utilised where practicable. Environmental offsets present opportunities where some ecological losses are unavoidable.</p>
<p>Principles relating to improved valuation, pricing and incentive mechanisms.</p> <p>(1) Environmental factors should be included in the valuation of assets and services.</p> <p>(2) The polluter pays principles – those who generate pollution and waste should bear the cost of containment, avoidance and abatement.</p> <p>(3) The user's goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste.</p> <p>(4) Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structure, including marketing mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solution and responses to environmental problems.</p>	Yes	<p>Water Corporation recognises and accepts a range of costs of managing the operation and impacts of this proposal. As Water Corporation operates on a full cost recovery basis, these costs will be passed onto its customer base within the parameters of the Government's pricing policies for the provision of water supplies.</p> <p>The price that industrial customers pay for water is based on full cost recovery by Water Corporation. This provides an appropriate signal to business and represents the true cost associated with provision of water services.</p> <p>The Government sets the price that residential customers pay for water (currently on the basis of the Uniform Pricing Policy). In Western Australia the price of residential water is split into consumption brackets (tapers).</p> <p>This tapered system helps to send a clear conservation message to people who consume large quantities of water. The more water used, the greater the payment.</p>
<p>Principle of Waste Minimisation</p> <p>All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.</p>	Yes	<p>Apart from seawater concentrate, which will be discharged to the ocean via an outlet and diffuser to ensure rapid mixing, the desalination process generates minimal wastes. Sludge disposal will be to a licensed landfill site.</p>

The Environmental Protection Act (1986) requires the EPA to report on key factors. This approach may result in inappropriate fragmentation of common or cumulative impacts. As a result, the EPA has often combined several factors which have clear relationships into environmental issues, or broadly interpreted a single factor to encompass a range of related impacts. The Water Corporation, having considered the EPA's 'Guide to EIA Environmental Principles, Factors and Objectives' believes that the following (Table 3) summarises key environmental factors, using EPA terminology, (encompassing a range of the significant environmental impacts and recognising that some are interrelated) and environmental objectives relevant to the EPA's assessment of the proposal.

**Table 3 - Key environmental factors (summary)**

Factor	Environmental objective
Flora	To maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.
Fauna	To maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystems levels through the avoidance or management of adverse impacts and improvement in knowledge.
Wetlands	To maintain the integrity, ecological functions and environmental values of wetlands.
Land (marine)	To maintain the integrity, ecological functions and environmental values of the seabed and coast.
Water quality (surface, marine or ground)	To ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.
Noise	To protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring the noise levels meet statutory requirements and acceptable standards.

### 9.3 Marine investigations

With respect to the potential marine and coastal impacts of the proposal, it was considered that the complexity of the additional investigations being undertaken by the Water Corporation warranted an expanded section on those studies. Studies for other factors have already been summarised in Table 1. The following describes the proposed marine and coastal investigations in detail. Table 5 at the conclusion of this section summarises the timing of all environmental studies to be included in the PER, including the marine studies.

It is planned to incorporate lessons learned from the Perth Seawater Desalination Plant (PSDP) (with respect to diffuser design) within the proposed SSDP. The PSDP outlet operation and resultant dilution has been extensively monitored and the design performance evaluated. This knowledge will be applied to the design of the outlet for the SSDP. For construction of the offshore pipelines, knowledge gained during the

construction of the Bunbury Ocean Outfall and the PSDP will be applied to minimise impacts on the Binningup coastal environment.

Typical water quality compositions of the seawater concentrate of a 45GL/yr plant are shown in Table 4. This summary shows that the post dilution seawater concentrate levels are calculated to be 36.4g/L TDS at the edge of the mixing zone (nominal 50m from the diffuser), based on 45-fold dilution, with natural variation for Cockburn Sound. Note that the significantly higher energy environment of the Binningup ocean environment will ensure mixing to a greater degree than at the existing PDSP.

**Table 4 - Typical average water quality compositions of the seawater concentrate from PDSP**

	Intake	Discharge pre-dilution)	Discharge (post-dilution)
Salinity (TDS g/L) (average)	35.9	65	36.4 (based on 45 fold dilution)
Temperature °C (average)	20-24	22-26	20-24

There are environmental risks associated with not achieving sufficient dilution. Diffusion depends on the diffuser design (through which the brine is ejected at high velocity) and the natural mixing. Provided that the dilution is high enough, EPA guidelines and ecotoxicity objectives will be met.

#### 9.4 Potential Impacts

Construction of the sub-sea pipelines and intake and outlet facilities are likely to temporarily affect water and sediment quality. Continuous operation of the diffuser could potentially involve impacts, though the Water Corporation, based on direct experience with the PSDP, is confident such impacts will not be detectable. The most significant possible impacts are:

- Discharge of seawater concentrate to ocean not meeting environmental guidelines for water quality;
- Discharge of chemicals used in RO process may adversely alter water and sediment quality;
- Possible cumulative impacts in marine environment from a combination of disposal streams; and
- Offshore pipeline construction activity increasing turbidity temporarily.

## **9.5 Proposed Studies**

### **9.5.1 Water Quality Characterisation**

A Water Quality Monitoring Study commenced in May 2006 and has continued for the duration of 2007 (March, July, September/October and December/January, representing four seasons of a year). These intensive field surveys will be performed at intervals of approximately 6 weeks until January 2008.

The aim of this on-going study is to develop baseline (pre-operation) water quality data and provide water quality parameters for process design.

This intensive water quality monitoring will be performed at five sites over three consecutive days. Parameters are major ions, nutrients, heavy metals (June and December only), total petroleum hydrocarbons (June and December only), DO-specific, chlorophyll-a, physiochemical parameters and silt density index (SDI).

In addition to the Water Quality Monitoring Study, a Real Time Monitoring System (RTMS) Marine Buoy has been deployed 800m offshore at Binningup Beach at the approximate location of the proposed outfall. This buoy will collect dissolved oxygen (DO), electrical conductivity (from which salinity is derived), temperature, wind speed and wind direction data on a continual basis.

Eight years of water quality data (including salinity) from the Bunbury and Kemerton areas will also be used to characterise the water quality at Binningup as it is believed to be a suitable surrogate. This data, combined with the four seasons of local Binningup water quality data will be sufficient to conduct a full impact assessment of the brine discharge.

### **9.5.2 Sediment Characterisation**

This study will provide background information on the seasonal and spatial variability for sediments in the Binningup region.

Triplicate sediment cores (20mm depth) will be taken at five determined monitoring sites. Two replicates are analysed while the third will be retained for additional analysis if required. The sediments will be analysed for nutrients, heavy metals, hydrocarbons and particulate size distribution. Sediment oxygen demand is expected to be negligible but will be measured to confirm this.

### **9.5.3 Bio-monitoring**

The study methodology will consist of deploying approximately 100 mussels at five sites for a pre-determined period. Two replicates will be analysed while the third will be retained for additional analysis if required.

Bio-monitoring will allow the determination of the accumulation of tributyl tin, lipid content, heavy metals and hydrocarbons and the resultant water quality.

Toxicity studies (Whole Effluent Toxicity (WET)) data using brine discharge from the PSDP will be summarised and assessed for the SSDP in the PER.

#### **9.5.4 Oceanographic Conditions and Coastal Processes**

A suite of surveys and studies will be conducted in order to gather knowledge of the oceanographic conditions and the coastal processes of the Binningup region.

Specifically this will consist of:

- 3-day Conductivity Temperature Depth (CTD) measurements via field surveys
- Drifter (dye release and/or drogue) field survey
- Acoustic Doppler Current Profiler (ADCP) deployment over 12 months. The ADCP is equipped with CTD-DO and thermistors (temperature)
- Detailed coastal processes data collection and assessment including
- Wave climate
- Cross-shore sediment transport
- Beach stability
- Longshore sediment transport
- Rates of sediment transport
- Wave modelling
- Review of relevant data sets from nearby locations
- Baseline beach profiling involving the establishment of beach profile lines which will be measured.
- Study of current/long-shore drift adjacent to shoreline. Deploy ADCP in the surf zone to measure the longshore current during a sea breeze cycle.
- Wave data records tied to a nearby data record to predict extreme wave conditions at the diffuser location.
- Storm erosion analysis to predict the maximum coastal erosion under the action of storms. This is important for locating the desalination plant infrastructure.

#### **9.5.5 Hydrodynamic Modelling**

A hydrodynamic model will be used which computes the water velocity and surface elevation fields in the vicinity of the proposed ocean diffuser and accurately characterises the likely dilution, advection, and far-field dispersion of the discharge plume from the proposed ocean diffuser.

The model will be run for a variety of cases including initial and capacity flow conditions for the outlet, as well as varying discharge water quality, based on likely ranges of treatment and water recycling and/or recovery schemes. Model scenarios will examine 'worst case' oceanographic and meteorological conditions (e.g. calm conditions with peak flows). In addition, the model scenarios will allow for long-term simulations to enable concentrations of materials in the treated seawater concentrate to be depicted in a statistical manner that is related to accepted water quality criteria. The modelling will also include a cumulative effects scenario.

#### **9.5.6 Bathymetric Survey**

A Multi-beam Echo Sounder and a GeoSwath Plus transducer will be mounted on an over-the-side pole to provide bathymetry data as well as backscatter information which is used to chart seabed features. Sub bottom profiling will be acquired using a Boomer Sub Bottom Profiler system. Seabed samples will be obtained using a bucket grab sampler. Velocity of sound will be determined by CTDs probe measurements through the water column.

A Bathymetric Survey will be undertaken to determine the contours of the ocean floor. These data will be used to assist in the accurate modelling of brine dispersion and pipeline construction.

#### **9.5.7 Refraction (Geotechnical) Survey**

A geotechnical survey will provide quantifiable velocity data of shallow marine soils. This will allow the identification of rock, reef and subsurface geology, which will influence design and construction methods. The refraction profiling will involve using a hydrophone streamer and an air gun. Probing methods may be used, if required (surf zone is a likely area for probing if refraction survey is unable to reach this location).

#### **9.5.8 Dye Dispersion Study**

Natural dispersion or mixing will be measured using drifters (drogues) and/or via dye release. Rhodamine is a fluorescent tracer dye that is often used in the natural environment due to its benign nature. Rhodamine will be released in the ocean near the likely diffuser location and its rate of spreading tracked.

This study will determine the horizontal mixing and dispersion characteristics of the brine due to natural mixing processes.

#### **9.5.9 Seaglider Monitoring**

An underwater seaglider will be deployed in the coastal waters of Binningup Beach. Communications with the seaglider occur through satellite telemetry when the instrument is near the surface.

A seaglider is a piece of scientific equipment which rises up and down through the water column while moving forwards to obtain a continuous three dimensional measurement of ocean parameters such as salinity, temperature, turbidity, chlorophyll and oxygen.

Table 5 below summarises the components of the all environmental investigations (including marine) and their likely timings.

Table 5 - Environmental investigations schedule of proposed works

Studies/Time	2006								2007												2008			
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
<b>Ocean Current Movement</b>																								
Acoustic Doppler Current Profiling (incl. Long-shore Drift & Current Studies)									Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Seaglider Monitoring																					Orange	Orange		
Dye Dispersion Testing																				Red				
RTMS Marine Buoy																					Orange	Orange	Orange	Orange
<b>Marine Sand Movement Studies</b>																								
Baseline Beach Profiling																						Blue		
Intensive Field Studies																								
Bathymetric Study																								
Geotechnical Study																								
<b>Marine Life &amp; Water Quality Studies</b>																								
Water Quality Monitoring	Green										Green				Green		Green	Green		Green	Green	Green		
Sediment and Bio-monitoring																					Blue	Blue	Blue	
Marine Species (incl larval) Studies Review																					Yellow	Yellow		
Eco-Toxicity Testing																						Pink	Pink	
CTD Measurement (Conductivity/Salinity, Temperature and Dissolved Oxygen)											Green				Green			Green						
<b>Flora and Fauna Surveys</b>																								
Level 1 Flora and Fauna Survey			Red	Red	Red	Red																		
Level 2 Flora and Fauna Survey (incl. <i>Armarillia</i> and <i>Phytophthora</i> Studies)																								



## **10 Applicable legislation**

Table 1 in Section 7 provides a complete list of relevant legislation applying to each factor in the objectives column. Additionally, the proposal will be referred to the federal Department of Environment and Water Resources under the *Environment Protection and Biodiversity Conservation Act (1999) (Cth)*. Preliminary discussions with the relevant sections in that agency have been held and the proposal will be referred under that Act. Discussions will continue with the Department as the proposal gains more definition.

## **11 Community and other stakeholder consultation program**

### **11.1 Communications context**

Keeping the community involved in the preservation and enjoyment of our natural water resources is a vital consideration for the Water Corporation. We encourage everyone in the community, from schools and businesses through to charities and government departments, to learn more about the environment and its resources, and assist us in maintaining our precious water supply.

Community involvement is also vital to the success of many of our projects. Without the help of many residents and community groups it would be much more difficult for us to ensure the sustainability of our water supply and preserve our world-class water resources. Because we have such a massive amount of infrastructure, most of it in urban environments, we understand the need to consult with communities. With the SSDP proposal we are committed to community and stakeholder consultation. We plan to be part of the south-west community for many years to come. We want to be a good neighbour, and like all good neighbours, we want to keep the community informed and involve them in the planning of the plant. The Water Corporation acknowledges that the desalination plant announcement came as a surprise to the local community and stakeholders. This is why we are investing time and effort to arm the community with the information they need to be an informed participant in the planning process.

The community has told us that they are worried about noise and visual impacts of the plant, and the Corporation has already made some firm commitments on noise and lighting. The community has also told us about the social and recreational values in the area, and the hope that these will remain. The Corporation will work with the community to ensure the social and recreational fabric of the area is retained and even enhanced. The Corporation will continue to talk to the community and listen to concerns and aspirations to ensure that we build the most sustainable plant possible.

Developing a productive relationship with the local community and the Binningup Desalination Action Group, the community-elected representative group, is an immediate goal of the Corporation's.

## **11.2 Understanding the community**

In addition to a consultation program (outlined in section 11.3 below) the Water Corporation will be undertaking qualitative social research right through the project development. This will inform the Corporation's communications activities to ensure the information we provide is relevant and meets the needs of the community. Our research will track awareness, attitudes and perceptions of desalination and of the communication needs of the local community. The first wave of research was undertaken in August 2007 with residents of Binningup, Myalup and Bunbury (Synovate 2007). This will be repeated in November 2007 (with additional residents from Harvey included, as the pipe route definition took place) and again in the first half of 2008.

## **11.3 The consultation program**

The Water Corporation's consultation program will cut across all elements and phases of the project, including:

- The desalination plant
- The pipeline route and summit tank facility
- The environmental approvals process
- The alliance development phase
- The construction phase

The overarching goal of our consultation program is to understand community values and concerns and enable informed input from the community into the planning for the plant by providing relevant information.

Our consultation program includes:

- Local advertising of community events and information on the project
- Participating in local events such as the Binningup Spring Fair
- Holding community forums, workshops and open house / 'walk-ins'
- Issuing regular community newsletters
- Media relations
- Community and stakeholder tours of the Kwinana desalination plant and the Taranto Road site
- Presentations and briefings to community groups and stakeholders as required
- The development of information in the form of brochures, fact sheets and other visual aids
- Our website [www.watercorporation.com.au](http://www.watercorporation.com.au) which will be regularly updated and will hold all relevant documents for community members and stakeholders to access any time.

## 12 Project and assessment schedule

**Table 6 - Proposed schedule (indicative dates which may change) to meet December 2011 deadline for water to the IWSS.**

Event	Date
Referral of proposal to EPA and setting of level of assessment	July 2007
Resolution of appeals on level of assessment	October 2007
Draft Environmental Scoping Document to the EPA	October 2007
Scoping document released for public comment (2 weeks)	November 2007
Draft PER document to the EPA	Late February 2008
EIA document released for public comment (8 weeks)	April 2008
EPA Bulletin released for public comment (2 weeks)	Late August 2008
Environment Minister's Statement released	November 2008
Construction commences	January 2009
Commissioning of the plant (first discharge of brine)	December 2010
Full production commences	December 2011

## 13 Peer review

The Water Corporation is in the process of engaging peer reviewers to provide expert advice on the studies undertaken for the PER and the document itself. Their names (and areas of review) are provided below. Each of the peer reviewers will review either specialist technical documents (with respect to their areas of expertise) which input into the development of the PER or review the PER itself, and provide a report to the Water Corporation on their views of the adequacy of the studies undertaken and the PER.

- PER document (Marine Impacts): Mark Bailey (Oceanica)
- PER document (Terrestrial Impacts): Karen Lane (ENV)
- Marine biological impacts: Dr Desmond Lord (UWA)
- Marine modelling and dispersion: Prof. Jörg Imberger (UWA)
- Preliminary diffuser design and marine construction: Dr Ian Wallis (CEE Pty Ltd)
- Marine toxicology: Dr Michael Warne (CSIRO)
- Social impact assessment: Dr Jo Ann Beckwith (Jo Ann Beckwith and Associates)
- Sustainability statement: Harry Ventriss (Strategen)

## 14 Study team

For the Water Corporation:

- Project Environmental Manager: Suzanne Brown
- Senior Environmental Scientist: Stuart Hawkins
- Senior Environmental Scientist: Fabienne Faskel
- Communications Officer: Jo Madin

**Table 7 - Consultants providing specialist advice and reports:**

Study	Consultant
Oceanographic survey (bathymetry, ADCP, weather) Preliminary diffuser design Marine hydrodynamic modelling Coastal processes Sediment characterisation Water characteristics Biomonitoring Benthic habitat	KBR, led by Dr Kresho Zic
Noise survey	Herring Storer Acoustics
Flora and Fauna surveys Contaminated site survey Wetland condition assessment	360 Environmental and Ninox Consulting, led by Felicity Donaldson
Western Ringtail Possum survey	Barbara Jones
Aboriginal heritage survey	Contract to be awarded
Social research	Synovate, led by David Svardov
Social impact assessment	GHD, led by Leah O'Brien
Sustainability Statement	GHD, led by Dr Jenny Pope
Ecotoxicity testing	Dr Jill Woodworth
Dieback and Armillaria survey	Contract to be awarded

## 15 References

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## FIGURES