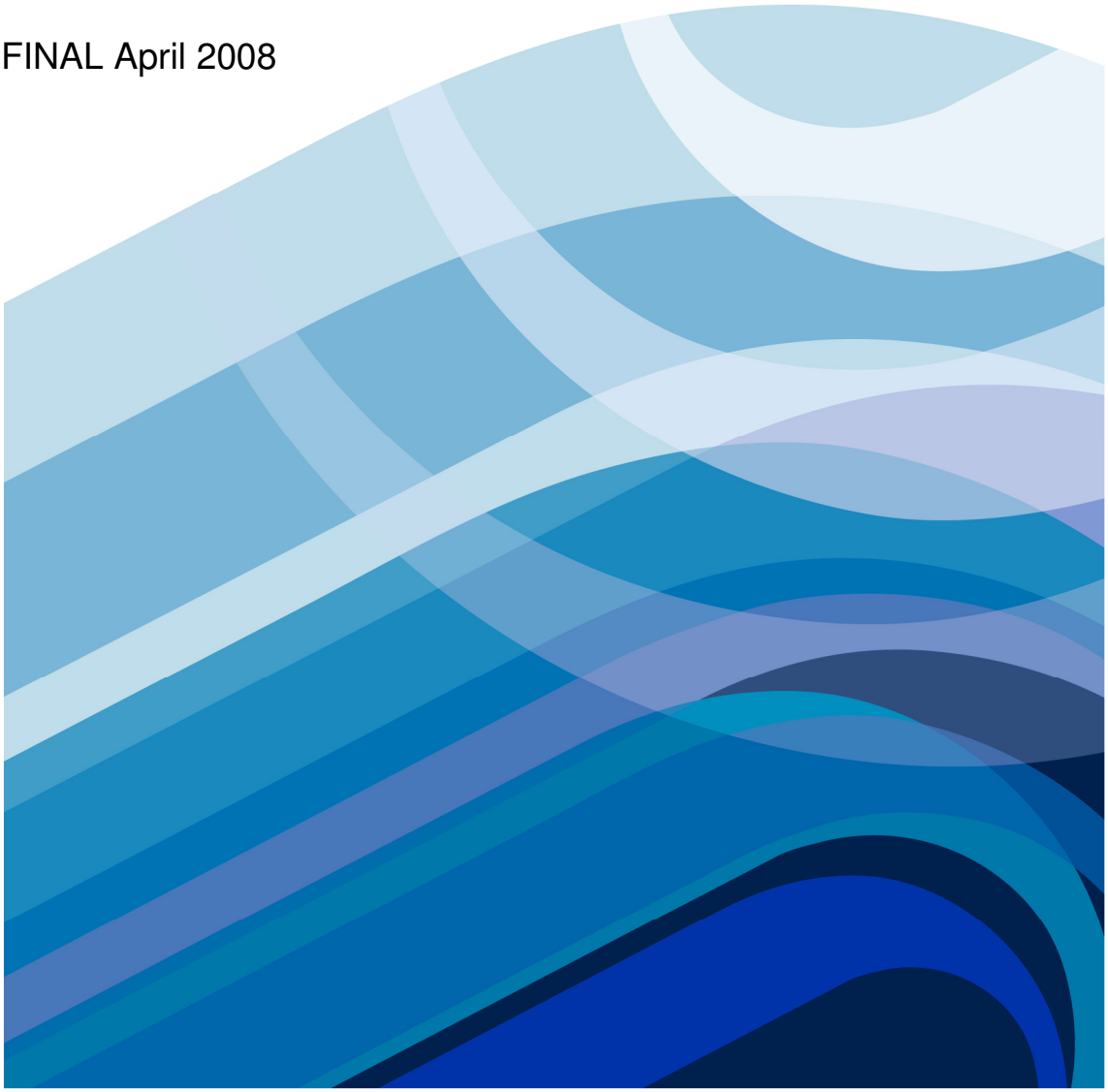
WATER CORPORATION

Southern Seawater Desalination Project

Construction Environmental Management Framework

FINAL April 2008



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Southern Seawater Desalination Project - Construction Environmental Management Plan.	Draft for Internal Review February 2008.	S A Hawkins, Snr. Environmental Scientist - Water Corporation.	D Lunetina - Environment Branch A Baker – Environment Branch D Thorpe - Environment Branch
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Southern Seawater Desalination Project - Construction Environmental Management Framework.	Public Environmental Review April 2008.		Environmental Impact Assessment - Public Environmental Review.

Reference

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Water Corporation (2008) *Southern Seawater Desalination Project Construction Environmental Management Framework Draft February 2008.*

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1.0 Overview

1.1 Project Outline

The Water Corporation is a public utility of the State Government of Western Australia responsible for public water supply in accordance with the *Water Corporation Act 1995* (WA) and associated legislation. The Water Corporation's Southern Seawater Desalination Project (SSDP) is critical Government infrastructure for public water supply to the Integrated Water Supply Scheme (IWSS).

The Southern Seawater Desalination Project involves the construction and operation of:

- A reverse osmosis seawater desalination plant to produce Up to 100 GL/y, located at Lots 32 and 33 and Part Lot 8 on Taranto Road in the Shire of Harvey (approximately 140km south of Perth).The plant will include:
    - Up to four submerged seawater intake pipelines extending up to 600m offshore.
    - Seawater pump station.
    - Chemical storage facility for chemicals including ferric sulphate, sulphuric acid and sodium hypochlorite.
    - Dual media filters (including backwash tanks) and drying beds.
    - Reverse osmosis building.
    - Potabilisation and storage facilities for chlorine, fluorosilicic acid, lime, carbon dioxide and minor process chemicals.
    - Drinking water storage tank(s) and pump station(s).
    - Up to four seawater brine outlets with diffusers extending to a distance of up to 1100m offshore.
    - Site amenity buildings for purposes including administration, plant operations control, laboratory, workshop and general storage.
- 100ML water storage facility (in up to 4 storage tanks) with up to 5ML sump located north-east of the town settlement in the Shire of Harvey.
- Approximately 30km of 1400mm diameter cement-lined steel pipeline to connect the plant to the storage facility, and the storage facility to the existing Stirling Trunk Main of the Integrated Water Supply System (IWSS).

Implementation of the Southern Seawater Desalination Project will be staged, with initial construction and operation for 50 GL/y water production capacity and with one water storage tank up to 32 ML capacity. All terrestrial and marine pipelines will be constructed for a 100 GL/y capacity at the initial stage of construction including all earthworks. The capacity of the plant site and water storage facility will be increased as water supply demand increases.

An overview map identifying the project infrastructure location is contained in Figure 1-1. Detailed maps of the infrastructure locations are contained in Appendices 1 to 3.

The Southern Seawater Desalination Project will produce drinking quality water from seawater abstracted via the inlet pipe(s). The desalination process allows for the recovery of approximately 42% of the volume of the seawater as drinking water with the remaining water being discharged as a waste brine solution. This brine will be approximately twice as saline as the feed water (i.e. seawater).

The intake pipelines will extend from the shore up to 600m offshore and the outlet pipelines up to 1100m offshore. The outlet pipe discharge system will include a multi-port diffuser which will facilitate mixing in the Low Ecosystem Protection Area (LEPA) surrounding the outlet diffuser (see Figure 1-2). The multi-port outfall is designed to constrain the salinity increase to 1 ppt or less above ambient conditions at the boundary of the LEPA. The LEPA is surrounded by a High Protection Ecosystem Area (HEPA).

Construction works will occur at several separate locations at the same time in order to meet the water supply demand timeframes. Construction works will generally be undertaken during daylight hours (0600hrs to 1900hrs), however construction works may be required 24-hours per day.

Figure 1-1 Locations of the Southern Seawater Desalination Project Infrastructure.

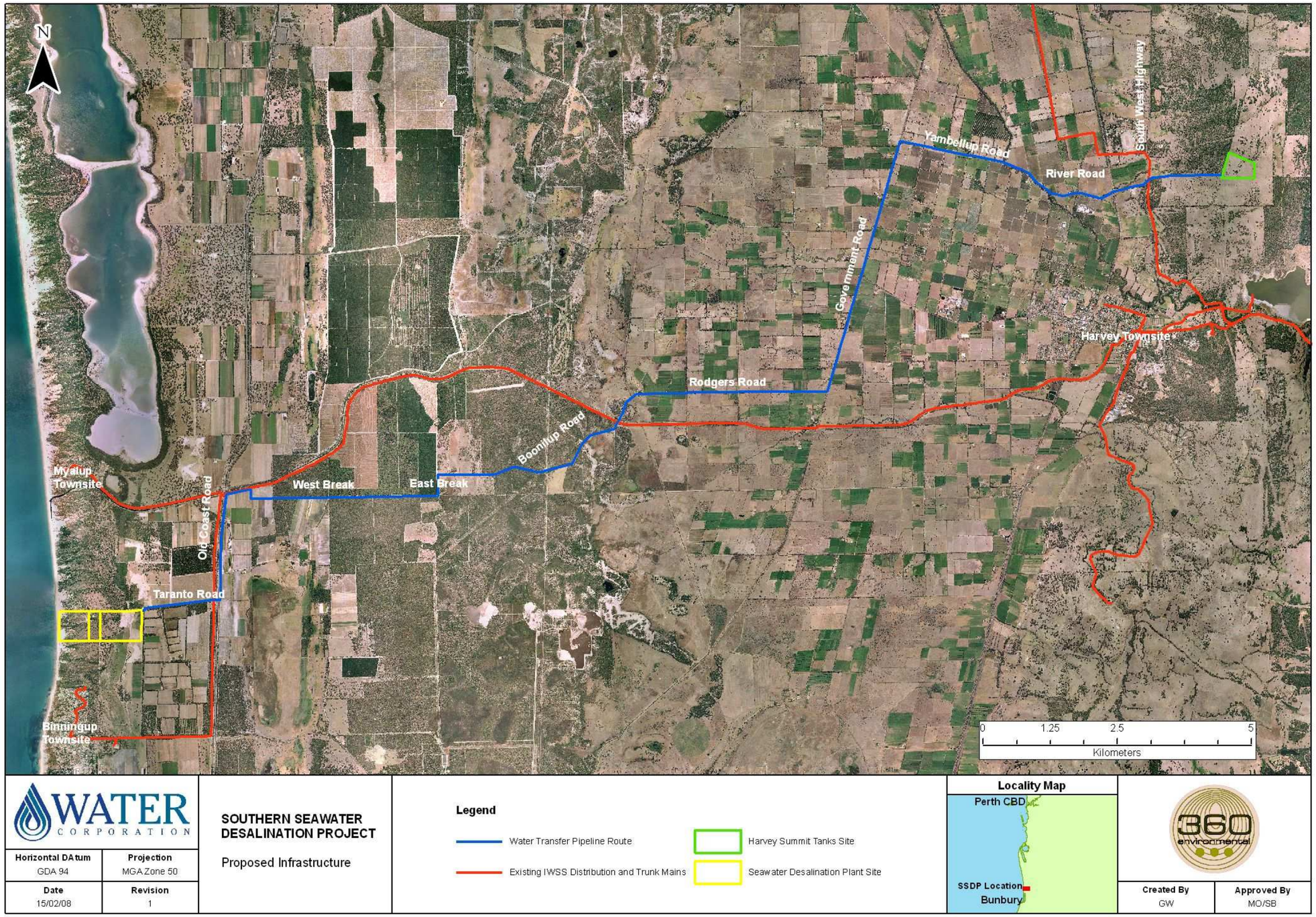
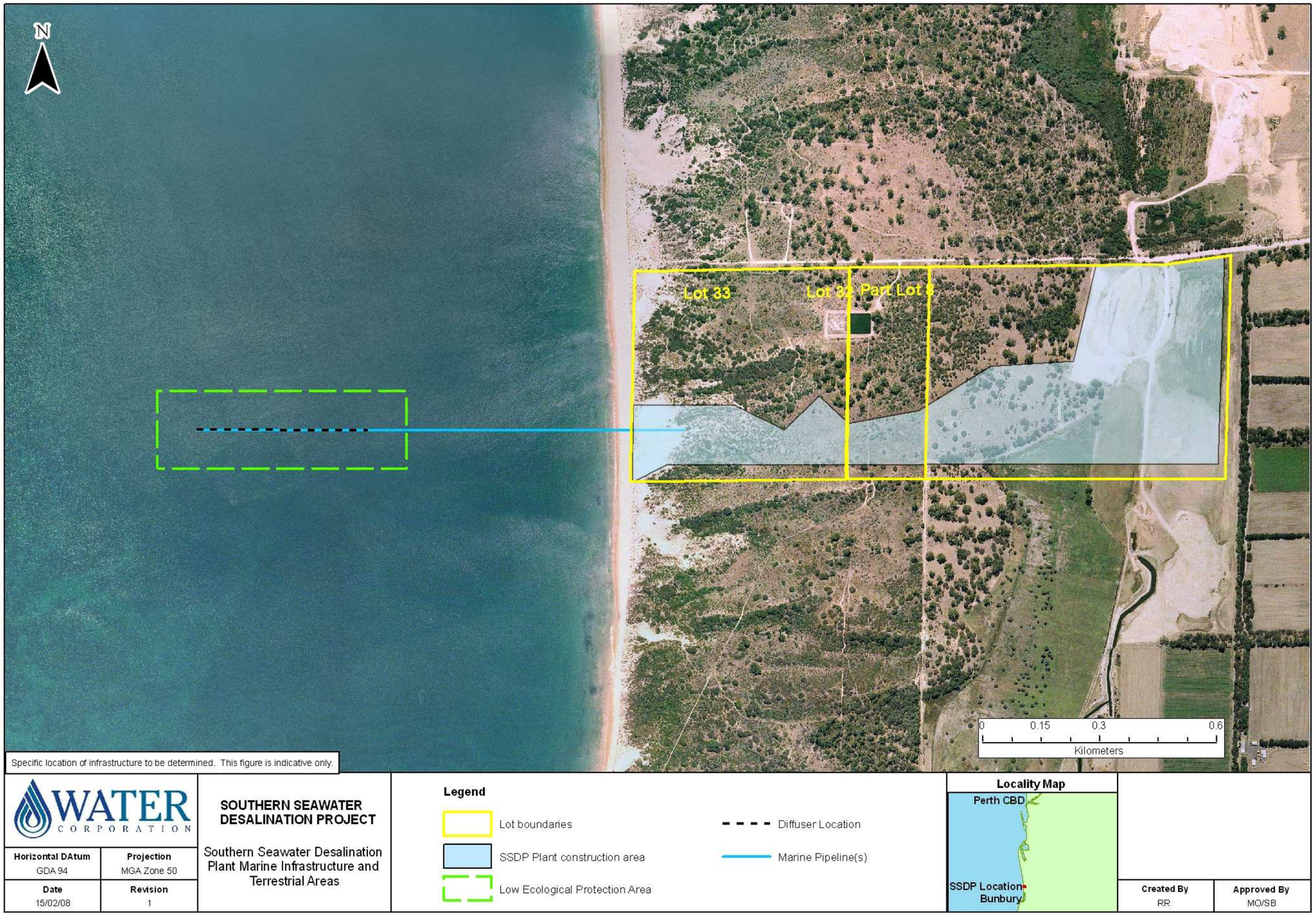


Figure 1-2 Schematic of the Outlet and the LEPA surrounding the diffuser



1.2 Purpose of this CEMF

This Construction Environmental Management Framework (CEMF) outlines the actions to be taken to minimise environmental impacts arising during construction. It is the primary objective that all environmental impacts during construction are avoided or minimised as far as practicable at all construction locations.

It is the purpose of this CEMF to:

1. address the statutory environmental requirements for the project (refer below).
2. identify the actions to be undertaken to manage the environmental impacts of the construction works.
3. address community and government expectations of transparency and accountability by identifying the management actions and making this CEMF publicly available.

1.2.1 Environmental Requirements of the CEMF

Construction of the project is regulated by Statement No. --- issued by the Minister for the Environment under s45(5) of the *Environmental Protection Act 1986* (WA). A copy of the Statement is contained in Appendix 6. The Western Australian Department of Environment and Conservation (DEC) is responsible for monitoring the implementation of conditions pursuant to s48(1) of the *Environmental Protection Act 1986* (WA).

This CEMF meets the requirements of the Water Corporation's Commitment 4 made in the Public Environmental Review, which states (Table 1-1):

Commitment No.	Commitment	Timing
4 Construction Environmental Management Framework – Implementation	The following management plans within the Construction Environmental Management Framework will be implemented: 1. Land Clearing and Trench Management. 2. Seawater Pipeline Installation Management 3. Watercourse Crossing Management 4. Dewatering and Acid Sulphate Soils Management 5. Hygiene (Plant Pathogen) Management 6. Fire Management 7. Waste Management 8. Noise Management 9. Vibration Management 10. Discharge of Pipeline Pressure Testing and Disinfection Waters Management 11. Rehabilitation Management 12. Environmental Incident Management 13. Compliance Management 14. Auditing Management	During construction and post-construction as defined by the plan.

Table 1-1 The Water Corporation's Commitment 2.1 of the Public Environmental Review.

The environmental issues listed above are addressed in a range of management plans in this CEMF. As this CEMF will be actively used during construction works, matters outside of the requirements of Commitment 4, including non-environmental matters and matters dealt with under requirements of other legislation, have also been included for operational completeness.

Furthermore, monitoring of the benthic habitat is not covered within this CEMF, although commencing prior to construction (to establish baseline data) and continuing throughout the operation of the SSDP Plant. Section 7.0 of the Operation Environmental Management Framework (OEMF) addresses this matter in detail.

This CEMF focuses on the management actions to be implemented during construction by construction staff. Consequently, background environmental information on the proposal has been intentionally limited. Background information is located in the Public Environmental Review (PER)

document produced for the environmental impact assessment process, available at www.watercorporation.com.au.

It is the intention of the Water Corporation that this CEMF is developed with the assistance of the stakeholders listed for each management plan. Stakeholders will be consulted for specific matters within their spatial or statutory jurisdiction during the environmental impact assessment process to enable the stakeholders to have an opportunity to provide input into the management actions governing the project.

1.3 Specifications

This CEMF and the materials and methodologies therein are correct as of the publication date. The following changes to materials and methodologies will not invalidate this plan:

1. Changes to materials that do not result in additional or different environmental impacts.
2. Minor changes to methodologies that do not result in lessened environmental monitoring and/or additional or different environmental impact.

Changes to the materials or methodology that may result in reduced monitoring and/or cause a significant environmental impact will be referred to the relevant advisory agencies prior to implementation of the change.

This plan needs to be read in conjunction with the applicable Ministerial Conditions and other regulatory instruments.

1.4 Implementation of Contingency Actions

The CEMF outlines a number of contingency actions that may be used in the event that the management actions proposed do not achieve the purpose stated in each management plan

1.5 Environment Policy

This CEMF has been drafted to support The Water Corporation's Environmental Policy as contained in Appendix 4.

1.6 Training on the CEMF

All staff involved in the construction of the PSDP will receive training on relevant management plans within this CEMF. The names of the people trained on this CEMF will be recorded in a CEMF Training Log along with the date and the specific plans for which that training was conducted.

1.7 Infrastructure Construction

This CEMF addresses matters related to construction. A separate Operation Environmental Management Framework (OEMF) contains management plans relating to operation.

1.8 Amendments arising from Public Environmental Review

This document may be amended following submissions through the environmental impact assessment process. This document (as amended) will be made publicly available prior to construction.

1.9 Limitations

There are a number of minor limitations contained in this version of the CEMF. These matters are:

1. The Statement number and a copy of the Statement have not been inserted as the proposal is awaiting an implementation decision from the Minister for the Environment under s45(5) of the *Environmental Protection Act 1986* (WA). The Statement number and a copy of the Statement will be inserted following the implementation decision from the Minister. This matter will not affect review of this document.
2. The location of acid sulphate soils, plant diseases, habitat trees and weed infestations have not been included in the infrastructure maps. This information was not available

at the time of publication of the maps. This information is available in *Southern Seawater Desalination Project 2007 Terrestrial Flora and Fauna Survey* (360 Environmental, January 2008). These matters will be incorporated into the maps for the CEMF prior to construction. These matters will not affect review of this document as the management actions are explicit in how these matters will be mapped prior to construction.

3. The approvals referred to in Appendices 5, 6 and 7 have not been inserted as they have not been issued at the time of publication. These approvals will be obtained and inserted into this CEMF prior to construction. These approvals are:
    a. Statement of Environmental Conditions under the *Environmental Protection Act 1986* (WA).
    b. Permit to Interfere with Bed and Banks of Watercourses under the *Rights in Water and Irrigation Act 1914* (WA).
    c. Consent to Interfere with a Registered Aboriginal Heritage Site under the *Aboriginal Heritage Act 1972* (WA).

2.0 Definitions

The terms used in this CEMF have the following meanings:

Airblast Level means the noise level resulting from blasting with explosives.

Biofouling means the accumulation of marine organisms (flora or fauna) that attach to vessel hulls, ropes, anchors and other equipment.

Blast overpressure means the sharp instantaneous rise in ambient atmospheric pressure resulting from detonation of an explosive.

Bund means an embankment of earth or a wall constructed of brick, stone or concrete to form the perimeter of a compound that will prevent lateral movement of the material contained within the embankment or wall.

Declared Rare Flora means the flora protected under the *Wildlife Conservation Act 1950* (WA) due to it being rare, in danger of extinction, or otherwise in need of special protection.

Elder means a mature person of Aboriginal decent with experience and knowledge on matters related to aboriginal culture, customs, traditions and/or heritage, as determined by the Aboriginal community.

Environmental Harm means the direct or indirect alteration of the environment as defined by the *Environmental Protection Act 1986* (WA).

Environmental Incident means any event or impact on the environment involving the Water Corporation and/or its contractor's actions or assets that is capable of:

- causing harm to the environment or any person or property;
- causing pollution; and/or
- coming to the attention of an environmental regulatory agency.

Excavator means a machine used for excavating soil or sediment material and may include a backhoe excavator, bulldozer, dredge or other similar equipment.

Ground Disturbing Activities means the disturbance of earth or waters involving machinery including clearing, excavation, backfilling and compacting, but excludes geotechnical investigations, surveying, fencing and rehabilitation works.

Fauna means animals.

Flora means plants.

Habitat Tree means a mature native tree containing hollows that may be suitable for habitat of native fauna.

Harvey Summit Tanks means the water storage and balancing facility located approximately 3km north-east of the Harvey Townsite. The Harvey Summit tanks consist of up to 100ML of water storage (in up to 4 tanks) and a maintenance sump of up to 5ML capacity.

Initial Ground Disturbing Activities means the disturbance of earth or waters involving machinery including clearing and excavation to a depth of 0.5m, but excludes geotechnical investigations, surveying, excavation in excess of 0.5m, backfilling, compacting, fencing and rehabilitation works.

Integrated Water Supply Scheme (or IWSS) means the water transfer network supplying drinking quality water to 1.5 million West Australians in the Perth metropolitan area, south-west, central wheatbelt and the goldfields regions.

Landowner means the person(s) or management body that lawfully owns or lawfully manages a specific parcel of land.

pH_F means a field test of a water and soil paste to determine the presence of actual acid sulphate soils.

pH_{FOX} means a field test of a water and soil paste to determine the presence of potential acid sulphate soils (stored acidity).

Photosynthetically active radiation means the spectral range of light useful for plants for photosynthesis.

Seawater Desalination Plant Site means the site of the Seawater Desalination Plant including Lots 32 & 33 Taranto Road Binningup, Part Lot 8 (to the southern boundary of Lots 32 and 33) Taranto Road Binningup, and includes the seawater pipelines located on part of Reserve 29628 (to the southern boundary of Lots 32 and 33) and the Indian Ocean (to the southern and northern boundaries of Lots 32 and 33) to a nominal distance of 1250m from the high water mark.

Pollution means the direct or indirect alteration of the environment to its detriment or degradation, to the detriment of an environmental value, or is of a prescribed kind from an emission (as defined by the *Environmental Protection Act 1986* (WA)).

Priority Flora means flora that is recognised by the DEC as being under threat and in urgent need of further study; but is not yet declared rare flora under the *Wildlife Conservation Act 1950* (WA). Priority Flora is divided into Priority 1, Priority 2, Priority 3 and Priority 4 listings, with Priority 1 being the flora most under threat.

Registered Site means a defined spatial area registered as having significance to Aboriginal persons under the *Aboriginal Heritage Act 1972* (WA). The term excludes sites listed as "Stored Data" on the Department of Indigenous Affairs heritage database, which are not classified as sites under the *Aboriginal Heritage Act 1972* (WA).

Superintendent's Representative means the person nominated by the Superintendent from time to time in writing by and representing the Superintendent.

Sterile Hay Bales are hay bales that do not contain viable seeds and will therefore not introduce weed propagules when used for turbidity management.

Trunkmain and Water Transfer Pipeline means the pipeline that connects the Seawater Desalination Plant to the Harvey Summit Tanks, and the Harvey Summit Tanks to the existing Stirling Trunkmain of the IWSS, for the purpose of transferring drinking water.

Watercourse means a river, creek, gully, brook or irrigation channel that contains or has contained water, but excludes wetlands.

Water level indicator means a round steel post with a flat marked gauge plate of white background and black 1cm increment gauge markings each with a total nominal length of 2.0m (refer Water Corporation Plan B055-18-1 for example).

Wetland means land that is permanently, seasonally or intermittently waterlogged or inundated with water, but excludes watercourses.

Windrow means a line of stockpiled material, such as soil or vegetation.

3.0 Abbreviations

The following abbreviations used in this CEMF have the following meanings:

Terms

ALT	Alliance Lead Team - committee consisting senior management representatives from the project Alliance organisations.
AMT	Alliance Management Team - committee consisting on-site management personnel from Alliance organisations.
AQIS	Australian Quarantine and Inspection Service
CEMF	Construction Environmental Management Framework
DAF	Department of Agriculture and Food (WA)
DEC	Department of Environment and Conservation (WA)
DEWHA	Department of the Environment, Water, Heritage and Arts (C'th)
DIA	Department of Indigenous Affairs (WA)
DoCEP	Department of Consumer and Employment Protection (WA)
DoF	Department of Fisheries (WA)
DoH	Department of Health (WA)
DoW	Department of Water (WA)
DPI	Department for Planning and Infrastructure (WA)
FESA	Fire and Emergency Services Authority (WA)
FPC	Forest Products Commission (WA)
IWSS	Integrated Water Supply Scheme
MRWA	Main Roads Western Australia
MSDS	Materials Safety Data Sheet
NATA	National Association of Testing Authorities
OC	Organochlorine
SWALSC	South West Aboriginal Land and Sea Council (WA)
PAR	Photosynthetically active radiation
WAPC	Western Australian Planning Commission

Measurement

cm	Centimetre
m	Metre
m^2	Square metre
km	Kilometre
ha	Hectare
kg	Kilograms
kg/ha	Kilograms per hectare
mg/kg	Milligrams per kilogram
mg/L	Milligrams per litre
ML	Megalitre
GL/y	Gigalitres per year
ML/y	Megalitres per year
^oC	Temperature in degrees Celsius
dB	Decibels of noise
S%	Sulphur percentage

4.0 Responsibility Matrix

The matrix below provides guidance on the plans that are relevant to contractors involved in the project. Given that contracts have not been let, and the management structure and responsibilities of delivery of this project not finalised, this matrix are indicative of the division of responsibilities:

CEMF Reference	Contractor Seawater Desalination Plant (Alliance)	Contractor Water Transfer Pipeline	Contractor Supply	Water Corporation Supervisory Staff
Overview	✓	✓	✓	✓
Land Clearing and Trench Management	✓	✓		✓
Seawater Pipeline Installation	✓			✓
Watercourse Crossing Management		✓		✓
Dewatering and Acid Sulphate Soils	✓	✓		✓
Hygiene Management	✓	✓	✓	✓
Fire Management	✓	✓		✓
Waste Management	✓	✓		✓
Aboriginal Heritage Management	✓	✓		✓
Traffic and Public Safety Management	✓	✓	✓	✓
Noise Management	✓	✓	✓	✓
Vibration Management	✓	✓		✓
Dangerous Goods and Explosives Management	✓	✓	✓	✓
Organochlorine (Dieldrin) Management		✓		✓
Discharge of Pressure-Test Water and Disinfection	✓	✓		✓
Rehabilitation Management	✓	✓		✓
Environmental Incident Management	✓	✓		✓
Non-Compliance Management	✓	✓		✓
Community Complaints Management	✓	✓		✓
Auditing of CEMF	✓	✓		✓

Table 4-1 Responsibility Matrix

5.0 Land Clearing and Trench Management

5.1 Context

The construction works will require clearing of agricultural pasture and native vegetation at the Seawater Desalination Plant site, Water Transfer Pipeline route and the Harvey Summit Tanks site. The construction area supports locally and regionally significant flora and fauna, some of which are specifically protected under State and/or Commonwealth legislation. Clearing will be carried out within defined clearing widths to minimise construction impacts on flora and fauna and to reduce the area requiring rehabilitation.

Construction of the Water Transfer Pipeline will require the excavation of trenches for pipeline installation. Excavated trenches have the potential to trap fauna, which may present an undesirable risk to the health of the fauna and/or contractors working within the trench.

Separate management actions are required for land clearing in agricultural land and native vegetation, with specific actions on retaining topsoil for seed and nutrient retention for the rehabilitation works.

Dust can be generated from land clearing activities, and from cleared areas exposed to wind. Dust generation has the potential to be a physical and health hazard, and can adversely affect the amenity of the construction staff, the community and agricultural crops.

5.2 Purpose

The purpose of the Land Clearing and Trench Management Plan is to outline management actions to:

1. minimise construction impacts on flora and fauna, more specifically to:
    a. protect Declared Rare Flora, consistent with the provisions of the *Wildlife Conservation Act 1950* (WA).
    b. protect Critically Endangered, Endangered and Vulnerable flora, consistent with the provisions of the *Environment Protection and Biodiversity Conservation Act 1999* (C'th).
    c. minimise impacts on Priority Flora identified by the DEC.
    d. protect Specially Protected Fauna, consistent with the provisions of the *Wildlife Conservation Act 1950* (WA).
    e. protect Critically Endangered, Endangered and Vulnerable fauna, consistent with the provisions of the *Environment Protection and Biodiversity Conservation Act 1999* (C'th).
    f. minimise impacts on Priority fauna identified by the DEC.
    g. minimise opportunities for fauna become trapped in the excavated trenches.
    h. response procedures for fauna that enter excavated trenches.
2. remove topsoil during clearing, and return it following installation of infrastructure.
3. minimise and control dust generation.

5.3 Performance Indicators

Performance will be demonstrated by:

5.3.1 Vegetation

1. Vegetation clearing is limited to within pre-determined clearing widths.
2. Habitat trees will be marked prior to construction and retained where possible.

3. Protected flora and fauna will not be disturbed without approval under the *Wildlife Conservation Act 1950* (WA) and/or the *Environment Protection and Biodiversity Conservation Act 1999* (C'th) (as appropriate).
4. Topsoil is managed to maximise germination of native vegetation contained in the topsoil.

5.3.2 Fauna

5. Trapped fauna are removed from the trench and released without harm.

5.3.3 Dust

6. No visible dust leaving the construction area.
7. No public complaints received regarding dust.

5.4 Management Actions

5.4.1 General

Prior to Construction

1. The Seawater Desalination Plant site, Water Transfer Pipeline route and the Harvey Summit Tanks site will be surveyed for the presence of Declared Rare Flora (as per the *Wildlife Conservation (Rare Flora) Notice 2008* and Priority Flora prior to construction. The survey will also identify the presence of Critically Endangered, Endangered and Vulnerable flora (as per the *Environment Protection and Biodiversity Conservation Act 1999* (C'th)).
2. If Declared Rare Flora are identified within the construction area a Licence to take Declared Rare Flora will be applied for, in accordance with the *Wildlife Conservation Act 1950* (WA) and the *Wildlife Conservation Regulations 1970* (WA).
3. The Seawater Desalination Plant site, Water Transfer Pipeline route and the Harvey Summit Tanks site will be surveyed for the presence of specially protected fauna (as per the *Wildlife Conservation (Specially Protected Fauna) Notice 2008* prior to construction.
4. If specially protected fauna are identified within the construction area a Licence to take specially protected fauna will be applied for in accordance with the *Wildlife Conservation Act 1950* (WA) and the *Wildlife Conservation Regulations 1970* (WA).
5. The Seawater Desalination Plant site, Water Transfer Pipeline route and the Harvey Summit Tanks site will be surveyed for the presence of potential habitat trees prior to construction.

Fauna Management

6. A barrier will be established at the end of each installed pipeline (excluding marine pipelines) at the end of each working day to prevent fauna entering the installed pipelines.
7. The end of each open excavation will be graded at the end of each day to provide a ramp for trapped fauna to escape the trench.
8. The Seawater Desalination Plant site and excavated trenches will be visually inspected prior to construction works commencing on each day to determine the presence of trapped fauna. The visual inspection will be conducted during daylight hours and will be completed by no later than 0900hrs.
9. Any fauna found within the Seawater Desalination Plant site or within any excavated trench will be removed and relocated to a minimum distance of 50m from the site or trench. The fauna removed will be recorded in the Fauna Removal Log, which shall be retained at the site office.
10. The types of fauna listed below will be treated by a qualified veterinary doctor (on-site or off-site) if found injured within the Seawater Desalination Plant site or the excavated trenches.
    - livestock (in consultation with the Landowner)
    - all birds
    - kangaroos

- large reptiles (includes snakes, monitor lizards and bobtails)
- Western Ringtail Possums or Brushtail Possums
- Chuditch (Western Quoll - native cat)
- Quokkas
- Southern Brown Bandicoot (Quenda)
- Woylie (Brush Tailed Bettong)
- Western Brush Wallabies

The injured fauna will not be harmed or killed unless a decision to euthanize (kill) any injured fauna is made by a veterinary doctor. A decision to euthanize livestock will only be made by the Landowner.

11. Dead fauna will be removed from the Seawater Desalination Plant site and excavated trenches to prevent additional fauna from entering the Seawater Desalination Plant site or excavated trenches to source food. They will be disposed of as putrescible waste (to landfill).
12. No dogs, cats or firearms will be allowed within any construction area.

Dust from Construction Works

13. Daily weather forecasts will be obtained for temperature and wind speed (South West Land Division - Bureau of Meteorology) and will make the forecast information available to persons involved in dust generating activities and dust suppression activities.
14. Water trucks and/or water cannons will be used to dampen areas identified as being potentially dust generating (sandy soils, soil stockpiles, unsealed access roads etc). The frequency of dampening will be determined based on weather conditions.
15. Dewatering water maybe used for dust suppression activities if the dewatering water meets the criteria for discharge to land contained in the Dewatering and Acid Sulphate Soils Management Plan.
16. Other dust control measures may be implemented (such as hydro-mulching, wind fencing, hardstanding or chemical dust supressants).
17. Vehicles transporting soils off-site will be covered to minimise dust generation during transport.

5.4.2 Seawater Desalination Plant

Clearing of Native Vegetation

18. Clearing of native vegetation will only commence once permission is obtained. It will be limited to those areas identified for clearing as contained in Appendix 1.
19. All timber trunks cleared will retained and stockpiled to a nominal height of no more than 3 metres. Vegetation crowns that have been cleared will be separately retained and stockpiled to a nominal height of no more than 5 metres. Vegetation crowns will be cut into sections of approximately 1m in length prior to stockpiling. The cleared and stockpiled vegetation trunks and crowns will be used during site rehabilitation[2].
20. Cleared vegetation will not be burned.
21. The Seawater Desalination Plant site will be surveyed at the completion of clearing works to determine the area (in ha or m^2) of native vegetation cleared. The area of clearing will be recorded.
22. Approximately 200mm of topsoil will be removed from the cleared areas and stockpiled in a windrow of no greater than 10 metres nominal height on the Seawater Desalination Plant site. The stockpiled topsoil will be used for rehabilitation works following construction.
23. A stock fence will be installed at the boundary of the defined Seawater Desalination Plant site clearing area (refer Appendix 1) to fence off the native vegetation that will be retained. The stock fence will be a 5 strand wire fence strained with posts with strand heights at 250mm, 500mm, 750mm, 1000mm and 1250mm above ground level prior to clearing. The fencing will aim to prevent unauthorised vehicle access and to discourage human traffic between the native vegetation and the construction areas, while still permitting fauna movement through the native vegetation and the construction areas.

24. Separate security fences will be installed of at least 1.8m height immediately around the Seawater Desalination Plant infrastructure and the Seawater Pump Station construction areas to prevent unauthorised human access.

Post-Construction

25. The Seawater Desalination Plant site will be contoured, including re-creation of the primary dune, establishment of earth screening bunds, and contouring of the whole site to achieve stable batters.
26. Areas compacted by construction works (excluding retained access and laydown areas) and that are to be rehabilitated, will be ripped. The areas will be ripped along the contour to a depth of approximately 300mm. Land will be graded following ripping to ensure that high or low points do not remain.
27. Stockpiled topsoil will be evenly spread over the ripped and graded areas as soon as reasonably practicable following the ripping and grading.
28. The retained large trunks and cut vegetation crowns will be randomly spread over the ripped, graded and topsoiled areas. Any other retained vegetation from dieback infected areas will be evenly spread within the dieback infected area (refer Hygiene Management Plan).
29. Excess overburden will be disposed of firstly within the Seawater Desalination Plant site, secondly to adjoining properties with agreement of adjoining Landowners, or thirdly the excess overburden will be disposed of to landfill.
30. If the overburden is from an area determined to be dieback infected, the overburden will be disposed of on-site (refer to Hygiene Management Plan).

5.4.3 Water Transfer Pipeline and Harvey Summit Tanks

Native Vegetation

Clearing - Pipeline

31. The clearing corridor for pipeline installation will be no greater than 20 metres width in native vegetation (excluding pipeline storage and vehicle turning points), excepting the pipeline section between the storage facility and the Stirling Trunkmain (where two pipelines will be installed – one to the Harvey Summit Tanks and one from the Harvey Summit Tanks) in which the clearing width will be no greater than 30 metres. The single pipeline clearing width maybe reduced to a minimum 15m width in sections less than 250m length to avoid sensitive environmental or social areas.
32. The clearing corridor will be marked in sections (up to 3km per section) with pegs and flagging tape (or other suitable marking method) prior to clearing.
33. Potential habitat trees will be marked with a different coloured flagging tape (or other suitable marking method) prior to clearing with a view to retaining the habitat trees. Potential habitat trees will only be cleared where retention is not practicably possible for pipeline installation.
34. Clearing of native vegetation will only commence once approval is received (hold point).
35. Only vegetation within the marked clearing areas (excepting the retainable habitat trees) will be cleared. During clearing, where existing fallen logs with a diameter larger than 300mm (950mm circumference) partially overlay the area to be cleared, the log will be cut at the clearing boundary to preserve the part of the log outside of the clearing corridor.
36. Each calendar week a survey of the area will be conducted to determine the area (in ha or m^2) of native vegetation cleared. The survey area will be recorded, and weekly updates will be provided along with the as-constructed drawings of the infrastructure.
37. Clearing in the State Forest will be conducted in consultation with the FPC (which retains rights to such timber). In consultation with the FPC, salvageable timber (trunks) that have been cleared will be removed to a location agreed with the FPC.
38. Any non-salvageable timber trunks will be retained and stockpiled to a nominal height of no more than 3 metres for later use in rehabilitation[1]. Retained tree crowns will be separately

stockpiled to a nominal height of no more than 5 metres after cutting the crowns into sections of approximately 1m length for later use in rehabilitation[1].

39. Cleared vegetation will not be burned.
40. Approximately 200mm of topsoil will be removed from 5m either side of the pipe centreline and stockpile it in a windrow of no greater than 5 metres nominal height. If access roads are constructed, topsoil will also be removed and stockpiled from these locations prior to construction of the access roads. Topsoil will be stockpiled for a period not exceeding two months for pipeline installation.
41. The trench will be excavated (to the required depth), with the excavated overburden stockpiled in a separate windrow of no greater than 5 metres nominal height.
42. The topsoil and overburden stockpiles maybe temporarily relocated to a point close to its place of origin where the clearing width is restricted to less than 20m. If the topsoil and overburden is dieback infected, the topsoil and overburden will only be relocated to with dieback infected areas (refer to the Hygiene (Plant Pathogen) Management Plan).
43. A temporary security fence will be installed of approximately 1.8m height around any open trench greater than 0.5m depth at the end of each construction day. The purpose of the fence will be to prevent access to the open trench by large terrestrial fauna (such as kangaroos). The fence base will have a continuous fabric shroud (such as shade cloth) pegged to the ground with a minimum height of 0.25m to prevent access to the construction site by small terrestrial fauna (such as snakes and lizards).

Fauna Management - Additional

44. The trench will be left open for the minimum time practicable to minimise the chance of fauna entering the trench and becoming trapped.
45. It will be ensured that at the end of each day, the length of open trench with a depth greater than 1.0m will not exceed 1000m for each separate construction area.

After Pipeline Installation

46. The overburden will be returned to the trench in layers, with each layer compacted in the trench at a thickness of no greater than 150mm to minimise soil consolidation in the trench following construction.
47. Clay cut-off walls[3] will be installed across the pipeline trench in agricultural land generally at a distance of no greater than 500m apart, as well as at the edge of wetland boundaries, irrigated paddocks, property boundaries and steeply sloping areas. The clay cut-off walls will be constructed of low to medium plasticity non-dispersive clay, sandy clay or silty clay with a nominal width of 1000mm and compacted in 150mm layers to minimise soil consolidation in the trench following construction.
48. Excess overburden will be disposed of to a suitable location agreed, firstly with the Landowner (the Landowner has first preference to retain excess overburden from their own property), secondly with adjoining Landowners, or thirdly the excess overburden will be disposed of to landfill.
49. If the overburden is from an area determined to be dieback infected, the overburden will be disposed of on-site (refer to Hygiene (Plant Pathogen) Management Plan).
50. The compacted areas (excluding retained access roads) will be ripped along the contour to a depth of approximately 300mm following backfilling and compaction of the trench. The land will be graded following ripping to ensure that high or low points do not remain.
51. The retained large trunks and cut vegetation crowns will be randomly spread over the ripped and graded areas. Any other retained vegetation from dieback infected areas will be evenly spread within the dieback infected area (refer Hygiene Management Plan)
52. The stockpiled topsoil will be evenly respread over the construction area as soon as reasonably practicable following ripping, grading and distribution of large trunks.

5.4.4 Agricultural Land

Prior to clearing

53. A land assessment survey will be undertaken (including photographs and/or video) of each land parcel (including road reserves) to determine pre-construction land condition.
54. Written notification will be provided to the landowner at least 14 days prior to the commencement of ground disturbing activities, including fencing, to enable the Landowner to prepare for construction (such as stock movement).
55. Prior to clearing on each lot, the construction corridor in agricultural land will be fenced where there is a risk of livestock (cattle or sheep) entering the open trench. The fence will be a 5 strand wire fence strained with posts and will be connected to the existing fences in each lot. The fence will be electrified where the existing fences in the lot are electrified, with strand heights at 200mm (earthed), 400mm (earthed), 600mm (electrified), 800mm (earthed) and 1000mm (electrified) above ground level.

Clearing

56. The clearing corridor for pipeline installation will be between 20 and 30 metres width in agricultural land (excluding pipeline storage and vehicle turning points).
57. The clearing corridor will be marked in sections (up to 3km per section) with pegs and flagging tape (or other suitable marking method) prior to clearing. Only then may the clearing be undertaken.
58. Cleared vegetation will not be burned.
59. approximately 200mm of topsoil will be removed from 5m either side of the pipe centreline and stockpile it in a windrow of no greater than 5 metres nominal height following vegetation clearing. If access roads are constructed, topsoil will also be removed and stockpiled from these locations prior to construction of the access roads.
60. The pipeline trenches will be excavated (to the required depth), with the excavated overburden stockpiled in a separate windrow of no greater than 5 metres nominal height.
61. Stockpiles of topsoil or overburden may be temporarily relocated to a location within 500m of its place of origin on occasions where the pipeline clearing corridor width is restricted to less than 30m width.

After Pipeline Installation

62. The overburden will be returned to the trench in layers, with each layer compacted at a thickness of no greater than 150mm to minimise soil consolidation in the trench following construction.
63. Clay cut-off walls[3] will be installed across the pipeline trench in agricultural land generally at a distance of no greater than 500m apart, as well as at the edge of wetland boundaries, irrigated paddocks, property boundaries and steeply sloping areas. The clay cut-off walls will be constructed of low to medium plasticity non-dispersive clay, sandy clay or silty clay with a nominal width of 1000mm and compacted in 150mm layers to minimise soil consolidation in the trench following construction.
64. Excess overburden will be disposed of to a suitable location agreed, firstly with the Landowner (the Landowner has first preference to retain excess overburden from their own property), secondly with adjoining Landowners, or thirdly the excess overburden will be disposed of to landfill.
65. The compacted areas (excluding retained access roads) will be ripped along the contour to a depth of approximately 300mm following backfilling and compaction of the trench. The Contractor will grade the land following ripping to ensure that high or low points do not remain.
66. The stockpiled topsoil will be evenly respread over the construction area as soon as reasonably practicable following ripping and grading.

5.5 Additional Information

[1] Fauna Removal

A Licence will be required under r17 of the *Wildlife Conservation Regulations 1970* (WA) issued by the DEC to take native fauna from the trench. A licence is not required for removal of livestock from the trench.

Guidance on fauna handling, fauna diseases and occupational safety matters in handling fauna can be sourced from the document *Minimising Disease Risk in Wildlife Management: Standard operating procedures for fauna translocation, monitoring and euthanasia in the field (*DEC, July 2005).

Photographs of native fauna that are likely to be encountered by the construction works are provided in the fauna Identification Chart (Figures 1-1 to 1-15). The Fauna Identification Chart will be displayed at the site offices to assist with field identification.

[2] Cleared Vegetation

The cutting of the vegetation crowns to a length of approximately 1m, then respreading over the cleared areas following construction, will help to create a microclimate suitable for seed germination. The cut and spread crowns will also assist with erosion control and minimise dust generation.

[3] Clay Cut-off Walls

Clay-cut-off walls will be installed to provide an impermeable seal (or plug) against preferential water movement through the pipeline bedding material along the length of the pipeline. The clay cut-off walls will be installed perpendicular to the trench.

5.6 Contingency Actions

Where the above actions do not achieve the purpose of this plan or are not complied with, the following contingency actions will be implemented as required:

Vegetation Clearing

1. The cause will be investigated and implementation of the management actions will be reinforced. If appropriate, the management actions will be amended.
2. Any environmental impacts will be mitigated.

Fauna

3. Fauna ladders and ramps will be installed within the open excavations to allow fauna to escape.
4. Shelters for fauna will be installed. Each shelter will consist of a damp hessian bag or an upturned ice-cream container (or other equivalent shade device). The shelters will be inspected for the presence of fauna as part of the inspection procedure.

Dust

5. Temporary wind fencing and/or hydro-mulching will be installed.
6. Dust generating construction work will temporarily cease during windy conditions until weather conditions become favourable.

5.7 Related Plans

1. Dewatering and Acid Sulphate Soils.
2. Hygiene Management.
3. Watercourse Crossing Management.
4. Incident Management.
5. Rehabilitation Management.

5.8 Relevant Legislation

1. *Wildlife Conservation Act 1950*, and *Regulations 1970* (WA).
2. *Environmental Protection Act 1986*, and *Regulations 1987* (WA).
3. *Conservation and Land Management Act 1984*, and *Regulations 2002* (WA).
4. *Environment Protection and Biodiversity Conservation Act 1999* (C'th).

5.9 Advisory Agencies

The following organisations will be consulted on this plan:

1. DEC
2. DAF
3. FPC
4. Conservation Commission
5. Shire of Harvey
6. DEWH

Table 5-1 Native Vegetation Clearing Log

Southern Seawater Desalination Project
Land Clearing and Trench Management

Native Vegetation Clearing Log

The purpose of the Native Vegetation Clearing Log is to record the area of native vegetation cleared. The area of native vegetation cleared will assist in determining the materials required for rehabilitation (tubestock, seed, staff). The Native Vegetation Clearing Log is to be completed by the Contractor on a weekly basis.

Name ……

Page ……. of …….

Date of Entry	Location and Property Reference	Area Cleared (m^2 or ha - specify)	Name and Position	Initial

Table 5-2 Fauna Removal Log

Southern Seawater Desalination Project
Land Clearing and Trench Management

Fauna Removal Log

The purpose of the Fauna Removal Log is to record the number, location and removal of fauna from within the trench. The Fauna Removal Log is to be completed by the Contractor on each day that fauna is removed from the trench.

Name ……

Page …… of ……

Date of Entry	Location and Property Reference	Fauna Description (eg. snake, lizard)	No. Removed	Alive (Y/N)	Method of Removal	Name and Position	Initial

Figure 5-1 Fauna Identification Chart

Southern Seawater Desalination Project
Land Clearing and Trench Management

Fauna Identification Chart

This chart identifies fauna that may occur within the Southern Seawater Desalination Project area.

Western Grey Kangaroo

Tammar Wallaby

Woylie (Brushed Tailed Bettong)

Chuditch (Western Quoll). Specially Protected – Rare or likely to become extinct.

Quokka.
Specially Protected Rare or likely to become extinct.

Western Pygmy Possum

Western Ringtail Possum. Specially Protected – Rare or likely to become extinct.

Brushed Tailed Phascogale. Specially Protected – Rare or likely to become extinct.

Southern Brown Bandicoot (Quenda)

Brushed Tailed Possum

Forest Red-Tailed Black Cockatoo. Specially Protected – Rare or likely to become extinct

White Tailed Black Cockatoo. Specially Protected – Rare or likely to become extinct (Baudin's and Carnaby's Cockatoo)

Dugite Snake

Carpet Python

Monitor Lizard

Photos: DEC WA (Wells & Wells) – www.environment.wa.gov.au
Australian Wildlife Conservancy – www.australianwildlife.org
Fourth Crossing Wildlife (Chris McGregor) – www.fourthcrossingwildlife.com

6.0 Seawater Pipeline Installation Management

6.1 Context

The Southern Seawater Desalination Project will require the installation of ocean pipelines for seawater intake and brine discharge. The intake pipelines will extend from the shore to approximately 600m offshore and the outlet pipelines to up to 1100m offshore. This management Plan covers installation of these pipelines, intake structures and the diffuser.

Maps produced from previous surveys show the presence and distribution of marine habitats, including flora and fauna. The marine pipelines and infrastructure have been located where they will have minimal impact on the marine ecology of the area.

Marine macroflora (including seaweeds and seagrasses) species occur at a distance from approximately 500m offshore to greater than 2500m offshore from the Seawater Desalination Plant site. More specifically, seagrasses are more than 1200m from the shore along the pipe alignment. The seawater intake and outlet pipelines will be located along an alignment that generally contains bare sand and shell material, however from 500m offshore the marine works are within 100m of marine flora to the south, west and north. The construction works may impact on the marine flora in close proximity. Environmental monitoring will be undertaken to ensure that the impacts of marine construction works are within a defined area.

The specific construction methods for seawater pipeline installation have yet to be selected. Initial investigations indicate open trenching is likely to be the most appropriate construction method and that blasting will not be required. The different construction alternatives under consideration are listed within this plan with the management actions for each construction method identified. Apart from the area of excavation, the environmental impacts of each construction method predominantly relate to the suspension of sediments, which can both reduce light available to marine flora for photosynthesis and settle onto marine flora.

Underwater blasting is unlikely, however may be required to remove rock where excavation is not practicable or possible. Blasting has the potential to affect marine mammals (including whales and dolphins) if they are within the immediate vicinity of blasts. Management actions are specified based upon Western Whale Research (2008) to minimise the impacts of underwater blasting on whales and dolphins.

6.2 Purpose

The purpose of the Seawater Pipeline Installation Management Plan is to outline management actions to:

1. minimise impacts on ocean water quality and marine flora during marine construction works.
2. minimise impacts of blasting on marine mammals.
3. inform the community of the location and timing of the works.
4. to quantify the final area of disturbance.

6.3 Performance Indicators

Performance will be demonstrated by:

1. Compliance with the prescribed management actions.

6.4 Management Actions

Prior to Construction

1. Vessels reaching the construction site by sea from international waters will discharge all ballast waters at least 12 nautical miles from the Western Australian coastline in accordance with Australian Quarantine and Inspection Service (AQIS) requirements for ballast water discharge.
2. All marine vessels will be visually inspected prior to entry to Australian Waters to confirm they are free from biofouling and sediments in accordance with AQIS requirements.
3. AQIS Bunbury (Phone 08 9791 4787) will be contacted to confirm any need for a quarantine inspection of marine vessels entering Australian Waters prior to their entry to Australian Waters.
4. A temporary Marine Exclusion Area will be established with marine warning buoys installed in the ocean at nominally 300m, 550m, 800m, 1050m and 1300m from the beach at nominally 500m north and 500m south from the marine pipeline alignment. Additional buoys will be installed at nominally 250m intervals between the two 1300m warning buoys in a north-south direction (refer Figure 6-1). The marine warning buoys will demarcate the marine construction zone where public marine access will be restricted during construction. The marine warning buoys will be marked identifying that the buoys mark a marine exclusion zone, and will be fitted with a flashing warning light to be visible at night.
5. Approval for installation of the marine warning buoys will be obtained from the DPI under the *Marine Navigational Aids Act 1973* (WA) prior to installing the warning buoys.
6. A Beach Exclusion Area will be established at nominally 500m north and 500m south of the marine pipelines' alignment to prevent public access to the construction area. The beach exclusion area will remain until beach construction works are completed and it is safe for the public to access the beach area.
7. The Marine Exclusion Area and the Beach Exclusion Area will be made known to the public by:
    a. Installation of signage at the Binningup and Myalup beach car parks that contain a map identifying the beach and marine exclusion areas, and the dates during which the access restrictions will apply.
    b. Installation of signage on each exclusion fence. The signage will contain a map identifying the Marine Exclusion Area and the Beach Exclusion Area, and the dates during which the access restrictions will apply.
    c. Placing a *Notice to Mariners* in public notices section of *The West Australian* newspaper and the *Harvey Reporter* newspaper identifying the Marine Exclusion Area and the marine warning buoys, in consultation with the DPI.
8. A marine biological survey with special emphasis on the distribution of seagrasses and macroalgae will be undertaken in the area shown in Figure 6-1 within the 12 months prior to the commencement of marine works to determine the species distribution and density of marine macroflora. The results of this survey will be used to compare the marine macroflora distribution and density post construction to determine impacts due to marine construction works.
9. The beach profile will be monitored during during and post -marine construction activities. Profiles will be collected in the same locations as used by UWA (2008b).

Construction – Construction Works

10. Offshore construction works will be contained within the Marine Exclusion Zone and will not extend further offshore than that necessary to place infrastructure in accordance with the nominal distances given in the approved Characteristics Table.
11. To avoid damaging seagrass areas, where practicable barge anchors and other large anchors will not be placed more than 1300m offshore, and in areas free of marine flora and fauna.

12. All marine construction works will temporarily cease if whales or dolphins (cetaceans) are sighted within the Marine Exclusion Area. Marine construction works may resume when the cetaceans are outside of the Marine Exclusion Area.

13. Construction will consist of some or all of the methods outlined in the following section:

Excavation and Backfilling

a. The maximum width of the excavated trench offshore will be 50m.

b. Excavated material from the trench may be sidecast to either side of the trench, where sidecasting is part of the construction method[1].

c. Where excavated material is sidecast, the vertical drop distance will be minimised as far as is practicable to minimise potential sediment suspension.

d. The total number of days on which excavation occurs offshore of the nominal 6m depth contour or where rock is encountered, whichever is further offshore, shall not exceed 122 days[1].

e. The trench containing the installed pipeline will be backfilled. Backfill may include material different from that excavated. Rock armouring, concrete and other anchoring materials may be used.

f. Any rock, concrete or pipelines within the beach or surf zone will be covered with sand to nominally level with the surrounding beach.

Jetty and Sheet Piling

g. A temporary construction jetty and/or sheet piling may be constructed from the beach and into the ocean for pipeline installation.

h. Visual monitoring will be conducted for the presence of whales and dolphins during pile driving from the pile driving machinery. Pile driving will temporarily cease if whales or dolphins are sighted within the Marine Exclusion Area.

i. The beach profile will be restored if jetty and/or sheet piling causes greater than 50m length and/or 5m width accretion or erosion on either side of the works, or if erosion is likely to extend to the primary dune. The source of the fill will be accreted sand or the excavated trench material.

Thrust Boring / Sub-Sea Tunnelling / Directional Drilling

j. Thrust boring or sub-sea tunnelling or directional drilling may be used for pipeline installation, with the launch pit to be land based and the receival pits to be ocean based.

k. Water-based drilling fluid will be used for boring or tunnelling or drilling. An oil-based drilling fluid will not be used for boring or tunnelling or drilling.

l. Sheet piles, rock or concrete may be used in the construction of the receival pit. (see sheet Piling, above)

m. Excavated material from the trench may be sidecast to either side of the trench, where sidecasting is part of the construction method.

Pipeline Burial/Partial Burial/Non-Burial

n. Seawater pipelines will be buried under the beach and offshore until a nominal 6m seawater depth contour. The depth of sand cover in the beach and surf zone over pipelines (and rock and concrete placed over the pipelines) shall be designed to prevent exposure during a 1 in 100 year storm.

o. The seawater pipelines may be rock armoured, anchored with metal and/or concrete weights and/or anchored with piles grouted into the sea floor.

p. Offshore of the nominal 6m depth contour, seawater pipelines may be placed on the sea floor, in a partially buried position, or in a completely buried position. Pipelines will be installed so that the pipelines, any rock or concrete armouring or anchoring do not project more than 10% of the water depth (based upon mean sea level) or 1.0m above the general level of the surrounding sea floor, whichever is lesser.

Construction – Marine Monitoring

14. Monitoring will be conducted for marine turbidity and photosynthetically active radiation (PAR) during excavation and backfilling, construction of receival pits, construction of the jetty and sheet piling, and correction of erosion and accretion of the beach profile.

15. Monitoring for the turbidity and PAR of the marine waters will be at 500m north (Site A) and 500m south (Site B) of the marine construction works at a distance of 1300m from the beach. Turbidity will also be monitored at 1250m south (Control Site A) and 1250m north (Control Site B)[2] (Refer Table 6-1 and Figure 6-1).

Table 6-1 Marine Monitoring Locations –Coordinates

Site	Northings (m N)	Eastings (m E)
A	6333938	376395
B	6332938	376395
Control Site A	6334688	376872
Control Site B	6332188	376872

16. Any visible turbidity plume from the marine construction works will be tracked and turbidity measured within the plume at 500m from the marine pipelines if the plume is visible at between 250m and 1300m from the shoreline.

17. Turbidity and PAR will be measured twice on each day of marine construction works. One set of measurements will be in the morning and one in the afternoon with at least 4 hours between measurements. PAR will be measured 1 m below the water surface and turbidity and PAR will be measured at 1m from the sea floor using a field probe. The turbidity and PAR results will be recorded in the Marine Monitoring Log.

18. Subject to safety considerations (i.e. in accordance with the *Occupational Safety and Health Act 1984* (WA)), based upon the judgement of the monitoring vessel master/skipper or marine works supervisor, monitoring for PAR and turbidity may temporarily cease. The master/skipper or marine works supervisor shall make a note in the Marine Monitoring Log as to the sea state and weather conditions in such circumstances. Where marine conditions do not allow marine monitoring to be undertaken, the marine works may continue in the absence of marine monitoring if it is safe to do so.

19. Monitoring equipment for PAR and Turbidity measurements will be maintained and serviced in accordance with the manufacturer's specifications to minimise the probability of equipment malfunctions. All equipment malfunctions will be recorded in the Marine Monitoring Log. All equipment malfunctions will be rectified as soon as is reasonably practicable.

20. The Marine Monitoring Log will be submitted to the Department of Environment and Conservation on a monthly basis during the offshore construction period.

Construction – Underwater Blasting

21. The Shire of Harvey will be informed prior to any underwater blasting.

22. Public notice signage will be installed on the Beach Exclusion Area fencing (500m north and south) and at the entrance to the main public beach at both Binningup and Myalup on each day of blasting. The public notice signage will indicate the proposed time(s) of the day in which underwater blasting will be undertaken.

23. An Ocean Watch Vessel[3] will survey the ocean for a 1 hour period immediately prior to blasting within a 2km radius of the blast site to confirm the presence or absence of whales and dolphins. Sighting for whales and dolphins will also be undertaken from elevated land near the blast site for a 1 hour period immediately prior to blasting.

24. Blasting will not be undertaken if whales or dolphins are located within a 1km radius of the blast area (as advised by Western Whale Research, 2008).

25. The Ocean Watch Vessel will ensure other vessels do not come within 500m of the blast site.

26. A Blast Supervisor will be responsible for the safe conduct of blasting. The Blast Supervisor will ensure that the minimum weight of explosives suitable to undertake the work is used (i.e. the weight of explosives does not exceed the weight of explosives required).
27. The Blast Supervisor will ensure that the explosive charges are placed in closely staggered drill holes (i.e. not surface blasting). The Blast Supervisor will determine the exact separation distances between drill holes. The Blast Supervisor will consider the suitability of delayed blasts to minimise blast energy.
28. The Underwater Blasting Log will be completed for each blast.
29. Visible fish mortalities[4] from within 500m of the blast site will be removed immediately following blasting to minimise attraction of scavenging fish and birds to the area.
30. Any surplus charges not detonated immediately following each blast will be removed.

Post Construction

31. The beach profile will be restored consistent with the surrounding natural beach profile.
32. The beach profile will be monitored over a 12 month period following marine works. The profiling will commence within 6 months of the marine works being completed. Profiles will be collected in the same locations as used by UWA (2008b). Should the profiles show greater erosion in the vicinity of the marine works than elsewhere, an additional 12 months of profiling will be undertaken.
33. The exclusion fence, ocean warning buoys[5], signage at the Binningup and Myalup beach car parks, and all other infrastructure and materials will be removed from all beach areas.
34. Disturbed beach areas will be rehabilitated in accordance with the Rehabilitation Management Plan.
35. A marine biological survey with special emphasis on the distribution of seagrasses and macroalgae will be undertaken in the area shown in Figure 2-1 within 12 months following the completion of marine works to determine the species distribution and density of marine macroflora. The survey will include a comparison of marine macroflora distribution and density with the pre-construction marine macroflora survey to determine impacts due to marine construction works.

6.5 Additional Information

[1] Excavation impacts

Suspended sediments from excavation can reduce light levels and thereby impact seagrasses. The area of greatest impact on turbidity and PAR is within 100-200m from the marine works, where the majority of suspended sediments settle (Oceanica, 2008b). The impacts on the seagrass species that occur around 1300m and further offshore will be temporary if excavation of areas containing rock (which can result in more turbid suspensions) is limited to 4 months (122 days) (Oceanica, 2008b). Further, the variable nature of the currents (UWA, 2008a) means that light attenuation due to suspended sediments from excavation on any particular seagrass area would be considerably less than 122 days.

[2] Marine Monitoring Sites

Control Sites A and B at 1250m north and south of the marine construction works were selected to provide background water quality data that is not affected by the construction activities nor unduly influenced by other human sources.

The monitoring sites 1300m offshore (Sites A and B) have been selected to coincide with the closest seagrass areas.

Turbidity is a measure of the cloudiness or amount of light scattered in the water. Light required for photosynthesis is measured by *Photosynthetically Active Radiation* (PAR). There is no standard direct correlation between turbidity and PAR – rather it tends to be site specific. For this reason, both parameters are measured.

[3] Warning Blasts

A small charge warning blast was considered to warn off dolphins, whales and fish from the blast site prior to the full charge blast. Advice obtained for the blasting for construction of the Bunbury Wastewater Treatment Plant Ocean Outfall was that a warning blast can attract inquisitive animals (such as dolphins) and the suspended sediment plume created can attract fish. Consequently, a small charge warning blast could result in higher marine mortalities during the full charge blast. Accordingly, ocean surveys (Ocean Watch Vessel) and land surveys for dolphins and whales are considered more appropriate than a small charge warning blast.

[4] Fish Mortalities

There are no practicable measures to reduce fish mortality that could be implemented. Consequently, no measures are proposed to reduce fish mortalities other than the removal of visible fish mortalities to minimise scavenging fish from entering the blasting area for future blasts.

[5] Permanent Markers

Note that some permanent buoys/markers are possibly needed to mark permanent Marine Exclusion Zones around the seawater intake structures and the diffuser structures. These exclusion zones will be much smaller than the temporary Marine Exclusion Zone used during construction. The location of the permanent markers will be specified in the Operational Environment Management Plan

Monitoring of other Water Quality Parameters

The marine water quality monitoring focuses on turbidity and PAR monitoring as it is known that sediment particles can become suspended in the water column from seabed disturbing construction works. Other water quality parameters (such as dissolved oxygen) are considered unlikely to be impacted by construction due to rapid mixing in the high energy marine environment. Consequently, the monitoring of water quality parameters during construction has been restricted to turbidity and PAR.

Silt Curtains

The use of silt curtains extending from the sea floor to the water surface was considered for containment of turbid waters resulting from marine construction works. Experience from the Perth Seawater Desalination Project located in Cockburn Sound found that during inclement weather the silt curtains were destroyed. As the marine waters at the Southern Seawater Desalination Project are higher energy than Cockburn Sound, it is considered improbable the silt curtains could be effectively deployed and maintained during construction. The decision not to use silt curtains is consistent with the marine construction works used for the Bunbury Wastewater Treatment Plant Ocean Outfall, located approximately 25km to the south and constructed in 2002. Accordingly, silt curtains are not proposed as part of the marine construction works.

Disposal of Excavated Material

Advice obtained from the Australian Government Department of the Environment, Water, Heritage and the Arts (formerly the Department of Environment and Water Resources; formerly the Department of Environment and Heritage) for the Perth Seawater Desalination Plant (letter dated 14 April 2005) confirmed that a Permit was not required under the *Environment Protection (Sea Dumping) Act 1981* (C'th) as (1) the backfilling is for a purpose other than the mere disposal of the matter, and (2) procedures were in place for ensuring the backfilling did not cause marine pollution. Accordingly, a Permit is not required under the *Environment Protection (Sea Dumping) Act 1981* (C'th) for the Southern Seawater Desalination Project. Similar circumstances apply for the *Western Australian Marine (Sea Dumping) Act 1981* (WA), and accordingly, a Permit is not required under that Act.

6.6 Contingency Actions

No contingency actions are proposed.

6.7 Related Plans

1. Dangerous Goods and Explosives Management
2. Environmental Incident Management
3. Community Complaints Management
4. Rehabilitation Management Plan

6.8 Relevant Legislation

1. *Environmental Protection Act 1986* (WA).
2. *Marine Navigational Aids Act 1973* (WA)
3. *Quarantine Act 1908* (C'th)
4. *Wildlife Conservation Act 1950* (WA)
5. *Wildlife Conservation Regulations 1970* (WA)
6. *Occupational Safety and Health Act 1984* (WA)

6.9 Advisory Agencies

The following organisations have been consulted on development of this plan:

1. AQIS
2. DEC
3. DoF
4. DoCEP (Worksafe WA)
5. DPI
6. Shire of Harvey
7. DEWHA

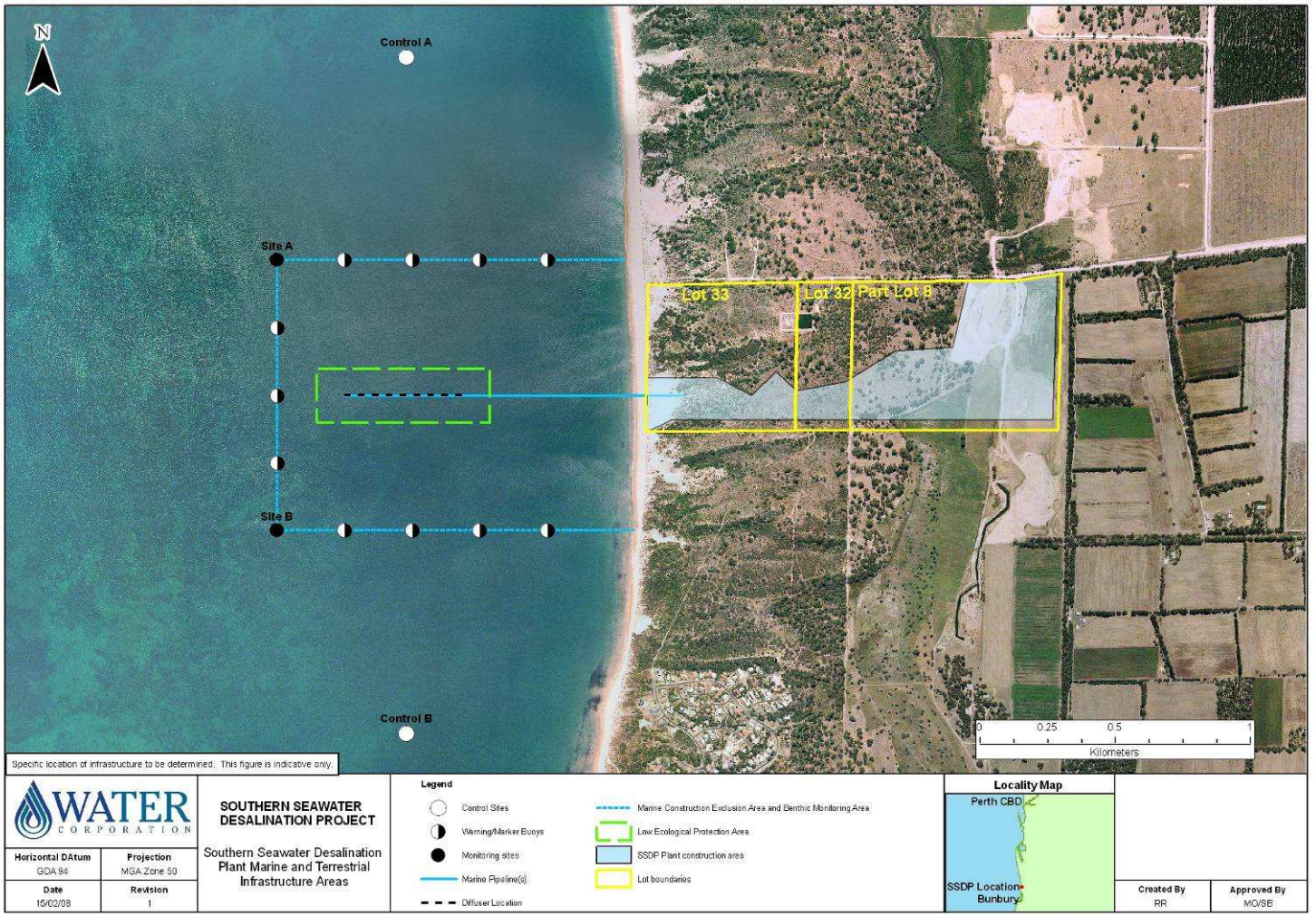


Figure 6-1 Marine Exclusion Area, Marine Pipelines and Monitoring Sites

Table 6-2 Marine Monitoring Log

Southern Seawater Desalination Project
Seawater Pipeline Installation Management

Marine Monitoring Log

The purpose of the Marine Monitoring Log is to record the marine turbidity and PAR during seawater pipeline installation.

Date: _____

Name: _____

Position: _____

Monitoring comments (optional):

_____

_____

_____

MONITORING TIME: Morning / Afternoon (please circle)

SAFE TO SAMPLE?: Yes / No (please circle)

COORDINATES:

Site	Northings (m N)	Eastings (m E)
A	6333938	376395
B	6332938	376395
Control Site A	6334688	376872
Control Site B	6332188	376872

FIELD SAMPLING RESULTS:

	Turbidity (NTU)				
	Site A	Site B	Control A	Control B	Mean of Control A & B
Time					
Recording at 2m from sea floor					

	Photosynthetically Active Radiation (PAR) (µmol/m/s)				
	Site A	Site B	Control A	Control B	Mean of Control A & B
Time					
Recording at 2m from sea floor					

Table 6-3 Underwater Blasting Log

Southern Seawater Desalination Project
Seawater Pipeline Installation Management

Underwater Blasting Log

The purpose of the Underwater Blasting Log is to record the key aspects of each underwater blast.

Date of Blast	Location of Blast	Weight of Charge (kg)	Time whale and dolphin surveys completed	Time of Blast	Mortalities (total number and species)	Comments	Name and Position

Page ……. of …

7.0 Watercourse Crossing Management

7.1 Context

The Water Transfer Pipeline from the Seawater Desalination Plant site to the Harvey Summit Tanks will cross a number of watercourses (drains, rivers and streams). Construction activities at the watercourses have the potential to disrupt natural water flows and add suspended sediment material (particulates) to the water column.

The watercourses may provide habitat for flora and fauna. Some of the watercourses may also have heritage significance to persons of Aboriginal descent (refer Aboriginal Heritage Management).

All watercourse crossings will be constructed using an open trench as identified in Figure 7-1. The pipeline will be buried below the watercourse so that watercourse flows are not interrupted following construction.

7.2 Purpose

The purpose of the Watercourse Crossing Management Plan is to outline management actions to minimise:

1. impacts on water quality and watercourse flow.
2. impacts on beds and banks of watercourses.

7.3 Performance Indicators

Performance will be demonstrated by:

1. Compliance with the prescribed management actions.

7.4 Management Actions

Prior to Construction

1. A permit to interfere with the beds and banks of watercourses will be obtained from the DoW in accordance with s17 of the *Rights in Water and Irrigation Act 1914* (WA).

Construction

2. Liaison with Harvey Water will occur at least 14 days prior to any works carried out in irrigation watercourses operated by Harvey Water.
3. Vegetation clearing will be undertaken at watercourses, if required, in accordance with the Land Clearing and Trench Management Plan.
4. The flow of the watercourse will be diverted by channel or by diversion pipeline. If a watercourse contains water that is not flowing or flowing slowly, it will be temporarily dammed with any minor water flow to be transferred by pump and pipeline.
5. A continuous row of sterile hay bales will be installed and maintained approximately 10m downstream of the construction works for sediment filtration and flow velocity reduction if the watercourse is visually turbid from construction works at a distance of approximately 100 metres downstream of the construction works. The bales will be fixed using stakes to the base of the watercourse during construction.

Post Construction

6. Any installed bales and stakes will be removed within 7 days following the completion of construction works at the watercourse.
7. The banks of the watercourse will be re-contoured using construction equipment so that the banks are returned to the original profile with equivalent pre-construction stability.
8. The banks of the watercourse will be rehabilitated as documented in the Rehabilitation Management Plan, with cleared and cut vegetation placed on the banks to minimise erosion and encourage microclimates for seed germination.

7.5 Contingency Actions

If the watercourse is visually turbid at a distance of 100m downstream of the construction works after the installation of sterile hay bales, the following actions will be undertaken:

1. installation of additional continuous row(s) of sterile hay bales or a geofabric barrier downstream of the construction works for sediment filtration and flow velocity reduction;

2. addition of Alum (aluminium sulphate $Al_2(SO_4)^{3-}$) to remove sediments from suspension between the construction works and the bales/geofabric. The concentration of alum required will be dependent on the level of sedimentation of the water. Soda Ash (sodium carbonate Na_2CO_3) will also be applied for pH correction during Alum dosing at a rate of 2 parts Alum: 1 part Soda Ash.

7.6 Related Plans

1. Land Clearing and Trench Management
2. Dewatering and Acid Sulphate Soils Management
3. Aboriginal Heritage Management
4. Rehabilitation Management

7.7 Relevant Legislation

1. *Rights in Water and Irrigation Act 1914*, and *Regulations 2000* (WA).

7.8 Advisory Agencies

The following organisations have been consulted on development of this plan:

1. DEC
2. DoW
3. Conservation Commission
4. Harvey Water

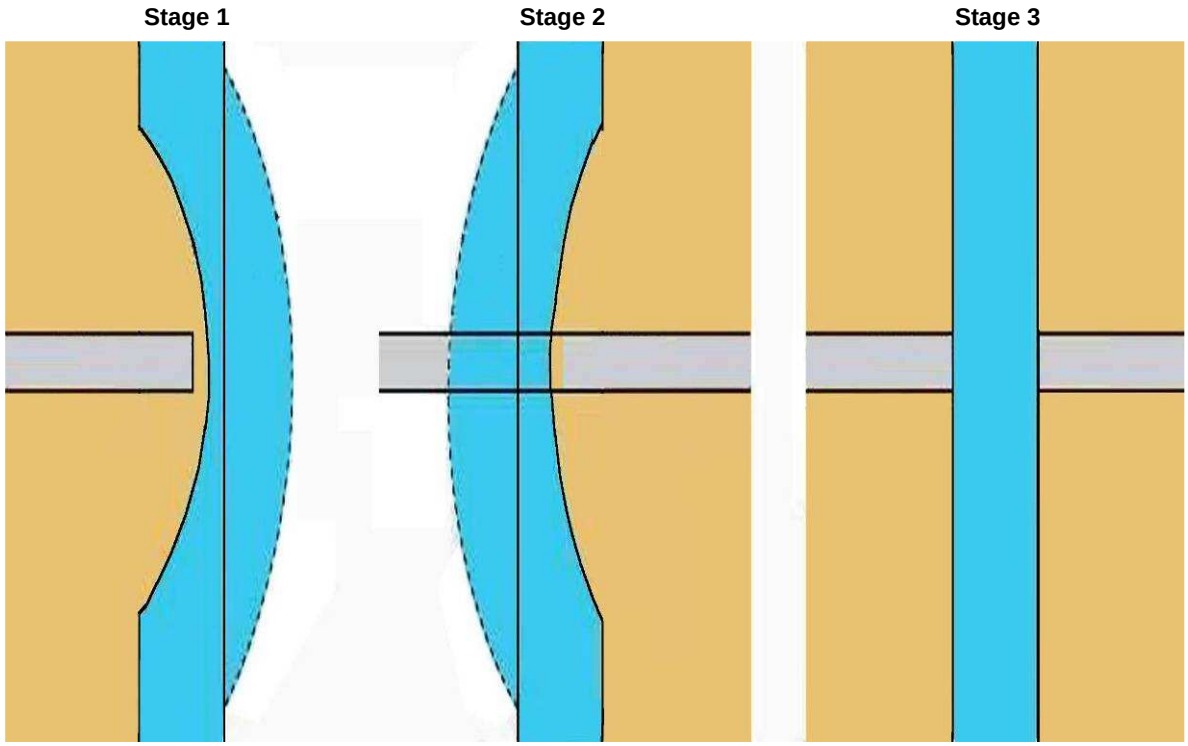


Figure 7-1 Watercourse Crossing by Open Trenching.

For ‘Stage 1’ the watercourse is diverted to one side, making one side dry for pipeline installation. At ‘Stage 2’ the watercourse is diverted in the opposite direction, making the other side dry for pipeline construction and to connect to the pipeline installed during ‘Stage 1’. ‘Stage 3’ involves the re-alignment of the watercourse banks to the original alignment and profile. The pipeline is buried below the land and the watercourse.

8.0 Dewatering and Acid Sulphate Soils Management

Management of dewatering and acid sulphate soils will be undertaken in a manner consistent with the risk based approach outlined in the Water Corporation Acid Sulphate Soil and Dewatering Management Strategy (Water Corporation 2007)

8.1 Context

Dewatering by spears and pumps will be required for excavations and installation of infrastructure in areas where the watertable is above the installation depth. Pipeline installation will occur during dry periods to reduce the need for dewatering, with the temporal extent of dewatering limited by the pipeline installation rate (at approximately 100m per day), with dewatering in any one area being completed within approximately 7 days.

The construction areas may also contain Acid Sulphate Soils (ASS), which are naturally occurring soils and sediments containing sulphide minerals. When ASS is dewatered, excavated or otherwise exposed to air, the sulphides react with oxygen in the air to form sulphuric acid. Sulphuric acid can contaminate the groundwater and cause the release of metals bound in the soil (such as arsenic, aluminium and iron).

Mapping completed by the WAPC (May 2007) identifies that the infrastructure has the following ASS risks:

	ASS RISK (for excavations up to 3m depth)
Seawater Desalination Plant:	2 ha of "high to moderate risk" (degraded remnant wetland) 19 ha of "moderate to low risk" 63 ha of "no known risk" (Note: marine areas have not been mapped by WAPC, however ASS are not expected due to the limestone marine environment).
Water Transfer Pipeline:	5.5 km of "no known risk"
	23 km of "moderate to low risk"
	0.5 km of "high to moderate risk" 0.5 km of no data recorded (Note: ASS is not expected due to the high elevation of the land (approximately 80m AHD to 130m AHD))
Harvey Summit Tanks:	No data recorded (Note: ASS are not expected due to the high elevation of the land (approximately 130m AHD to 170m AHD)).

Table 8-1 ASS Risk mapping for the Southern Seawater Desalination Project areas.

The ASS identified at the Seawater Desalination Plant site is not anticipated to be of concern as those areas will be filled to achieve the necessary height for infrastructure installation. Exposure of ASS in stockpiles and within the excavated trench for the Water Transfer Pipeline will be limited due to the rate of pipeline installation (at approximately 100 metres per day).

8.2 Purpose

The purpose of the Dewatering and Acid Sulphate Soils Management Plan is to outline management actions to:

1. minimise the environmental impacts of dewatering.
2. identify and manage areas of ASS.

8.3 Performance Indicators

Performance will be demonstrated by:

1. Compliance with the prescribed management actions.

8.4 Management Actions

Prior to Construction

1. The presence of ASS and the depth to groundwater will be determined as described below:
    a. Sample sites will be located at 500m[1] intervals along the pipeline routes, except for the Boonilup Road section where the sampling distance will be 100m[1]. At the Seawater Desalination Plant site the degraded remnant wetland will be sampled (minimum 2 sample sites).
    b. At each sample site, one 500 gram sample will be taken from the centre of each soil layer (horizon)[2] to a depth of approximately 4.0 metres[3]. The sample will be collected and placed in a sealed plastic bag, excluding air. Shell material, if present, will be removed from the sample in the field. Samples will be placed in a field freezer or esky containing ice, then frozen within 24 hours of collection (i.e. on return from field sampling).
    c. Each soil sample will be tested by the Suspension Peroxide Oxidation Combined Acidity and Sulphate (SPOCAS)[4] suite method by a laboratory accredited by NATA for analysis by SPOCAS.
    d. For each soil profile, the following will be recorded:
        i. Location (geo-referenced to eastings and northings) of the sample site.
        ii. Depth from which the soil sample was taken.
        iii. Description of thickness, soil texture and grain size for each layer.
        iv. Description of colour using a Munsell colour chart for each layer.
        v. Description of soil mottling, organic matter, moisture content, and presence of shell material for each layer.
        vi. Estimation of the water table depth below ground level.
        vii. Photograph of the soil profile with a field marking indicating the sample collection points.
    e. Reporting of the results will include:
        i. Description of the equipment and methods used for sample collection.
        ii. Maps with geo-referenced coordinates of each sampling site.
        iii. Results of SPOCAS tests (includes Titratable Actual Acidity, Titratable Peroxide Acidity, Acid Neutralising Capacity, Titratable Sulfidic Acidity).
        iv. Recorded matters listed in part ‘1d’ (above).
        v. NATA endorsed laboratory report for the laboratory results.
        vi. Description of Chain of Custody for samples collected for laboratory analysis.
        vii. Discussion of laboratory analysis.

Construction

Dewatering General

2. Excessive dewatering will be avoided. The rate of dewatering will be limited to the minimum rate required for the infrastructure to be installed within the trench.

Dewatering to Ocean

3. Dewatering water maybe discharged to the ocean from the Seawater Desalination Plant site. It will be ensured that the dewatering water is discharged within the surf zone (nominally within 0m to 25m of the shoreline) where the dewatering water will be rapidly mixed by wave action.
4. Dewatering discharge will not create a visible plume greater than 100m from the discharge location.

Dewatering to Land

5. Dewatering water will be infiltrated on-site within cleared or agricultural areas. Infiltration of dewatering water will be within a defined area (may require earth bunding).
6. Dewatering to native vegetation will only occur where no other practicable disposal option exists.
7. Dewatering water maybe used for dust suppression if monitoring confirms that the discharge water meets the following water quality criteria for discharge to land (below).

Dewatering to a Watercourse

8. Dewatering water may be discharged to a watercourse if monitoring confirms that the water meets the water quality criteria for discharge to a watercourse (Table 8-2).
9. Dewatering water will be discharged to a watercourse via a settling tank/bund to remove suspended sediments. The size of the settling tank/bund will be designed (subject to land availability) to allow for sufficient retention time to remove visible suspended solids.
10. The dewatering water will be discharged from the settling tank/bund onto a hard surface (such as a rocky ledge), or via a diffuser, to minimise flow velocity that could erode the watercourse bed, banks or vegetation of the watercourse, and to aerate the discharge.
11. A continuous row(s) of sterile hay bales or geofabric will be installed, through which the discharge will pass prior to entering the watercourse if the settling tank/bund does not sufficiently remove suspended sediments (i.e. the watercourse is visibly turbid). The bales/geofabric will be fixed using stakes to the base of the watercourse. The bales/geofabric and stakes will be removed following the completion of discharge.
12. If required, the dewatering discharge will be dosed with Alum (aluminium sulphate - $Al_2(SO_4)^{3-}$) to remove sediments from suspension within the settling tank/bund or on the discharge side of the bales/geofabric. The concentration of alum required will be dependent on the level of sedimentation of the water. Soda Ash will also be applied (sodium carbonate - Na_2CO_3) during Alum dosing at a rate of 2 parts Alum: 1 part Soda Ash for pH correction.

Monitoring of Dewatering Discharge to a Watercourse or Land

13. The discharge water will be monitored at the discharge point once per day for pH and temperature using a calibrated multimeter probe(s).
14. The water within a watercourse to which dewatering water is discharged will be monitored at 100m upstream and 100m downstream of the discharge point for pH and temperature using a calibrated multimeter probe(s). The results of discharge will be compared to the upstream water quality.
15. The discharge will be managed such that the following water quality objectives are achieved:

	Temperature	**pH**
Discharge to Watercourse[5]	Within ± 2 degrees Celsius in watercourse (100m downstream v. 100m upstream)	6.0-8.5 for discharge water *or* within ± 2 pH units in watercourse (100m downstream v. 100m upstream)
Discharge to Land	Not applicable	4-10 for discharge water[6]
Discharge to Ocean	Not applicable	4-10 for discharge water[6]

Table 8-2 Dewatering Discharge Objectives.

16. A visual turbidity assessment will be taken of the discharge and of the watercourse at 100m upstream and downstream of the discharge.
17. Sterile hay bales and/or a geofabric will be installed within the watercourse downstream of the discharge to reduce turbidity if the watercourse is identified as visibly turbid.
18. The watercourse will be dosed on the discharge side of the bales/geofabric with Alum (aluminium sulphate - $Al_2(SO_4)^{3-}$) to reduce turbidity if the installation of bales/geofabric does not sufficiently reduce turbidity. The concentration of alum required will be dependent

on the level of turbidity of the water. Soda Ash (sodium carbonate - Na_2CO_3) will also be applied during Alum dosing at a rate of 2 parts Alum: 1 part Soda Ash for pH correction.

19. The results of monitoring for pH, temperature and turbidity will be recorded on the Water Discharge Monitoring Log.
20. The pH of the dewatering waters will be neutralised with liquid lime if the dewatering discharge water quality does not meet the discharge objectives for pH. The rate of neutralisation will be based on achieving a neutralised discharge quality to within the pH discharge water objective of pH 6.0-8.5 for a watercourse or pH 4.0-10.0 for discharge to land or ocean.
21. The rate of dewatering will be adjusted, or location of dewatering changed, if the dewatering discharge to a watercourse does not meet the temperature discharge objectives.

Dewatering on Boonilup Road Wetland (Watercourse) Area

22. A fixed water level indicator will be installed with 1cm increments into the open water area of each wetland containing open water within 100m of the Water Transfer Pipeline on Boonilup Road (excluding the Harvey-Myalup Drain).
23. The wetland water levels will be monitored and recorded on the Wetland Water Level Monitoring Log to 1cm accuracy in all wetlands within 100m of the Water Transfer Pipeline on Boonilup Road on each day during construction.
24. Dewatering water may be temporarily discharged to any wetland that records a reduction in water level greater than 10cm (and accounting for any natural reduction in water levels recorded in wetlands beyond the immediate construction area). Discharge will continue until the natural water level is restored to within 1cm. Discharge will be monitored and recorded on the Water Discharge Monitoring Log.

ASS Soil Management

25. The ASS risk (based on preconstruction investigations) will be marked on the infrastructure maps for the Water Transfer Pipeline (Appendix 2). The maps will identify a 500m/100m buffer on pipeline areas identified as having ASS given the investigation confidence (sampling) interval was 500m/100m for preconstruction investigations.
26. Field sampling and field analysis will be conducted for pH_F and pH_{FOX} at 50m intervals within the 500m/100m buffer during construction to determine the starting location of ASS where present. The field sampling and analysis will be conducted in accordance with Appendix 1 of *Performing and Interpreting Soil Field pH* of *Draft Identification and Investigation of Acid Sulfate Soils* (DoE, May 2006).
27. ASS material will be stockpiled separately from non-ASS material. Stockpiles of ASS material will be placed on a pad of Aglime (pulverised limestone) of no less than 100mm depth.
28. Stockpiles of ASS material will be neutralised by thorough mixing with the following ratios of aglime (pulverised limestone) based on the ASS risk supplied in Appendix 2:

	ASS Assessment			
	Nil	**Low** *(S% 0.03-0.4)*	**Medium** *(S% 0.5 -1.9)*	**High** *(S% 2.0-5.0)*
Rate of Aglime dosing[7] (tonne of lime : tonne soil excavated)	No treatment required	2:100	8:100	19:100

Notes:
1. Ratios are based on tonnage, not volume. Estimation of the bulk density of the ASS material is required prior to neutralisation.
2. Aglime dosing rates are for pure fine Aglime (100% $CaCO_3$) using a safety factor of 1.5. If commercial grade lime is used the rates must be proportionally emended to account for change in purity.
3. Aglime dosing rate includes the weight of Aglime pad on which ASS material is placed.
4. Limestone has not been recommended given low surface (reaction) area and high volume requirements for neutralisation.

Table 8-3 Aglime Dosing Rates for ASS Soils.

29. Neutralised ASS material maybe disposed of to:
    a. the excavated trench.
    b. a suitable location agreed with the Landowner (the Landowner has first preference to retain excess overburden from their own property).
    c. a suitable location agreed with adjacent Landowners (with preference to Landowners on the pipeline route) or other nearby Landowners.
    d. a local landfill as inert waste.
    e.

Reporting

30. The following details will be recorded and reported weekly:
    a. volume of dewatering.
    b. locations of dewatering discharge.
    c. volume of ASS material excavated and neutralised.
    d. disposal locations of neutralised ASS material.

8.5 Additional Information

ASS Sampling

[1] It is noted that *Draft Identification and Investigation of Acid Sulfate Soils* (DoE, May 2006) recommends an ASS linear sampling interval of 50m. The preconstruction sampling interval to be undertaken for the pipeline will be at 500m intervals (which is predominantly "moderate to low risk"), with 100m intervals for the Boonilup Road section (which is mostly "moderate to low risk" with sections of "high to moderate risk"). The recommended interval of 50 metres for investigative sampling is not practicable (would equate to approximately 800 sites), consequently, a conservative linear interval buffer of 500m/100m will be added to the results of investigation sampling from the ASS delineation mapping, with field testing at 50m intervals conducted during construction for field delineation.

[2] It is noted that *Draft Identification and Investigation of Acid Sulfate Soils* (DoE, May 2006) recommends an ASS vertical sampling interval of 0.25 metres, or greater where soil layers are less. The recommended interval for investigative sampling is not considered necessary as the material will not be returned in layers (excepting topsoil). One sample from each soil layer will be sufficient to determine the overall ASS risk and allow ASS, if present, to be quantified by volume and concentration for effective management during construction.

[3] 4 metres is the approximate maximum reach of the machinery which will be used for geotechnical excavations and construction. Sampling beyond this depth is not practicable.

[4] SPOCAS tests are being conducted on all soil samples collected. Tests for pH_F and pH_{FOX} will not be conducted for pre-construction delineation of ASS as the DEC (formerly as the WA Department of Environment, May 2006) identifies that tests for pH_F and pH_{FOX} have a 20-40% error (false positives and false negatives). Consequently, tests for pH_F and pH_{FOX} (as a precursor for determining the need for SPOCAS testing) are not considered by the Principal to be reliable for pre-construction delineation of ASS.

Dewatering Discharge

[5] pH 6.5 is the lower guideline value for South-western freshwater river ecosystems by ANZECC (2000). pH 6.0 is the guideline action trigger level recommended by DoW (2006).

[6] pH range of 4-10 is consistent with the *Environmental Protection (Unauthorised Discharges) Regulations 2004* (WA).

[7] the aglime dosing rate is based on Appendix 1 of *Acid Sulfate Soils Guideline Series – Treatment and Management of disturbed acid sulfate soils* (DEC, October 2004).

Dewatering Licence

A licence from the DoW to conduct dewatering activities is not required as a result of powers contained in s83(2)(b)(i) of the *Water Agencies (Powers) Act 1984* (WA).

8.6 Contingency Actions

No contingency actions are considered necessary.

8.7 Related Plans

1. Land Clearing and Trench Management Plan
2. Watercourse Crossing Management Plan

8.8 Relevant Legislation

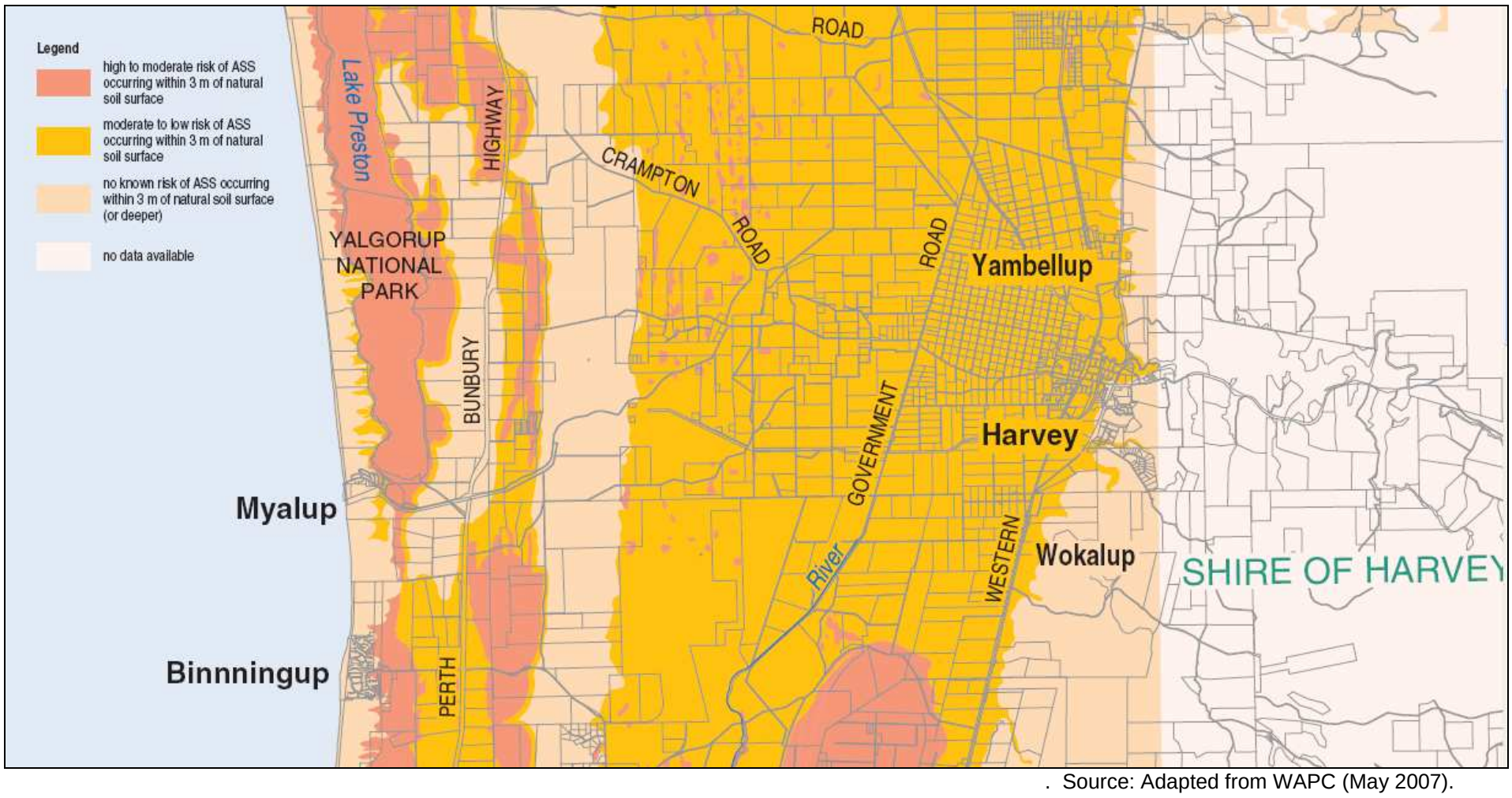
1. *Environmental Protection Act 1986*, and *Regulations 1987* (WA).
2. *Environmental Protection (Unauthorised Discharges) Regulations 2004* (WA)
3. *Contaminated Sites Act 2003*, and *Regulations 2006* (WA).
4. *Water Agencies (Powers) Act 1984* (WA).

8.9 Advisory Agencies

The following organisations have been consulted on development of this plan:

1. DEC
2. DoW

Figure 8-1 ASS Risk Mapping for the Construction Area.



. Source: Adapted from WAPC (May 2007).

Table 8-4 Water Discharge Monitoring Log

Southern Seawater Desalination Project
Dewatering and Acid Sulphate Soils Management

Water Discharge Monitoring Log

The purpose of the Water Discharge Monitoring Log is to record the water quality of water discharge to land/water. The Water Discharge Monitoring Log is to be completed by the Site Environmental Scientist on each day of water discharge.

Name ……

Page …… of ……

Date of Entry	Property Description and Sample Site (e.g. discharge, watercourse upstream or downstream)	Discharge Rate (L/min)	Temp. (^{o}C)	pH	Turbidity (visible)	Name and Position	Initial

Table 8-5 Wetland water Level

Southern Seawater Desalination Project
Dewatering and Acid Sulphate Soils Management

Wetland Water Level Monitoring Log

The purpose of the Wetland Water Level Monitoring Log is to record the water level in the open water of wetlands within 100m of the Boonilup Road Section of the Water Transfer Pipeline. The Wetland Water Level Monitoring Log is to be completed by the Site Environmental Scientist on each day of construction of the Water Transfer Pipeline on Boonilup Road.

Name ……

Page ……. of …….

Date of Entry	Wetland No / Description	Water Level at Construction Start (cm)	Current Water Level (cm)	Is Level Change greater than 10cm?	Dewatering to wetland required (accounting for natural reductions in water level)?	Name and Position	Initial

9.0 Hygiene (Plant Pathogen) Management

9.1 Context

The construction areas may contain infestations of the plant pathogens that cause Phytophthora Dieback (*Phytophthora cinnamomi*) and Armillaria Root Disease (*Armillaria luteobubalina*). The symptoms of plant pathogens include the dieback of limbs and branches, yellowing of foliage, and vegetation death.

The construction areas also contain a range of weed species, which have the potential to compete with native flora and can affect agricultural productivity. Dormant weed seeds can be contained in topsoil, which when disturbed by construction activities can cause the weed seeds to germinate. Weed species are often opportunistic and can quickly colonise cleared land.

Plant pathogens and weeds are spread through the movement of soil from infected areas to uninfected areas. The construction areas will be surveyed prior to construction for evidence of plant pathogens and significant weed infestations. These areas will be marked on the infrastructure maps contained in Appendix 2.

9.2 Purpose

The purpose of the Hygiene Management Plan is to outline management actions to minimise:

1. the spread of the plant pathogens (*Phytophthora cinnamomi* and *Armillaria luteobubalina*) and weeds from infested to uninfested land.

9.3 Performance Indicators

Performance will be demonstrated by:

1. Compliance with the management actions (hygiene procedures) to minimise the spread of plant pathogen and weeds.
2. Weed distribution and density post-construction compared to pre-construction records.

9.4 Management Actions

Prior to Construction

1. Identified infestations of declared weeds and Watsonia (*Watsonia bulbillifera*) will be sprayed to minimise weed spread during construction.
2. It will be ensured that vehicles and machinery (including wheels, racks, undercarriage and inside cabins) and footwear are to be inspected and cleaned of sods of dirt and slurry prior to entry to the construction areas.

Construction

3. Construction materials (e.g. soil, revegetation material) will not be sourced from areas known to contain forest diseases or high weed infestations.
4. Hygiene Inspection Points (with signage, refer Figure 20) will be established at the sites to be marked on the infrastructure maps contained in Appendix 2 (based on a pre-construction dieback survey to prevent soil transfer from infected areas to uninfected 'protectable' areas).
5. It will be ensured that all vehicles, footwear and equipment entering the Hygiene Inspection Points will be cleaned to remove attached sods of dirt (including the tyres, undercarriage and inside cabin of the vehicle). Vehicles, footwear and equipment will be cleaned by:

a. air hosing and brushing during dry conditions.
b. low volume, high pressure water hosing during wet/boggy conditions.

6. Construction vehicles will be kept within the clearing corridor (nominally 20 metres in native vegetation and 30m in agricultural land – refer to Land Clearing and Trench Management Plan).
7. Topsoil, overburden or vegetation will not be transported from dieback infected areas to uninfected 'protectable' areas.
8. Excess overburden will be disposed of from dieback infected areas on-site within the dieback infected construction corridor by evenly spreading over the construction area prior to spreading the infected topsoil. This may result in a raised land level. Where disposal of overburden by this manner is not practicable due to excessive mounding, an alternative disposal location will be sought.
9. Cleared vegetation will not be removed from determined dieback infected areas. All cleared vegetation from dieback infected areas will be retained within the dieback infected areas.
10. Topsoil will not be respread from agricultural areas in areas of native vegetation in order to minimise the spread of pasture species.

Post-Construction

11. The construction area will be monitored for weed infestations in spring (September to November) for a period of 12 months following completion of the construction works. The monitoring will include:
    a. the species of weeds identified.
    b. an estimation of the distribution and densities of weeds.
    c. a comparison with pre-construction weed distribution and densities to identify areas requiring spraying, based on photographs from the land condition survey (refer to Land Clearing and Trench Management Plan).
12. The construction areas will be sprayed where weed infestations exist at densities or distributions at more than 50% above pre-construction levels during the 12 month weed monitoring period. The spraying of agricultural land will be conducted in consultation with the Landowner using a herbicide listed in the 2006/2007 DAF Canola, Pulse and Legume Pasture Spraying Charts (Bulletin 4674, 2006) (refer Figure 21). The spraying within native vegetation will be conducted using Fusilade® herbicide. Weed infestations immediately adjacent to watercourses will be sprayed in a manner which prevents overspray to the watercourse, or alternatively the weeds will be removed by hand.
13. The construction area will be monitored for weed infestations annually in spring (September to November) for a further period of 2 years following completion of the construction works. The monitoring will include:
    a. the species of weeds identified.
    b. an estimation of the distribution and densities of weeds.
    c. a comparison with pre-construction weed distribution and densities to identify areas requiring spraying, based on photographs from the land condition survey (refer to Land Clearing and Trench Management Plan).
14. The construction areas will be annually sprayed where weed infestations exist at densities or distributions at more than 50% above pre-construction levels during the 3 year weed monitoring period. The spraying of agricultural land will be conducted in consultation with the Landowner using a herbicide listed in the 2006/2007 DAF Canola, Pulse and Legume Pasture Spraying Charts (Bulletin 4674, 2006) (refer Figure 21). The spraying within native vegetation will be conducted using Fusilade® herbicide. Weed infestations immediately adjacent to watercourses will be sprayed in a manner which prevents overspray to the watercourse, or alternatively the weeds will be removed by hand.

9.5 Additional Information

Hygiene Inspection Points

Hygiene Inspection Points will be designed such that:

1. there is physical separation between object being cleaned and effluent produced (i.e. grate over a sump).
2. cleaning wastewater is infiltrated on-site within infested areas.
3. the object being cleaned does not become re-contaminated by the wastewater.

Figure 9-1 Hygiene Inspection Point Signage.

(600 x 350mm – Black lettering on white background. Corporate logos are in colour)

Herbicides

A range of herbicides suitable for use is contained in spray charts produced by the DAF (refer Figure 21). As different herbicides may use the same active ingredient, but with varying concentrations, the application rate must be adjusted according to the directions supplied by the manufacturer of each individual herbicide.

9.6 Contingency Actions

No contingencies are considered necessary.

9.7 Related Plans

1. Land Clearing and Trench Management
2. Watercourse Crossing Management

9.8 Relevant Legislation

1. *Conservation and Land Management Act 1984*, and *Regulations 2002* (WA)
2. *Agriculture and Related Resources Protection Act 1976* (WA)

9.9 Advisory Agencies

The following organisations have been consulted on development of this plan:

1. DEC
2. DAF
3. Conservation Commission

Figure 9-2 DAF Spray Charts. Page 1 of 7.

Grains Research & Development Corporation

2006/2007
CANOLA, PULSE AND LEGUME PASTURE SPRAYING CHARTS
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These charts list herbicides registered in Western Australia for the control of weeds in pulse and canola crops and legume pastures.

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USERS OF ANY CHEMICAL PRODUCT SHOULD ALWAYS READ THE PRODUCT LABEL BEFORE USE AND FOLLOW THE DIRECTIONS SPECIFIED ON THAT LABEL

REGISTRATIONS
These charts summarise registered broad acre herbicide uses and rates per hectare for common weeds and should be used as a guide only.

PRODUCTS CONTAINING THE SAME ACTIVE INGREDIENT
For many herbicides there may be a large number of alternative products containing the same or different concentrations of the same active ingredient.

In these charts a representative active ingredient concentration has been specified and the herbicide rate stated is for products with that concentration.

Where it is known that there are alternative products available that have a different active ingredient concentration/s the following statement has been included with the product details (in red text):

'Alternative concentration/s available'

Where this alert appears users should check their product label to determine active ingredient concentration and use the rates specified on that label.

ALTERNATIVE PRODUCTS
There may be variation in registered uses, withholding periods and rates between alternative products containing the same active ingredient at the same and/or different concentrations of that active ingredient. Follow the directions on the label of the product to be used.

CODE
The chart should be read with reference to the code present.

WEED IDENTIFICATION
To identify weeds mentioned in this chart consult:

- *Weeds: The Ute Guide (Southern Edition Version 2)*
  Available GRDC Ground Cover Direct - 1800 11 00 44
- *Western Weeds (A guide to the weeds of Western Australia)*
  Available Department of Agriculture Western Australia (South Perth) - (08) 9368 3333

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1. The information in this chart has been written for Western Australian conditions and may not be applicable or suitable for use in States other than Western Australia.
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b) make no representation or warranty that any of the active ingredients or products specified in this chart are registered pursuant to the Agricultural and Veterinary Chemicals Code Act 1994 (WA);

c) have relied on the information contained in the Australian Pesticides and Veterinary Medicines Authority database and herbicide labels in preparing this chart and accept no liability for any errors in this chart that arise from such reliance; and

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Notes

Restricted herbicides

The following herbicides have restricted use in areas where grapes and tomatoes are grown commercially:

MCPA, MCPB, 2,4-D, 2,4-DB, dicamba and picloram.

Consult the Department of Agriculture for information concerning the storage and application of these herbicides near these areas.

2,4-D Additional label instructions for application

Additional instructions to strengthen the current label warnings in relation to minimising chemical spray drift.

"This is a PHENOXY HERBICIDE that can cause severe damage to susceptible crops such as cotton, grapes, tomatoes, oilseed crops and ornamentals.

- DO NOT use unless wind speed is more than 3 kilometres per hour and less than 15 kilometres per hour as measured at the application site.

- DO NOT apply with smaller than coarse to very coarse spray droplets according to the ASAE S572 definition for standard nozzles."

Herbicide compatibility - Tank mixing

Before tank mixing pesticides you should ask the following questions;

- Is the mixture proven and registered?

- Is the proposed mixture the best approach to the problem?

Before making a mixture the physical compatibility of the components should be checked. This can be done in a glass jar or similar transparent container. It requires accurate measurement of the component chemicals and mixing in the correct volume of water so as to achieve the same concentrations as the proposed tank mix. Use the same water as that which will be used in the paddock.

Allow test jar to sit for several hours or longer following agitation.

If gelling, precipitation or separation occurs after standing then the tank mix should not be used unless after re-agitation the gel or precipitate goes back into solution or suspension.

Mixing Order

Fill the tank with water to at least one third to half full then mixing should be in the order of:

- wettable powders,

- flowables,

- emulsifiable concentrates,

- water solubles

- followed by surfactants.

Physical compatibility does not imply biological compatibility. Unproven tank mixes may have poorer weed control and/or cause crop damage. Compatibilities should be checked annually as formulations may vary between seasons and between companies.

Check the label for information on product compatibilities and recommendations on suggested intervals between application of various products.

Check label for information on tank mixes and the addition of crop oils and other surfactants/adjuvants. The addition of adjuvants to some herbicides or mixtures can result in severe crop damage.

Herbicide resistance

Continuous use of the same herbicide or herbicides with the same mode of action may lead to the development of herbicide resistance to that group of chemicals. Selection of resistant populations can occur in as little as 3-4 years.

Research indicates that once a weed population is resistant to herbicides from MOA groups A and B it will not become susceptible to those herbicides again.

Herbicide Mode of Action

Herbicides act by interfering with specific processes occurring in plants. This interference is described as the herbicide's Mode of Action. In Australia, the group to which a herbicide product belongs is identified by a letter code, A, B, C… This code is found on all product labels and herbicide drums.

Avoiding herbicide resistance

The adoption of Integrated Weed Management (IWM) is likely to prevent or at least delay herbicide resistance.

IWM involves the use of many different approaches to weed control including techniques that are chemical, mechanical, agronomic and biological.

Examples of weed management techniques include cultivation, burning, grazing, hay cutting, spray topping, crop topping, seed collection, seeding rates, crop competition and crop choice/rotation.

Resistance risk of herbicides

The risk of developing resistance to herbicides is different for each of the mode of action groups. A low risk rating does not mean that resistance will not develop.

High Risk – Group A and Group B herbicides

Moderate Risk – Groups C, D, E, F, G

Low risk – Groups I, J, K, L, M, N

Herbicide use guidelines

1. Read the label.

2. Apply only one application of any herbicide from any herbicide MOA group in a single season.

3. Where a herbicide from a specific group has been used on a particular paddock, avoid using a herbicide from the same group in the following season for control of that weed in that paddock.

4. Consider using tank mixes of products with different modes of actions that also control the target weed species.

Herbicide Mode of Action Groups

MOA	MOA Sub-group	Example Herbicides
A	Fops - Aryloxyphenoxy-propionates	Diclofop-methyl, fenoxaprop haloxyfop, propaquizafop, quizalofop
	Dims - Cyclohexanediones	Butroxydim, clethodim, sethoxydim, tepraloxydim, tralkoxydim
B	Sulfonyl ureas	Chlorsulfuron, iodosulfuron-methyl, mesosulfuron-methyl, metsulfuron, triasulfuron
	Sulfonamides	Flumetsulam, metosulam
	Imidazolinones	Imazamox, imazapic, imazapyr, imazethapyr
C	Ureas	Diuron, linuron
	Triazines	Atrazine, cyanazine, simazine, terbutryn
	Triazinones	Metribuzin
	Nitriles	Bromoxynil
D	Dinitro-anilines	Oryzalin, pendimethalin, trifluralin
E	Thiocarbamates	Tri-allate
F	Nicotinanilides	Diflufenican, picolinafen
	Isoxazolidinones	Isoxaflutole
G	Diphenyl ethers	Oxyfluorfen
	Pyrimidinones	Butafenacil
	Triazolinones	Carfentrazone-ethyl
I	Benzoic acids	Dicamba
	Phenoxyalkanoic acids	2,4-D, 2,4-DB, MCPA
	Pyridine carboxylic acids	Clopyralid
K	Amides	Metolachlor
	Amino propionates	Flamprop-methyl
	Benzamides	Propyzamide
L	Bipyridyliums	Diquat, paraquat
M	Glycines	Glyphosate
N	Glycines	Glufosinate

Known resistant weeds in Australia

Weed species	MOA groups to which resistance has developed
Annual ryegrass	A, B, C, D, E*, K*, M
Barley grass	A, B, L
Brome grass	A
Capeweed	L
Fumitory (Dense Flower)	D
Indian hedge mustard	B
Paterson's curse	B
Prickly lettuce	B
Silvergrass	L
Sowthistle	B
Wild oat	A, B, K
Wild radish	B, C, F, I
Wild turnip	B

* Resistance to these MOA groups has been detected in cross resistance testing - not in populations where field selection of resistance has occurred.

Figure 9-2. DAF Spray Charts. Page 2 of 7. Print A3 for best results.

Pasture topping options - label registrations

Herbicide	Trade name	Operation	Rate/ha	Withholding period	Notes - See label for additional critical comments
Diquat/paraquat 115/135 g/L	e.g. Spray.Seed®	Spray topping for control of grass seed set	**800 mL/ha**	GSF - 1 day (7 days horses) - remove stock from treated areas 3 days before slaughter	- Apply in a minimum of 50 L/ha water by boom spray. - Apply at end of growing season. Heavily graze paddocks during spring flush period to prevent early seed heads emerging. - Remove all stock about 3 weeks before end of growing season to allow seed heads to emerge evenly. - Set boom spray at a height to give double overlap spray pattern at the top of the pasture being sprayed.
		Hay freezing	**1.5 L/ha**	As above	- Hay freezing for maximum retention of protein for summer grazing.
Paraquat 250 g/L	e.g. Gramoxone® (alternative paraquat products are available which have this registration)	Spray topping Grasses generally (particularly Annual ryegrass)	**400 mL/ha**	GSF - 1 day (7 days horses) - remove stock from treated areas 3 days before slaughter	- Heavily graze paddocks during spring flush to encourage even head emergence. - Remove stock 2-3 weeks before anticipated maturity of target. - Delay spraying until last heads at the bottom of the plant have emerged and initial signs of haying off appear. - Set boom spray at a height to give double overlap spray pattern at the level of the seed heads.
		Spray topping Barley grass	**400 mL/ha**	As above	- Manage paddocks as above. Spray after head emergence when all seed heads are green and no sign of haying off.
		Spraytop - graze to destroy seed heads (Prevention of Annual ryegrass Toxicity (ARGT))	**400 mL/ha**	As above	- Grazing management as for spray topping. Remove stock 3-4 weeks before anticipated maturity date. - Spray must be applied within 10 days of first annual ryegrass seed heads emerging. - To ensure adequate control of toxin development, heavy continuous grazing is essential from 1 day after spraying until the pasture has completely hayed off. Regrowth after spraying must be eaten off to prevent new seed heads which could become toxic.
		Hay freezing	**800 mL/ha**	As above	- Graze paddocks as for spray topping. Remove stock 3-4 weeks before anticipated maturity. Apply prior to start of haying off regardless of grass species.
Glyphosate 450 g/L (isopropylamine salt) **	Numerous	Pasture topping for annual grass and Capeweed seed set reduction	Barley grass, Brome grass, Capeweed, Silvergrass: **240-360 mL/ha**; Annual ryegrass: **360 mL/ha**	Not required when used as directed	- Remove stock prior to treatment to allow even regrowth. - Apply to capeweed and annual ryegrass at flowering. For other grasses apply from head - milky dough stage. - Use high rate for dense infestations or where annual ryegrass is present. - Apply before signs of plants haying off. - Reduction in pasture legume population may occur. - DO NOT apply to clover or medic crops intended for seed or hay.

** NOTE: Glyphosate products come in many different concentrations of active ingredient and in different formulations. Follow directions and use rates specified on the label of the product being used.

Figure 9-2. DAF Spray Charts. Page 3 of 7. Print A3 for best results.

Pulse and canola crop-topping, pre-harvest desiccation and pre-harvest weed control registrations

Herbicide	Trade name	Operation	Crop	Rate/ha	Withholding period	Notes - See label for additional critical comments
Diquat 200 g/L	Reglone®	Pre-harvest crop desiccation	Chickpeas, Faba beans, Dry peas Lentils, Lupins	2 to 3 L/ha	GSF: 1 day Harvest: Lupins - NS Chickpeas, Lentils, Faba beans, - 2 days Dry peas - NRD	- Spray as soon as crop reaches full maturity. - Helps overcome slow and uneven ripening and harvest weed problems - Add Agral® at 200 mL/100 L or BS 1000® at 160 mL/100 L prepared spray.
		Pre-harvest crop desiccation	Canola	1.5 to 3.0 L/ha	GSF: 1 day Harvest: 4 days	- Spray when 70% of the pods are yellow and the seeds are browny/bluish and pliable. - Canola ripens unevenly and is prone to pod shatter and seed loss. - Direct harvest 4-7 days after spraying. - Add Agral® at 200 mL/100 L or BS 1000® at 160 mL/100 L.
Paraquat 250 g/L	e.g. Gramoxone® (Alternative paraquat products are available which also have this registration)	Crop topping to reduce Annual ryegrass seed set	Chickpeas, Faba beans, Field peas, Lentils, Lupins, Vetch	400 or 800 mL/ha	GSF: 1 day (7 days horses) - remove stock from treated areas 3 days before slaughter Harvest: 14 days	- Spray when the ryegrass is at the optimum stage, that is when the last ryegrass seed heads at the bottom of the plant have emerged and the majority are at or just past flowering (with anthers present or glumes open) but before haying off is evident. - Use of the higher rate in these crops is usually more reliable and gives a greater reduction in seed set. - Reduction in crop yield may occur especially if the crop is less advanced relative to the ryegrass, that is if crops have a majority of green immature pods. The higher rate may also result in higher yield losses. In practice crop yield losses in excess of 25% may occur. - Apply by ground boom only in 50-100 L/ha. - Spray with a calibrated boom spray designed to give double overlap at the level of the ryegrass seed heads. Pressures of 250-350 kPa and use of 110015 or 02 nozzles or equivalent will aid coverage.
Glyphosate **540 g/L**	Roundup PowerMAX®[1]	Crop topping to reduce viable seed set (Annual ryegrass)	Faba beans, Field peas	320-680 mL/ha	GSF: 7 days Harvest: 7 days	- Use lower rate if ryegrass is flowering and higher rate if ryegrass is at milky dough stage. - Application should be made at or after crop maturity. Application before this time may significantly reduce yields (in practice losses in excess of 25% can occur). - Apply when the average seed moisture content is below 30%. For Faba beans this is indicated by the pods going black, for Field peas by the pods going yellow. - DO NOT USE ON CROPS INTENDED FOR SEED OR SPROUTING
		To desiccate crop as a harvest aid and weed control (may reduce germination % of seed to unacceptable levels of crops intended for production)	Chickpeas, Faba beans, Field peas, Lentils	680 mL - 1.8 L/ha	GSF: 7 days Harvest: 7 days	- Apply by boom or by air. Use higher rates where crops or weeds are dense and where faster desiccation is required. Application should be made at or after crop maturity. - Chickpeas and Lentils - apply when physiologically mature and less than 15% green pods. - Field peas - apply when seeds turn yellow and average seed moisture content is below 30%. - Faba beans - apply when the pods turn black and average seed moisture content is below 30%.
Metsulfuron + Glyphosate **540 g/L**	Ally® +Roundup PowerMAX®[2]	Crop desiccant and knockdown weed control	Chickpeas	5 g + 0.5-1.1 L	GSF: 7 days Harvest: 7 days	- Apply when chickpeas physiologically mature with < 15% green pods - Use higher glyphosate rate when crops or weeds are dense and faster desiccation required.

[1,2] While there are alternative glyphosate and metsulfuron products available as far as we can determine they do not currently have these registrations on their labels for WA and as such cannot be used for this use. Registration changes occur frequently. Check the label of your specific product to see if a registration is in place for Western Australia.

Figure 9-2. DAF Spray Charts. Page 4 of 7. Print A3 for best results.

HERBICIDE OPTIONS FOR USE IN LEGUME PASTURES

Weeds	PRE-EMERGENCE			POST-EMERGENCE											
	IMAZETHAPYR 700 g/kg (Spinnaker®)	S-METOLACHLOR 960 g/L (Dual® Gold) Alternative concentration/s available	TRIFLURALIN 480 g/L Alternative concentration/s available	2,4-D AMINE 500 g/L (Spray/Graze) Alternative concentration/s available	2,4-DB 500 g/L (e.g. Buttress®) Alternative concentration/s available	ATRAZINE 500 g/L Alternative concentration/s available	BROMOXYNIL 200 g/L (e.g. Bromicide®)	BROMOXYNIL/DIFLUFENICAN 250/25 g/L (e.g. Jaguar®) Alternative concentration/s available See notes regarding rates	BUTROXYDIM/FLUAZIFOP 250/212 g/kg (Fusion®Super)	DICLOFOP-METHYL 375 g/L	DIFLUFENICAN 500 g/L (e.g. Brodal® Options)	DIFLUFENICAN/MCPA 25/250 g/L (e.g. Tigrex®) Alternative concentration/s available	DIQUAT 200 g/L (Reglone®)	DIURON 900 g/kg Alternative concentration/s available	FLUAZIFOP-P-BUTYL 128 g/L (Fusilade® Forte) Alternative concentration/s available
Herbicide Group	B	K	D	I	I	C	C	C/F	A/A	A	F	F/I	L	C	A
Annual ryegrass	70-140 g S	NRW	1.2-1.7 L			NRW			230-320 g	1.0 L				1.0-2.0 kg	820 mL Luc 0.82-1.24 L
Barley grass	70-140 g S		NRW						230-320 g				see label	1.0-2.0 kg	820 mL Luc 0.82-1.24 L
• Brome grass			NRW S						285-320 g				see label	NRW S	820 mL Luc 0.82-1.24 L
• Cape tulip				NRWA	see label										
Capeweed	NRWA S			0.75-1.0 L	2.1-3.2 L	NRW	1.4-2.0 L	500 mL-1.0 L			200 mL S	0.5-1.0 L	see notes	1.0-2.0 kg	
• Chickweed	NRWA							1.0 L S			NRWA S	1.0 L S		2.0 kg	
Corn gromwell (Ironweed, Sheepweed)							1.4-2.0 L	500-750 mL			200 mL S	1.0 L		NRW S	
•Cotula							NRWA	NRWA							
• Crassula								500 mL S			200 mL S	500-750 mL		NRW	
Dock (seedlings)				0.75-1.0 L	1.0-2.0 L			1.0 L S				1.0 L S		2.0 kg	
Doublegee (Spiny emex)	70-140 g S			0.75-1.0 L	2.1-3.2 L	NRW	2.0 L	500-750 mL				1.0 L S		1.0-2.0 kg	
• Erodium (Storksbill)	70-140 g			NRWA				500 mL S				1.0 L S	see notes	NRW	
• Fumitory			1.2-1.7 L	see label	see label		2.0 L S	0.75-1.0 L S				see label			
• Iceplant						Permit						1.0 L S		NRW	
• Lesser Canary grass			1.2-1.7 L						230-320 g						820 mL Luc NRW
• Mallows					Not common WA species			NRWA S			200 mL S	1.0 L S			
Mintweed (*Salvia reflexa*)	NRWA					1.1 kg		NRWA S							
• Mustards	70-140 g			0.75-1.0 L	1.0-2.0 L	NRW	2.0 L	0.5-1.0 L			100-200 mL	0.5-1.0 L		NRW	
Paterson's curse	70-140 g S			0.75-1.0 L	2.1-3.2 L		2.0 L S	500-750 mL			NRWA S	1.0 L S			
Peppercress							1.4-2.0 L	1.1 L				1.0 L S			
Prickly lettuce	NRWA S			NRW	2.1-3.2 L			1.0 L S			NRWA	0.5-1.0 L			
Saffron thistle				1.5 L	2.1-3.2 L		1.4-2.0 L	1.0 L				1.0 L S		1.0-2.0 kg	
Silvergrass (Vulpia)													see label		
Slender thistle				0.75-1.0 L	2.1-3.2 L									1.0-2.0 kg	
Sorrel (seedlings)				NRWA				1.0 L S			NRWA S	NRWA			
Sowthistle				0.75-1.0 L	2.1-3.2 L			1.0 L S				1.0 L S		1.0-2.0 kg	
Toad rush	70-140 g	200-250 mL						1.0 L S			NRWA S	1.0 L		NRW	
Volunteer canola	NRW not IT			NRW				500-750 mL				500 mL			
Volunteer cereals									230-320 g						820 mL Luc NRW
Volunteer field peas								750 mL S							
Volunteer lupins	NRW			NRWA				0.5-1.0 L S				1.0 L S			
Wild oat	70-140 g S		1.2-1.7 L S						230-320 g	1.5-2.0 L				NRWA	820 mL Luc 0.82-1.24 L
Wild radish	70-140 g S			0.75-1.0 L	NRWA S	NRW	2.0 L	350 mL-1.0 L			100-200 mL	0.25-1.0 L		NRWA	
Wild turnip				0.75-1.0 L	1.0-2.0 L	NRW	2.0 L	500-750 mL			100-200 mL	0.5-1.0 L		NRWA	
Wireweed	70-140 g S		1.2-1.7 L	NRW	2.1-3.2 L	NRW	2.0 L S	1.0 L			NRWA S	750 mL S		2.0 kg	
Yellow burrweed	NRWA S		NRW				1.4-2.0 L	750 mL			NRWA S			NRW	
Lucerne 1st Year	X	NRC	IBS SCO	NRC	see label	X	1 leaf +	3-8 leaf	PO	SCO	NRC	NRC	NRC	X	> 2-3 leaf
Lucerne Established	after C/G	NRC	IBS SCO	NRC	see label	PO	< 150 mm regrowth	PO	PO	SCO	NRC	NRC	see label	see notes	PO
Medic	NRC	NRC	IBS SCO	NRC	3-8 leaf	NRC	see label	see label	PO	SCO	NRC	NRC	NRC	NRC	PO
Sub Clover	NRC	IPP	IBS SCO	see label	3-8 leaf	NRC	1 leaf +	3-8 leaf	PO	SCO	> 3 leaf	3-8 leaf	NRC	NRC	PO
Serradella	see label	NRC	NRC	NRC	NRC	NRC	NRC	NRC	NRC	SCO	NRC	NRC	NRC	NRC	NRC
Weed Stage	PE	PE	PE	see label	2-6 leaf	5-8 cm	to 6 leaf	see label cot-8 leaf	2 leaf-ET	2-4 leaf	2-6 leaf see label	2-6 leaf see label	see label	PE - seedling	5 leaf - ET
Wetting agent (WA)/Oil	NN	NN	NN	NN	see label	NN	NN	NR	Oil required	WA	NR	NR	WA	NN	NN
Formulation	WG	EC	EC	AC	AC	tank mix	EC	EC	EC	EC	SC	EC	AC	WG	EC
Rainfastness	2 hours	NS	NS	6 hours	4 hours	NS	3 hours	4 hours	1 hour	2 hours	4 hours	4 hours	NS	NS	1 hour
Aerial application	Yes	No	No	Yes	No	No	Yes	NR	Yes	Yes	NS	Not WA	Yes	No	Yes
Withholding Period- GSF	14 days	13 weeks	NRD	7 days	7 days	NRD	14 days	14 days	21 days	7 weeks	14 days	7 days	1 day	NRD	21 days

Weeds	POST-EMERGENCE														
	FLUMETSULAM 800 g/kg (Broadstrike®)	HALOXYFOP 520 g/L (e.g. Verdict® 520) Alternative concentration/s available	IMAZAMOX 700 g/kg (Raptor®)	IMAZETHAPYR 700 g/kg (Spinnaker®)	MCPA AMINE 500 g/L (Spray/graze)	PARAQUAT (e.g. Gramoxone®) 250 g/L (Autumn/early winter)	PARAQUAT (e.g. Gramoxone®) 250 g/L (Late winter/early spring)	PARAQUAT/DIQUAT 135/115 g/L (e.g. Spray.Seed®)	PROPAQUIZAFOP 100 g/L (e.g. Correct®)	PROPYZAMIDE 500 g/L (e.g. Kerb®)	QUIZALOFOP-P-ETHYL 99.5 g/L (e.g. Targa®) Alternative concentration/s available	SETHOXYDIM 186 g/L (Sertin®)	SIMAZINE 500 g/L Alternative concentration/s available	TEPRALOXYDIM 200 g/L (Aramo®)	TERBUTRYN/MCPA 275/160 g/L (e.g. Agtryne® MA)
Herbicide Group	B	A	B	B	I	L	L	L/L	A	K	A	A	C	A	C/I
Annual ryegrass		75-100 mL + oil 100 mL + WA				Sub 0.6-1.6 L Luc 1.2-1.6 L	Luc 1.6-2.4 L	1.6-2.4 L	300-450 mL	1.0-1.5 L	300 or 375 mL	0.5-1.0 L		175-300 mL	
Barley grass		50-75 mL + oil 75-100 mL + WA	45 g			Sub 0.6-1.6 L Luc 1.2-1.6 L	Luc 1.6-2.4 L	1.6-2.4 L	200 mL	1.0-1.5 L	250 mL	see label		175-250 mL	
• Brome grass		50-75 mL + oil 75-100 mL + WA	45 g			Sub 0.6-1.6 L Luc 1.2-1.6 L	Luc 1.6-2.4 L	1.6-2.4 L	300 mL	1.0-1.5 L	300 or 375 mL	see label		175-250 mL	
• Cape tulip					see label										
Capeweed	25 g + D see label				0.35-1.4 L	see label	see label	1.6-2.4 L							1.0-1.5 L
• Chickweed	NRWA S		NRW					1.6-2.4 L		1.5-2.0 L					
Corn gromwell (Ironweed, Sheepweed)								1.6-2.4 L							NRW
•Cotula	25 g					**	**								
• Crassula						**	**								1.0-1.5 L
Dock (seedlings)					0.35-1.4 L										
Doublegee (Spiny emex)	25 g + D		45 g S	see notes		**	**	1.6-2.4 L							NRW
• Erodium (Storksbill)		50-100 mL + oil	45 g		NRWA	see label	see label	1.6-2.4 L							1.0-1.5 L
• Fumitory	NRWA S				see label	**	**	1.6-2.4 L							
• Iceplant															
• Lesser Canary grass						Sub 0.6-1.6 L Luc 1.2-1.6 L	Luc 1.6-2.4 L	1.6-2.4 L		1.0-1.5 L		1.0 L			
• Mallows	25 g see label					**	**	1.6-2.4 L							
Mintweed (*Salvia reflexa*)															
• Mustards	25 g		45 g	70-140 g	0.35-1.4 L	**	**	1.6-2.4 L							NRW
Paterson's curse	25 g S				0.35-1.4 L			1.6-2.4 L		1.5-2.0 L					300-500 mL or 1.0-1.5 L
Peppercress	25 g														
Prickly lettuce															
Saffron thistle					NRWA										NRW
Silvergrass (Vulpia)			50 g see label			Sub 0.6-1.6 L Luc 1.2-1.6 L	Luc 1.6-2.4 L	1.6-2.4 L		1.0-1.5 L			0.75-1.0 L		
Slender thistle					NRWA										
Sorrel (seedlings)										1.5-2.0 L					
Sowthistle					NRWA										
Toad rush				70-140 g		**	**	1.6-2.4 L							1.0-1.5 L
Volunteer canola	25 g (Not IT)				NRWA	**	**	1.6-2.4 L							
Volunteer cereals		50-75 mL + oil 75-100 mL + WA	45 g			Sub 0.6-1.6 L Luc 1.2-1.6 L	Luc 1.6-2.4 L	1.6-2.4 L	200 mL B, O, W 250 mL Tr	NRW	250 mL B, W	1.0 L W, O		175-250 mL	
Volunteer field peas								1.6-2.4 L							
Volunteer lupins	10-25 g		45 g		see label	**	**	1.6-2.4 L							
Wild oat		37.5-50 mL + oil 50-75 mL + WA	45 g			Sub 0.6-1.6 L Luc 1.2-1.6 L	Luc 1.6-2.4 L	1.6-2.4 L	250 mL	1.5-2.0 L	125 or 250 mL	1.0 L		175-250 mL	
Wild radish	25 g S		45 g S		0.35-1.4 L			1.6-2.4 L							
Wild turnip	25 g		45 g		0.35-1.4 L			1.6-2.4 L							NRW
Wireweed	see label		45 g S	70-140 g S				1.6-2.4 L		1.5-2.0 L					NRW
Yellow burrweed	25 g														NRW
Lucerne 1st Year	> 2-3 leaf	> 2 leaf	3 leaf - pre fl	2 leaf +	NRC	X	X	X	PO	3 leaf +	PO	PO	NRC	NRC	NRC
Lucerne Established	PO	> 2 leaf	pre fl	after C/G	NRC	> 12 month	> 12 month	2-4 cm see notes	PO	pre July 31	PO	PO	see label	NRC	NRC
Medic	> 2-3 leaf	> 2 leaf	3 leaf - pre fl see notes	NRC	NRC	NRC	NRC	NRC	PO	3 leaf +	PO	PO	NRC	NRC	NRC
Sub Clover	> 2-3 leaf	> 2 leaf	3 leaf - pre fl	see label	4 leaf - pre fl	> 6 leaf	NRWA	> 6 leaf **see notes**	PO	3 leaf +	PO	PO	3 leaf < 8 wks post sow	SCO	3 leaf +
Serradella	> 3 leaf	NRC	3 leaf - pre fl	2 leaf +	NRC	NRC	NRC	NRC	PO	see label	NRC	NRC	NRC	NRC	NRC
Weed Stage	< 10 cm see label	2 leaf-ET	Gr < 2 T Bl cot-3 leaf	cot-3 leaf	cot-5 cm see label	young	young	< 10 cm	3 leaf-MT	PE-PO see label	3 leaf-ET/MT	2-6 leaf/T	2 leaf-T Gr	2 leaf-FT	see label
Wetting agent (WA)/Oil	see label	see label	WA see label	WA	NN	see label	see label	see label	WA or veg oil	see label	WA &/or Oil	Oil required	NR	Oil	NN
Formulation	WG	EC	WG	WG	AC	AC	AC	AC	EC	SC	EC	EC	SC	EC	SC
Rainfastness	4 hours	1 hour	2 hours	2 hours	6 hours	1 hour	1 hour	1 hour	1 hour	NS	3 hours	2 hours	NS	1 hour	6 hours
Aerial application	Yes	Yes	No	No	Yes	No	No	No	Yes	NS	NS	Yes	No	No	Yes
Withholding Period- GSF	3 days	Luc 21 days Sub/Med 7 days	7 days	14 days	7 days	1 day (horses 7 days)	1 day (horses 7 days)	1 day (horses 7 days)	3 days	25 days	Luc 28 days Sub/Med 14 days	14 days	grazing 14 days cutting 21 days	4 weeks	7 days

Code	Definition
•	Check label for species controlled
**	Label states 'will provide control of some small broad-leaved weeds'
AC	Aqueous concentrate
After C/G	After cutting and/or grazing
B	Barley
Bl	Broad-leaved weeds
cot	Cotyledon
D	Diuron
DNG	Do not graze
EC	Emulsifiable concentrate
ET	Early tillering
fl	Flowering
FT	Full tillering
Gr	Grass weeds
GSF	Withholding period for grazing or cutting for stock food
IBS	Incorporated by sowing
IPP	Immediately post planting
Luc	Lucerne
Med	Medics
MT	Mid tillering
NN	Not necessary
Not IT	Inadequate control of imidazolinone tolerant canola
NR	Not recommended
NRC	Not registered for use in this crop (pasture)
NRD	Withholding period not required when used as directed
NRW	Not registered for this weed in these crops (pastures)
NRWA	No registration for this pattern of use in WA
NS	Not stated
O	Oat
Oil	Spray oil
PE	Pre-emergence
Per/Permit	Use permitted under APVMA permit
PO	Post-emergence
Pre fl	Pre flowering
Pre S	Pre sowing
PSPE	Post sowing pre-emergence
S	Suppression only of this weed
SC	Suspension concentrate
SCO	Seed crops only
see label	Refer to label for clarification on tank mixes, growth stages, adjuvants etc.
Sub	Sub. clover
Tr	Triticale
T	Tiller/s, tillering
veg oil	Vegetable based spray oil
W	Wheat
WA	Wetting agent
WG	Water dispersible granule
WP	Wettable powder
X	DO NOT USE on first year lucerne

Note: The use of brand, trade and proprietary names has been done solely for the purpose of assisting users in identifying products.
It does not imply a preferred recommendation. Alternative products with the same active ingredient as products specified on this chart may perform as well or better than those specified products.

Pasture tolerances
Exact values for species/variety tolerance are difficult to determine as variations can occur due to stage of pasture growth, variety or environmental conditions. Follow label directions. Seek advice from your chemical manufacturer, Department of Agriculture or local agronomist on individual species/variety tolerance.

POISON'S EMERGENCY INFORMATION CENTRE 13 11 26

Herbicide resistance to this mode of action sub group is confirmed in Australian populations of this weed.

Herbicide resistance has been confirmed in Australian populations of this weed species to one or more MOA components of this herbicide mixture.

Herbicide resistance is expected based on other data.

ALWAYS READ THE LABEL OF THE PRODUCT YOU ARE ABOUT TO USE

- **Product registrations may vary between seasons.**
- There may be variation in rates, registered uses and/or withholding periods between labels of individual products containing the same active ingredient
- **Always check the label to ensure compliance with the registrations of the specific product being used.**

Figure 9-2. DAF Spray Charts. Page 5 of 7. Print A3 for best results.

HERBICIDE OPTIONS FOR WEED CONTROL IN PULSE CROPS

PRE CROP EMERGENCE HERBICIDE OPTIONS

Weeds	ATRAZINE + SIMAZINE 500+500 g/L (Alternative concentration/s available)	CARFENTRAZONE-EHTYL 240 g/L (Hammer®)	CYANAZINE 900 g/kg (Bladex®) (Alternative concentration/s available)	DIURON 900 g/kg (Alternative concentration/s available)	DIURON + TRIFLURALIN 500 g/L + 480 g/L respectively (Alternative concentration/s available)	IMAZETHAPYR 700 g/kg (Spinnaker®)	ISOXAFLUTOLE 750 g/kg (Balance®)	METRIBUZIN 750 g/kg (e.g. Lexone®) (Alternative concentration/s available)	PENDIMETHALIN 330 g/L (Alternative concentration/s available)	SIMAZINE 500 g/L (Alternative concentration/s available)	SIMAZINE + TRIFLURALIN 500 g/L + 480 g/L respectively (Alternative concentration/s available)	TRI-ALLATE 500 g/L (e.g. Avadex® Xtra) (Alternative concentration/s available)	TRIFLURALIN 480 g/L (Alternative concentration/s available)
Herbicide Group	C+C	G	C	C	C+D	B	F	C	D	C	C+D	E	D
Annual ryegrass	0.5-1.0 L + 0.5-1.0 L Sim S		1.1 kg	Lu 1.1 kg S Fp 835 g-1.2 kg	2.0 L + 1.25 L trif S	70 g S		180-380 g S see label	2.0-3.0 L see label	see notes	see notes	see notes	1.2-1.7 L
Barley grass	0.5-1.0 L + 0.5-1.0 L Sim S		1.1 kg S	Fp 835 g-1.2 kg		70 g S		see label		see notes	see notes		
• Brome grass	0.5-1.0 L + 0.5-1.0 L Sim S		1.1 kg S	Lu 1.1 kg S Fp 835 g-1.2 kg				180-380 g		see notes	see notes		1.7 L S
Capeweed	0.5-1.0 L + 0.5-1.0 L Sim	25-75 mL + kdown	1.1 kg	Lu 1.1 kg Fp 835 g-1.2 kg		NRWA S	100 g	180-380 g S see label		see notes	see notes		
• Clovers	0.5-1.0 L + 0.5-1.0 L Sim	25-75 mL + kdown		Lu 1.1 kg				180-380 g S		see notes	see notes		
Dock (seedling)	NRW			Lu 1.1 kg S				180-380 g		see notes	see notes		
Doublegee (Spiny emex)	0.5-1.0 L + 0.5-1.0 L Sim	25-75 mL + kdown	1.1 kg	Lu 1.1 kg Fp 835 g-1.2 kg	2.0 L + 1.25 L trif	70 g S	see label	180-380 g		see notes	see notes		
• Erodium	NRW	25-75 mL + kdown	NRWA			70 g		180-380 g		NRW	see notes		
• Fumitory	25-75 mL + kdown		1.1 kg S					180-380 g		see notes	see notes		1.2-1.7 L
• Lesser canary grass												see notes	1.2-1.7 L
Mallows		25-75 mL + kdown											
• Mustards	0.5-1.0 L + 0.5-1.0 L Sim		1.1 kg	Fp 835 g-1.2 kg		70 g	100 g	180-380 g		see notes	see notes		
Silver grass (Vulpia)	0.5-1.0 L + 0.5-1.0 L Sim						see label	NRW	2.0-3.0 L S see label	see notes	see notes		
Sorrel (seedling)				Lu 1.1 kg S						see label			
Soursob				NRW						see label	see notes		
Volunteer canola	NRW not TT					NRW not IT				see notes not TT			
Volunteer cereals	0.5-1.0 L + 0.5-1.0 L Sim S									see notes			
Volunteer lupins						NRW							
Wild oat	0.5-1.0 L + 0.5-1.0 L Sim S			Lu 1.1 kg S Fp 835 g-1.2 kg	2.0 L + 1.25 L trif S	70 g S		NRWA	2.0-3.0 L S	see notes	see notes	1.6 L	1.2-1.7 L S
Wild radish	0.5-1.0 L + 0.5-1.0 L Sim	25-75 mL + kdown	1.1 kg S	Lu 1.1 kg Fp 835 g-1.2 kg	2.0 L + 1.25 L trif	70 g S	100 g	180-380 g		see notes	see notes		
Wild turnip (Mediterranean turnip)	0.5-1.0 L + 0.5-1.0 L Sim		1.1 kg	Lu 1.1 kg Fp 835 g-1.2 kg	2.0 L + 1.25 L trif	NRW		180-380 g		see notes	see notes		
Wireweed	0.5-1.0 L + 0.5-1.0 L Sim		1.1 kg S	Lu 1.1 kg S		70 g S	see label	180-380 g S	2.0-3.0 L see label	see notes	see notes	see notes	1.2-1.7 L
Narrow leaved lupins	Pre S; PSPE	Pre S	NRC	Pre S; PSPE	IBS	NRC	NRC	NRC	IBS	Pre S; PSPE	IBS	IBS	IBS
Field peas	NRC	Pre S	Pre S; 3-5 node	Pre S; PSPE see notes	NRC	PSPE	NRC	PSPE; 3 node Permit	IBS	NRC	NRC	IBS	IBS
Chickpeas	NRC	Pre S	Pre S	NRC	NRC	NRWA	PSPE	PSPE	IBS	Pre S; PSPE	IBS	IBS	see label
Faba beans	NRC	Pre S	Pre S	NRC	NRC	PSPE	NRC	PSPE	IBS	Pre S; PSPE	IBS	IBS	see label
Lentils	NRC	Pre S	Pre S	NRC	NRC	NRC	NRC	PSPE	NRC	NRC	NRC	NRC	NRWA
Vetches	NRC	Pre S	NRWA	NRC	NRC	NRC	NRC	PSPE	NRC	NRC	NRC	NRC	IBS
Weed Stage	PE	< 6-8 leaf	PE-3 cm	PE-seedling	PE	PE	PE	PE-4 leaf	PE	PE	PE	PE	PE
Wetter(WA)/Oil	NN	see label	NR	NN	NN	NN	NR	NR	NN	NN	NN	NN	NN
Formulation	tank mix	EC	WG	WG	tank mix	WG	WG	DF/WG	EC	SC	tank mix	EC	EC
Rainfastness	NS	1 hour see notes	NS	NS	NS	2 hours	NS	NS	NS	NS	NS	NS	NS
Aerial application	No	No	No	No	No	Yes	No	see label	No	No	No	NS	No
Withholding period	H & GSF see labels	H NRD GSF 14 days	H & GSF NRD	H & GSF NRD	H & GSF NRD	H NRD GSF 14 days	H NRD GSF 4 wks	H NRD GSF-0 or 14 days see label	H & GSF NRD	H NRD GSF Ck 9 wks GSF Fb 8 wks	H NRD GSF Ck 9 wks GSF Fb 8 wks	NRD	H & GSF NRD

POST CROP EMERGENCE HERBICIDE OPTIONS

Weeds	BUTROXYDIM/FLUAZIFOP-P 250/212 g/L (Fusion® Super)	CLETHODIM 240 g/L (Select®)	CLETHODIM/HALOXYFOP 200/48 g/L (Motsa®)	CYANAZINE 900 g/kg (Bladex®) (Alternative concentration/s available)	DICLOFOP-METHYL 375 g/L (Alternative concentration/s available)	DIFLUFENICAN 500 g/L (e.g. Brodal® Options)	DIFLUFENICAN + METRIBUZIN 500 g/L + 750 g/kg respectively (Alternative concentration/s available)	FLUAZIFOP-P 128 g/L (Fusilade® Forte) (Alternative concentration/s available)	FLUMETSULAM 800 g/kg (Broadstrike®)	HALOXYFOP 520 g/L (e.g. Verdict® 520) (Alternative concentration/s available)	IMAZAMOX 700 g/kg (Raptor®)	METOSULAM 714 g/L (Eclipse®)	PICOLINAFEN 750 g/kg (Sniper®)	PROPAQUIZAFOP 100 g/L (e.g. Correct®)	QUIZALOFOP-P-ETHYL 99.5 g/L (e.g. Targa®) (Alternative concentration/s available)	SETHOXYDIM 186 g/L (Sertin®)	SIMAZINE "top up" 500 g/L (Alternative concentration/s available)	TEPRALOXYDIM 200 g/L (Aramo®)
Herbicide Group	A/A	A	A/A	C	A	F	F+C	A	B	A	B	B	F	A	A	A	C	A
Annual ryegrass	230-320 g	150-250 mL	200-300 mL	0.55-1.1 kg	1.0 L			410-820 mL see label		75-100 mL Oil 100 mL WA				300-450 mL see label	300 or 375 mL	0.5-1.0 L	0.75-2.0 L S	175-300 mL
Barley grass	230-320 g	175-250 mL	150-200 mL	0.55-1.1 kg S				410-820 mL see label		50-75 mL Oil 75-100 mL WA	45 g			200 mL see label	250 mL	see label	0.75-2.0 L S	175-250 mL
• Brome grass	285-320 g	175-250 mL	150-200 mL	0.55-1.1 kg S				410-820 mL see label		50-75 mL Oil 75-100 mL WA	45 g			300 mL see label	300 or 375 mL	see label	0.75-2.0 L S	175-250 mL
Capeweed				0.55-1.1 kg		200 mL S	100 mL + 100-150 g Mbz S		25 g S			NRW	50 g S				0.75-2.0 L	
• Clovers												NRW						
Dock (seedling)																	0.75-2.0 L	
Doublegee (Spiny emex)				0.55-1.1 kg			100 mL + 100-150 g Mbz S		25 g S		45 g S	NRW					0.75-2.0 L	
• Erodium				NRWA						NRW	45 g							
• Fumitory				0.55-1.1 kg S														
• Lesser canary grass	230-320 g	150-250 mL	150-200 mL					410-820 mL		NRW						1.0 L		
Mallows						200 mL S	NRW		NRW S									
• Mustards				0.55-1.1 kg		100-200 mL	NRW		NRWA		45 g	NRW					0.75-2.0 L	
Silver grass (Vulpia)											NRW						0.75-2.0 L	
Sorrel (seedling)						NRWA S												
Soursob																		
Volunteer canola									NRW not IT		NRW not IT	NRW not IT						
Volunteer cereals	230-320 g	175-250 mL W,O 250 mL B	150-200 mL					410-820 mL see label		50-75 mL Oil 75-100 mL WA	45 g			200 mL W,O,B 250 mL Tr	250 mL W, B	1.0 L W, O see label	0.75-2.0 L	175-250 mL
Volunteer lupins									25 g		45 g							
Wild oat	230-320 g	175-250 mL	150-200 mL		1.5-2.0 L			410-820 mL see label		37.5-50 mL Oil 50-75 mL WA	45 g			250 mL see label	125 or 250 mL see label	1.0 L	0.75-2.0 L S	175-250 mL
Wild radish				0.55-1.1 kg S		100-200 mL	100 mL + 100-150 g Mbz		25 g S		45 g S	7-10 g	33-50 g				0.75-2.0 L	
Wild turnip (Mediterranean turnip)				0.55-1.1 kg		100-200 mL	NRW		25 g		45 g	NRW					0.75-2.0 L	
Wireweed				0.55-1.1 kg S		NRWA S					45 g S							
Narrow leaved lupins	PO	PO-80% flower	PO-flower	NRC	PO	2-6 leaf see notes	> 3 leaf see label	PO	NRC	2 leaf-pre fl	NRC	8 leaf-flower bud	2-6 leaf	PO	PO	PO-pre fl	PO see notes	PO
Field peas	PO	PO-full flower	PO-flower	Pre S; 3-5 node	PO	3 node-pre fl	NRC	PO	2-6 nodes	2 node-pre fl	PO-4 node	NRC	3 node-pre fl	PO	PO	PO-pre fl	NRC	PO
Chickpeas	PO	PO-full flower	PO-flower	NRC	NRC	NRC	NRC	PO	4-6 branch	2 leaf-pre fl	NRC	NRC	NRC	PO	PO	PO-pre fl	NRC	PO
Faba beans	PO	PO-full flower	PO-flower	NRC	NRC	NRC	NRC	PO	NRC	2 leaf +	3-6 node Per	NRC	NRC	PO	PO	PO-pre fl	NRC	PO
Lentils	PO	PO-2 node	PO-7 node	NRC	NRC	3 leaf-pre fl	NRC	NRC	4-8 leaf	2 node-pre fl	NRC	NRC	NRC	PO	PO	PO-pre fl	NRC	PO
Vetches	PO	NRC	NRC	NRC	NRC	NRC	NRC	PO	NRC	2 node-pre fl	NRC	NRC	NRC	PO	PO	NRC	NRC	PO
Weed Stage	2 leaf-ET	2 leaf-FT	2 leaf-ET	PE-3 cm	2-4 leaf	2-6 leaf	to 25 cm	2 leaf-ET	< 5 cm	2 leaf-ET	Gr < 2 T Bl cot-3 leaf	< 8 leaf; < 20 cm	2-8 leaf	3 leaf-MT	3 leaf-ET/MT	2-6 leaf/T	2 leaf-T Gr < 10 cm Bl	2 leaf-FT
Wetter(WA)/Oil	Oil required	Oil see notes	Oil see notes	NR	WA	NR see notes	NR	NN	NR	see notes	WA	NR	NR	WA see label	WA & or Oil	Oil required	NN	Oil
Formulation	EW	EC	EC	WG	EC	SC	Tank mix	EC	WG	EC	WG	WG	WG	EC	EC	EC	SC	EC
Rainfastness	1 hour	1 hour	1 hour	8 hours	2 hours	4 hours	4 hours	1 hour	4 hours	1 hour	2 hours	2 hours	4 hours	1 hour	3 hours	2 hours	NS	1 hour
Aerial application	Yes	Yes	Yes	No	Yes	NS	No	Yes	Yes	Yes	No	see label	No	Yes	NS	Yes	No	No
Withholding period	see notes	H NRD GSF 21 days	H NRD GSF 8 wks	GSF & H NRD	H NRD GSF 7 wks	H NRD GSF 14 days	H NRD GSF 14 days	see label GSF 3-7 wks H 5-17 wks	H NRD GSF 4 wks	H NRD GSF 28 days	H NRD GSF 6 wks	H NRD GSF 4 wks	H NRD GSF Lu 6 wks GSF Fp 4 wks	see label H 7-15 wks	see label H 6-12 wks GSF 28 days	H NRD GSF 21 days	H NRD GSF see label	H 12 wks GSF 4 wks

Notes:

Do not use on whitish or grey sands. Apply maximum of 750 mL/ha atrazine + 750 mL/ha simazine on yellow sands. **DO NOT** apply atrazine post emergence to lupins - it will kill them. Sufficient rainfall to wet the soil through to the root zone necessary within 2-3 weeks of application.

CAUTION: Emerged grain legumes are extremely sensitive to Hammer®. Ensure boom cleaned thoroughly as per label instructions prior to post-emergent spraying. Addition to knockdown improves speed at which visual symptoms develop. Do not sow for one hour after application. Use low rates for small weeds in good growing conditions. Use high rates for older weeds that may have grown in less than optimal conditions. Temporary crop damage (yellowing) may occur where applied to crops grown on sand over clay (duplex soils). Do not apply to soils with high sand or gravel content. For peas, pre-sowing applications preferred to post emergent application, check label. If mixing with glyphosate add ammonium sulphate 2% w/v.

Peas: Do not use on sandy soils. Use lower rate pre-sowing in low rainfall wheatbelt and use higher rate immediately after sowing in Great Southern area. Weak on grasses. Tank mix with trifluralin where annual ryegrass is expected. [Apply to lupins on light soils only]. Do not use on white or grey sands. Apply in minimum 50 L water/ha.

Will provide better control of annual ryegrass than diuron alone.

Spinnaker® may not kill weeds, however severe weed stunting will eliminate competition. Do not apply after end of June in low rainfall areas.

Ensure applied after furrow closure, direct contact of herbicide with seed may cause crop injury. A minimum spray volume 50 L/ha recommended. Refer to label for plant back periods for other crops and minimum post application rainfall requirements.

Use lower rates on sands and highest rates on very heavy soils. Plant crop at least 5 cm deep. Best results when rain follows within a few days of spraying. Note: Use in peas permitted under permit. Note: Can be applied as an early post-emergent option in field peas only when the crop is at the 3 node stage. Post emergent application to other pulse crops will result in crop damage.

Incorporate by sowing within 24 hours of application. Attempting to incorporate when soils are very wet or very dry may result in insufficient mixing and therefore poor weed control.

Rates - Chickpeas 1.0-2.0 L/ha; Faba beans 2.0-2.5 L/ha; Lupins 1.0-2.0 L/ha on light soils; 2.0-3.0 L/ha on gravelly loam soils. Add trifluralin if annual ryegrass or wild oats are expected.

Rates - Chickpeas 2.0 L/ha Sim + 1.25-1.7 L/ha trifluralin; Faba beans 1.0-1.5 L/ha Sim + 800 mL/ha of trifluralin; Lupins 1.0-2.0 L/ha Sim + 1.25 L/ha of trifluralin. For lupins maximum 1.5 L/ha simazine on yellow sands. Application should not be made to ridged or excessively cloddy soil.

Apply up to 3 weeks before to immediately before sowing. Incorporate immediately on wet soil, on dry soil, may be left for up to 24 hours. Plant 5 cm deep. Tank mix with trifluralin if annual ryegrass, annual phalaris or wireweed present or for enhanced control of wild oats emerging from top 1 cm.

Incorporate by seeding within 4 hours of application. Use lower rates on sandy soils. Use higher rate for heavy stubble cover. Stubble cover above 40-50% can reduce weed control achieved. Check rate for each crop species.

Always apply with Supercharge® at 1 L/100 L, or D-C-Trate® at 2 L/100 L of spray solution. Do not apply in less than 50 L/ha water. Use lower rates for young weeds growing in ideal conditions, higher rates for weeds that are predominantly at early tillering in dense populations or growing in less than ideal conditions. Fb GSF&H 5 wks; Ck/Fp GSF&H 7 wks; Lu GSF 3 wks H 4 wks.

See label for specific details on crop growth stage. Use lower rates for small weeds in good growing conditions. Always apply with D-C-Trate® at 2 L/100 L; Hasten® or Kwickin® at 1 L/100 L volume; Uptake® at 500 mL/100 L spray volume. The addition of Liase® at 2% may improve control if application conditions are not ideal.

The lower doses will provide effective control if applied under ideal conditions to weeds that are smaller, actively growing and free from stress. Always apply with Hasten®, Kwickin® or Uptake® at 1 L/100 L of spray volume.

Use the higher rate where large weeds are present. Post emergence application to chickpeas, faba beans and lentils will result in crop damage.

Wetter essential unless not recommended for tank mixes. Check label for tank mix recommendations. 500 g/L formulations not registered in pulses.

150 mL/ha is the preferred rate when the first weeds are at the 4 leaf stage. Increase rates for older and larger weeds or for dense weed infestations. Do not add oil. Apply when weeds are actively growing. Best 4-6 weeks after sowing. Brodal® Options lupin growth stage 2 leaf - before start of primary flowering (Big Bud).

Crop damage (leaf burn) may occur if crop is stressed, e.g. by brown leaf spot or is still adversely affected by simazine. Not recommended where more than 2.5 L of simazine used before seeding. Do not apply with wetting agents, crop oils or grass selectives. Crop damage more common south of Great Eastern Highway. Do not apply to Myallie lupins if atrazine has been applied pre-emergence.

See label for maximum rate information for different pulse crops. Apply at lowest rate only if weeds not tillering and before 5 leaves present. Use higher rate once tillering started.

Do not apply to crops suffering from any other herbicide treatment. Lupins controlled at 25 g. Do not add oils and wetters.

Note: Latest crop growth stage for application varies between products - check label. Check label for tank mixing with post emergence broadleaf herbicides. Use non-ionic wetting agent where tank mixing. Increase rates when grasses more than 4 leaf stage. See label for specific adjuvant recommendations. Broadleaf herbicides should not be mixed with this product. Spray at least one week apart.

Do not use adjuvants other than BS 1000® or equivalent at 200 mL per 100 L water. Do not roll field peas after germination if use of Raptor® is planned. Controls lupins at 45 g. Faba bean registration on permit. Do not apply if frost is forecast.

Use only on healthy crops. A slight yellowing often accompanied by height reduction may be noticeable from 1-4 weeks after application. Do not use oils or wetters. Use higher rate when large wild radish populations or crop competition is poor.

Use lower rate on 2-4 leaf radish. Use higher rate at 4-6 leaf radish. To achieve effective control of 6-8 leaf radish good spray coverage of weeds is essential, majority of plants must be 2-6 leaf. Peas grown on high pH soils in the presence of free lime may be less tolerant.

Do not use crop oils. For best control wait until 75% of annual ryegrass have begun tillering. Can be tank mixed for broad spectrum of grass weeds. See label for details.

Use higher rate under high weed burden and/or when weeds are tillering. See label for specific adjuvant details.

See label for adjuvant requirements. Use 500 mL rate for annual ryegrass prior to tillering. See label for grass selective mixtures to improve control of brome, barley grass, wild oats and self sown cereals. Do not allow spray mix to sit overnight. See label for clarification of latest crop growth stages.

Apply within 4 weeks of sowing. To be used in conjunction with pre-emergent application of simazine. Do not apply to lupins showing signs of damage from pre-emergent application.

Always apply Hasten® or Kwickin® at 1 L/100 L spray volume or similar adjuvant see label compatibility section. The lower doses will only provide effective control if applied under ideal conditions to susceptible weeds that are smaller, actively growing and free from temperature or moisture stress.

• Check label for species controlled

STOP ALWAYS READ THE LABEL OF THE PRODUCT YOU ARE ABOUT TO USE AND FOLLOW THE DIRECTIONS ON THE LABEL

Figure 9-2. DAF Spray Charts. Page 6 of 7. Print A3 for best results.

HERBICIDE OPTIONS FOR WEED CONTROL IN CANOLA CROPS

PRE CROP EMERGENCE HERBICIDE OPTIONS

Weeds	ATRAZINE 500 g/L Only for TT varieties. Alternative concentration/s available	SIMAZINE 500 g/L Only for TT varieties. Alternative concentration/s available	CARFENTRAZONE-EHTYL 240 g/L (Hammer®)	s-METOLACHLOR 960 g/L (Dual®Gold) Alternative concentration/s available	ORYZALIN/TRIFLURALIN 125/125 g/L (e.g. Duet®/Yield®)	PENDIMETHALIN 330 g/L Alternative concentration/s available	TRI-ALLATE 500 g/L (e.g. Avadex®Xtra) Alternative concentration/s available	TRIFLURALIN 480 g/L Alternative concentration/s available
Herbicide Group	C	C	G	K	D/D	D	E	D
Annual ryegrass	2.0-4.0 L S	2.0-4.0 L S		NRW	1.6 or 2.3 L	1.8-3.0 L	NRW see notes	1.2-1.7 L
Barley grass	2.0-4.0 L S	2.0-4.0 L S						
• Brome grass	2.0-4.0 L S	2.0-4.0 L S						
Capeweed	2.0-4.0 L	2.0-4.0 L	25-75 mL + kdown					
• Clovers	2.0-4.0 L	2.0-4.0 L	25-75 mL + kdown					
Doublegee (Spiny emex)	2.0-4.0 L	2.0-4.0 L	25-75 mL + kdown					
• Erodium (Storksbill)	2.0-4.0 L	2.0-4.0 L	25-75 mL + kdown					
• Fumitory	2.0-4.0 L	2.0-4.0 L			1.6 or 2.3 L S			1.2-1.7 L
Medics	NRW							
• Mustards	2.0-4.0 L	2.0-4.0 L						
Silver grass (Vulpia)	2.0-4.0 L	2.0-4.0 L			1.6 L S	2.0-3.0 L S		
Toadrush				150-250 mL				
Volunteer cereals	NRW	NRW						
Volunteer legumes			NRW					
Wild oat	2.0-4.0 L S	2.0-4.0 L S			1.6 or 2.3 L S	1.8-3.0 L S	1.6 L	1.2-1.7 L
Wild radish	2.0-4.0 L S	2.0-4.0 L S	25-75 mL + kdown					
Wild turnip (Mediterranean turnip)	2.0-4.0 L	2.0-4.0 L						
Wireweed	NRW S	NRW			1.6-2.3 L	1.8-3.0 L	see notes	1.2-1.7 L
Canola Stage	Pre S; PSPE	Pre S; PSPE	Pre S	see notes	IBS	IBS	IBS	IBS
Weed Stage	PE-2 leaf	PE	< 6-8 leaf	PE	PE	PE	PE	PE
Wetting agent (WA)/Oil	see label	NN	see label	NN	NN	NN	NN	NN
Formulation	SC	SC	EC	EC	EC	EC	EC	EC
Rainfastness	NS	NS	1 hour	NS	NS	NS	NS	NS
Aerial Application	No	No	No	No	No	No	No	No
Withholding Period - Harvest	NRD	NRD	NRD	NRD	NRD	NRD	NRD	NRD
Withholding Period - GSF	15 weeks	15 weeks	14 days	10 weeks	NRD	NRD	NRD	NRD
Notes	**Only for Triazine Tolerant (TT) Canola!** For best results apply to bare moist soil, either immediately before seeding or as a PSPE treatment at or within 7 days of sowing. The use of atrazine in canola is subject to adherence to the Integrated Weed Management strategy for TT Canola. See label for details.	**Only for Triazine Tolerant (TT) Canola!** For best results apply to bare moist soil, either immediately before seeding or as a PSPE treatment at or within 7 days of sowing. The use of simazine in canola is subject to adherence to the Integrated Weed Management strategy for TT Canola. See label for details.	CAUTION: Emerged canola is extremely sensitive to Hammer®. Ensure boom cleaned thoroughly as per label instructions prior to post-emergent spraying. Apply with knockdown herbicides at label rates to increase visual speed at which broadleaf weeds develop visual symptoms and improve final control. Do not sow for one hour after application. Use low rates for small weeds in good growing conditions. Use high rates for older weeds that may have grown in less than optimal conditions.	Apply to moist soil. Use rates toward higher end of range where longer residual control is required. Apply at or immediately after planting before crops and weeds emerge. When sowing using knife points and zero tillage and leaving a seeding slot do not apply post seeding unless harrows or similar have filled-in the seeding slot before application. Alternatively apply immediately before seeding.	Incorporation within 4 hours of application recommended. If tank mixing with knockdown herbicides the mixture should be kept thoroughly agitated and sprayed within 1 hour of mixing. Low rate for use with conventional cultivation, high rate for use with direct seeding.	Incorporate by sowing within 24 hours of application. Use higher rates on medium to heavy textured soils and lower rates on light textured soils. Heavy soil which are cloddy or have surface crust or surface seal should be avoided. Waterlogged conditions after application may retard emergence.	Apply up to 3 weeks before to immediately before sowing. Incorporate immediately on wet soil, on dry soil, may be left for up to 24 hours. Plant 5 cm deep. Tank mix with trifluralin, if annual ryegrass, annual phalaris or wireweed are present and for enhanced control of wild oats emerging from top 1 cm of seed bed.	Apply 4 weeks before or just before sowing. Incorporate within 4 hours. Water logging immediately post seeding and or sowing deeper than approx. 1-2 cm can severely reduce emergence.

POST CROP EMERGENCE HERBICIDE OPTIONS

Weeds	ATRAZINE 500 g/L Only for TT varieties. Alternative concentration/s available	BUTROXYDIM/FLUAZIFOP-P 250/212 g/L (Fusion®) Super	CLETHODIM 240 g/L (Select®)	CLETHODIM/HALOXYFOP 200/48 g/L(Motsa®)	CLOPYRALID 300 g/L (e.g. Lontrel®) Alternative concentration/s available	DICLOFOP-METHYL 375 g/L
Herbicide Group	C	A/A	A	A/A	I	A
Annual ryegrass	1.0-2.0 L	210 g	150-250 mL	200-300 mL		1.0 L
Barley grass	NRW	210 g	175-250 mL	150-200 mL		
• Brome grass	NRW	250-280 g	175-250 mL	150-200 mL		
Capeweed	NRW				300 mL	
• Clovers					150 mL	
Doublegee (Spiny emex)	NRW					
• Erodium (Storksbill)						
• Fumitory						
Medics					150 mL	
• Mustards	1.0-2.0 L					
Silver grass (Vulpia)	NRW					
Toadrush						
Volunteer cereals	NRW	210 g	175-250 mL W,O 250 mL B	150-200 mL		
Volunteer legumes					100-250 mL see label	
Wild oat		210 g	175-250 mL	150-200 mL		1.5-2.0 L
Wild radish	1.0-2.0 L					
Wild turnip (Mediterranean turnip)	1.0-2.0 L					
Wireweed	NRW					
Canola Stage	PO	4 leaf +	PO-BFB	BSE; BFB	2-8 leaf	PO
Weed Stage	PE-2 leaf	2 leaf-ET	2 leaf-FT	2 leaf-ET	< 10 cm	2-4 leaf
Wetting agent (WA)/Oil	Oil required	Oil required	Oil see notes	Oil see notes	NN	WA
Formulation	SC	WG	EC	EC	AC	EC
Rainfastness	NS	1 hour	1 hour	1 hour	3 hours	2 hours
Aerial Application	No	Yes	Yes	Yes	Yes	Yes
Withholding Period - Harvest	NRD	17 weeks	NRD	8 weeks	12 weeks	NRD
Withholding Period - GSF	6 weeks	21 days	21 days	8 weeks	12 weeks	7 weeks
Notes	**Only for Triazine Tolerant (TT) Canola!** Apply to moist soil when weeds are actively growing. The addition of 0.5-1% v/v of crop oil will enhance post emergence activity. The use of atrazine in canola is subject to adherence to the Integrated Weed Management strategy for TT Canola. See label for details.	Always apply with Supercharge® at 1 L/100 L, or D-C-Trate® at 2 L/100 L. Canola can be sensitive. To minimise leaf symptoms do not apply to any variety before majority (80%) of plants are at the true 4 leaf stage (4th leaf expanded 5th leaf emerging).	Use lower rates for small weeds in good growing conditions. Always apply with D-C-Trate® at 2 L/100 L; Hasten® or Kwickin® at 1 L/100 L volume; Uptake® at 500 mL/100 L spray volume. The addition of Liase® at 2% may improve control if application conditions are not ideal.	The lower doses will provide effective control if applied under ideal conditions to weeds that are smaller, actively growing and free from stress. Always apply with Hasten®, Kwickin® or Uptake® at 1 L/100 L of spray volume.	Effective treatment for transplant capeweed control. Can be tank mixed with most other herbicides. Also available in 750 g/kg formulation, adjust rates accordingly. Volunteer faba beans and lupins will only be suppressed.	Wetter essential unless not recommended for tank mixes. Check label for tank mixture recommendations. 500 g/L formulation not registered for use in canola.

Weeds	FLUAZIFOP-P 128 g/L (Fusilade® Forte) Alternative concentration/s available	HALOXYFOP 520 g/L (e.g. Verdict® 520) Alternative concentration/s available	PROPAQUIZAFOP 100 g/L (e.g. Correct®)	QUIZALOFOP-P-ETHYL 99.5 g/L (e.g. Targa®) Alternative concentration/s available	SETHOXYDIM 186 g/L (Sertin®)	TEPRALOXYDIM 200 g/L (Aramo®)	IMAZAPIC/IMAZAPYR 525/175 g/kg (OnDuty®) (Clearfield) varieties Only for imidazolinone tolerant (IT)
Herbicide Group	A	A	A	A	A	A	B/B
Annual ryegrass	410 mL see label	75-100 mL Oil 100 mL WA	300-450 mL see label	300 or 375 mL	0.5-1.0 L see label	175-300 mL	40 or 55 g
Barley grass	410 mL see label	50-75 mL Oil 75-100 mL WA	200 mL see label	250 mL	see label	175-250 mL	40 g
• Brome grass	NRW	50-75 mL Oil 75-100 mL WA	300 mL see label	300 or 375 mL	see label	175-250 mL	40 g
Capeweed							see notes
• Clovers							40 g
Doublegee (Spiny emex)							40 g
• Erodium (Storksbill)		NRW					40 g S
• Fumitory							40 g
Medics							40 g S
• Mustards							20-40 g
Silver grass (Vulpia)							40 g S see label
Toadrush							40 g
Volunteer cereals	410 mL see label	50-75 mL Oil 75-100 mL WA	200 mL W,B,O 250 mL Tr	250 mL B,W	1.0 L W, O see label	175-250 mL	20 g O 40 g W, B
Volunteer legumes							40 g S vetch only
Wild oat	410 mL see label	37.5-50 mL Oil 50-75 mL WA	250 mL see label	125 or 250 mL	1.0 L see label	175-250 mL	20-40 g
Wild radish							20-40 g
Wild turnip (Mediterranean turnip)							20-40 g
Wireweed							40 g
Canola Stage	PO-6 leaf	2 leaf-BSE	PO	PO	PO-BFB	PO-BSE	2-6 leaf
Weed Stage	2-5 leaf	2 leaf-ET	3 leaf-MT	3 leaf-ET/MT	2-6 leaf	2 leaf-FT	see label
Wetting agent (WA)/Oil	NN	see notes	WA see label	WA &/or Oil	Oil required	Oil required	Oil
Formulation	EC	EC	EC	EC	EC	EC	WG
Rainfastness	1 hour	1 hour	1 hour	3 hours	2 hours	1 hour	2 hours
Aerial Application	Yes	Yes	Yes	NS	Yes	No	No
Withholding Period - Harvest	17 weeks	NRD	16 weeks	11 weeks	NRD	NRD	NRD
Withholding Period - GSF	21 days	28 days	see label	28 days	21 days	4 weeks	6 weeks
Notes	Do not apply at flowering stage of weeds. Do not allow weeds to reach late tillering stage before applying. Apply in no less than 50 L/ha water. See label for rates for larger weeds.	Increase rates when grasses more than 4 leaf stage. Use Uptake® at 0.5 L/100 L or if using other oils 1.0 L/100 L and add a non-ionic wetter at 200 mL/100L. Note: Withholding periods vary between individual products - check label.	Use with either a non ionic surfactant such as BS 1000® at 0.2% v/v or Hasten® or Kwickin® at 0.5% v/v. Do not use with Synertrol® or Codacide® oil. For best control wait until 75% of annual ryegrass have begun tillering. Can be tank mixed for broad spectrum of grass control. See label for details.	Use higher rate under high weed burden and/or when weeds are tillering. See label for surfactant/wetting agent details.	See label for adjuvant details. See label for grass selective mixtures to improve control brome, barley grass, wild oats and self sown cereals. Do not allow spray mix to sit overnight.	For adjuvant requirements see label compatibility section. The lower doses will only provide effective control if applied under ideal conditions to susceptible weeds that are smaller, actively growing and free from temperature or moisture stress. Do not apply after the commencement of stem elongation or after 8 leaf stage, whichever is earliest.	**For use with Clearfield production system (Imidazolinone tolerant) canola only.** Always apply with Hasten® or Kwickin® at 0.5 L/100 L. Tank mixture with 150 mL clopyralid 300 g/L improves capeweed control if applied at cotyledon - 4 leaf stage of capeweed. Use 55 g rate where annual ryegrass significant weed. Do not use at 40 to 55 g on shallow, strongly duplex soils in WA.

Herbicide resistance to this mode of action sub group has been confirmed in Australian populations of this weed species.

Herbicide resistance has been confirmed in Australian populations of this weed species to one or more MOA components of this herbicide mixture.

Herbicide resistance is expected based on other data.

STOP

ALWAYS READ THE PRODUCT LABEL
- Product registrations may vary between seasons.
- There may be variation in rates, registered uses and/or withholding periods between labels of individual products containing the same active ingredient, of the same or a different concentration and of the same or different formulation.
- Always check the label to ensure compliance with the registrations of the specific product being used.

CODES FOR PULSE AND CANOLA SPRAY CHARTS

Code	Definition
•	Check label for species controlled
AC	Aqueous concentrate
B	Barley
BFB	Before flower bud
Bl	Broad-leaved weeds
BSE	Before stem elongation
Ck	Chickpeas
cot	Cotyledon
DF	Dry flowable
EC	Emulsifiable concentrate
ET	Early tillering
Fb	Faba beans
Fp	Field peas
FT	Fully tillered
Gr	Grass weeds
GSF	Withholding period for grazing or cutting for stock food
H	Harvest withholding period
IBS	Incorporated by sowing
IPP	Immediately post planting
IT	Imidazolinone tolerant (Clearfield®)
kdown	Knockdown herbicide (glyphosate or paraquat/diquat)
Le	Lentils
Lu	Lupins
Mbz	Metribuzin
MT	Mid tillering
NN	Not necessary
Not IT	Will not provide adequate control of IT Canola
Not TT	Will not provide adequate control of TT Canola
NR	Not recommended
NRC	Not registered for use in this crop
NRD	Withholding period not required when used as directed
NRW	Not registered for this weed in these crops
NRWA	No registration for this pattern of use in WA
NS	Not stated
O	Oats
Oil	Spray oil
PE	Pre-emergence
Per/Permit	Use permitted under APVMA permit
PO	Post-emergence
Pre fl	Pre flowering
Pre S	Pre sowing
PSPE	Post sowing pre-emergence
S	Suppression only of this weed
SC	Suspension concentrate
see label	Refer to label for clarification on tank mixes, growth stages, adjuvants etc.
Sim	Simazine
T	Tiller/s or Tillering
Tr	Triticale
trif	Trifluralin
TT	Triazine tolerant
Ve	Vetch
W	Wheat
WA	Wetting agent
WG	Water dispersible granule
wks	Weeks
WP	Wettable powder

Note: The use of brand, trade and proprietary names has been done solely for the purpose of assisting users in identifying products.

It does not imply a preferred recommendation. Alternative products containing the same active ingredient may perform similarly to those products specified.

Crop tolerances
Exact values for species/variety tolerance are difficult to determine as variations can occur due to stage of crop growth, variety or environmental conditions. Follow label directions. Seek advice from your chemical manufacturer, Department of Agriculture or local agronomist on species/variety tolerance.

POISON'S EMERGENCY INFORMATION CENTRE
13 11 26

For further weed management information:
Department of Agriculture, Western Australia
South Perth (08) 9368 3333
www.agric.wa.gov.au

Figure 9-2. DAF Spray Charts. Page 7 of 7. Print A3 for best results.

10.0 Fire Management

10.1 Context

The construction works include activities that may represent a fire risk. Such risks may arise from welding and grinding, vehicle movements over dry vegetation, and disposal of matches or cigarettes. Fires have the potential to cause irreversible damage to the environment, property and human heath or life.

10.2 Purpose

The purpose of the Fire Management Plan is to outline management actions to:

1. minimise the risk of preventable fires.
2. respond to fires in an appropriate manner.

10.3 Performance Indicators

Performance will be demonstrated by:

1. absence of fires generated during construction.
2. response to fires in accordance with the management actions.

10.4 Management Actions

Fire Prevention - General

1. A Site Fire Officer will be designated for each construction area to identify and rectify potential fire hazards. Construction staff will report potential fire hazards to the Site Fire Officer.
2. The daily 'fire danger' ratings will be obtained from the Bureau of Meteorology and will display the ratings daily at the site office for the awareness of construction personnel.
3. The lighting and smoking of cigarettes will be prohibited except in designated cleared areas and immediately outside of site buildings.
4. Cleared vegetation from the construction area will not be burned.
5. Dry chemical or carbon dioxide fire extinguishers[1] will be located in close proximity to all cutting, grinding or welding (or any other spark generating activity).
6. A shroud will be installed if cutting, grinding or welding (or any other spark generating activity) occurs within 5m of vegetation/dry grasses. The shroud will be installed between the activity and the vegetation to capture sparks.
7. Flammable liquids and materials (including explosives) will only be stored in designated areas fitted with a dry chemical or carbon dioxide fire extinguisher.
8. On the advice of FESA or relevant Local Government Authority, construction work that may present a high risk of ignition (e.g. cutting, grinding or welding) may be temporarily terminated on days declared to have a "high", "very high" or "extreme" fire danger and if there are a number of fires in close proximity in order to avoid the potential for further depletion of fire fighting resources.

Fire Prevention - Vehicles

9. It will be ensured that all construction vehicles will be fitted with a dry chemical or carbon dioxide fire extinguisher[1].

10. There will be daily inspections of all construction vehicles to remove combustible material from radiators, tracks, guards and undercarriages.
11. It will be ensured that construction vehicles are inspected and serviced to prevent or repair oil and fuel leaks prior to the start of construction works, and then inspected monthly.
12. It will be ensured that tractors, bulldozers and road graders will not be used during prohibited burning times, unless they are fitted with a vertical exhaust pipe that is maintained in a sound and efficient condition and fitted with a spark arrestor (r37A *Bush Fires Act 1954* (WA)).

Fire Response

13. Training will be provided to construction staff on the proper use of fire extinguishers.
14. A mobile water tanker will be located within 10km of any construction area for fire response. Each water tanker will be equipped with a connectable hose that can be used for fire fighting.
15. Dewatering water maybe used for fire response (irrelevant of water quality).
16. Fires will be managed by:
    a. Small fires – fire extinguishers and/or on-site water tankers will be used by the field personnel to extinguish the fire.
    b. Large fires – FESA will be called to attend and extinguish fires that cannot be managed by the field personnel. Phone 000.
17. The relevant Local Government Authority and FESA will be notified of any fire in which fire fighting equipment is used. Notification will be made as soon as reasonably practicable following the detection of the fire.
18. The DEC, FPC and the Conservation Commission will also be notified of any fire in which fire fighting equipment is used in land vested with the Conservation Commission (State Forest). Notification will be made as soon as reasonably practicable following the detection of the fire.

10.5 Additional Information

[1] Fire extinguishers

Carbon dioxide fire extinguishers and dry chemical powder fire extinguishers are both suitable for ordinary combustibles, flammable liquids, flammable gasses and live electricity.

Dry chemical powder fire extinguishers are suitable for ordinary combustibles, flammable liquids, flammable gasses, live electricity and cooking oils.

10.6 Contingency Actions

No contingency actions are considered necessary.

10.7 Related Plans

1. Land Clearing and Trench Management Plan.
2. Dangerous Goods and Explosives Management Plan

10.8 Relevant Legislation

1. *Bush Fires Act 1954* (WA).

10.9 Advisory Agencies

The following organisations have been consulted on development of this plan:

1. FESA
2. DEC
3. FPC
4. Conservation Commission
5. Relevant Local Government Authority

11.0 Waste Management

11.1 Context

The construction works will produce a range of liquid and solid wastes. These wastes include:

- site office rubbish, paper, packaging and domestic wastes.
- spent welding rods, grinding wheels, visors and shot blast from welding operations.
- spoil and surplus rock from boring activities or backfilling.
- sewage from temporary toilets.
- used lubricating oils from machinery maintenance.

Inappropriate waste disposal has the potential to contaminate soil, surface water or groundwater and affect visual amenity. Wastes from construction must be disposed of in a lawful and environmentally acceptable manner.

11.2 Purpose

The purpose of the Waste Management Plan is to outline management actions to:

1. reuse waste materials where possible
2. recycle wastes where practicable
3. dispose of construction wastes in an acceptable manner.

11.3 Performance Indicators

Performance will be demonstrated by:

1. Compliance with the prescribed management actions.

11.4 Management Actions

Construction

1. Separate and marked waste bins will be established for:

CATEGORY	DISPOSAL
General wastes.	Dispose on-site in a covered bin to prevent attraction of vermin. Bulk disposal offsite to the nearest landfill.
Recyclables (generally glass, paper and plastics).	Bulk dispose offsite to the nearest recycling facility. May be disposed of to landfill if a facility does not exist within 50km of the construction area.
Steel Recycling (generally steel pipe and other steel wastes).	Bulk dispose offsite to the nearest steel recycling facility. May be disposed of to landfill if a facility does not exist within 50km of the construction area.
Hydrocarbons (generally drums/containers containing oil, grease, petrol, diesel or hydrocarbon contaminated soil).	Dispose on-site to plastic lined or bunded bins. Bulk dispose offsite to: 1. a Controlled Waste Contractor licensed under the *Environmental Protection (Controlled Waste) Regulations 2004* (WA); or 2. a hydrocarbon recycler (Note: if hydrocarbons are recycled they are not a controlled waste for transport purposes).

Table 11-1 Waste Bins for General Wastes, Recyclables, Steel Recycling and Hydrocarbons.

2. Periodic disposal of wastes from the construction area to the identified disposal locations will be arranged.
3. Wastes, other than excess overburden (excluding spoil) will not be buried on any construction site.
4. All wastes will be removed from all construction sites following the completion of construction works.
5. Excess overburden produced from trench excavation will be disposed of to:
    a. the excavated trench or the Seawater Desalination Plant site.
    b. a suitable location agreed with the Landowner (the Landowner has first preference to retain excess overburden from their own property),
    c. a suitable location agreed with adjacent Landowners (with preference to Landowners on the pipeline route).
    d. a local landfill as inert waste.

    Other suitable sites for disposal of excess overburden may be identified. Disposal of soils affected by ASS will be treated as per the Dewatering and Acid Sulphate Soils Management Plan prior to disposal.

Post-Construction

6. Any waste that is identified post-construction will be removed.

11.5 Contingency Actions

1. The following actions will be undertaken if wastes are not appropriately disposed of:
    a. investigate the cause.
    b. alter management actions, if required.
    c. inform all field personnel of revised management actions.
    d. mitigation of any environmental and visual impacts.

11.6 Related Plans

1. Dewatering and Acid Sulphate Soils Management Plan.

11.7 Relevant Legislation

1. *Environmental Protection Act 1986*, and *Regulations 1987* (WA).
2. *Environmental Protection (Controlled Waste) Regulations 2004* (WA).

11.8 Advisory Agencies

The following organisations have been consulted on development of this plan:

1. DEC
2. Shire of Harvey

12.0 Aboriginal Heritage Management

12.1 Context

The *Aboriginal Heritage Act 1972* (WA) registers and protects sites of importance to Aboriginal persons. It is an offence to interfere with a registered site[1] without the consent of the Western Australian Minister for Indigenous Affairs. The construction works avoid all existing registered sites on the Department of Indigenous Affairs database.

The construction area is also subject to a native title claim by the Gnaala Karla Boojah Native Title Claimant Group (NTCG) under the *Native Title Act 1993* (C'th). The South West Aboriginal Land and Sea Council is the representative body for the Gnaala Karla Booja NTCG. Native title has yet to be determined by the National Native Title Tribunal.

Prior to construction, an Aboriginal heritage survey of the Seawater Desalination Plant site, Water Transfer Pipeline and the Harvey Summit Tanks site will be conducted with the Gnaala Karla Booja NTCG to identify the presence of any unidentified Aboriginal heritage sites. If new sites are identified by the preconstruction survey, consent will be obtained from the Minister for Indigenous Affairs to interfere with those sites prior to construction. Initial ground disturbing activities at registered sites will be conducted in the presence of a Cultural Monitor from the Gnaala Karla Booja NTCG.

Despite preconstruction surveys, additional heritage materials or artefacts may also be identified during construction.

12.2 Purpose

The purpose of the Aboriginal Heritage Management Plan is to outline management actions to:

1. identify the presence of Aboriginal heritage sites
2. manage disturbance of registered Aboriginal heritage sites, if required.
3. identify procedures in the event that a new potential site is identified during construction.

12.3 Performance Indicators

Performance will be demonstrated by:

1. Compliance with the prescribed management actions.

12.4 Management Actions

Prior to Construction

1. An Aboriginal heritage survey of the Seawater Desalination Plant site, Water Transfer Pipeline and the Harvey Summit Tanks site will be conducted with the Gnaala Karla Booja NTCG.

During Construction

2. A Cultural Monitor will be employed in consultation with the Gnaala Karla Booja NTCG to monitor initial ground disturbing activities at any registered Aboriginal heritage site identified. The Cultural Monitor will be paid at a rate in accordance with The Water Corporations policies for Cultural Monitors.

3. Shade, water and personal protective equipment (hard hat, safety glasses, noise (ear) protection and high visibility vest) will be provided to the Cultural Monitor. The Cultural Monitor will be responsible for personal transport to the construction areas.

4. The Cultural Monitor will monitor initial ground disturbing activities to:
    a. detect the presence of archaeological material of heritage significance.
    b. detect human skeletal material.
    c. advise on minimisation of construction impacts on heritage values.
5. The Cultural Monitor will advise during the construction works if archaeological material or human skeletal material is identified, as well as any matters of heritage concern.
6. Construction works will be undertaken in the absence of the Cultural Monitor if for any reason the arranged Cultural Monitor does not attend the site. A replacement Cultural Monitor will be sort as soon as reasonably practicable following the absence if future attendance at the construction works by the Cultural Monitor is unlikely.
7. Construction works will cease as soon as practicable within a nominal 20 metres of any archaeological material (artefacts including hunting tools, scatters, scar trees) identified within the construction area. An archaeologist will be engaged to record the identified material and to advise the DIA if the identified material is likely to be of Aboriginal heritage significance. Construction activities within 20 metres of the identified material will only recommence based on advice of the archaeologist or the DIA.
8. Construction works will cease as soon as practicable within a nominal 20 metres of any skeletal material identified within the construction area. The Harvey Police Station (Phone 9729 1001, located at 17A Hayward St in Harvey) will be contacted to attend and determine a resolution of the matter. Construction activities will only recommence within 20 metres of the identified material on the direction of the Superintendent based on advice of the Police.
9. Any dispute between the Cultural Monitor and site construction personnel will be resolved on advice from the Water Corporation's Manager, Indigenous Resources Section (Phone 9420 3864)

12.5 Additional Information

[1] The construction works avoid all locations identified by the DIA site register. A number of locations on the DIA site register occur within the greater Harvey area:

DIA SITE ID	LOCATION NAME	TYPE	REGISTER	SITE?
5614	Lake Preston	Artefacts / Scatter	Stored data	No
5843	Harvey	Artefacts / Scatter	Stored data	No
5797	Harvey 45	Artefacts / Scatter	Stored data	No
5798	Harvey 46	Artefacts / Scatter	Stored data	No
5799	Harvey 47	Artefacts / Scatter	Stored data	No
5800	Harvey 48	Artefacts / Scatter	Stored data	No
5801	Harvey 49/Myalup Beach Road	Artefacts / Scatter	Stored data	No
5802	Harvey 50/Myalup Beach Road	Artefacts / Scatter	Stored data	No
5811	Harvey 60	Artefacts / Scatter	Stored data	No
17778	Kellys Camp	Man-Made Structure, Historical	Stored data	No
17779	Wallams Camps 1 & 2	Man-Made Structure, Historical	Stored data	No
17783	Mornington Mill Corroboree Ground	Ceremonial	Permanent	YES

Table 12-1 Locations listed the DIA site register.

Only the Mornington Mill Corroboree Ground is classified as an Aboriginal heritage site under the *Aboriginal Heritage Act 1972* (WA).

Sites that are classified on the 'Permanent' register are classified as sites under the *Aboriginal Heritage Act 1972* (WA) and are protected. Sites classified as 'Stored data' are not sites under the

Aboriginal Heritage Act 1972 (WA) due to unreliable information, however are maintained on the DIA database as a record of having been previously reported and for future reference.

12.6 Contingency Actions

No contingency actions are considered necessary.

12.7 Related Plans

1. Land Clearing and Trench Management Plan
2. Watercourse Crossing Management Plan

12.8 Relevant Legislation

1. *Aboriginal Heritage Act 1972* (WA), and *Regulations 1974* (WA).
2. *Native Title Act 1993* (C'th)

12.9 Advisory Agencies

The following organisations have been consulted on development of this plan:

1. SWALSC
2. DIA

13.0 Traffic and Public Safety Management

13.1 Context

There will be in excess of 5000 vehicle movements for the cartage of pipelines and other equipment (excludes support vehicle movements) for the Southern Seawater Desalination Project. Some partial road closures will be required, and increased traffic volumes from construction vehicles will result in short-term impacts on local traffic movement.

Construction will occur within publicly accessible roads and road reserves, private farmland and State Forest. The construction works involve deep earthworks, materials storage and handling, and heavy machinery and equipment that could pose a risk to members of the public if accessing the site.

13.2 Purpose

The purpose of the Traffic and Public Safety Management Plan is to outline management actions to:

1. manage construction vehicle traffic and local traffic.
2. minimise construction impacts on local traffic movements.
3. reduce the risk to public accessing the construction site.

13.3 Performance Indicators

Performance will be demonstrated by:

1. Compliance with the prescribed management actions.

13.4 Management Actions

Traffic

1. Traffic management activities on public roads will be coordinated with MRWA and the Shire of Harvey prior to construction.
2. It will be ensured that construction vehicles will typically use the following major roads for the transport of construction materials and equipment to minimise disturbance on local traffic and the community:
    a. South Western Highway
    b. Perth-Bunbury Highway (Old Coast Road)
    c. Government Road
    d. Forestry Road

    Local roads will be used for accessing the construction sites where major roads do not allow access to the construction works.
3. The use of local roads by semi-trailers and road trains will be limited for the transport of construction materials and equipment to daylight hours (nominally 6am-8pm) to minimise noise impacts on residences positioned on local roads.
4. Road signage will be displayed within all construction areas in accordance with Australian Standard 1742.3-2002 *Manual of Uniform Traffic Control Devices - Part 3: Traffic control devices for works on roads*.
5. Road access in the construction area will be maintained by the use of signed detours and/or a single lane. Advisory signs will be installed sufficiently in advance of the construction works to allow road users to take alternative routes.
6. A temporary crossover(s) will be installed to maintain access by Landowners to their properties if the existing crossover is disturbed by the construction works. All disturbed

crossovers will be repaired or replaced as soon as practicable following construction works affecting that property.

7. It will be ensured that construction vehicles do not exceed 50km/h on non-bituminised roads or access tracks outside of the active construction area.
8. A 15km/h speed limit will be imposed within the active construction area. Signage of the speed limit will be displayed within construction areas.

Safety

9. The public will be excluded from accessing all construction areas where practicable. Open excavations (such as trenches and dewatering pits) will be fenced or otherwise demarcated where there is a risk of public access.
10. Advisory warning boards identifying hazards, risks, safety requirements and emergency phone numbers will be installed at each entry to all construction areas.
11. Machinery and plant that is located in publicly accessible locations will be secured (in a locked compound where practicable) when the construction site is not occupied.

13.5 Additional Information

The statutory requirements and guidelines that apply to the *Local Government Act 1995* (WA), *Main Roads Act 1930* (WA) and the *Road Traffic Act 1974* (WA), will be aware of and complied with.

13.6 Contingency Actions

No contingency actions are considered necessary.

13.7 Related Plans

1. Land Clearing and Trench Management
2. Noise Management

13.8 Relevant Legislation

1. *Local Government Act 1995* (WA)
2. *Main Roads Act 1930* (WA)
3. *Road Traffic Act 1974* (WA)

13.9 Advisory Agencies

The following organisations have been consulted on development of this plan:

1. MRWA
2. Shire of Harvey

14.0 Noise Management

14.1 Context

Construction works will generate noise that may interfere with the amenity of occupants of near residential properties. Noise from the construction works will be monitored to determine and manage the impacts of noise.

Noise in Western Australia is regulated under the *Environmental Protection (Noise) Regulations 1997* (WA). Construction works (excluding blasting) are generally exempt from compliance with the assigned noise levels between the hours of 7.00 am and 7.00 pm, subject to a number of provisions (the provisions are contained within the plan). Despite this exemption, construction noise should still be managed and noise level objectives set to minimise noise impacts.

Noise from blasting activities during construction is regulated under the *Environmental Protection (Noise) Regulations 1997* (WA). Blasting noise limits apply.

The nearest noise sensitive premises for the Seawater Desalination Plant site is approximately 600m to the south east. The nearest noise sensitive premises for the Harvey Summit Tanks site is approximately 650m to the north east. A number of noise sensitive premises occur within 50m of the Water Transfer Pipeline.

14.2 Purpose

The purpose of the Noise Management Plan is to outline management actions to:

1. identify noise objectives and blasting noise limits.
2. undertake noise monitoring.
3. outline corrective actions to variances of noise objectives and limits.

14.3 Performance Indicators

Performance will be demonstrated by:

1. Compliance with the prescribed management actions.

14.4 Management Actions

General Construction Considerations

1. Plant and practices that have the lowest possible noise emissions, will be used where practicable.
2. Portable noise generating equipment (e.g. generators) will be located as far away from noise sensitive premises as practicable. Noise screening will be installed where particularly noisy construction works are conducted adjacent to residential premises.
3. Known noisy activities (e.g. rock breaking) will be scheduled during daylight hours (nominally 7am to 7pm) where they occur within 100m of residential premises. Notice to the Landowner of the residential premises will be provided prior to the commencement of such works.

Noise Meter Calibration

4. Noise will be measured using a portable sound level meter. It will be ensured that the meter is calibrated at least every 2 years by a laboratory accredited by NATA to undertake calibration of sound level measuring instruments.

5. The portable sound level meter will be tested in the field (using a standard sound source) prior to, and after, any series of measurements to be taken. The tests will be undertaken to confirm if the meter is accurate within ±0.5 dB.

Measuring Construction Noise

6. Noise levels will be measured at least once every 7 days during construction, or in response to any complaint that may arise. Noise monitoring will be undertaken for a period of no less than 15 minutes, and no greater than 4 hours.
7. The frequency of noise monitoring maybe increased (up to a maximum daily monitoring frequency) if complaints of unacceptable noise are received.
8. Noise measurements will be undertaken at the boundary of the construction sites and at least 1.2m above ground level. For the Seawater Desalination Plant site and the Harvey Summit Tanks site, the boundary is the cadastral (land) boundary of the site. For the Water Transfer Pipeline, the boundary will be the edge of the pipeline working width (30m for agricultural land and 20m for native vegetation).
9. Noise measurements will be undertaken on the Water Transfer Pipeline route at least 3 metres from any noise reflecting surface (building wall, vehicles, etc).
10. All noise measurements will be recorded in the Noise and Vibration Monitoring Log.
11. The occupiers of each premises will be given written notice at which noise emissions will be likely to exceed the specified noise levels at least 24 hours prior to such works for Sunday and Night Construction Works (7.00pm to 7.00 am).
12. It will seek to meet the following noise level objectives:

Location of measurement	**Time of day**	**Assigned level (dB)**		
		L_{A10} (not to be exceeded more than 10% of the time)	L_{A1} (not to be exceeded more than 1% of the time)	L_{Amax} (must not be exceeded at any time)
Boundary of Water Transfer Pipeline working width when less than 15m from a Residential of Rural Building	0700 to 1900 hrs Monday to Saturday	45 + influencing factor	55 + influencing factor	65 + influencing factor
	0900 to 1900 hrs Sunday and Public Holidays	40 + influencing factor	50 + influencing factor	65 + influencing factor
	1900 to 2200 hrs all days	40 + influencing factor	50 + influencing factor	55 + influencing factor
	2200 hrs on any day to 0700 hrs Monday to Saturday and to 0900 hrs Sunday and Public Holidays	35 + influencing factor	45 + influencing factor	55 + influencing factor
Boundary of Seawater Desalination Plant site or Boundary of Harvey Summit Tanks site. Boundary of Water Transfer Pipeline working width when greater than 15m from Residential of Rural Building	All Hours	60	75	80
Note: (1) An influencing factor of 2 dB will be added to the Assigned Level where there is a major road within 100 metres of the construction works (6000-15000 vehicles per day; e.g. Old Coast Road and South Western Highway). (2) 10 db will be added to the noise measurement where impulsiveness is present (banging, thumping).				

Table 14-1 Noise Level Objectives for Construction.

Measuring Blasting Noise

13. Blasting will only be undertaken between 7.00 am and 6.00pm on any day.

14. Blasting noise (airblast level) will be measured if blasting occurs within 100 metres of any residential premises. Airblast level will be measured at the nearest noise sensitive premises (where access is possible) at between 1.2 and 1.6 metres in height above ground level, and at least 5 metres from any noise reflecting surface (building wall, vehicles, etc).

15. The following blasting noise criteria will be complied with:

Day/Time	Airblast assigned level (dB)
0700 to 1800hrs Monday to Saturday	125 dB $L_{linear, peak}$ for any blast
	120 dB $L_{linear, peak}$ for nine in any 10 consecutive blasts, regardless of interval.
0700 to 1800hrs Sundays	120 dB $L_{linear, peak}$ for any blast
	115 dB $L_{linear, peak}$ for nine in any 10 consecutive blasts, regardless of interval.

Table 14-2 Blasting Noise Criteria.

14.5 Additional Information

Regulation 7 of the *Environmental Protection (Noise) Regulations 1997* (WA) prohibits the exceeding of assigned levels of noise defined by Regulation 8. Table 14-1 (above) identifies the assigned levels contained in Regulation 8. Regulation 13 exempts construction works at construction sites from compliance with the assigned levels between 7.00am and 7.00pm, subject to a number of provisions (the provisions are contained within the plan). Consequently, Table 14-1 lists the assigned levels as "objectives" and not as defined limits for construction works for the project.

The blasting noise criteria have been stated as limits as there are no exemptions in the *Environmental Protection (Noise) Regulations 1997* (WA) that allow for variation from the assigned levels.

14.6 Contingency Actions

1. Actions maybe taken to reduce noise impacts on residential premises if the construction noise criteria or the blasting noise criteria are exceeded. Such actions may include:
    a. noise bunds or screens.
    b. adjusting the work schedule for the offending work to be conducted in more appropriate time.
    c. changing the technology or method of construction.
    d. temporary relocation of the affected Landowner (subject to agreement with the Landowner).
2. Noise monitoring will be undertaken to confirm that the noise criteria have been achieved by the directed actions.

14.7 Related Plans

1. Land Clearing and Trench Management.
2. Explosives and Dangerous Goods Management Plan
3. Vibration Management Plan

14.8 Relevant Legislation

1. *Environmental Protection Act 1986* (WA)
2. *Environmental Protection (Noise) Regulations 1997* (WA)

14.9 Advisory Agencies

The following organisations have been consulted on development of this plan:

1. DEC
2. Shire of Harvey

Table 14-3 Noise and Vibration Log

Southern Seawater Desalination Project
Noise Management Plan & Vibration Management Plan

Noise and Vibration Monitoring Log

The purpose of the Noise and Vibration Monitoring Log is to record the levels of noise and vibration against the criteria. The Noise and Vibration Monitoring Log is to be completed by the Site Environmental Scientist.

Name ……

Page ……. of ……..

Date of Entry	Location of monitoring location (Lot number and location description)	Construction activity description (general construction, blasting, etc)	Noise (dB)	Applicable Noise Criteria Limit (dB)	Vibration (mm/s)	Applicable Vibration Criteria Limit (mm/s)	Name and Position	Initial

15.0 Vibration Management

15.1 Context

Vibration caused by construction works (including earthmoving, rock breaking and blasting) has the potential to affect the integrity of buildings and their fittings. The areas of impact may include walls (internal and external), architraves and skirtings, glass and mirrors, tiled flooring, and external fixtures such as concrete pools and brick fences.

The nearest vibration sensitive premises for the Seawater Desalination Plant site is approximately 600m to the south east. The nearest vibration sensitive premises for the Harvey Summit Tanks site is approximately 650m to the north east. A number of vibration sensitive premises occur within 50m of the Water Transfer Pipeline.

A Building Inspector will be engaged to undertake property condition assessments of properties within 100m of all construction works, and within 1000m of any blasting, to determine any structural impacts caused by vibration.

15.2 Purpose

The purpose of the Vibration Management Plan is to outline management actions to:

1. undertake vibration monitoring.
2. identify the pre-construction condition of properties.
3. identify the post-construction condition of properties.

15.3 Performance Indicators

Performance will be demonstrated by:

1. Compliance with the prescribed management actions.

15.4 Management Actions

Vibration Monitoring

1. Vibration will be monitored using a portable vibration monitor at least once every 7 days if construction works are within 100 metres of residential premises. The frequency of monitoring maybe increased (up to a maximum daily monitoring frequency) for residences within 20m of the construction works.
2. The vibration monitoring will be undertaken at a distance of 5 metres from any residential premises, at a location between the construction works and the residential premises.
3. All noise measurements will be recorded on the Noise and Vibration Monitoring Log (refer to Noise Management Plan).
4. The following vibration standard (the safe limit applied for blasting affecting residential buildings) will be complied with:

Frequency	Vibration Standard
Not to be exceeded for 9 in 10 blasts.	5 mm/s
Not to be exceeded at any time	10 mm/s

Table 15-1 Vibration Standards.

Property Assessment

5. Landowners located within 100mof all construction works, and within 1000m of any blasting, will be offered a pre-construction property condition assessment prior to construction. The assessment will be conducted by a Building Inspector. The assessment will be conducted in consultation with the Landowner to identify any existing building defects (e.g. cracking). The assessment will include use of a video and/or photographs to document any existing building defects. A Property Condition Report will be prepared by the Building Inspector and provided to the Landowner.
6. The Building Inspector will undertake a second property condition assessment in consultation with the Landowner following the completion of construction works near the property for comparison to the pre-construction property condition report.
7. Any new building defects, or worsened existing defects, that are caused by the construction works will be repaired. The repairs will be conducted in consultation with the Landowner and to a standard equivalent or better than the pre-construction condition.
8. No fee will be charged to the Landowner to undertake the property condition assessments, reports or any required repair works.

15.5 Additional Information

Vibration Standard

[1] The German Standard DIN 4150-3 (1999) has been used as the vibration standard.

Noise and Vibration Monitoring Log

The Noise and Vibration Monitoring Log is contained in the Noise Management Plan.

Property Condition Report

An example Property Condition Report is attached to this plan. The Building Inspector may use a separate report that meets the same minimum requirements identified in the example Report.

15.6 Contingency Actions

Vibration Monitoring

1. The construction technology or method will be modified or the work schedule adjusted, to reduce the cumulative impacts of construction works if the vibration standard for blasting is exceeded.

Property Assessment

2. A resolution will be facilitated between the Landowner if agreement cannot be reached as to the nature and scale of impacts, or the nature and quality of remediation, of any vibration impacts.

15.7 Related Plans

1. Land Clearing and Trench Management
2. Explosives and Dangerous Goods Management Plan
3. Vibration Management Plan

15.8 Advisory Agencies

The following organisations have been consulted on development of this plan:

1. DoCEP
2. Shire of Harvey

Table 15-2 Property Condition Report

PROPERTY CONDITION REPORT	
Property Owner:	_____
Property Address:	_____
	_____
Date Pre-construction assessment:	_____/_____/ 20_____
Pre-construction Building Inspector:	_____
Date Post-construction assessment:	_____/_____/ 20_____
Post-construction Building Inspector:	_____

The Building Inspector will inspect each area of the property, paying particular attention to the condition of walls (internal and external), architraves and skirtings, glass and mirrors, tiled flooring, and external fixtures such as concrete pools and brick fences.

Pre-construction Condition		Post-construction Condition	
Entry/Hallway			
Notes:		Change?: Yes ☐ No ☐ Action Required?: Yes ☐ No ☐ If action required, list:	
Photographs: Yes ☐	Video: Yes ☐	Photographs: Yes ☐	Video: Yes ☐
Lounge Room			
Notes:		Change?: Yes ☐ No ☐ Action Required?: Yes ☐ No ☐ If action required, list:	
Photographs: Yes ☐	Video: Yes ☐	Photographs: Yes ☐	Video: Yes ☐

Family Room			
Notes: Photographs: Yes ☐	Video: Yes ☐	Change?: Yes ☐ No ☐ Action Required?: Yes ☐ No ☐ If action required, list: Photographs: Yes ☐	Video: Yes ☐
Dining Room			
Notes: Photographs: Yes ☐	Video: Yes ☐	Change?: Yes ☐ No ☐ Action Required?: Yes ☐ No ☐ If action required, list: Photographs: Yes ☐	Video: Yes ☐
Kitchen			
Notes: Photographs: Yes ☐	Video: Yes ☐	Change?: Yes ☐ No ☐ Action Required?: Yes ☐ No ☐ If action required, list: Photographs: Yes ☐	Video: Yes ☐
Bedroom 1			
Notes: Photographs: Yes ☐	Video: Yes ☐	Change?: Yes ☐ No ☐ Action Required?: Yes ☐ No ☐ If action required, list: Photographs: Yes ☐	Video: Yes ☐

Bedroom 2			
Notes:		Change?:	Yes ☐ No ☐
		Action Required?:	Yes ☐ No ☐
		If action required, list:	
Photographs: Yes ☐	Video: Yes ☐	Photographs: Yes ☐	Video: Yes ☐
Bedroom 3			
Notes:		Change?:	Yes ☐ No ☐
		Action Required?:	Yes ☐ No ☐
		If action required, list:	
Photographs: Yes ☐	Video: Yes ☐	Photographs: Yes ☐	Video: Yes ☐
Bedroom 4 / Study			
Notes:		Change?:	Yes ☐ No ☐
		Action Required?:	Yes ☐ No ☐
		If action required, list:	
Photographs: Yes ☐	Video: Yes ☐	Photographs: Yes ☐	Video: Yes ☐
Bathroom 1			
Notes:		Change?:	Yes ☐ No ☐
		Action Required?:	Yes ☐ No ☐
		If action required, list:	
Photographs: Yes ☐	Video: Yes ☐	Photographs: Yes ☐	Video: Yes ☐

Bathroom 2			
Notes: Photographs: Yes ☐ Video: Yes ☐		Change?: Yes ☐ No ☐ Action Required?: Yes ☐ No ☐ If action required, list: Photographs: Yes ☐ Video: Yes ☐	
Toilet			
Notes: Photographs: Yes ☐ Video: Yes ☐		Change?: Yes ☐ No ☐ Action Required?: Yes ☐ No ☐ If action required, list: Photographs: Yes ☐ Video: Yes ☐	
Laundry			
Notes: Photographs: Yes ☐ Video: Yes ☐		Change?: Yes ☐ No ☐ Action Required?: Yes ☐ No ☐ If action required, list: Photographs: Yes ☐ Video: Yes ☐	
Garage			
Notes: Photographs: Yes ☐ Video: Yes ☐		Change?: Yes ☐ No ☐ Action Required?: Yes ☐ No ☐ If action required, list: Photographs: Yes ☐ Video: Yes ☐	

House Exterior	
Notes: Photographs: Yes ☐ Video: Yes ☐	Change?: Yes ☐ No ☐ Action Required?: Yes ☐ No ☐ If action required, list: Photographs: Yes ☐ Video: Yes ☐
Other (eg Pool, Brick Fencing)	
Notes: Photographs: Yes ☐ Video: Yes ☐	Change?: Yes ☐ No ☐ Action Required?: Yes ☐ No ☐ If action required, list: Photographs: Yes ☐ Video: Yes ☐
Additional Comments (optional):	Additional Comments (optional):
Agreement	
Building Inspector: _____ Landowner: _____	Building Inspector: _____ Landowner: _____

The Building Inspector and the Landowner are to sign this Property Condition Report to indicate agreement to the above information.

16.0 Dangerous Goods and Explosives Management

16.1 Context

Dangerous goods used and stored during construction works will include hydrocarbons (fuels & oils), and chemicals for water treatment (chlorine, acids). Spillages of dangerous goods have the potential to:

- contaminate soil, surface water and groundwater.
- impact personnel and public safety.
- create an ignition source.

Dangerous goods must be contained (bunded) to prevent spillages and ensure compliance with regulatory requirements.

Explosives may also be stored and used for blasting of rock for pipeline installation. Explosives need to be contained to prevent unauthorised access and ignition.

16.2 Purpose

The purpose of the Dangerous Goods and Explosives Management Plan is to outline management actions for:

1. the storage and containment of dangerous goods and explosives.
2. responding to a spill of a dangerous good.
3. the reporting of incidents involving dangerous goods and explosives.

16.3 Performance Indicators

Performance will be demonstrated by:

1. Compliance with the prescribed management actions.

16.4 Management Actions

Dangerous Goods

1. A Licence issued by the Chief Inspector of the DoCEP under s45A(1) of the *Explosives and Dangerous Goods Act 1961* (WA) will be obtained prior to any storage of dangerous goods.
2. Liquid dangerous goods will be stored in a bund or compound capable of containing 110% of the volume of the dangerous goods stored. For packaged liquid dangerous goods (goods in a number of smaller containers), the goods shall be stored in a bund or compound capable of containing 110% of the volume of the largest container.
3. Dangerous goods will be stored in minimum quantities (where possible) to minimise the environmental impact if spillage occurs.
4. Dangerous goods will be segregated to ensure incompatible dangerous goods are not co-located (refer Figure 16-1).
5. Dangerous goods will not be stored within 25m of any watercourse or wetland.

Explosives

6. A Permit issued by the Chief Inspector of the DoCEP under s34 of the *Explosives and Dangerous Goods Act 1961* (WA) will be obtained prior to any storage or use of explosives at construction sites.

7. A Shotfirer's Permit under r116A of the *Explosives and Dangerous Goods (Explosives) Regulations 1963* (WA) will be obtained for use of explosives.

8. FESA will be notified where any unexploded ordnances are located or stored within the construction area. Construction within 20m of identified unexploded ordnance will cease until FESA has attended and confirmed the area safe to continue work.

Record Keeping

9. Material Safety Data Sheets will be maintained for each dangerous good and each explosive stored. The MSDS will be located outside of the compound in which the material is stored. The compound will be placarded in accordance with the DoCEP's *Guidance Note for Placarding*.

10. Deliveries of dangerous goods and explosives will only be accepted if they are accompanied by a Materials Safety Data Sheet (MSDS) for that dangerous good or explosive, or, if there is an existing and current MSDS for that dangerous good or explosive already held on the site.

11. A Dangerous Goods and Explosives Log (Manifest) will be maintained of all dangerous goods and explosives held on the construction sites. The Log will be stored in a secure location at the site entrance. The Log will identify the:
    a. date on which the goods were received.
    b. location(s) at which the goods are stored.
    c. volume/quantity stored at each location.
    d. date and volume/quantity removed from storage when used.
    e. name of the person(s) receiving/removing goods to/from storage on each occasion.

    A site plan that identifies the storage location of each dangerous good will accompany the Log.

Safety

12. Dangerous goods and explosives will be stored in a locked compound to prevent unauthorised access.

13. Ignition sources (e.g. welding equipment, cigarettes, lighters) will be prohibited within any compound used for the storage of dangerous goods or explosives.

Training

14. All construction staff will be trained on identification, storage and handling procedures for dangerous goods and explosives. Construction staff will also be trained on response procedures (including use of Spill Response Kits) for accidents and incidents and emergencies involving dangerous goods or explosives.

Accidents, Incidents and Emergencies

15. A Spill Response Kit will be installed and maintained at each construction site for the clean-up and containment of spills to land or water. Each spill kit will contain:
    a. universal absorbent pads or pillows or blankets.
    b. a containment boom (for containing discharges to water).
    c. labelled plastic contaminated waste bags.
    d. safety gloves.

    Contaminated material will be disposed of from a spill in accordance with the Waste Management Plan.

16. The Chief Inspector of the DoCEP will be notified of any accident involving explosives or dangerous goods (s55(1) of the *Explosives and Dangerous Goods Act 1961* (WA)).

17. FESA will be notified of any incident involving dangerous goods or an explosive that has had, or has the potential to, have a significant impact on the environment or human safety.

18. The DEC will be notified of any incident involving dangerous goods or an explosive that has had, or has the potential to, have a significant impact on the environment.

16.5 Additional Information

An example Dangerous Goods and Explosives Log is attached to this plan.

16.6 Contingency Actions

No contingency actions are considered necessary.0

16.7 Related Plans

1. Incident Management
2. Waste Management

16.8 Relevant Legislation

1. *Explosives and Dangerous Goods Act 1961* (WA)
2. *Explosives and Dangerous Goods (Dangerous Goods Handling and Storage) Regulations 1992* (WA)
3. *Explosives and Dangerous Goods (Explosives) Regulations 1963* (WA)
4. *Environmental Protection Act 1986* (WA)
5. *Occupational Safety and Health Regulations 1996* (WA)

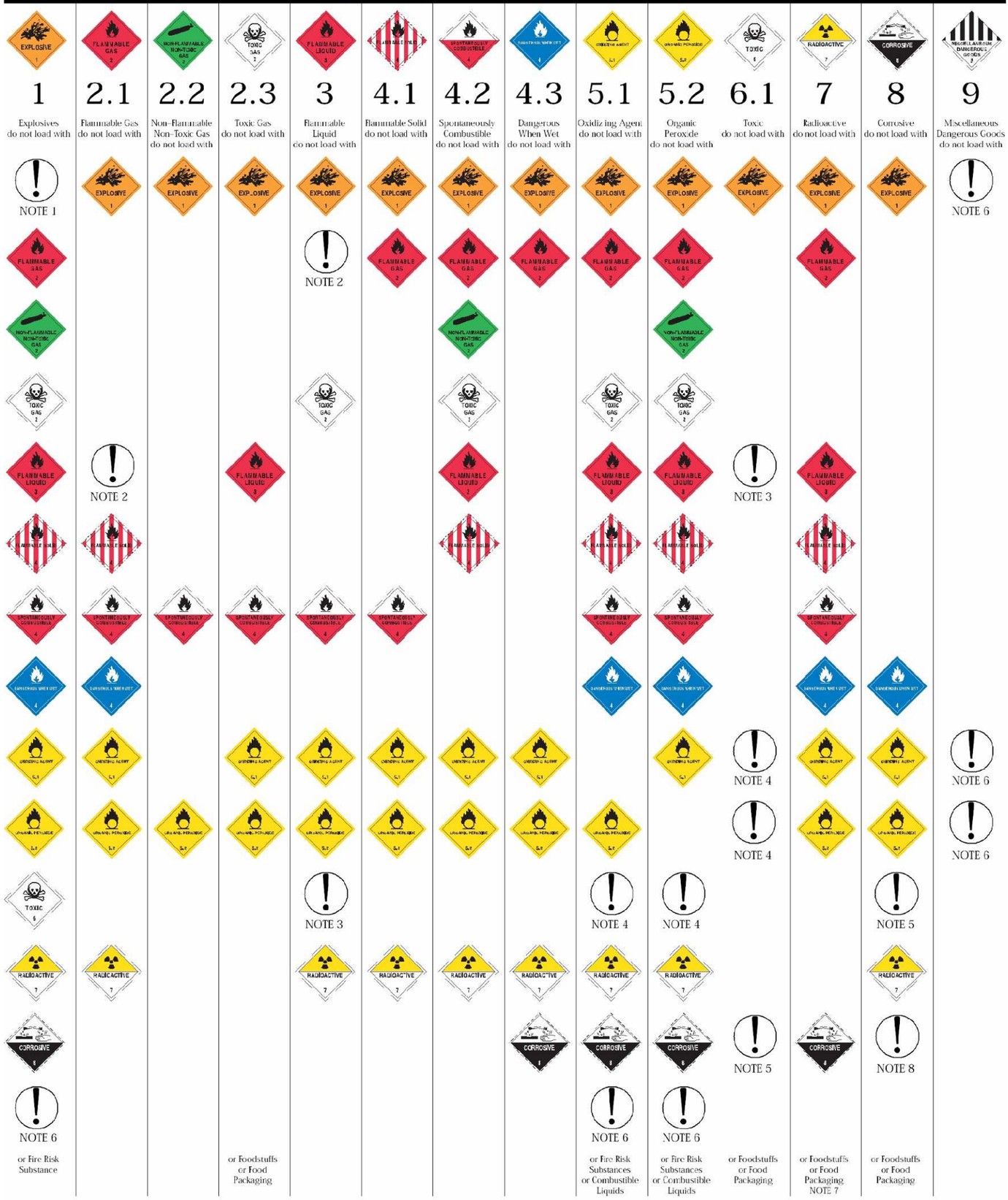
16.9 Advisory Agencies

The following organisations have been consulted on development of this plan:

1. DoCEP
2. FESA
3. DEC

Recognising dangerous goods

Segregation of dangerous goods in road vehicles and freight containers



NOTES:

1. Refer to explosives regulations for details of the transport of explosives. Explosives of Class 1.4 S may be transported with dangerous goods of any other Class if the total quantity of dangerous goods does not exceed 1,000 kg.
2. When both Classes are in bulk.
3. When Class 3 substance is nitromethane.
4. When Class 6 substance is a fire risk substance.
5. When Class 6 is a cyanide and Class 8 is an acid (is acidic).
6. When Class 9 substance is a fire risk substance.
7. See also the Code of Practice for the Safe Transport of Radioactive Substances.
8. Concentrated strong acid is to be segregated from concentrated strong alkali.

Figure 16-1 Guidance on Segregation of Dangerous Goods.

This guidance has been designed for road vehicles and freight containers, however is also applicable to storage on construction sites. Print A3 for best results

Table 16-1 Dangerous and Explosive Goods Manifest (6 pages)

Southern Seawater Desalination Project

Dangerous Goods and Explosives Log

The principal purpose of the manifest is to provide contractors and emergency service authorities with information about the quantity, type and location of dangerous goods and explosives stored.

Licensee
……

Address of Premises
……

Date of Preparation
……

Site Plan No.
……

Emergency Contacts

Name	Position	Telephone	
		B/H: A/H/Mobile:	
		B/H: A/H/Mobile:	
		B/H: A/H/Mobile:	
		B/H: A/H/Mobile:	
		B/H: A/H/Mobile:	
		B/H: A/H/Mobile:	

Dangerous Goods and Explosives Emergency Contacts

Water Corporation's Emergency Contacts

Name	Position	Organisation	Telephone	
George Basanovic	Corporate Incident Management Coordinator	Water Corporation	B/H: A/H/Mobile:	9420 3247 [redacted]
Ciaran MacCarron	Manager Occupational Health and Safety	Water Corporation	B/H: A/H/Mobile:	9420 3690 [redacted]
Mark Oliver	Senior Project Manager – Seawater Desalination Plant	Water Corporation	B/H: A/H/Mobile:	9420 3752 [redacted]
John Stansfield	Project Manager – Seawater Desalination Plant	Water Corporation	B/H: A/H/Mobile:	9420 3406 [redacted]
John Goullee	Principal Project Manager – Water Transfer Pipeline and Harvey Summit Tanks	Water Corporation	B/H: A/H/Mobile:	9420 2149 [redacted]
Stuart Hawkins	Senior Environmental Scientist	Water Corporation	B/H: A/H/Mobile:	9420 3266 [redacted]
Trevor Roffman	OSH Coordinator, Project Management Group	Water Corporation	B/H: A/H/Mobile:	9420 2413 [redacted]
Guy Watson	Environmental Operations Manager	Water Corporation	B/H: A/H/Mobile:	9420 3832 [redacted]

External Emergency Contacts

Position	Telephone	
Fire and Emergency Services Authority (Bunbury)	B/H: A/H/Mobile:	9780 1900 000 all hours
Police (Harvey)	B/H: A/H/Mobile:	9729 1001 - 17A Hayward St Harvey 000 all hours
Department of Consumer and Employment Protection Resources Safety Division	B/H:	9222 3595
Department of Environment and Conservation (Perth)	B/H: A/H/Mobile:	9726 4111 1300 784 782

Dangerous Goods - Maximum Permissable Quantities

Summary of Maximum Permissible Quantities - Licence under s45A of the *Explosives and Dangerous Goods Act 1961* (WA)

Bulk Storage

Tank Id No.	Dangerous Goods					Tank	
	Name	Class	Sub Risk(s)	UN No.	PG	Type	Capacity (L)

Package Storage Areas

Storage area			Dangerous Goods			Quantity (kg)	
	Name	Class	Sub Risk(s)	UN No.	PG	Average	Maximum

Other Packaged

Storage Area	Class	Sub Risk(s)	Packaging Group	Average Quantity (kg or L)	Maximum Quantity (kg or L)

Dangerous Goods - Receipt/Removal Log

Date Received/ Removed	Storage Location	Type of Dangerous Good	Maximum Permissible Quantity (kg)	Quantity Received (kg)	Quantity Removed (kg)	Quantity Remaining in Storage (kg)	Name of Person Receiving/ Removing

Explosives - Maximum Permissable Quantities

Summary of Maximum Permissible Quantities – Permit under s34 of the *Explosives and Dangerous Goods Act 1961* (WA)

Bulk Storage

Tank Id No.	Dangerous Goods					Tank	
	Name	Class	Sub Risk(s)	UN No.	PG	Type	Capacity (L)

Explosives - Receipt/Removal Log

Receipt/Removal

Date Received/ Removed	Storage Location	Type of Explosives	Maximum Permissible Quantity (kg)	Quantity Received (kg)	Quantity Removed (kg)	Quantity Remaining in Storage (kg)	Name of Person Receiving/ Removing

17.0 Organochlorine (Dieldrin) Management

17.1 Context

The Water Transfer Pipeline crosses land in which dieldrin pesticide, an organochlorine (OC), was historically applied to the soil surface for the control of the African black beetle in potato crops and to control weevils in fruit trees. Residual OC contamination exists in the top 10cm to 15cm of soil in the OC contaminated land. The residual OC contamination will require management during construction.

The WA Department of Agriculture and Food (DAF) (circa 2004) has determined the known dieldrin concentrations in the affected land:

Land on Water Transfer Pipeline route	Dieldrin Concentration (mg/kg)	Length of water transfer main affected
[redacted], Shire of Harvey	0.21	200m
[redacted], Shire of Harvey	0.07-0.09	150m
[redacted], Shire of Harvey	0.06-0.3	125m

Table 17-1. Land Affected by Residual OC Contamination on the Water Transfer Pipeline Route. The location of the OC contaminated lands have been suppressed and will remain strictly confidential as requested by the DAF (refer to Additional Information below).

Aerial imagery of the affected lands is depicted in Figure 23. Construction works are expected to impact approximately 1425m^3 of OC contaminated soil (475m length x 20m width x 15cm depth).

The residual OC contamination does not represent a health risk to construction staff and no personal protective equipment is required (the health investigation level for dieldrin is 10.00mg/kg for occupation of residential dwellings and 50.00mg/kg for occupation of commercial and industrial sites).

The risk is that construction works will remobilise dieldrin in the soil to the surface, with cattle consuming the remobilised dieldrin through ingestion of pasture and soil. Dieldrin consumed by cattle can bio-accumulate in the meat and milk; making it unsuitable for human consumption.

17.2 Purpose

The Purpose of the Organochlorine (Dieldrin) Management Plan is to outline management actions to:

1. manage remobilisation of residual OC contaminated soil during construction.
2. ensure that livestock do not access exposed OC contaminated soil during construction and immediately following post-construction.

17.3 Performance Indicators

Performance will be demonstrated by:

1. Compliance with the prescribed management actions.

17.4 Management Actions

Hygiene

1. It will be ensured that all vehicles and equipment will be brushed and/or air jetted to remove sods of dirt attached to the vehicle (including tyres, undercarriage and inside cabin) prior to exiting OC affected land to minimise contamination of adjacent lands (note there is no requirement for cleaning procedures prior to entering the affected land)

Construction

2. It will be ensured that livestock do not access OC affected land under construction or stockpiles of OC affected material.
3. A maximum 20m construction width will be used through OC contaminated land. The construction width maybe further reduced in the OC contaminated land to further minimise the area and volume of OC contaminated soil disturbed that would require management.
4. OC contaminated topsoil (top 15cm) will be stockpiled separately from soil stockpiles from other land. OC contaminated topsoil will not be placed on non- OC contaminated land.
5. An agreement with the Landowner will be reached on the management of OC contaminated topsoil by one of the following methods:
    a. **Remediation**[1]: Removal of OC contaminated topsoil to a depth of 15cm, replaced with 15cm of clean fill.
    b. **Partial Remediation**[2]: Removal of OC contaminated topsoil to a depth of 15cm, replaced with 50% clean fill and 50% OC contaminated topsoil to a depth of 15cm.
    c. **No Remediation**[3]: Removal of OC contaminated topsoil to a depth of 15cm during construction, which will be replaced following construction to a depth of 15cm.

    Where an agreement cannot be reached on the method, the 'No Remediation' method will be undertaken.
6. Surplus OC contaminated topsoil from the construction works maybe disposed of within the excavated trench of the affected agricultural land, with a minimum cover of 750mm of uncontaminated soil.
7. Surplus OC contaminated topsoil maybe disposed of to landfill or any other location not used for agriculture.
8. Surplus overburden (soil beneath 15cm depth) maybe disposed of to any land as this soil will not be OC contaminated.

Post-Construction

9. Liaisons will occur with the Landowner to ensure that livestock are excluded from land on which no remediation[3] has occurred until that area has been rehabilitated with pasture grass (refer to Rehabilitation Management Plan for agricultural lands).

17.5 Additional Information

Confidentiality

The location of the OC contaminated lands will remain strictly confidential as requested by the DAF. The locations of the OC contaminated lands will only be provided to the construction staff on the Water Transfer Pipeline. The locations of the OC contaminated lands will not be made available in the publicly available copy of the CEMF to maintain this confidentiality.

Pre-construction testing

Preconstruction testing of the affected lands will not be undertaken. The previous testing results from the DAF (circa 2004) are considered sufficient for construction management given that all OC contaminated land will be managed by the same management actions listed in this plan (i.e. the concentration is irrelevant to management). The DAF have provided verbal confirmation that pre-construction testing is not required (pers. com. 22 October 2007 A.Drage (DAF) to S.Hawkins (Water Corporation)).

Remediation

[1] Where the Landowner agrees to 'Remediation' of the OC contaminated land, topsoil will not be returned. The area will be fertilised and seeded as defined by the Remediation Management Plan. The DAF will then be able to assess the land to determine if it can be regarded as remediated.

[2] Where the Landowner agrees to 'Partial Remediation' of the OC contaminated land, the OC contaminated topsoil will be returned. Partial Remediation is considered an option as the Landowner may wish to retain the seed bank and nutrients contained in the topsoil. The area will be fertilised and seeded as defined by the Remediation Management Plan. The affected land may remain determined as OC contaminated by the DAF.

[3] Where the Landowner agrees to 'No Remediation' of the OC contaminated land, the OC contaminated topsoil will be returned in full. No Remediation is considered an option as the Landowner may wish to retain the seed bank and nutrients contained in the topsoil. The area will be fertilised and seeded as defined by the Remediation Management Plan. The affected land will likely remain determined as OC contaminated by the DAF.

17.6 Contingency Actions

No contingency actions are considered necessary.

17.7 Related Plans

1. Land Clearing and Trench Management
2. Dewatering and Acid Sulphate Soils Management

17.8 Relevant Legislation

1. *Agricultural Produce (Chemical Residues) Act 1983* (WA)

Note: The *Contaminated Sites Act 2003* (WA) and *Regulations 2006* (WA) do not apply as the residual OC contamination is a result of correct application of a pesticide (refer s5(2) and s4 of the *Contaminated Sites Regulations 2006* (WA)).

17.9 Advisory Agencies

The following organisations have been consulted on development of this plan:

1. DAF
2. DoH
3. DoCEP (Worksafe WA)

Figure 17-1 Organochlorine Contaminated Land

at [redacted], [redacted] and [redacted] The location of the OC contaminated lands has been intentionally 'blacked-out' in this publicly available version of this plan to comply with the confidentiality requirements of the DAF.

18.0 Discharge of Pipeline Pressure Testing and Disinfection Waters Management

18.1 Context

Following the construction of sections of the Water Transfer Pipeline, each section will be pressure tested to confirm its structural integrity. Each section tested will be approximately 5km in length. The pressure testing will be conducted using groundwater, scheme water, or a disinfection water containing 12.5% sodium hypochlorite.

Immediately prior to operation, the entire 30km Water Transfer Pipeline will be disinfected with 12.5% sodium hypochlorite. Disinfection is required in order to reduce bacterial contamination within the pipeline. This process will produce a disinfection water at approximately 5mg/L to 20mg/L chlorine.

Both the pressure test water and disinfection water will have a pH of between 8 to 12 pH units resulting from interaction with the lime in the cement lining of the pipeline.

The pressure test and disinfection waters will be unsuitable for domestic supply, and consequently must be discharged to the environment in an appropriate manner.

Residual chlorine contained in disinfection waters can be consumed by material with a high carbon content (such as soil and vegetation), or can be neutralised with 10% Sodium Thiosulphate using a de-chlorination unit. The impacts of pH can be controlled by management of flow rates for discharge to a watercourse, or can be neutralised by acid dosing (using a non-chlorinated acid).

The estimated total volume of controlled discharge to the environment will be approximately 100 ML (50 ML each from the pressure test water and the disinfection water).

The waters will be discharged from section valves to land, watercourses along the pipeline route, or to the ocean. The quality of the discharge waters will be monitored prior to, and during, discharge to the environment.

18.2 Purpose

The purpose of the Discharge of Pipeline Pressure Testing and Disinfection Waters Management Plan is to outline the management actions to:

1. Define the method and management of discharge of pressure test water and disinfection water to the environment.

18.3 Performance Indicators

Performance will be demonstrated by:

1. Compliance with the prescribed management actions.
2. Results of pH and chlorine monitoring in compliance with the discharge criteria.

18.4 Management Actions

General

1. Sections of pipeline between section valves (approximately 5km each) of the Water Transfer Pipeline will be pressure tested following construction of that section. The pressure testing will be conducted using groundwater, scheme water, or disinfection water containing 12.5% sodium hypochlorite.
2. The entire Water Transfer Pipeline will be disinfected with 12.5% sodium hypochlorite prior to operation.
3. Pressure test and disinfection waters will be preferentially discharged to the following major watercourses via scour valves:
   a. Harvey River
   b. Myalup/Harvey Main Drain
   c. Harvey Irrigation Channels
4. Disinfection water maybe preferentially discharged to agricultural land where approval of the Landowner has been obtained, or secondly to minor watercourses or drains, where discharge to the major watercourses is not practicable.
5. Pressure test and disinfection waters maybe discharged to the ocean at the Seawater Desalination Plant site. The discharge will occur through the outlet pipeline constructed for the Seawater Desalination Plant, or alternatively through a separate pipeline located in the surf zone (nominally 10m to 25m from the shoreline).

Chlorine and pH Discharge Criteria

6. The following discharge criteria apply:

	Chlorine (mg/L)	**pH**
Discharge to Watercourse	1.0[1] for discharge water	6.0 to 8.5 for the discharge water ***or*** ± 2 pH units downstream v. upstream measured at 100m from the discharge[2]
Discharge to Agricultural Land	1.0[1] for discharge water	4.0 to 10.0 for the discharge water[3]
Discharge to Ocean	Not applicable[4]	4.0 to 10.0 for the discharge water[3]

Table 18-1 Chlorine and pH Discharge Criteria

Management and Monitoring of Chlorine

7. Disinfection water will be tested for total chlorine prior to discharge to confirm that the total residual chlorine meets the discharge objectives. Testing may be conducted by water samples taken to a laboratory, or by field test equipment capable of accuracy to 1.0mg/L.
8. A mobile de-chlorination unit will be used to neutralise the residual chlorine with 10% Sodium Thiosulphate if the disinfection water has residual chlorine greater than 1.0mg/L.
9. Disinfection water will be discharged to a watercourse through a series of sterile hay bales. The bales will assist to aerate the discharge, reduce flow velocity, and reduce any suspended solids and turbidity. The bales will also assist in the neutralisation of residual chlorine (by acting as a carbon source).

Management and Monitoring of pH

10. The pH of the pressure test water and disinfection water will be field tested for (by multimeter) at the discharge point prior to discharge to confirm that the pH meets the discharge criteria on each day of discharge.
11. The pH of the pressure test water and disinfection water will be field tested for (by multimeter) at 100m upstream and 100m downstream of the discharge point on each day of discharge if the discharge does not meet the pH criteria for the discharge water for

discharges to a watercourse. The rate of discharge will be adjusted so that the pH in the watercourse downstream of the discharge is within ± 2 pH units of the upstream water quality.

12. The pH of the discharge water will be neutralised with sulphuric acid if the pH of the discharge does not meet the pH discharge criteria (with flow adjustment).

18.5 Additional Information

Discharge Criteria for Chlorine and pH

[1] Chlorine at 1.0mg/L is consistent with chlorine residual in potable water supply and is in accordance with the Water Corporation's guideline for disposal of disinfection water. Chlorine will be diluted by mixing within the watercourse, and consumed through biological uptake by bacteria, sediments and flora.

[2] Discharge pH is consistent with ANZECC/ARMCANZ and DoW guidelines for freshwater. Watercourse pH is consistent with the Water Corporation's guideline for disposal of disinfection water.

[3] pH limits defined by the *Environmental Protection (Unauthorised Discharges) Regulations 2004* (WA).

[4] Chlorine concentration for discharge to the ocean is not of concern given the concentration of chlorine present in the ocean as chloride (being part of sodium chloride (salt)).

De-chlorination

The Water Corporation's Water Technologies Division has two mobile de-chlorination units that may be made available upon request. The rate of de-chlorination capability is approximately 4ML/day. The discharge water may be pH corrected using an acid prior to de-chlorination.

Reuse

Consideration may be given to the reuse of the pressure test water and/or the disinfection water by a transfer of the water from one section of the pipeline to the next, with disinfection reoccurring in the next section. This will reduce the volume of water to be disposed of to the environment.

Consideration may also be given to reuse of the pressure test water and/or the disinfection water by discharge to a Harvey Summit Tanks such as the Harvey Dam.

18.6 Contingency Actions

1. Pressure testing of the pipeline may be repeated if the pressure test identifies that there are defects in the pipelines. The same procedure for monitoring the discharge of pressure test water to the environment will apply.
2. The same procedure for monitoring the discharge of the disinfection water to the environment will apply if disinfection is repeated.

18.7 Relevant Legislation

1. Environmental Protection Act 1986 (WA).
2. *Environmental Protection (Unauthorised Discharges) Regulations 2004* (WA).

18.8 Advisory Agencies

The following organisations have been consulted on development of this plan:

1. DoW
2. DEC
3. Harvey Water

19.0 Rehabilitation Management

19.1 Context

Construction of the Seawater Desalination Plant, Water Transfer Pipeline and the Harvey Summit Tanks will involve clearing of agricultural land and native vegetation (located in agricultural land, road reserves and State Forest). Rehabilitation of areas cleared will be undertaken as soon as reasonably practicable following the completion of construction works.

Following the implementation of rehabilitation actions, the success of the rehabilitation works will be monitored for a period of one year for agricultural lands, and for 5 years for native vegetation.

19.2 Purpose

The purpose of the Rehabilitation Management Plan is to outline management actions for:

1. rehabilitation of agricultural land disturbed during construction to a condition that is equal to the pre-construction condition and that is acceptable to the Landowner.
2. rehabilitation of native vegetation (including dune vegetation) to a condition that supports a self-sustaining plant community with comparable density and diversity to the pre-existing vegetation.

19.3 Performance Indicators

Performance will be demonstrated by:

1. Compliance with the prescribed management actions.

19.4 Management Actions

19.4.1 Seawater Desalination Plant

Native Vegetation

1. The proponent's completion objective for rehabilitation of Seawater Desalination Plant site for native vegetation is:

Native Vegetation	*Rehabilitation will achieve a post-construction condition of native vegetation that will, in the future[1], likely support a self-sustaining plant community with comparable species density and species diversity to the pre-existing vegetation.*

2. The Seawater Desalination Plant site will be re-contoured, including re-creation of the primary dune, establishment of earth screening bunds, and contouring of the whole site to achieve stable batters.
3. Seed for rehabilitation will be collected from within nominally 50km of the construction site between (nominally) December to March of the year prior to seeding. A Licence will be obtained from the CEO of the DEC under s88(1) of the *Conservation and Land Management Act 1984* (WA) for collection of seed within DEC managed land (Note: Licence application to be made in accordance with r83 of the *Conservation and Land Management Regulations 2004* (WA)).
4. Seed will be collected based upon the species list identified in Table 19-2. The mass of each species collected will be determined based on seed availability (including consideration of recalcitrant species).
5. Following ripping of the compacted areas (refer to Land Clearing and Trench Management), the land will be seeded[2] with native vegetation seed at a rate of 5kg/ha. The 5kg/ha seed

base will be mixed with a 10kg/ha bulking agent (such as white sand) to achieve a more even spread of seed.

6. A slow release fertiliser having a low phosphorus content (such as Osmocote® PLUS Native Gardens (ratio Nitrogen 17: Phosphorus 1.6: Potassium 8.7)) will be applied at a nominal rate of 200kg/ha (by total weight, or at a rate as directed by the manufacturer) at the time of seeding.
7. Areas seeded and fertilised will be irrigated once per week for a period of 4 weeks following seeding and fertilising to encourage seed germination at a nominal irrigation rate of 50kL/ha (being equivalent to 5mm rainfall). Irrigation will be undertaken using a diffuse spray to prevent erosion during irrigation. Where seeding is undertaken in the months of December, January, February or March, there will be additional irrigation of the seeded area once per week for those months.
8. The revegetation works will be monitored for growth cover and vigour for a period of five springs following seeding and fertilising. The monitoring will assess the density and diversity of the rehabilitated areas compared to pre-construction photographs and any relevant pre-construction reports (including flora surveys).
9. Supplementary seeding, direct planting, fertilising and/or irrigation will be undertaken if the monitoring identifies poor growth in any revegetation area following the completion of spring monitoring,
10. Growth of large tree species (such as Jarrah and Marri) will be removed from within 7.5m of buried pipelines during the monitoring period[3]. Removal of these species will occur by cutting at the base of the plant and applying a Glyphosate herbicide to the cut surface.

19.4.2 Pipeline and Harvey Summit Tanks

Agricultural Land

11. The completion objective for rehabilitation of construction areas of agricultural land is:

Agricultural Land	*Rehabilitation will achieve a post-construction agricultural condition that is equal or better than the pre-construction agricultural condition, and is acceptable to the Landowner.*

12. Irrigation paddocks (that were laser levelled prior to construction) will be re-laser levelled as soon as practicable following construction on each lot.
13. Following ripping of the compacted areas (refer to Land Clearing and Trench Management), land disturbed by construction works will be seeded in consultation with the Landowner. Generally, three types of seed mixes containing a combination of rye grass and clover will be used, being separate proportions for irrigated agriculture, dry land agriculture, or agriculture on winter waterlogged land.
14. The following rates of seed and fertiliser will be applied on agricultural land under rehabilitation:

Seed (kg/ha)	Phosphorus (kg/ha)	Nitrogen (kg/ha)	Potassium (kg/ha)	Sulphur (kg/ha)
25	40	35	20	20

Table 19-1 Seed and Fertiliser Application rates

Seed and fertiliser applications rates maybe varied by agreement with the Landowner.

15. The seed and fertiliser will be supplied to the Landowner at the above rate if the Landowner wishes to undertake the seeding and fertilising on their own land.
16. The Landowners of laser levelled irrigation paddocks will be requested to commence irrigation following seeding and fertilising to encourage seed germination. All non-irrigated paddocks will be irrigated with a nominal depth of 10mm of water (equivalent to 100kL/ha) following seeding and fertilising to encourage seed germination. Irrigation will be undertaken using a diffuse spray to prevent erosion during irrigation.

17. The growth success of rehabilitation works on agricultural land will be monitored for a period of one full spring following seeding and fertilising. The growth success will be measured by vegetation cover and vigour compared to pre-construction photographs.

18. Soil consolidation of the construction areas will be monitored on all laser levelled irrigation paddocks and measure any soil consolidation.

19. A report will be provided detailing the monitoring undertaken and the results of growth success and soil consolidation.

20. In consultation with the Landowner (and at no cost to the Landowner), seeding, fertilising and irrigation will be repeated in any areas that do not have vegetation cover or vigour that is equal to or better than the preconstruction condition within the first 12 months following the completion of all construction works on the land.

21. In consultation with the Landowner (at no cost to the Landowner), remedial works will be undertaken to correct soil consolidation if the trench settles or consolidates greater than 3cm in laser levelled irrigation paddocks, or greater than 10cm in non-irrigated paddocks, within the first 12 months following the completion of all construction works. The remedial works to be undertaken will involve (as per the Land Clearing and Trench Management Plan):
    a. removal of topsoil.
    b. replacement and compaction with clean fill of equivalent soil type.
    c. replacement of topsoil.
    d. seeding and fertilising as stated above.
    e. Any other actions as agreed on with the Landowner (which may or may not include other actions to account for consequential loss or future soil consolidation).

Native Vegetation

22. The completion objective for rehabilitation of construction areas with native vegetation is:

Native Vegetation	*Rehabilitation will achieve a post-construction condition of native vegetation that will, in the future[1], likely support a self-sustaining plant community with comparable species density and species diversity to the pre-existing vegetation.*

23. Following ripping of the compacted areas (refer to Land Clearing and Trench Management), the land will be seeded[2] with native vegetation seed at a rate of 5kg/ha. The 5kg/ha seed base will be mixed with a 10kg/ha bulking agent (such as white sand) to achieve a more even spread of seed.

24. Seed for rehabilitation will be collected from within 50km of the construction site between (nominally) December to March of the year prior to seeding. A Licence will be obtained from the CEO of the DEC under s88(1) of the *Conservation and Land Management Act 1984* (WA) for collection of seed within State Forest (Note: Licence application to be made in accordance with r83 of the *Conservation and Land Management Regulations 2004* (WA)).

    The species of seed to be collected will be based upon the species list identified in Table 15-2. The mass of each species collected will be determined based on seed availability (including consideration of recalcitrant species).

25. A slow release fertiliser having a low phosphorus content (such as Osmocote® PLUS Native Gardens (ratio Nitrogen 17: Phosphorus 1.6: Potassium 8.7)) will be applied at a nominal rate of 200kg/ha (by total weight, or at a rate as directed by the manufacturer) at the time of seeding.

26. Areas seeded and fertilised will be irrigated once per week for a period of 4 weeks following seeding and fertilising to encourage seed germination at a nominal irrigation rate of 50kL/ha (being equivalent to 5mm rainfall). Irrigation will be undertaken using a diffuse spray to prevent erosion during irrigation. Where seeding is undertaken in the months of December, January, February or March, the seeded area will be additionally irrigated once per week for those months.

27. The revegetation works will be monitored for growth cover and vigour for the period of one full spring following seeding and fertilising. A report on the monitoring undertaken will be prepared.

28. If the monitoring identifies poor growth in any revegetation area following the completion of spring monitoring, supplementary seeding, direct planting, fertilising and/or irrigation will be undertaken.
29. Following the spring monitoring and any supplementary works, there will be annual monitoring of the rehabilitation works for a further 4 spring periods (i.e. a total of 5 spring monitoring years). The monitoring will assess the density and diversity of the rehabilitated areas compared to pre-construction photographs and any relevant pre-construction reports (including flora surveys).
30. Direct planting by seedlings maybe undertaken if supplementary works within the monitoring period are required to improve vegetation density or diversity.
31. Growth of large tree species (such as Jarrah and Marri) will be removed from within 7.5m of the Water Transfer Pipeline centreline within the Water Corporation's monitoring period[3]. Removal of these species will occur by cutting at the base of the plant and applying a Glyphosate herbicide to the cut surface.

19.5 Additional Information

Native Vegetation Rehabilitation

[1] The density and diversity of rehabilitated native revegetation will change over time. Such changes over time include:

1. increase in overstorey height.
2. development of understorey with increased overstorey height.
3. leaf litter drop from overstorey to suppress weed species.
4. species recruitment from adjacent vegetation.

As the changes listed above can only be developed over time, it would be unlikely that rehabilitation of native vegetation could be deemed to support a self-sustaining plant community with comparable species density and species diversity to the pre-existing vegetation within a period of 20 to 30 years.

A 20 to 30 year timeframe for implementing rehabilitation of native vegetation is considered inappropriate given that:

1. native revegetation requires limited active management once established.
2. the area of native vegetation to be cleared is small (<15ha).
3. large trees cannot be planted within 7.5m of the pipeline (due to root damage of rubber ring joints), so the vegetation structure will be different for a large proportion of the rehabilitation.
4. the *likelihood* of the vegetation to meet the completion objectives into the future can be assessed after a lesser time period (5 years after establishment)

Consequently, the likelihood of the vegetation achieving the completion objectives in the future will be assessed after a period of 5 years. The 5-year assessment will include:

1. calculation of the current species density and species diversity in comparison to the pre-construction species density and species diversity
2. the likelihood of recruitment of species from adjacent vegetation.
3. a determination if the native vegetation will, within a period of 30 years, likely achieve the completion objectives. The determination will be made in consultation with the Landowner with a view to hand over management of the rehabilitated areas to the Landowner
4. the determination will include any requirement to fund minor active management (such as weed control) to the Landowner.

[2] Timing of seeding for native vegetation will be dependant on seed availability.

Infrastructure Maintenance

[3] It is required by this plan to remove large trees species from within 7.5m of buried pipelines to prevent tree roots from interfering with the rubber ring joints that connect the pipe lengths. This operational maintenance work will need to be undertaken throughout the life of the project in consultation with the relevant Landowner(s) beyond the timeframe covered by this CEMF.

Weed Management

The 3 year monitoring and management period for weeds in agricultural land and native vegetation specified in the Hygiene Management Plan is separate to the monitoring and management periods for rehabilitation. These actions will be undertaken concurrently.

19.6 Contingency Actions

Native Vegetation

1. Additional or alternative actions required will be considered to meet the completion objectives if the rehabilitation works in native vegetation do not meet the completion objectives within 5 years.

Agricultural Land

2. A resolution will be facilitated with the Landowner if agreement cannot be reached as to the success of rehabilitation works on agricultural land.

19.7 Related Plans

1. Land Clearing and Trench Management
2. Well Construction Management
3. Hygiene Management

19.8 Relevant Legislation

1. *Conservation and Land Management Act 1984* (WA) and *Regulations 2004* (WA).

19.9 Advisory Agencies

The following organisations have been consulted on development of this plan:

1. DEC
2. DAF
3. Conservation Commission
4. Shire of Harvey

Table 19-2 Native Flora to be Considered for Rehabilitation of Native Vegetation

(from 360 Environmental 2008).

Notes:
1. The *WAH No.* is the plant family number used by the Western Australian Herbarium.
2. *Declared weed* means the species has been declared under the *Agriculture and Related Resources Protection Act 1976* (WA).
3. Priority flora species are as defined by the Department of Environment and Conservation, but have no specific legal protection.
4. *NS* indicates a weed of national significance as defined by Thorp & Lynch (2000).

WAH No.	FAMILY / TAXA	COMMON NAMES	NOTES
3	**Selaginellaceae**		
	Selaginella gracillima		
011C	**Dennstaedtiaceae**		
	Pteridium esculentum	bracken	
016A	**Zamiaceae**		
	Macrozamia riedlei	zamia	
017A	**Pinaceae**		
	Pinus pinaster	maritime pine	weed
20	**Typhaceae**		
	Typha orientalis	bullrush	weed
23	**Potamogetonaceae**		
	Potamogeton drummondii	pond weed	
26	**Juncaginaceae**		
	Triglochin sp. B Flora of Australia (P.G. Wilson 4294)		
	Triglochin trichophora		
	Triglochin huegelii		
	Triglochin nana		
27	**Alismataceae**		
	Alisma lanceolatum	water plantain	weed
31	**Poaceae (grasses)**		
	Aira caryophyllea	silvery hairgrass	weed
	Aira cupaniana	early hairgrass	weed
	Aira praecox	early hairgrass	weed
	Ammophila arenaria	marram grass	weed
	Amphipogon laguroides subsp. laguroides		
	Amphibromus nervosus		
	Amphipogon turbinatus		
	Amphipogon amphipogonoides		
	Amphipogon laguroides subsp. laguroides		
	Austrodanthonia occidentalis		
	Arundo donax	'bamboo'	weed
	Austrostipa campylachne		
	Austrostipa compressa		
	Austrostipa flavescens		
	Austrostipa sp.		
	Avena barbata	wild oats	weed
	Briza maxima	blowfly grass	weed
	Briza minor	shivery grass	weed
	Bromus diandrus	great brome	weed
	Bromus hordeaceus	soft brome	weed
	Bromus rubens	red brome	weed
	Cynodon dactylon	couch	weed
	Dactylis glomerata	cocksfoot	weed
	Deyeuxia quadriseta	reed bentgrass	weed
	Dichelachne crinita	longhair plumegrass	
	Ehrharta brevifolia	annual veldt grass	weed
	Ehrharta calycina	perennial veldt grass	weed
	Ehrharta longiflora	annual veldt grass	weed
	Elymus scaber		
	Eragrostis curvula	African love grass	weed
	Glyceria declinata		weed
	Holcus lanatus	Yorkshire fog	weed
	Holcus setiger	annual fog	weed
	Hordeum geniculatum	barley grass	weed
	Hordeum leporinum	barley grass	weed
	Lagurus ovatus	hair's tail grass	weed
	Lolium multiflorum	Italian rye grass	weed
	Lolium perenne	perennial ryegrass	
	Lolium rigidum	annual rye grass	weed
	Medicargo polymorpha		weed
	Microlaena stipoides var. stipoides		
	Paspalum sp.		weed
	Pennisetum clandestinum	kikuyu	weed
	Poa annua	winter grass	weed
	Poa drummondiana	knotted poa	weed
	Poa poiformis	coastal poa	
	Poa porphyroclados		

	Poa porphyroclados		
	Polypogon monspeliensis	annual beardgrass	weed
	Sorghum halepense	Johnson grass	weed
	Spinifex hirsutus	hairy spinifex	
	Stenotaphrum secundatum buffalo grass	buffalo grass	weed
	Vulpia bromoides	squirrel tail fescue	weed
	Vulpia muralis		weed
32	**Cyperaceae (sedges)**		
	Baumea articulata	jointed rush	
	Baumea preissii subsp. laxa		
	Bolboschoenus caldwellii	marsh club-rush	
	Carex appressa	tall sedge	
	Carex preissii		
	Cyathochaeta ?avenacea		
	Cyperus sp.		
	Cyperus tenellus	tiny flatsedge	weed
	Eleocharis acuta	common spike-sedge	
	Ficinia nodosa	knotted club-rush	
	Gahnia trifida	coastal saw-sedge	
	Isolepis cernua var. setiformis		
	Isolepis hystrix		weed
	Isolepis marginata	coarse club-rush	weed
	Isolepis stellata	star club-rush	
	Lepidosperma gladiatum	coastal sword-sedge	
	Lepidosperma longitudinale	pithy sword-sedge	
	Lepidosperma pubisquameum		
	Lepidosperma scabrum		
	Lepidosperma squamatum		
	Lepidosperma tetraquetrum		
	Mesomelaena graciliceps		
	Schoenus caespititius		
	Schoenus curvifolius		
	Schoenus efoliatus		
	Schoenus grandiflorus	large flowered bogrush	
	Schoenus subfascicularis		
	Schoenus sublateralis		
	Tetraria capillaris	hair sedge	
	Tetraria octandra		
35	***Araceae***		
	Zantedeschia aethiopica	Arum lilly	Declared weed
39	***Restionaceae (rushes)***		
	Anarthria laevis		
	Desmocladus asper		
	Desmocladus flexuosus		
	Hypolaena exsulca		
	Lepyrodia glauca		
	Lepyrodia muirii		
	Lyginia barbata		
	Lyginia imberbis		
	Meeboldina roycei		
	Meeboldina scariosa		
40	***Centrolepidaceae***		
	Aphelia cyperoides		
	Centrolepis aristata	pointed centrolepis	
	Centrolepis drummondiana		
	Centrolepis mutica		
47	**Commelinaceae**		
	Cartonema philydroides		
50	**Philydraceae**		
	Philydrella pygmaea subsp. pygmaea		
52	**Juncaceae**		
	Juncus articulatus	jointed rush	
	Juncus bufonius	toad rush	weed
	Juncus kraussii	sea rush	
	Juncus microcephalus		weed
	Juncus pallidus	pale rush	
	Juncus pauciflorus	loose flower rush	
	Juncus subsecundus	finger rush	
	Juncus usitatus	common rush	weed
	Luzula meridionalis	field woodrush	
054B	**Asparagaceae**		
	Asparagus asparagoides	bridal creeper	Declared weed & NS
054C	**Dasypogonaceae**		
	Acanthocarpus preissii		
	Dasypogon bromeliifolius	pineapple bush	
	Lomandra hermaphrodita		
	Lomandra maritima		
	Lomandra micrantha subsp. micrantha		
	Lomandra nigricans		
	Lomandra odora	tiered matrush	
	Lomandra preissii		
	Lomandra purpurea	purple matrush	
	Lomandra sericea	silky matrush	

	Lomandra sonderi		
054D	**Xanthorrhoeaceae**		
	Xanthorrhoea brunonis		
	Xanthorrhoea preissii	grass tree or blackboy	
054E	**Phormiaceae**		
	Dianella revoluta var. divaricata		
054F	**Anthericaceae**		
	Agrostocrinum hirsutum		
	Agrostocrinum scabrum subsp. scabrum		
	Caesia micrantha	pale grass-lily	
	Chamaescilla corymbosa var. corymbosa		
	Corynotheca micrantha var. micrantha		
	Dichopogon capillipes		
	Johnsonia acaulis		
	Laxmannia squarrosa		
	Sowerbaea laxiflora	purple tassels	
	Thysanotus arbuscula		
	Thysanotus arenarius		
	Thysanotus manglesianus	fringed lily	
	Thysanotus multiflorus	many-flowered fringe lily	
	Thysanotus thyrsoideus		
	Tricoryne elatior	yellow Autumn lily	
054G	**Asphodelaceae**		
	Trachyandra divaricata	onion weed	weed
054J	**Colchicaceae**		
	Burchardia congesta		
	Wurmbea monantha		
55	**Haemodoraceae**		
	Anigozanthos manglesii subsp. manglesii	kangaroo paw	
	Conostylis aculeata subsp. aculeata	prickley conostylis	
	Conostylis aculeata subsp. preissii		
	Conostylis juncea		
	Haemodorum ?sparsiflorum		
	Phlebocarya ciliata		
60	**Iridaceae**		
	Gladiolus undulatus	wild gladiolus	weed
	Patersonia occidentalis	purple flag	
	Romulea obscura		weed
	Romulea rosea var. rosea	Guilford grass	weed
	Romulea sp.		
	Watsonia sp.		weed
66	**Orchidaceae**		
	Caladenia discoidea	dancing orchid	
	Caladenia flava subsp. flava		
	Caladenia latifolia	pink fairy orchid	
	Caladenia longicauda subsp. calcigena		
	Caladenia marginata	white fairy orchid	
	Caladenia paludosa		
	Caladenia speciosa		DEC Priority 4 species
	Cryptostylis ovata		
	Disa bracteata		weed
	Diuris corymbosa		
	Drakaea glyptodon	king-in-his-carrage	
	Drakaea micrantha		Declared Rare Flora
	Elythranthera brunonis	purple enamel orchid	
	Elythranthera emarginata	pink enamel orchid	
	Eriochilus dilatatus subsp. dilatatus		
	Eriochilus dilatatus subsp. multiflorus		
	Leporella fimbriata	hare orchid	
	Lyperanthus serratus	rattle beak orchid	
	Microtis media subsp. media		
	Microtis media subsp. quadrata		
	Paracaleana nigrita	flying duck orchid	
	Prasophyllum parvifolium	Autumn leek orchid	
	Pterostylis aff. nana		
	Pterostylis brevisepala		
	Pterostylis crenulata		
	Pterostylis recurva	jug orchid	
	Pterostylis sanguinea		
	Pterostylis vittata	banded greenhorn	
	Pyrorchis nigricans	red beaks	
	Thelymitra benthamiana	cinnamon sun orchid	
	Thelymitra crinita	blue lady orchid	
	Thelymitra flexuosa	twisted sun orchid	
	Thelymitra graminea		
	Thelymitra macrophylla		
	Thelymitra paludosa		
	Thelymitra vulgaris		
70	**Casuarinaceae**		
	Allocasuarina sp.		Introduced horticultural species
88	**Urticaceae**		
	Parietaria ?cardiostegia		
	Parietaria debilis	pelitory	

90	**Proteaceae**		
	Adenanthos meisneri		
	Adenanthos obovatus	basket flower	
	Banksia attenuata	slender banksia	
	Banksia grandis	bull banksia	
	Banksia ilicifolia	holy-leaved banksia	
	Banksia littoralis	swamp banksia	
	Grevillea diversifolia subsp. diversifolia		
	Hakea lissocarpha	honey bush	
	Hakea prostrata	harsh hakea	
	Hakea ruscifolia	candle hakea	
	Hakea varia	variable-leaved hakea	
	Persoonia longifolia	snottygobble	
	Persoonia saccata	snottygobble	
	Petrophile linearis	pixie mops	
	Stirlingia latifolia	blueboy	
92	**Santalaceae**		
	Exocarpos sparteus	broom ballart	
	Leptomeria cunninghamii		
	Leptomeria pauciflora	sparse-flowered currant bush	
	Santalum acuminatum	quondong	
97	**Loranthaceae**		
	Nuytsia floribunda	Christmas tree	
103	**Polygonaceae**		
	Persicaria ?prostrata		weed
	Polygonum aviculare	wireweed	
	Rumex crispus	curled dock	weed
105	**Chenopodiaceae**		
	Rhagodia baccata subsp. baccata		
	Threlkeldia diffusa	coast bonefruit	
109	**Phytolaccaceae**		
	Phytolacca octandra	red ink plant	weed
110	**Aizoaceae**		
	Carpobrotus edulis	hottentot fig	weed
	Carpobrotus virescens	coastal pigface	
111	**Portulacaceae**		
	Calandrinia brevipedata	short-stalked purselane	
	Calandrinia granulifera	pygmy purselane	
	Calandrinia liniflora	parakeelya	
	Calandrinia sp. SW coastal (J. Dodd 753)		
113	**Caryophyllaceae**		
	Cerastium glomeratum	mouse ear chickweed	weed
	Cerastium pumilum		weed
	Petrorhagia dubia	velvet pink	weed
	Silene gallica	French catchfly	weed
	Stellaria pallida		
119	**Ranunculaceae**		
	Clematis linearifolia		
	Ranunculus sessiliflorus	smallflower buttercup	
131	**Lauraceae**		
	Cassytha racemosa forma racemosa		
	Cinnamomum camphora	camphor laural	weed
136	**Fumariaceae**		
	Fumaria muralis	wall fumitory	weed
138	**Brassicaceae**		
	Cakile maritima	sea rocket	weed
	Heliophila pusilla		weed
	Stenopetalum gracile		
143	**Droseraceae**		
	Drosera erythrorhiza subsp. squamosa		
	Drosera gigantea subsp. geniculata		
	Drosera menziesii subsp. penicillaris		
	Drosera macrantha	bridal rainbow	
	Drosera minutiflora		
	Drosera neesii	jewel rainbow	
	Drosera pallida	pale rainbow	
	Drosera porrecta		
149	**Crassulaceae**		
	Crassula colorata var. acuminata		
	Crassula colorata var. colorata		
152	**Pittosporaceae**		
	Marianthus tenuis		
161	**Rosaceae**		
	Rubus sp.	blackberry	Declared weed & NS
163	**Mimosaceae (acacias)**		
	Acacia applanata		
	Acacia cochlearis	rigid wattle	
	Acacia cyclops	coastal wattle	
	Acacia dentifera		
	Acacia extensa	wiry wattle	
	Acacia huegelii		
	Acacia lasiocarpa var. lasiocarpa		
	Acacia paradoxa	kangaroo thorn	weed

	Acacia pulchella var. glaberrima		
	Acacia pycnantha	golden wattle	weed
	Acacia saligna	orange wattle	
	Acacia semitrullata		DEC Priority 3 species
	Acacia stenoptera	narrow winged wattle	
	Acacia truncata (Sand dune variant)		
	Acacia urophylla		Introduced horticultural species
	Acacia willdenowiana	grass wattle	
	Paraserianthes lophantha subsp. lophantha	formerly Albizia	Introduced horticultural species
164	**Caesalpiniaceae**		
	Labichea punctata	lance-leaved cassia	
165	**Papilionaceae (peas)**		
	Aotus gracillima		
	Aotus procumbens		
	Aotus sp.		
	Bossiaea eriocarpa	common brown pea	
	Callistachys lanceolata	connich	
	Chamaecytisus palmensis	tagasaste	weed
	Daviesia divaricata subsp. divaricata		
	Daviesia physodes		
	Dillwynia dillwynioides		DEC Priority 3 species
	Dipogon lignosus	dolichos Pea	weed
	Euchilopsis linearis	swamp pea	
	Gastrolobium ebracteolatum		
	Gompholobium capitatum		
	Gompholobium confertum		
	Gompholobium polymorphum		
	Gompholobium tomentosum	hairy yellow pea	
	Hardenbergia comptoniana	native wisteria	
	Hovea pungens	Devil's pins	
	Hovea trisperma	common hovea	
	Isotropis cuneifolia subsp. cuneifolia		
	Jacksonia furcellata	grey stinkwood	
	Jacksonia gracillima		
	Jacksonia sternbergiana	stinkwood	
	Kennedia prostrata	scarlet runner	
	Latrobea tenella		
	Lotus angustissimus	narrow leaf trefoil	weed
	Lotus subbiflorus		weed
	Lotus uliginosus	greater lotus	weed
	Lupinus cosentinii	lupins	weed
	Melilotus indicus		weed
	Melilotus siculus		weed
	Ornithopus compressus	yellow serradella	weed
	Pisum sativum		weed
	Pultenaea ochreata		
	Pultenaea reticulata		
	Templetonia retusa	cockies tongues	
	Trifolium angustifolium var. angustifolium	narrow leaf clover	weed
	Trifolium campestre var. campestre	hop clover	weed
	Trifolium cernuum	drooping flower clover	weed
	Trifolium hybridum var. hybridum	alsike clover	weed
	Vicia sativa subsp. nigra	common vetch	weed
	Viminaria juncea	swishbush	
167	**Geraniaceae**		
	Erodium cicutarium	common stalksbill	weed
	Geranium molle	dove's foot cranesbill	weed
	Geranium retrorsum		
	Pelargonium capitatum	rose pelargonium	weed
	Pelargonium littorale subsp. littorale		
168	**Oxalidaceae**		
	Oxalis corniculata	yewllow wood sorrel	weed
	Oxalis perennans		
	Oxalis pes-caprae	soursob	weed
173	**Zygophyllaceae**		
	Zygophyllum fruticulosum	shrubby twinleaf	
	Zygophyllum simile		
175	**Rutaceae**		
	Boronia dichotoma		
	Diplolaena dampieri	southern Diplolaena	
	Philotheca spicata	pepper and salt	
182	**Tremandraceae**		
	Platytheca galioides		
	Tetratheca hirsuta	black eyed Susan	
183	**Polygalaceae**		
	Comesperma calymega	blue-spike milkwort	
	Comesperma flavum		
	Comesperma virgatum	milkwort	
185	**Euphorbiaceae**		
	Euphorbia paralias	sea spurge	weed
	Euphorbia terracina	Geraldton carnation weed	weed
	Monotaxis occidentalis		
	Phyllanthus calycinus	false Boronia	

	Poranthera drummondii		
	Poranthera microphylla	small Poranthera	
215	**Rhamnaceae**		
	Spyridium globulosum	basket bush	
223	**Sterculiaceae**		
	Lasiopetalum membranaceum		DEC Priority 3 species
	Thomasia cognata		
226	**Dilleniaceae**		
	Hibbertia cuneiformis	cutleaf Hibbertia	
	Hibbertia hypericoidesi		
	Hibbertia racemosa	stalked guinea flower	
	Hibbertia stellaris	orange stars	
	Hibbertia vaginata		
263	**Thymelaeaceae**		
	Pimelea lanata		
265	**Lythraceae**		
	Lythrum hyssopifolia	lesser loosestrife	weed
273	**Myrtaceae**		
	Agonis flexuosa var. flexuosa	peppermint	
	Astartea scoparia		
	Calothamnus quadrifidus	one-sided bottlebrush	Introduced horticultural species
	Calytrix angulata	yellow starflower	
	Calytrix flavescens	summer starflower	
	Calytrix fraseri	pink summer calytrix	
	Corymbia calophylla	marri	
	Darwinia citriodora	lemon-scented Darwinia	
	Eucalyptus gomphocephala	tuart	
	Eucalyptus gomphocephala (mallee form)		
	Eucalyptus marginata subsp. marginata	jarrah	
	Eucalyptus platypus	moort	Introduced horticultural species
	Eucalyptus rudis subsp. cratyantha		DEC Priority 4 species
	Eucalyptus rudis subsp. rudis	flooded gum	
	Eucalyptus wandoo	wandoo	
	Hypocalymma angustifolium	white myrtle	
	Kunzea glabrescens	spearwood	
	Leptospermum laevigatum	Victorian tea tree	weed
	Melaleuca incana subsp. incana	grey honeymyrtle	
	Melaleuca lanceolata	rottnest teatree	Introduced horticultural species
	Melaleuca lateritia	robin redbreast bush	
	Melaleuca preissiana	Moonah	
	Melaleuca preissiana	Moonah	
	Melaleuca rhaphiophylla	swamp paperbark	
	Melaleuca teretifolia	banbar	
	Melaleuca thymoides		
	Melaleuca trichophylla (glabrous form)		
	Melaleuca viminea subsp. viminea		
	Pericalymma ellipticum	swamp teatree	
275	**Onagraceae**		
	Oenothera mollissima		weed
	Oenothera stricta	common Evening Primrose	weed
276	**Haloragaceae**		
	Gonocarpus pithyoides		
281	**Apiaceae**		
	Actinotus glomeratus		
	Centella asiatica		
	Daucus glochidiatus	Australian carrot	
	Eryngium pinnatifidum subsp. pinnatifidum		
	Homalosciadium homalocarpum		
	Hydrocotyle callicarpa	small pennywort	
	Hydrocotyle pilifera var. glabrata		
	Hydrocotyle pilifera var. pilifera		
	Hydrocotyle tetragonocarpa		
	Platysace filiformis		
	Trachymene coerulea subsp. coerulea		
	Trachymene pilosa	native parsnip	
	Xanthosia huegelii		
288	**Epacridaceae**		
	Astroloma ciliatum	candle cranberry	
	Astroloma sp.		
	Brachyloma preissii subsp. obtusifolium		
	Conostephium pendulum	pearl flower	
	Leucopogon australis	spiked beard-heath	
	Leucopogon conostephioides		
	Leucopogon cordatus		
	Leucopogon parviflorus	coast beard-heath	
	Leucopogon propinquus		
	Leucopogon racemulosus		
	Leucopogon sprengelioides		
	Lysinema ciliatum	curry flower	
293	**Primulaceae**		
	Anagallis arvensis var. arvensis	pimpernel	weed
	Anagallis arvensis var. caerulea	pimpernel	weed
	Samolus junceus		

301	**Oleaceae**		
	Olea europaea	olive	weed
302	**Loganiaceae**		
	Logania serpyllifolia subsp. angustifolia		
	Logania vaginalis	white spray	
	Phyllangium divergens		
	Phyllangium paradoxum		
303A	**Menyanthaceae**		
	Villarsia albiflora		
304	**Apocynaceae**		
	Alyxia buxifolia	dysentery bush	
	Vinca major	blue periwinkle	weed
305	**Asclepiadaceae**		
	Gomphocarpus fruticosus	cotton bush	Declared weed
307	**Convolvulaceae**		
	Dichondra repens	kidney weed	
307A	**Cuscutaceae**		
	Cuscuta epithymum	lesser dodder	weed
310	**Boraginaceae**		
	Heliotropium curassavicum	smooth heliotrope	
	Echium plantagineum	Paterson's curse	weed
313	**Lamiaceae**		
	Hemiandra glabra subsp. glabra		
	Hemiandra pungens	snakebush	
	Mentha x piperita	eau de Cologne mint	weed
315	**Solanaceae**		
	Anthocercis littorea	yellow tailflower	
	Solanum linnaeanum	apple of sodon	Declared weed
	Solanum nigrum	black berry nightshade	weed
	Solanum symonii		
	Cuscuta epithymum	lesser dodder	
316	**Scrophulariaceae**		
	Bacopa ?monnieri		
	Dischisma arenarium		
	Parentucellia viscosa	sticky bartsia	
	Veronica distans		
	Dischisma arenarium		weed
320	**Orobanchaceae**		
	Orobanche australiana	Australian broomrape	
	Orobanche minor	lesser broomrape	weed
326	***Myoporaceae***		
	Myoporum insulare	blueberry tree	
329	**Plantaginaceae**		
	Plantago lanceolata	ribwort plaintain	weed
331	**Rubiaceae**		
	Opercularia hispidula	hispid stinkweed	
	Opercularia vaginata	dog weed	
339	**Campanulaceae**		
	Wahlenbergia capensis	cape bluebell	weed
	Wahlenbergia gracilenta	annual bluebell	
340	**Lobeliaceae**		
	Isotoma hypocrateriformis	woodbridge poison	
	Lobelia alata	angled Lobelia	
	Lobelia rhytidosperma	wrinked-seeded Lobelia	
	Lobelia tenuior	slender Lobelia	
341	**Goodeniaceae**		
	Dampiera linearis	common Dampiera	
	Lechenaultia biloba	blue Leschenaultia	
	Lechenaultia floribunda	free-flowering Leschenaultia	
	Scaevola calliptera		
	Scaevola crassifolia	thick-leaved fan-flower	
343	**Stylidiaceae**		
	Levenhookia pusilla	midget stylewort	
	Levenhookia stipitata	common stylewort	
	Stylidium aff. junceum		
	Stylidium brunonianum	pink fountain triggerplant	
	Stylidium calcaratum	book trigger plant	
	Stylidium carnosum	fleshy-leaved triggerplant	
	Stylidium guttatum	dotted triggerplant	
	Stylidium junceum	reed triggerplant	
	Stylidium piliferum	common butterfly triggerplant	
	Stylidium repens	matted triggerplant	
	Stylidium schoenoides	cow kicks	
345	**Asteraceae**		
	Arctotheca calendula	capeweed	weed
	Arctotheca populifolia	dune Arctotheca	weed
	Asteridea pulverulenta	common bristle daisy	
	Carduus tenuiflorus	sheep thistle	
	Cirsium vulgare	spear thistle	weed
	Conyza bonariensis	flaxleaf fleabane	weed
	Cotula coronopifolia	waterbuttons	weed
	Craspedia variabilis		
	Euchiton sphaericus		weed

Hyalosperma cotula		
Hyalosperma pusillum		
Hypochaeris glabra	smooth catsear	weed
Lactuca serriola	prickley lettuce	weed
Lagenophora huegelii		
Millotia myosotidifolia		
Millotia tenuifolia var. tenuifolia	soft Millotia	
Olearia axillaris	coastal daisybush	
Olearia paucidentata	Autumn scrub daisy	
Ozothamnus cordatus		
Podotheca angustifolia	sticky longheads	
Quinetia urvillei		
Rhodanthe citrina		
Senecio diaschides		weed
Senecio pinnatifolius var. latilobus		
Siloxerus humifusus	procumbent Siloxerus	
Sonchus oleraceus	common sowthistle	weed
Trichocline spathulata	native gerbera	
Ursinia anthemoides	Ursinia	weed

20.0 Environmental Incident Management

20.1 Context

Environmental incidents have the potential to occur on construction sites due to the scale and type of works being undertaken. For the purposes of this CEMF, an Environmental Incident is:

> *any event or impact on the environment involving actions or assets associated with the project that is capable of:*
> 1. *causing harm to the environment or any person;*
> 2. *causing pollution; and/or*
> 3. *coming to the attention of the public or an environmental regulatory agency.*

Environmental incidents include matters such as:

1. chemical spills (including hydrocarbons).
2. fires.
3. discharges of contaminated waters to the environment.
4. environmental monitoring results indicating an impact to the environment or any person (water quality, noise, etc).
5. death or injury of a marine mammal (such as whales or dolphins) or terrestrial fauna.

Environmental incidents do not include matters where there is no impact on the environment or do not cause concern for external groups, for example, a routine variance to compliance with this CEMF (routine variances will be dealt with under the Non-compliance Management Plan).

The Water Corporations Standard *SG110 Incident Management Corporate Planning Model* defines the manner in which the Principal responds to incidents. Environmental incidents relating to construction of the Southern Seawater Desalination Project shall be conducted as per Standard SG110.

20.2 Purpose

The purpose of the Environmental Incident Management Plan is to outline management actions to:

1. identify, manage and report on environmental incidents.
2. identify management actions required for prevention of future environmental incidents.

20.3 Performance Indicators

Performance will be demonstrated by:

1. Compliance with the prescribed management actions.

20.4 Management Actions

Determining an Environmental Incident

1. Suspected environmental incidents will be reported to an on-site environmental scientist. The environmental scientist will assess the impact site and make a determination (based upon professional experience) on whether the suspected environmental incident is confirmed.

2. If a confirmed environmental incident occurs, the incident will be repored as soon as reasonably practicable to:

Name	Position	Organisation	Telephone	
George Basanovic	Corporate Incident Management Coordinator	Water Corporation	B/H: A/H/Mobile:	9420 3247 0417 180 677
Mark Oliver	Senior Project Manager – Seawater Desalination Plant	Water Corporation	B/H: A/H/Mobile:	9420 3752 0419 941 204
John Stansfield	Project Manager – Seawater Desalination Plant	Water Corporation	B/H: A/H/Mobile:	9420 3406 0413 458 535
John Goullee	Principal Project Manager – Water Transfer Pipeline and Harvey Summit Tanks	Water Corporation	B/H: A/H/Mobile:	9420 2149 043 909 2103
Stuart Hawkins	Senior Environmental Scientist	Water Corporation	B/H: A/H/Mobile:	9420 3266 0408 934 744
Guy Watson	Environmental Operations Manager	Water Corporation	B/H: A/H/Mobile:	9420 3832 0438 947 828

Table 20-1 The Water Corporations Environmental Incident Contact List.

During an Environmental Incident

3. The on-site environmental scientist will determine if the incident is likely to have a continued environmental impact if construction work continues.
4. Based on that advice, construction work that would continue to have an environmental impact will temporarily cease. Other construction works not related to the environmental incident and environmental impact will continue.
5. Construction works at the affected area will only recommence on the approval of the on-site environmental scientist.
6. The incident will be investigated and an Incident Report (refer Figure 24) will be completed as soon as reasonably practicable (generally within 24 hours). The Incident Report will be provided to the persons listed above.
7. All Incident Reports will be logged on a file retained at the construction site office.

Reporting an Environmental Incident

8. Environmental incidents will be reported to the DEC by phone as soon as reasonably practicable following the environmental incident if the environmental incident has caused or is likely to cause pollution, or material or serious environmental harm (in accordance with s72(1) of the *Environmental Protection Act 1986* (WA)). Contact both:
    a. DEC Bunbury Office
    Phone: 9726 4300
    b. DEC Pollution Response (Perth)
    Phone: 1300 784 782

    Written confirmation of the environmental incident will be provided to the CEO of the DEC, based on the Incident Report.
9. Environmental incidents will be reported to the Local Government Authority, FESA and the Police as appropriate (as per Standard SG110).
10. All environmental incidents will be reported to the DEC as part of annual compliance reporting required under the Minister for the Environment's Statement of Conditions imposed under the *Environmental Protection Act 1986* (WA), irrespective of whether the environmental incidents have caused or is likely to cause pollution, or material or serious

environmental harm (in accordance with s72(1) of the *Environmental Protection Act 1986* (WA)).

Remediation of an Environmental Incident

11. The on-site environmental scientist, will determine any requirement to undertake remediation works, and the manner in which remediation works will be undertaken. Additional advice maybe sought from The Water Corporation, the other on-site personnel or the DEC in making that determination.

Post Environmental Incident Training

12. There will be a briefing following the investigation of a confirmed environmental incident. The briefing will include any identified construction process improvements that could prevent reoccurrence of the same environmental incident.
13. The CEMF will be updated (as appropriate) to reflect process improvements.

20.5 Contingency Actions

No contingency actions are considered necessary.

20.6 Related Plans

1. Fire Management
2. Dewatering and Acid Sulphate Soils Management
3. Land Clearing and Trench Management
4. Dangerous Goods and Explosives Management

20.7 Relevant Legislation

1. *Environmental Protection Act 1986* (WA)

20.8 Advisory Agencies

The following organisations have been consulted on development of this plan:

1. DEC
2. FESA

INCIDENT REPORT

From: _____ Branch/Region: _____

Description: _____

REPORT

WHAT HAPPENED: _____

WHY: _____

WHEN: _____

WHERE: _____

EXTENT OF IMPACT - Actual _____

Potential - *(Consider; Secondary Effects, Environment, Customer, Community, Corporation's System)* _____

THOSE INFORMED OF THE INCIDENT (*Internal & External*) (*When*?) _____

PROGNOSIS - (*Consider; Action Taken, Action Planned, Time to Resolution*) _____

DECISION and NOTIFICATION by BRANCH/REGION

IS THE INCIDENT REPORTABLE? ☐ NO ☐ YES (provide details) ☛

IS IT? ☐ MINOR ☐ SIGNIFICANT ☐ MAJOR

(Seek advice from senior management or the CIMC if unsure)

Decisions made by (Name): (*print*) _____

Designation: _____

Notified Control Centre/CIMC
Customer Contact & Scheduling/Manager

Report to (Name): _____

Date: ..../..../.... Time: _____

Agreed report back (*who & when*)

_____

Report By: _____

Signed: _____ Date: _____ Contact Phone (24 *hr*) _____

Branch/Region: _____ Time: _____ Contact Fax (24 *hr*) _____

Contact Callsign (24 *hr*) _____

A copy of this form must be faxed/phoned to the
Corporate Incident Management Coordinator Fax (09) 420 2656 Mobile 0417 180 677

Figure 20-1 Water Corporation's Incident Report Form

21.0 Compliance Management

21.1 Context

This CEMF outlines the actions, criteria and objectives to be implemented or achieved during construction. If for any reason the actions, criteria or objectives are not implemented or achieved, a response process is required to correct those matters within an appropriate timeframe and with notification to appropriate personnel.

21.2 Purpose

The purpose of the Compliance Management Plan is to outline the management actions to:

1. identify, communicate and correct non-conformity with the management actions contained in this CEMF.

21.3 Performance Indicators

Performance will be demonstrated by:

1. Resolution of non-conformity with the management actions contained CEMF in accordance with the actions contained in this plan.

21.4 Management Actions

1. The site personnel, Water Corporation, or third parties (such as regulators, local government authorities and the public) may identify potential non-conformity with the actions, criteria or objectives identified in this CEMF. All potential non-coconformities will be reported to the an appropriately qualified environmental scientist on site.
2. The report will be investigated within 48 hours notification to confirm its validity.
3. An Improvement Notice will be issued if the report is confirmed as valid (i.e. there is a non-conformity with the CEMF). The Improvement Notice details:
    a. the nature of the non-conformity;
    b. an assessment of the environmental impact;
    c. a decision on the corrective action(s) required. This may include revision of the actions, criteria or objectives identified in the CEMF;
    d. the timeframes allowed to implement the corrective actions;
    e. any requirements to inform contracting staff of the corrective actions to prevent reoccurrence; and
    f. close-out of corrective actions.

    The Improvement Notice is shown at Figure 21-1.
4. The corrective actions contained in the Improvement Notice will be implemented.
5. The actions required by the Improvement Notice will be completed and notification that the corrective actions have been completed will be provided to the environmental scientist..
6. The environmental scientist will review the actions taken, will be confirm that the corrective actions have been implemented and the complete the close-out section of the Improvement Notice.
7. A copy of all completed Improvement Notices will be maintained at the Site Office.

21.5 Additional Information

An Improvement Notice is a written communication tool that is used to improve environmental performance. An Improvement Notice should not be regarded as a sanction.

The process flowchart for management of CEMF non-compliances is contained in Figure 21-2.

21.6 Contingency Actions

If there is a dispute between the on-site environmental scientist and construction personnel, regarding the requirements contained in an Improvement Notice, the Water Corporation will resolve the dispute.

21.7 Related Plans

All plans are considered relevant

21.8 Relevant Legislation

1. *Environmental Protection Act 1986* (WA)

21.9 Advisory Agencies

The following organisations have been consulted on development of this plan:

1. DEC

Improvement Notice

Report - On-site environmental scientist and responsible construction personnel to complete

Date: _____

Location: _____

Contractor: _____

Nature of Non-Compliance Reported: _____

_____

_____

Is the Reported Non-Compliance Valid? Yes / No (please circle)

Assessment of Environmental Impact: _____

_____

_____

Corrective Actions to be Implemented: _____

_____

_____

Timeframe for completion: Immediately 24hrs 48hrs 7 days (please circle)

Contractor to Inform Staff: Yes/No (please circle)

Issue Date and Time: _____

Issued to (Name and Position):

Close-out - Responsible construction personnel to complete

Describe the corrective actions implemented: _____

_____

_____

_____

Name: Signature: Date:

Close-out - On-site environmental scientist to complete

Corrective actions have been implemented?: Yes / No (please circle)

Are additional corrective actions required? Yes / No (please circle)
If Yes – complete a new Improvement Notice with the new corrective actions

Name: Signature: Date:

A copy of the completed Improvement Notice is to be forwarded to the Site Management Team

Figure 21-1 Improvement Notice

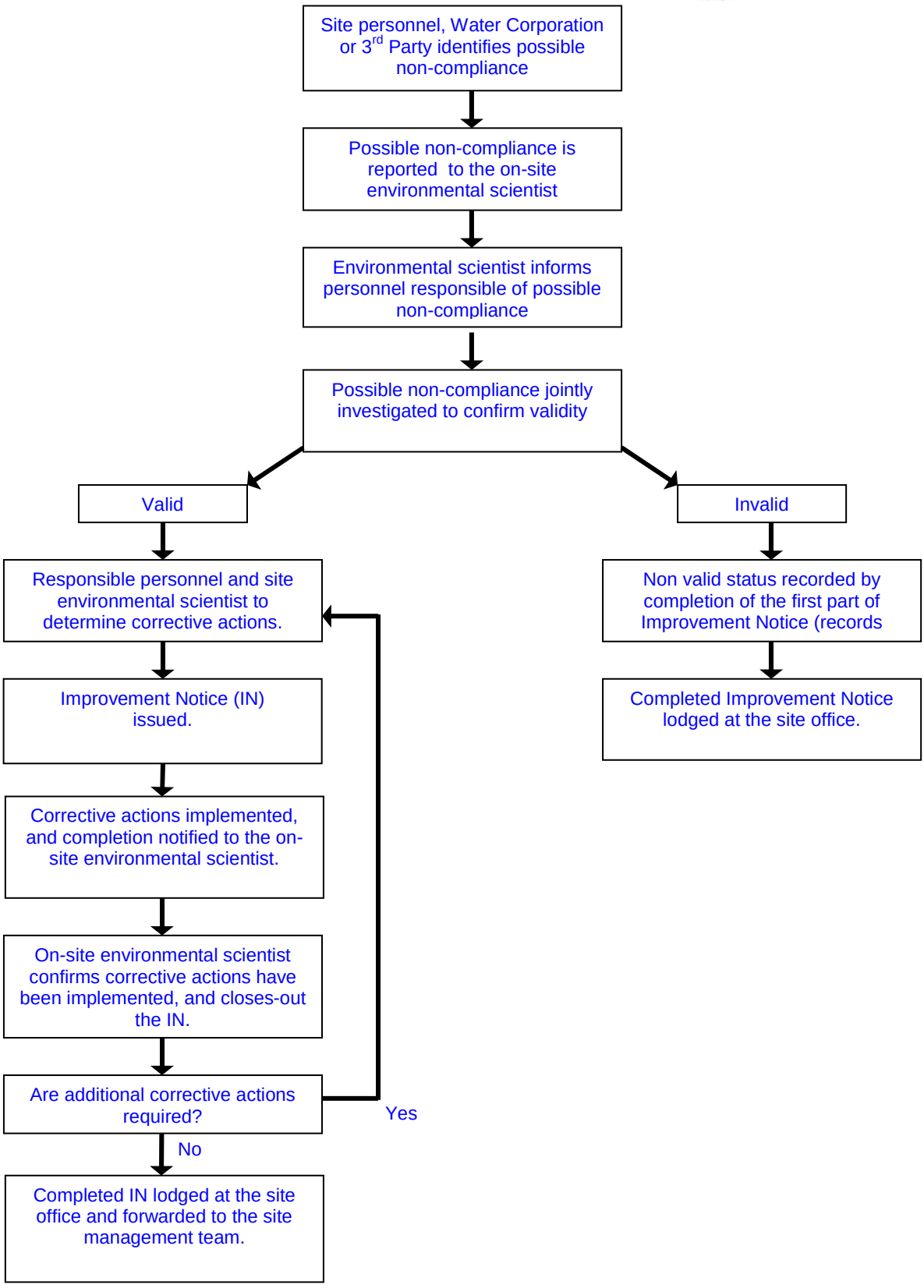


Figure 21-2 Compliance Assessment Process Flowchart

22.0 Community Complaints Management

22.1 Context

Construction works will occur in public and private lands and in close proximity to private residences. Impacts on the community during construction works are expected. A community complaints process will be established to ensure that community complaints are managed effectively.

22.2 Purpose

The purpose of the Community Complaints Management Plan is to outline management actions to:

1. record complaints received from the community.
2. record the response to community complaints received.

22.3 Performance Indicators

Performance will be demonstrated by compliance with the prescribed management actions.

22.4 Management Actions

1. There will be a designated Communications Officer to coordinate the receipt, investigation and resolution of community complaints.
2. There will be a free-call telephone number and an email address through which the community can telephone/email and have their complaints recorded.
3. The Communications Officer will acknowledge receipt of emailed complaints within nominally 48 hours of receipt.
4. The free-call telephone number and email contact details will be displayed at the external fence to each construction site.
5. The Communications Officer (or delegate) will record all complaints received on a Community Complaint Record (Figure 22-1). All Community Complaint Records will be maintained at the site office.
6. The Communications Officer will commence investigations into the nature and cause for the complaint within nominally 48 hours of receipt of the complaint. The investigation will include consultation with the on-site environmental scientist to determine if the cause for the complaint was in conformity with the management actions contained within this CEMF.
7. The Communications Officer will seek to provide a response to the complainant within 7 days of receipt of the complaint. The Communications Officer will complete the Community Complaint Record with details of how the complaint was addressed and the close-out discussions with the Complainant.
8. The Communications Officer will retain all Community Complaint Records at the site office during construction.
9. The Communications Officer will provide a copy of all Community Complaint Records at the end of each month during construction.

22.5 Contingency Actions

No contingency actions are considered necessary.

22.6 Related Plans

All plans are considered relevant.

22.7 Relevant Legislation

1. *Environmental Protection Act 1986* (WA)

22.8 Advisory Agencies

The following organisations have been consulted on development of this plan:

1. Shire of Harvey
2. DEC

Community Complaint Record

Complaint Receipt – Communications Officer to Complete

Date: _____

Time: _____

Complainant Details: Name: _____

Telephone Number(s): _____

Email address: _____

Residential Address: _____

Postal Address: _____

Nature of Complaint: _____

_____

_____

_____

Does the complaint require further investigation? Yes / No (please circle)

Estimated timeframe for completion: 24hrs 48hrs 7 days (please circle)

Relevant on-site personnel: _____

Construction location relevant to complaint: _____

Details of investigations undertaken: _____

_____

_____

_____

Assessment of complaint: _____

_____

Are corrective actions to be implemented? (if yes, describe) _____

_____

Close-out with Complainant - Communications Officer to Complete

Date of response to Complainant: _____

Time of response to Complainant: _____

Method of response: Telephone Email (please circle)

Describe the actions implemented: _____

_____

_____

_____

_____

Is the complaint resolvable? Yes / No (please circle)

Inform staff? Yes / No (please circle)

Does the Complainant wish to be added to the project mailing list? Yes / No (please circle)

Officer Name: _____ Signature: _____

A copy of all completed Community Complaint Records is to be forwarded to the Superintendent at the end of each month of construction.

Figure 22-1 Community Complaint Record

23.0 Auditing of the CEMF

23.1 Context

This CEMF for the Southern Seawater Desalination Project outlines a large number of management actions to be implemented during construction. These management actions will be audited to confirm that the management actions have been implemented. Auditing will be undertaken by the Alliance Lead Team (ALT) or their assigned representatives and an External Auditor, and may also be undertaken by local and state regulatory agencies.

Where auditing identifies that the management actions contained in the CEMF have not been implemented or do not achieve a satisfactory environmental performance, the specified contingency actions will be undertaken. Where contingency actions are not specified or are considered unsuitable, the auditor will seek to identify alternative actions to achieve the intended environmental objective.

23.2 Purpose

The purpose of Auditing of the CEMF is to outline management actions to:

3. identify the schedule and context of audits against the management actions contained within this CEMF.
4. confirm compliance with the management actions.
5. identify potential improvements in environmental performance.

23.3 Performance Indicators

Performance will be demonstrated by:

1. Compliance with the prescribed management actions contained in this CEMF.

23.4 Management Actions

1st Party Audits - Alliance Management Team (AMT)

10. The AMT or its delegates (including the on-site environmental scientist) will undertake daily informal observations of compliance with the management actions contained in this CEMF. These audits need not be recorded.

2nd Party Audits – Water Corporation

11. The Water Corporation will undertake assessments of compliance with the management actions contained in this CEMF each 3 consecutive months of construction. Reports generated from the audits will be provided to the AMT.

3rd Party Audits – Water Corporation's External Auditor

12. The Water Corporation will employ an External Auditor to undertake audits each 12 consecutive months of construction. The External Auditor will be a Certified Environmental Practitioner or Auditor, preferably with experience in the water industry.

3rd Party Audits – DEC

13. The DEC may undertake compliance audits of construction works at any time pursuant to the provisions of s48(1) and Part VI of the *Environmental Protection Act 1986* (WA).

3rd Party Audits – Shire of Harvey or other State Government Agency

14. The Contractor and the Principal will welcome inspections and audits by the Shire of Harvey and other State Government agencies interested in the project. The Principal will arrange the timing of such audits and inspections following requests from the Shire of Harvey and other State Government agencies.

23.5 Additional Information

1. All audits by all parties should seek to indicate if the project has:
    a. complied with the requirements as stipulated in the CEMF; and
    b. achieved satisfactory environmental performance.

    Non-conformity will be deemed to have occurred if the requirements of this CEMF have not implemented and there is unsatisfactory environmental performance.

    Both criteria are relevant, because although the CEMF may not have been strictly followed, alternative (and more appropriate) actions to achieve the intended environmental outcome may have been implemented. Alternatively, compliance with the actions specified in the CEMF may not have achieved satisfactory environmental performance and require modification/corrective action.

2. It is expected that any audit by a 3rd party (other than the Water Corporation's External Auditor) will be limited to within the statutory jurisdiction of that party.

23.6 Contingency Actions

No contingency actions are considered necessary.

23.7 Related Plans

All plans are considered relevant.

23.8 Relevant Legislation

1. *Environmental Protection Act 1986 (WA)*

23.9 Advisory Agencies

The following organisations have been consulted on development of this plan:

1. DEC

24.0 References

The following documents were reviewed and/or cited in preparation of the CEMF:

360 Environmental (February 2007) *Binningup Water Treatment Facility and Pipeline – Due Diligence Flora and Fauna Survey*.

360 Environmental (March 2007) *Perth Seawater Desalination Plant Dredging and backfilling Environmental Management Plan*.

360 Environmental (January 2008) *Southern Seawater Desalination Project Terrestrial Flora and Fauna Survey.*

Australian and New Zealand Environment and Conservation Council (October 2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Chapter 3.

Commonwealth of Australia (2007) *Environment Protection and Biodiversity Conservation Act 1999 Decision to Approve the Taking of an Action: Bleached Kraft Pulp Mill at Bell Bay, Tasmania* (Gunns Limited).

Commonwealth of Australia (2007) *Chief Scientist's Report on the Scientific Aspects of the Department of Environment and Water Resources Recommendation Report, Relevant Supporting Documentation and Public Comments on the Gulls Limited Pulp Mill Proposal (EPBC 2007/3385) in Tasmania.*

D A Lord and Associates Pty Ltd (February 2002) *Bunbury Ocean outlet: Addendum to Construction Environmental Management Framework: Blast Management Plan* (Draft). Report No 00/189/3

Department of Agriculture Western Australia (1999) *Farmnote 40/98: Direct seeding of native plants for revegetation*.

Department of Agriculture Western Australia and Grains Research and Development Corporation (2006) *2006/2007 Canola, Pulse and Legume Pasture Spraying Charts – Bulletin 4674.*

Department of Conservation and Land Management (July 2005) *Minimising Disease Risk in Wildlife Management: Standard operating procedures for fauna translocation, monitoring and euthanasia in the field.*

Department of Environment (August 2003) *General Guidance on Managing Acid Sulfate Soils*.

Department of Environment (October 2004) *Acid Sulfate Soils Guideline Series – Treatment and management of disturbed acid sulfate soils*.

Department of Environment and Conservation (27 August 2007) *Perth Seawater Desalination Licence.* Letter to the Water Corporation from Director Environmental Regulation Division on marine field monitoring.

Department of Environmental Protection (1997) *Environmental Protection (Noise) Regulations 1997: Summary of the Regulations.*

Department of Industry and Resources (2003) *Guidance Note S310 Rev 5: Guidelines for the Preparation of an Emergency Plan and Manifests*.

Department of Water (April 2006) *Water Quality Protection Note #13 – Dewatering of soils at construction sites.*

Department of Water (June 2006) *Draft Water Quality Protection Note #83 - Infrastructure corridors near sensitive water resources.*

Environmental Protection Authority (New South Wales) (2006) *Assessing Vibration: A technical guide.*

Kellogg Brown and Root Pty Ltd (2007a) *Southern Seawater Desalination Plant – Marine Investigations: Water Quality Monitoring – Stage 1*.

Kellogg Brown and Root Pty Ltd (2007b) *Southern Seawater Desalination Plant – Marine Investigations: Water Quality Monitoring – September and October 2007*.

National Environment Protection Council (1999) *National Environment Protection (Assessment of Site Contamination) Measure 1999: Schedule B(1) Guideline on the Investigation Levels for Soil and Groundwater*.

National Environment Protection Council (1999) *National Environment Protection (Assessment of Site Contamination) Measure 1999: Schedule B (7a) Guideline on Health-Based Investigation Levels.*

German Standard DIN 4150-3 (1999) *Structural vibration – effects of vibration on structures*.

Oceanica (2008b), *Impact of Dredging on Seagrass Health and Sessile Invertebrates*.

Ralph P.J., Durako M.J., Enriquez S., Collier C.J. and Doblin M.A. (2007) *Impact of light limitation on seagrasses.* In *Journal of Experimental marine Biology and Ecology*. Vol 350. p176-193.

Standards Australia (1981) *Australian Standard AS 2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites*.

Standards Australia (1994) *Australian Standard AS 3780-1994 The storage and handling of corrosive substances.*

Standards Australia (2002) *Australian Standard AS 1742.3-2002 Manual of Uniform Traffic Control Devices - Part 3: Traffic control devices for works on roads*.

Thorp, J R, & Lynch, R (2000) *The Determination of Weeds of National Significance.* National Weeds Strategy Executive Committee, Launceston.

University if Western Australia Marine Research Group (2008) *Characteristerising the marine benthic habitats of the proposed Binningup Desalination Plant Site: Interpretation from underwater towed video: Dec-07*. Report to Kellogg Brown and Root.

University if Western Australia (2008b), *Beach Profile Monitoring at Binningup Beach, school of Environmental Systems Engineering*.

Water Corporation (December 1999) *Work Instruction: Water Storage – Reservoir – Alum Dosing*.

Water Corporation (January 2007) *Guideline*: *Drafting and Implementation of Environmental Management Plans.*

Water Corporation (2007) *Water Corporation Acid Sulphate Soil and Dewatering Management Strategy.* AQUA Document No. 441876.

Water Corporation (2000) *Disinfection Guidelines for Water Mains.* Document No BWW 024-1.

Water Corporation (undated) *Guidelines for the Disposal of Disinfection Water.* Document No BWW 024-2.

Water Corporation (July 2003) *Pipeline Chlorination Trailer Operations and Maintenance Manual*.

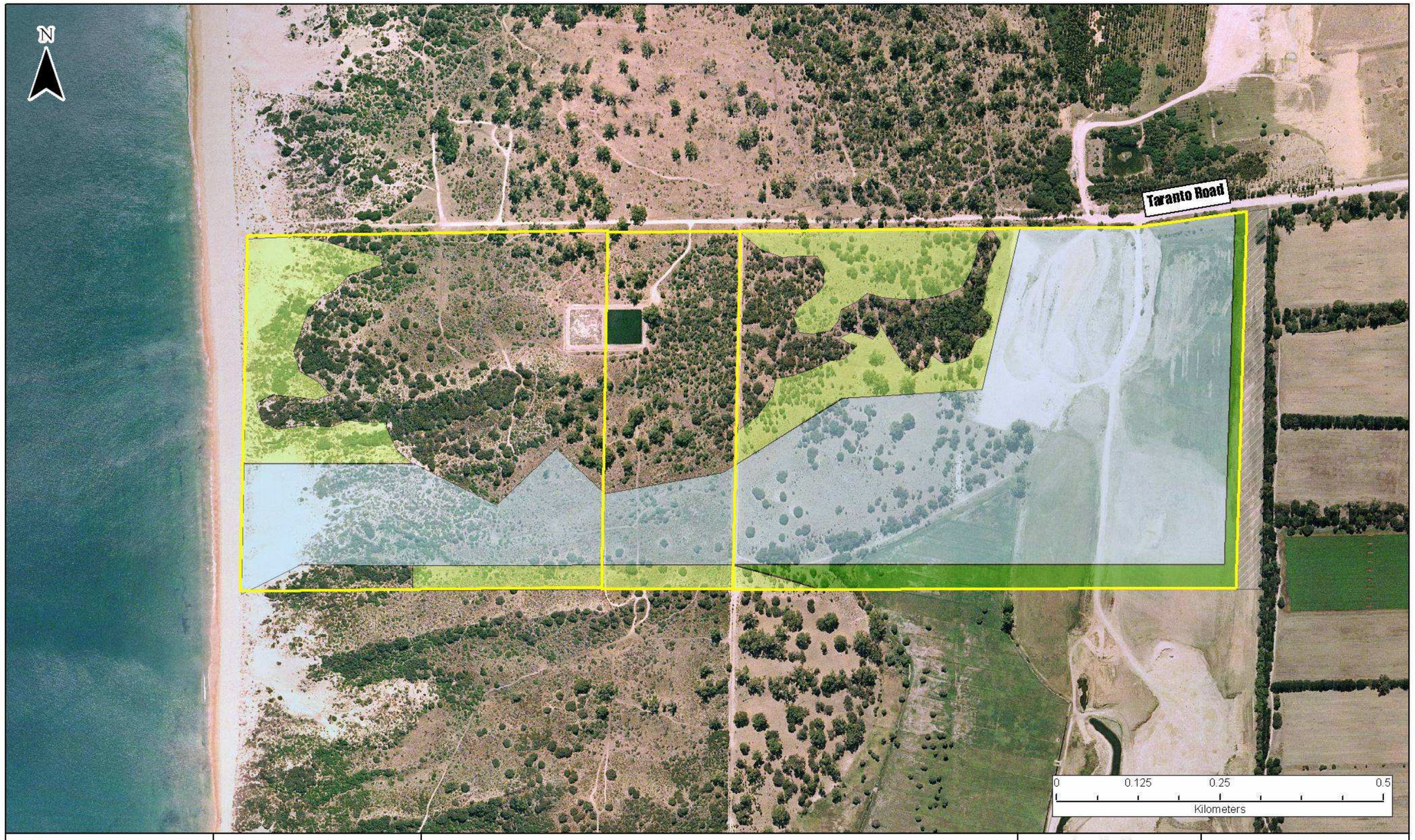
Water Corporation (16 September 2003) *SG113 Guideline for Indigenous Issues – Engagement of Indigenous People as Aboriginal Heritage Monitors During Water Corporation Activities*.

Water Corporation (October 2004) *SG110 Incident Management Corporate Planning Model*.

Water Corporation (December 2005) *Environment Branch Incident Response Procedures*.
Wester Whale Research (2008), *Cetacean Management Advice*.

Legislation referred to in this CEMF can be accessed via the Western Australian State Law Publisher website at *http://www.slp.wa.gov.au* or via the Australasian Legal Information Institute website at *http://www.austlii.edu.au*.

Appendix 1 - Seawater Desalination Plant Site Structure Map



WATER CORPORATION

SOUTHERN SEAWATER DESALINATION PROJECT

Proposed Seawater Desalination Plant Terrestrial Construction and Revegetation Areas

Horizontal DAtum	Projection
GDA 94	MGA Zone 50
Date	**Revision**
15/02/08	1

Legend

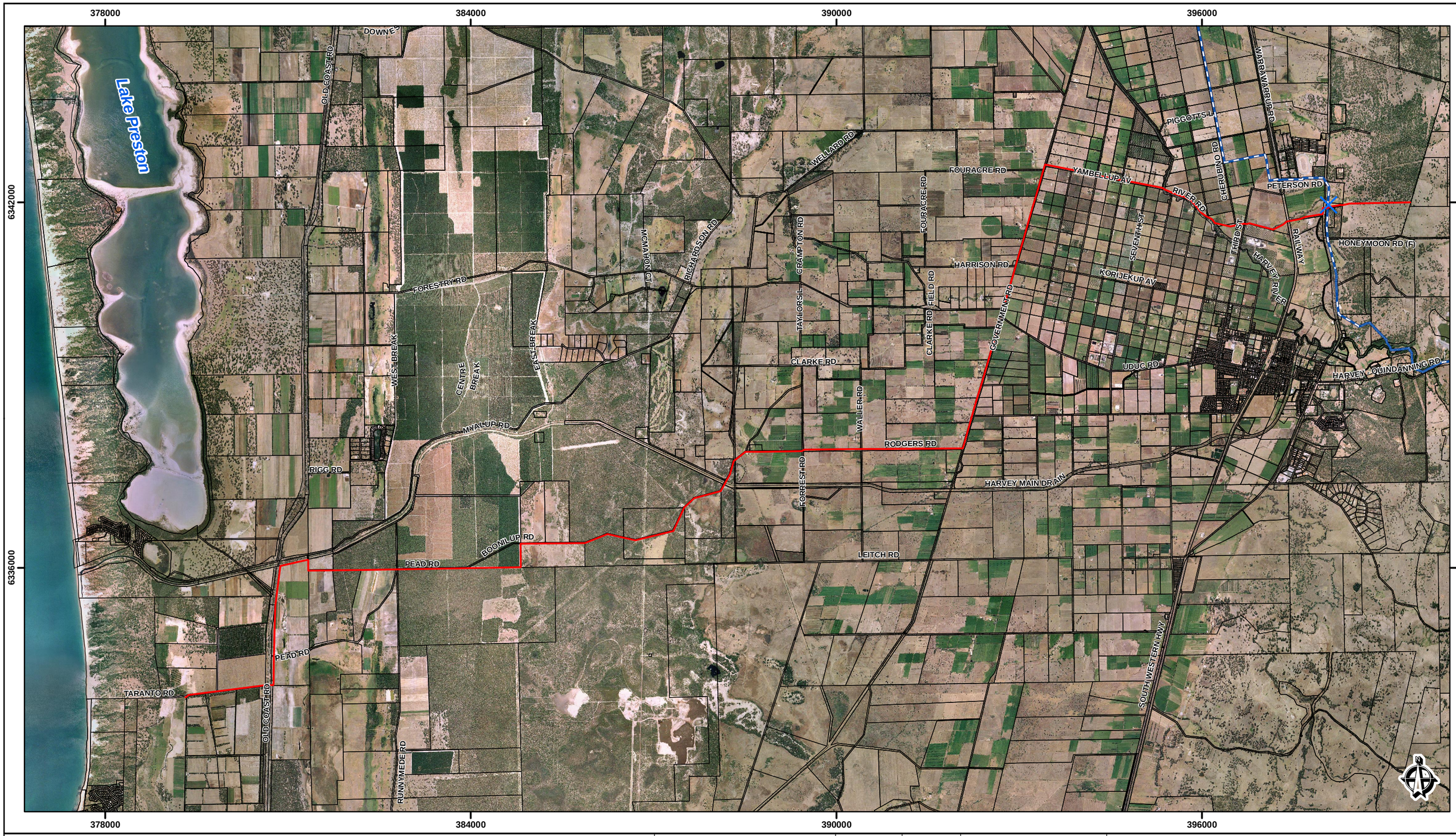
- SSDP construction area (actual cleared area for construction will be much less) - areas without plant infrastructure to be rehabilitated post construction
- Visual and noise berm with revegetation
- Lot 8 access road
- Lot boundaries
- Potential areas for rehabilitation (refer to biodiversity offset commitments)

Locality Map

360 environmental

Created By	Approved By
GW	MO/SB

Appendix 2 - Water Transfer Pipeline Maps



LEGEND

- Preferred Pipeline Route - GHD - 20071115
- Existing Regulating Valve - GHD - 20070801
- DN1400 Stirling Trunk Main - Water Corporation - 20070907
- Cadastral Boundaries - Landgate - 20070927

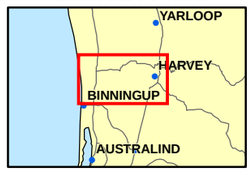
ALL DATA SOURCED FROM WATER CORPORATION UNLESS OTHERWISE STATED
MAP UNITS PROJECTED IN MGA ZONE 50
NOTE THAT POSITIONAL ERRORS CAN BE > 5M IN SOME AREAS
AERIAL PHOTOGRAPHY DATED MARCH 2006 SOURCED FROM WATER CORPORATION

SCALE

600 0 600 1,200 1,800 m

1:60,000 at A3

LOCALITY MAP



Harvey Region

CREATED BY	CHECKED	APPROVED
KI	MD	

HORIZONTAL DATUM: GDA 94 **PROJECTION:** MGA ZONE 50

HEIGHT DATUM: NA **METADATA RECORDED:** 100%

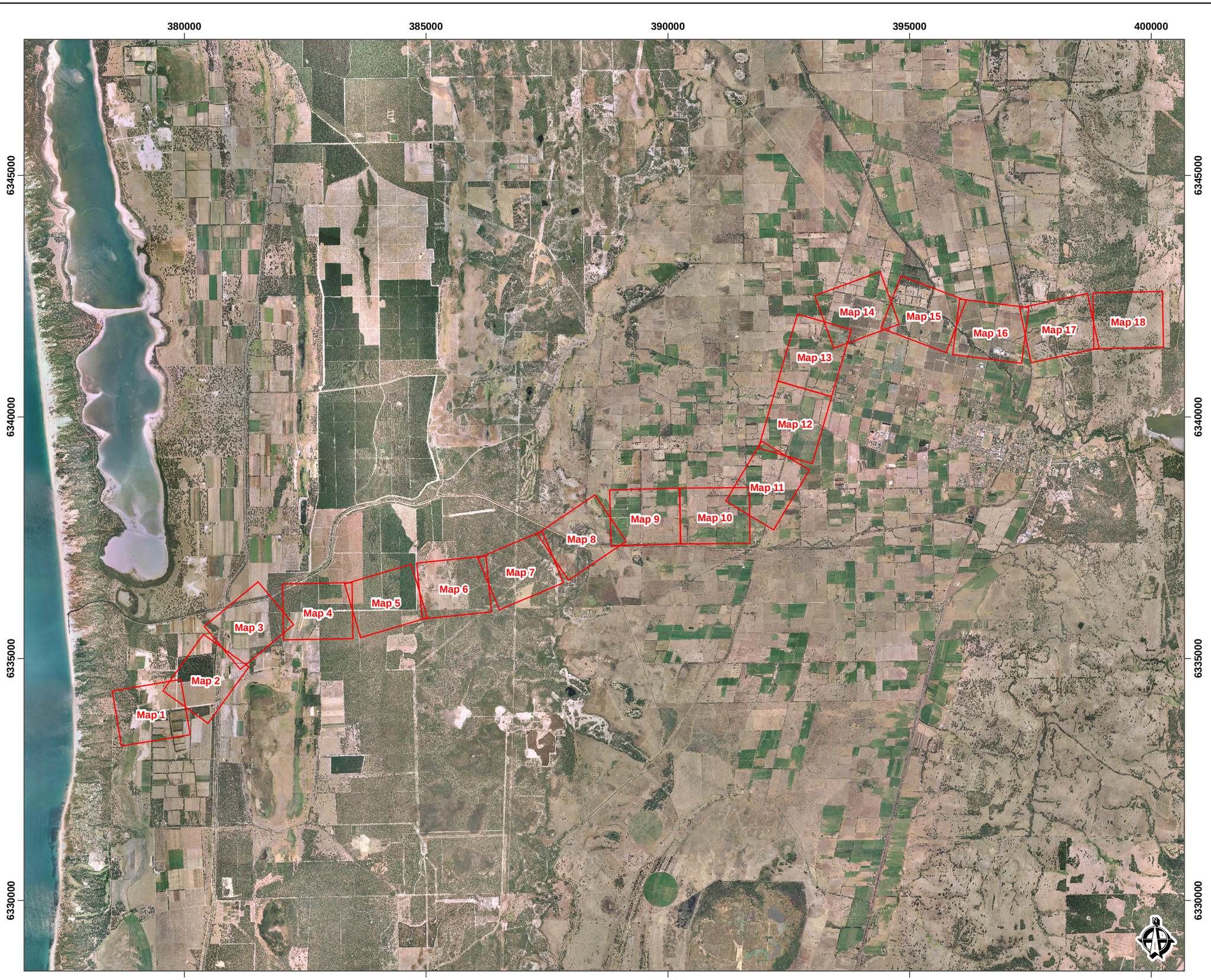
DATE	FILE LOCATION
23.01.2008	G:\61\21216\GIS\MXDS\6121216-G14_REV5.MXD
REVISION	**DRAWING NO**
5	6121216-G14

WATER CORPORATION

GHD CLIENTS | PEOPLE | PERFORMANCE

SOUTHERN SEAWATER DESALINATION PLANT PRELIMINARY DESIGN

Transfer Main Route



LEGEND

1:5000 Map Book Extents - GHD - 20080121

NOTE THAT POSITIONAL ERRORS CAN BE > 5M IN SOME AREAS
LANDGATE AERIAL PHOTOGRAPHY DATED MAR 2006
SOURCED FROM THE WATER CORPORATION

SCALE

750 0 750 1,500 2,250 m

1:75,000 at A3

LOCALITY MAP

Western Australia

CREATED BY	CHECKED	APPROVED
KI	MD	

HORIZONTAL DATUM: GDA94 **PROJECTION:** MGA ZONE 50

HEIGHT DATUM: N/A **METADATA RECORDED:** 100%

DATE	FILE LOCATION
22.01.2008	G:\61\21216\05-GIS\MXD\6121216-G10_rev5.mxd

REVISION	DRAWING NO
5	6121216-G10

WATER CORPORATION

GHD CLIENTS|PEOPLE|PERFORMANCE

SOUTHERN SEAWATER DESALINATION PLANT

Pipeline Route Preliminary Design
Map 0: Key Plan

LEGEND

Declared Rare and Priority Flora - DEC - 20070823

- (R) Declared Rare Flora - Extant Taxa
- Priority 1 - Poorly Known Taxa
- Priority 2 - Poorly Known Taxa
- Priority 3 - Poorly Known Taxa
- Priority 4 - Rare Taxa
- TEC - DEC - 200708
- Preferred Option - GHD - 20080121

Western Power Network - 20070927

- 330Kv OH
- 132Kv Transmission OH
- 66Kv Transmission
- High Voltage OH Cable - Single Phase
- High Voltage OH Cable - Three Phase
- High Voltage UG Cable
- Low Voltage OH
- Low Voltage UG
- Optus Cable - Optus - 20070813

Telstra Services - Telstra - 200708

- Optic Fibre
- Distribution
- Drainage Assets - WC - 200708
- Irrigation Assets - WC - 200708
- Sewer Assets - WC - 200708
- Water Assets - WC - 200708
- Alinta Services - DBNGP_20070813
- Contours (5m) - Landgate
- TEC Buffers - DEC - 200708
- DEC Estate - DEC - 200606
- Mining Tenements - DOIR - 200706
- Public Drinking Water Supply Areas -DOW- 200707
- LGA Boundaries - Landgate
- Cadastre - Landgate - 200708

NOTE THAT POSITIONAL ERRORS CAN BE > 5M IN SOME AREAS
LANDGATE AERIAL PHOTOGRAPHY DATED DEC 2006
SOURCED FROM WATER CORPORATION

SCALE

50 0 50 100 150 m

1:5,000 at A3

LOCALITY MAP

Harvey Region

CREATED BY	CHECKED	APPROVED
CR/KI	MD	

HORIZONTAL DATUM: GDA94 **PROJECTION:** MGA ZONE 50
HEIGHT DATUM: N/A **METADATA RECORDED:** 70%

DATE	FILE LOCATION
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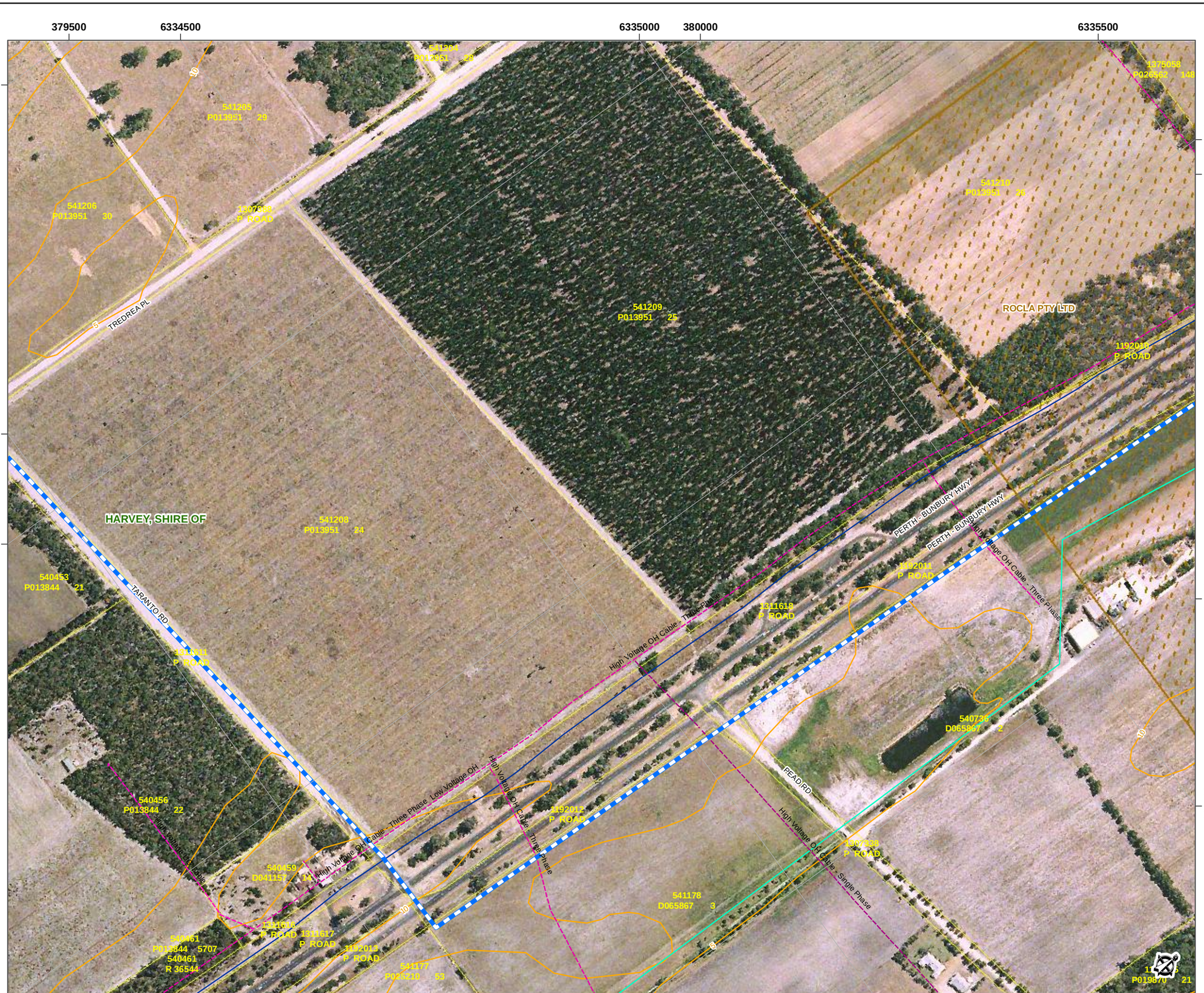
REVISION	DRAWING NO
5	6121216-G9

WATER CORPORATION

GHD CLIENTS|PEOPLE|PERFORMANCE

SOUTHERN SEAWATER DESALINATION PLANT

Pipeline Route Preliminary Design
Map 1



LEGEND

Declared Rare and Priority Flora - DEC - 20070823

- (R) Declared Rare Flora - Extant Taxa
- Priority 1 - Poorly Known Taxa
- Priority 2 - Poorly Known Taxa
- Priority 3 - Poorly Known Taxa
- Priority 4 - Rare Taxa
- TEC - DEC - 200708
- Preferred Option - GHD - 20080121

Western Power Network - 20070927

- 330Kv OH
- 132Kv Transmission OH
- 66Kv Transmission
- High Voltage OH Cable - Single Phase
- High Voltage OH Cable - Three Phase
- High Voltage UG Cable
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- Optus Cable - Optus - 20070813

Telstra Services - Telstra - 200708

- Optic Fibre
- Distribution
- Drainage Assets - WC - 200708
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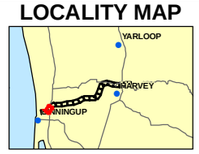
NOTE THAT POSITIONAL ERRORS CAN BE > 5M IN SOME AREAS
LANDGATE AERIAL PHOTOGRAPHY DATED DEC 2006
SOURCED FROM WATER CORPORATION

SCALE

50 0 50 100 150 m

1:5,000 at A3

LOCALITY MAP



Harvey Region

CREATED BY	CHECKED	APPROVED
CR/KI	MD	

HORIZONTAL DATUM: GDA94 **PROJECTION:** MGA ZONE 50
HEIGHT DATUM: N/A **METADATA RECORDED:** 70%

DATE	FILE LOCATION
22.01.2008	G:\61\21216\GIS\MXD\6121216-G9_Rev5.mxd

REVISION	DRAWING NO
5	6121216-G9

WATER CORPORATION

GHD CLIENTS|PEOPLE|PERFORMANCE

SOUTHERN SEAWATER DESALINATION PLANT

Pipeline Route Preliminary Design
Map 2

LEGEND

Declared Rare and Priority Flora - DEC - 20070823

- (R) Declared Rare Flora - Extant Taxa
- Priority 1 - Poorly Known Taxa
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- Priority 4 - Rare Taxa
- TEC - DEC - 200708
- Preferred Option - GHD - 20080121

Western Power Network - 20070927

- 330Kv OH
- 132Kv Transmission OH
- 66Kv Transmission
- High Voltage OH Cable - Single Phase
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SOURCED FROM WATER CORPORATION

SCALE

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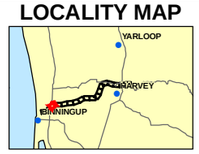
1:5,000 at A3

LOCALITY MAP



Harvey Region

CREATED BY	CHECKED	APPROVED
CR/KI	MD	

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WATER CORPORATION

GHD CLIENTS|PEOPLE|PERFORMANCE

SOUTHERN SEAWATER DESALINATION PLANT

Pipeline Route Preliminary Design
Map 3

LEGEND

Declared Rare and Priority Flora - DEC - 20070823

- (R) Declared Rare Flora - Extant Taxa
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- Preferred Option - GHD - 20080121

Western Power Network - 20070927

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SCALE

50 0 50 100 150 m

1:5,000 at A3

LOCALITY MAP

Harvey Region

CREATED BY	CHECKED	APPROVED
CR/KI	MD	

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HEIGHT DATUM: N/A **METADATA RECORDED:** 70%

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REVISION	DRAWING NO
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WATER CORPORATION

GHD CLIENTS|PEOPLE|PERFORMANCE

SOUTHERN SEAWATER DESALINATION PLANT

Pipeline Route Preliminary Design
Map 4

LEGEND

Declared Rare and Priority Flora - DEC - 20070823

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SCALE

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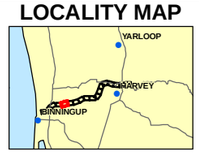
1:5,000 at A3

LOCALITY MAP



Harvey Region

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CR/KI	MD	

HORIZONTAL DATUM: GDA94 **PROJECTION:** MGA ZONE 50
HEIGHT DATUM: N/A **METADATA RECORDED:** 70%

DATE	FILE LOCATION
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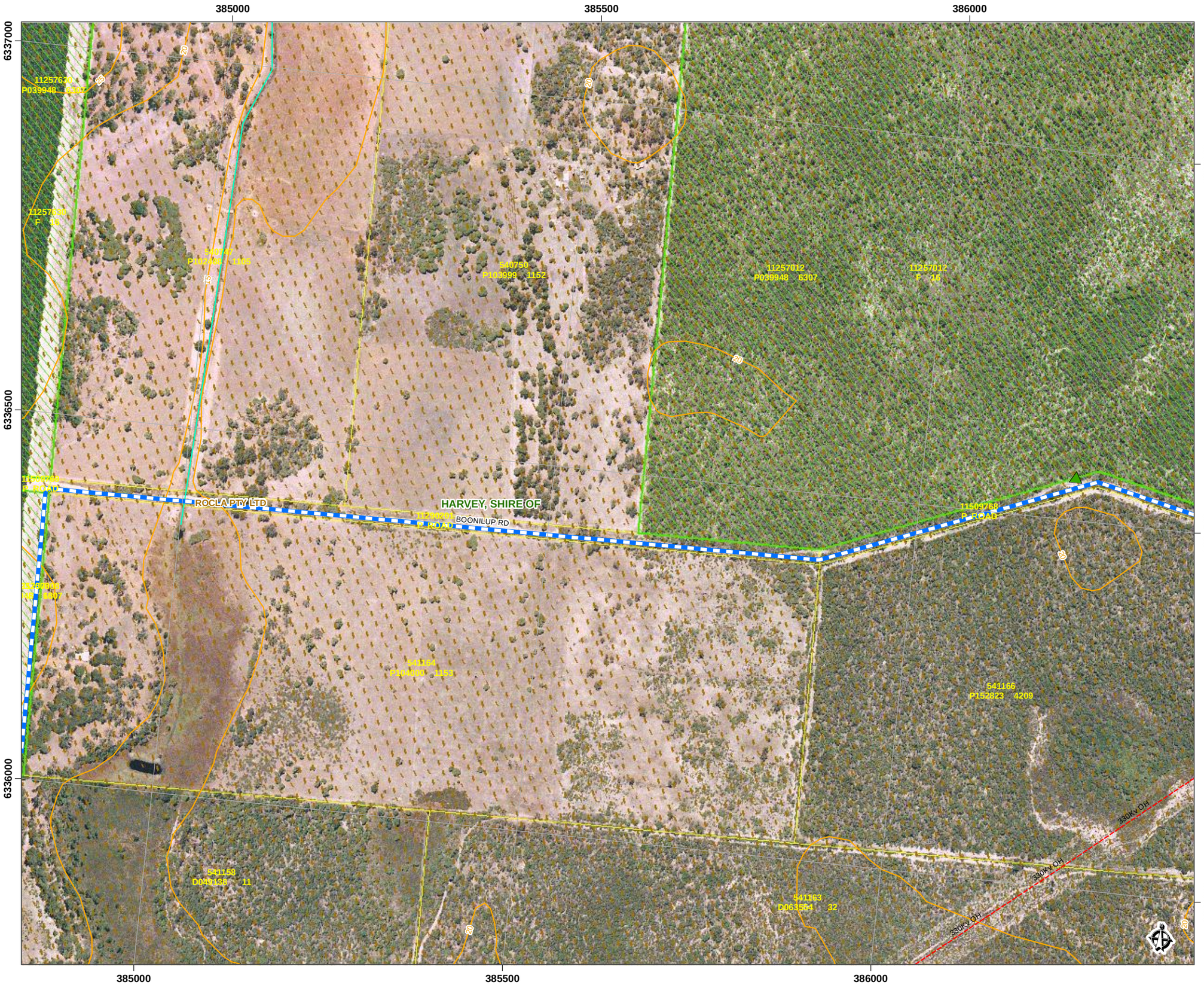
REVISION	DRAWING NO
5	6121216-G9

WATER CORPORATION

GHD CLIENTS|PEOPLE|PERFORMANCE

SOUTHERN SEAWATER DESALINATION PLANT

Pipeline Route Preliminary Design
Map 5



LEGEND

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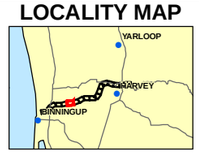
SOURCED FROM WATER CORPORATION

SCALE

50 0 50 100 150 m

1:5,000 at A3

LOCALITY MAP



Harvey Region

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REVISION	DRAWING NO
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WATER CORPORATION

GHD CLIENTS|PEOPLE|PERFORMANCE

SOUTHERN SEAWATER DESALINATION PLANT

Pipeline Route Preliminary Design
Map 6

LEGEND

Declared Rare and Priority Flora - DEC - 20070823

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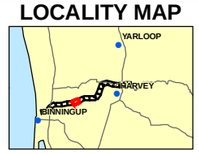
SOURCED FROM WATER CORPORATION

SCALE

50 0 50 100 150 m

1:5,000 at A3

LOCALITY MAP



Harvey Region

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REVISION	DRAWING NO
5	6121216-G9

WATER CORPORATION

GHD CLIENTS|PEOPLE|PERFORMANCE

SOUTHERN SEAWATER DESALINATION PLANT

Pipeline Route Preliminary Design
Map 7

LEGEND

Declared Rare and Priority Flora - DEC - 20070823

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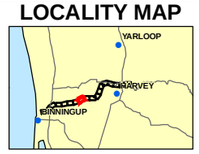
SCALE

50 0 50 100 150 m

1:5,000 at A3

LOCALITY MAP



Harvey Region

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HORIZONTAL DATUM: GDA94 **PROJECTION:** MGA ZONE 50

HEIGHT DATUM: N/A **METADATA RECORDED:** 70%

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WATER CORPORATION

GHD CLIENTS|PEOPLE|PERFORMANCE

SOUTHERN SEAWATER DESALINATION PLANT

Pipeline Route Preliminary Design
Map 8

389000 389500 390000

6338500 6338000 6337500

549560 P232775 16
11600481 P ROAD
549562 P232775 16
549563 D027535 1
549565 D032974 1
11600486 P ROAD
549567 D032974 2
549566 P162598 64
11600402 P ROAD
549658 P235005 2
549666 P162598 65
11600395 P ROAD
549660 P235005 3
549668 V CROWN LAND
549669 P235005 4
549651 P235005 1
11600396 P ROAD
11600393 P ROAD
11491460 P005896 58
11424642 P005636 57
11491461 P005896 58
11424641 P005636 57
11600394 P ROAD
ROCLA PTY LTD
HARVEY, SHIRE OF
ROGERS RD
FORREST RD
High Voltage OH Cable - Single Phase
20
15

LEGEND

Declared Rare and Priority Flora - DEC - 20070823

- (R) Declared Rare Flora - Extant Taxa
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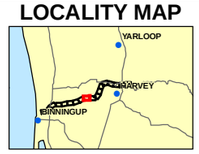
SOURCED FROM WATER CORPORATION

SCALE

50 0 50 100 150 m

1:5,000 at A3

LOCALITY MAP



Harvey Region

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CR/KI	MD	

HORIZONTAL DATUM: GDA94 **PROJECTION:** MGA ZONE 50
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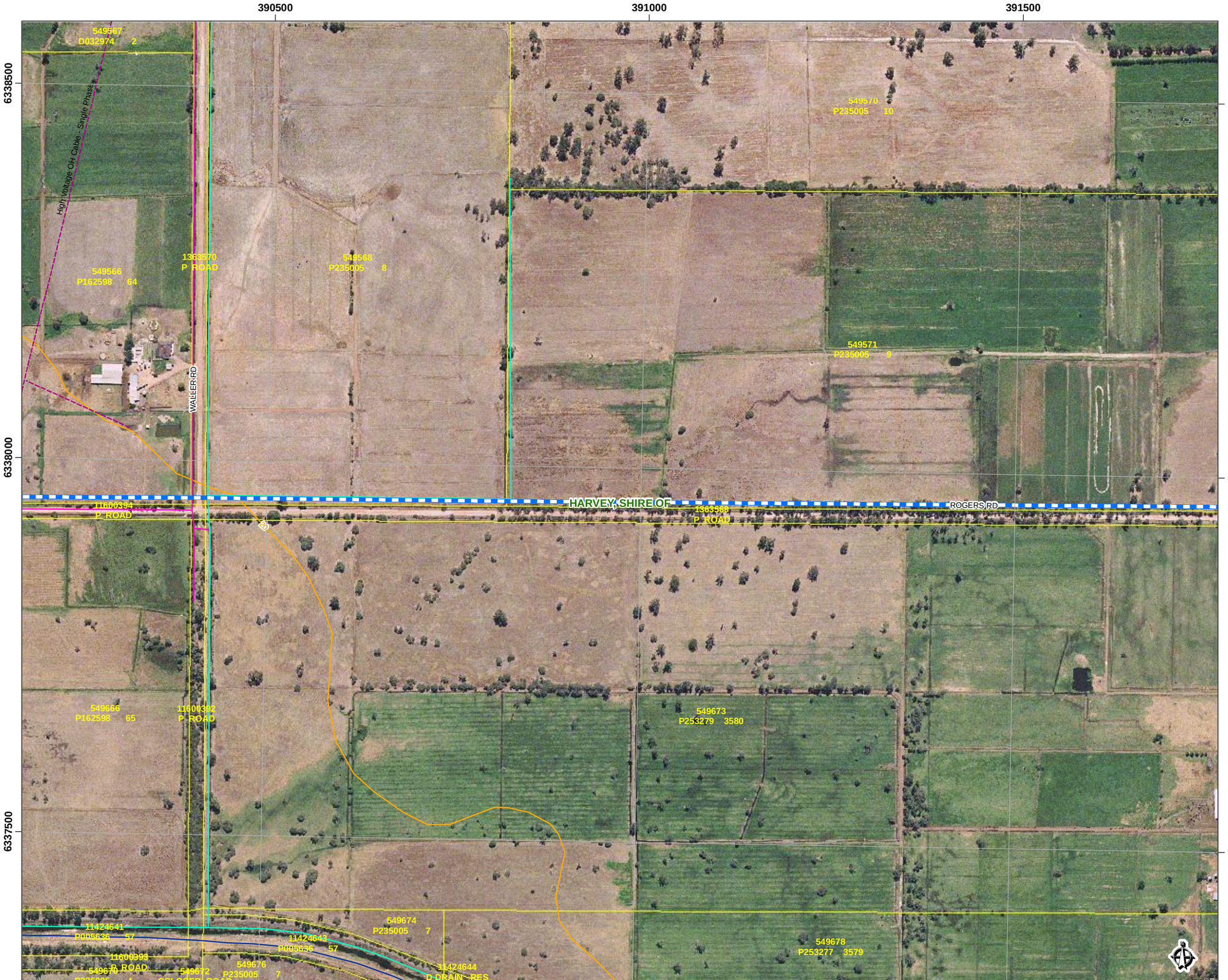
WATER CORPORATION

GHD CLIENTS|PEOPLE|PERFORMANCE

SOUTHERN SEAWATER DESALINATION PLANT

Pipeline Route Preliminary Design
Map 9



LEGEND

Declared Rare and Priority Flora - DEC - 20070823

- (R) Declared Rare Flora - Extant Taxa
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50 0 50 100 150 m

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LOCALITY MAP

Harvey Region

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WATER CORPORATION

GHD CLIENTS|PEOPLE|PERFORMANCE

SOUTHERN SEAWATER DESALINATION PLANT

Pipeline Route Preliminary Design
Map 10

LEGEND

Declared Rare and Priority Flora - DEC - 20070823

- (R) Declared Rare Flora - Extant Taxa
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SCALE

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LOCALITY MAP

Harvey Region

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WATER CORPORATION

GHD CLIENTS|PEOPLE|PERFORMANCE

SOUTHERN SEAWATER DESALINATION PLANT

Pipeline Route Preliminary Design
Map 11

LEGEND

Declared Rare and Priority Flora - DEC - 20070823

- (R) Declared Rare Flora - Extant Taxa
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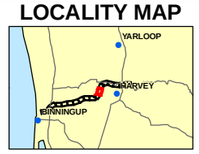

Harvey Region

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WATER CORPORATION

GHD CLIENTS|PEOPLE|PERFORMANCE

SOUTHERN SEAWATER DESALINATION PLANT

Pipeline Route Preliminary Design
Map 12

LEGEND

Declared Rare and Priority Flora - DEC - 20070823

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- TEC - DEC - 200708
- Preferred Option - GHD - 20080121

Western Power Network - 20070927

- 330Kv OH
- 132Kv Transmission OH
- 66Kv Transmission
- High Voltage OH Cable - Single Phase
- High Voltage OH Cable - Three Phase
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- Low Voltage UG
- Optus Cable - Optus - 20070813

Telstra Services - Telstra - 200708

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- Irrigation Assets - WC - 200708
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- Water Assets - WC - 200708
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- DEC Estate - DEC - 200606
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- Cadastre - Landgate - 200708

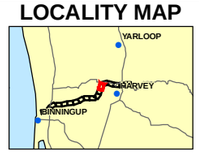
NOTE THAT POSITIONAL ERRORS CAN BE > 5M IN SOME AREAS
LANDGATE AERIAL PHOTOGRAPHY DATED DEC 2006
SOURCED FROM WATER CORPORATION

SCALE

50 0 50 100 150 m

1:5,000 at A3

LOCALITY MAP



Harvey Region

CREATED BY	CHECKED	APPROVED
CR/KI	MD	

HORIZONTAL DATUM: GDA94 **PROJECTION:** MGA ZONE 50
HEIGHT DATUM: N/A **METADATA RECORDED:** 70%

DATE	FILE LOCATION
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REVISION	DRAWING NO
5	6121216-G9

WATER CORPORATION

GHD CLIENTS|PEOPLE|PERFORMANCE

SOUTHERN SEAWATER DESALINATION PLANT

Pipeline Route Preliminary Design
Map 13

LEGEND

Declared Rare and Priority Flora - DEC - 20070823

- (R) Declared Rare Flora - Extant Taxa
- Priority 1 - Poorly Known Taxa
- Priority 2 - Poorly Known Taxa
- Priority 3 - Poorly Known Taxa
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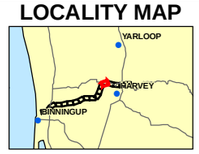
LOCALITY MAP



Harvey Region

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CR/KI	MD	

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HEIGHT DATUM: N/A **METADATA RECORDED:** 70%

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REVISION	DRAWING NO
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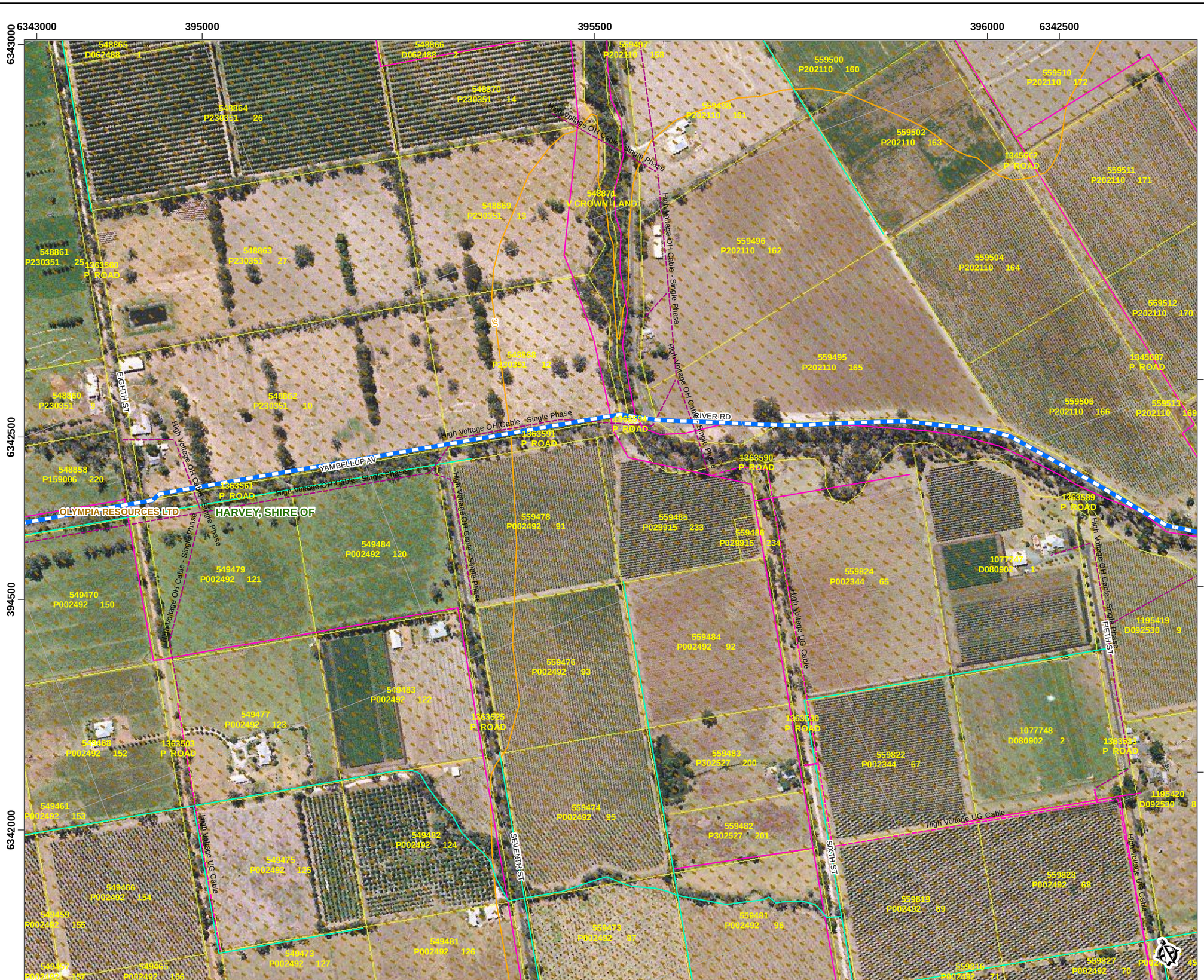
WATER CORPORATION

GHD CLIENTS|PEOPLE|PERFORMANCE

SOUTHERN SEAWATER DESALINATION PLANT

Pipeline Route Preliminary Design
Map 14



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LANDGATE AERIAL PHOTOGRAPHY DATED DEC 2006
SOURCED FROM WATER CORPORATION

SCALE

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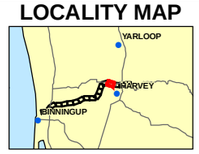
1:5,000 at A3

LOCALITY MAP



Harvey Region

CREATED BY	CHECKED	APPROVED
CR/KI	MD	

HORIZONTAL DATUM: GDA94 **PROJECTION:** MGA ZONE 50
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REVISION	DRAWING NO
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WATER CORPORATION

GHD CLIENTS|PEOPLE|PERFORMANCE

SOUTHERN SEAWATER DESALINATION PLANT

Pipeline Route Preliminary Design
Map 15

LEGEND

Declared Rare and Priority Flora - DEC - 20070823

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LANDGATE AERIAL PHOTOGRAPHY DATED DEC 2006
SOURCED FROM WATER CORPORATION

SCALE

50 0 50 100 150 m

1:5,000 at A3

LOCALITY MAP

Harvey Region

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CR/KI	MD	

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HEIGHT DATUM: N/A **METADATA RECORDED:** 70%

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REVISION	DRAWING NO
5	6121216-G9

WATER CORPORATION

GHD CLIENTS|PEOPLE|PERFORMANCE

SOUTHERN SEAWATER DESALINATION PLANT

Pipeline Route Preliminary Design Map 16

LEGEND

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LANDGATE AERIAL PHOTOGRAPHY DATED DEC 2006
SOURCED FROM WATER CORPORATION

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LOCALITY MAP

Harvey Region

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CR/KI	MD	

HORIZONTAL DATUM: GDA94 **PROJECTION:** MGA ZONE 50

HEIGHT DATUM: N/A **METADATA RECORDED:** 70%

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REVISION	**DRAWING NO**
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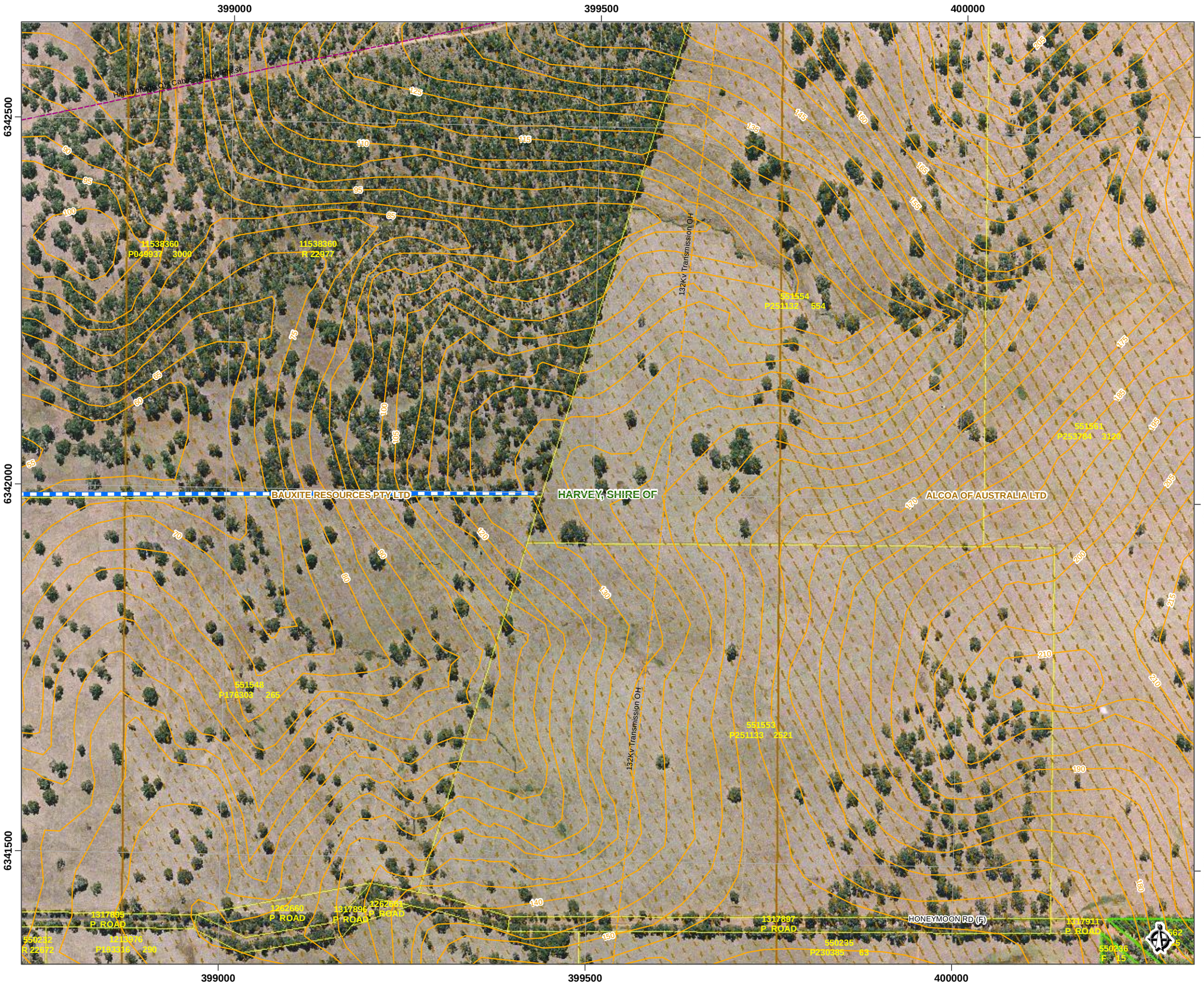
WATER CORPORATION

GHD CLIENTS|PEOPLE|PERFORMANCE

SOUTHERN SEAWATER DESALINATION PLANT

Pipeline Route Preliminary Design
Map 17



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SCALE

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1:5,000 at A3

LOCALITY MAP

Harvey Region

CREATED BY	CHECKED	APPROVED
CR/KI	MD	

HORIZONTAL DATUM: GDA94 **PROJECTION:** MGA ZONE 50

HEIGHT DATUM: N/A **METADATA RECORDED:** 70%

DATE	FILE LOCATION
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REVISION	DRAWING NO
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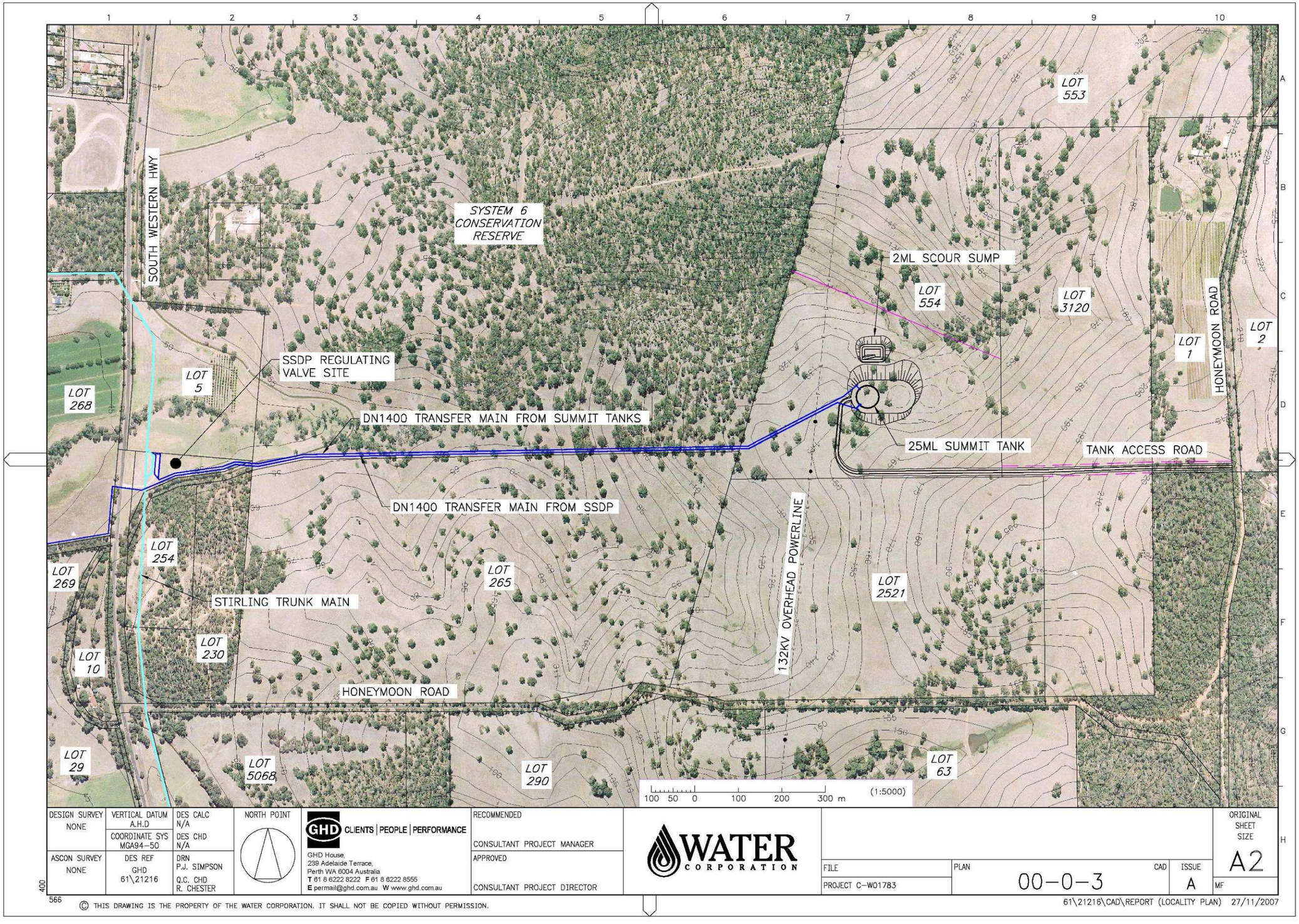
WATER CORPORATION

GHD CLIENTS|PEOPLE|PERFORMANCE

SOUTHERN SEAWATER DESALINATION PLANT

Pipeline Route Preliminary Design
Map 18

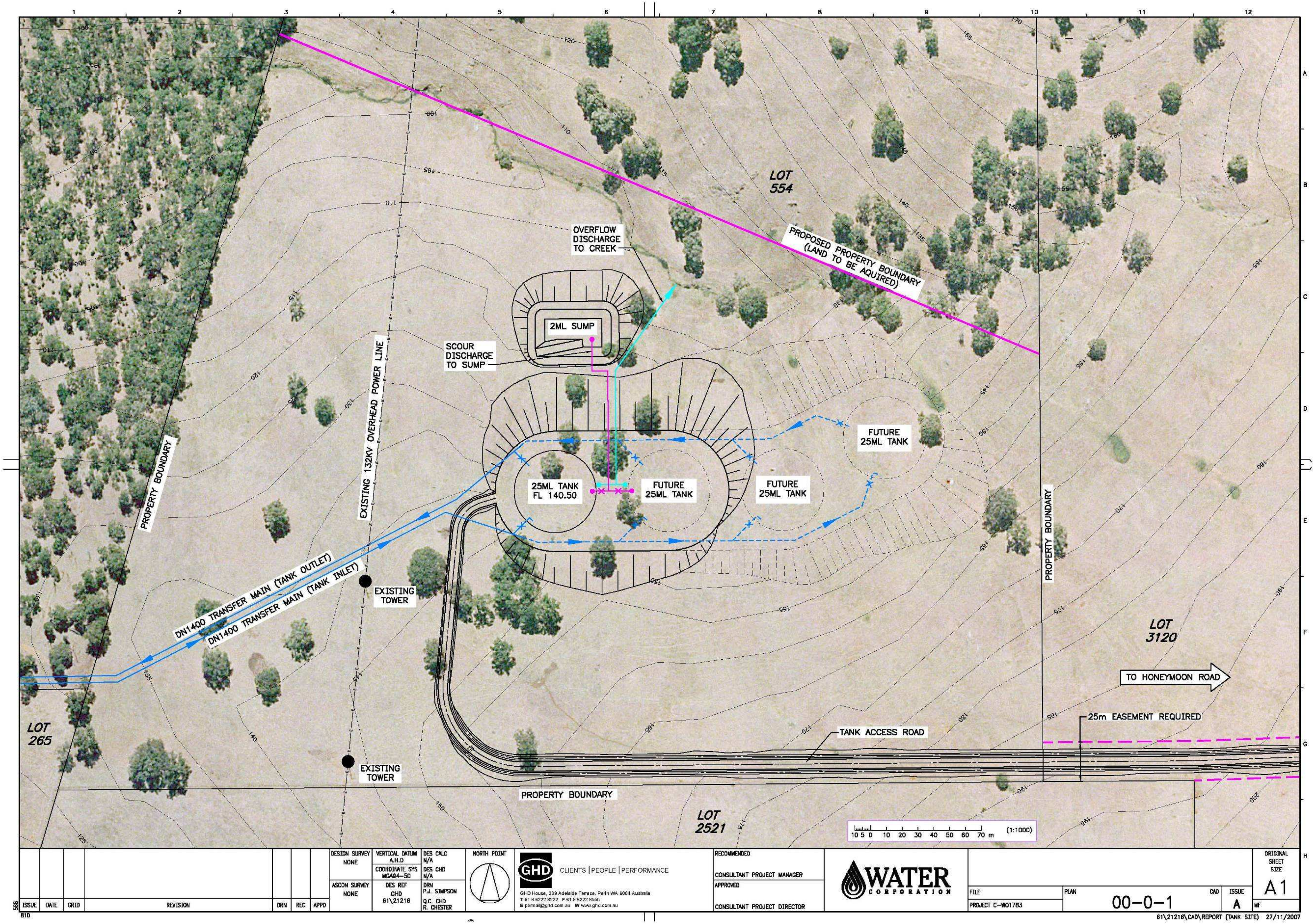
Appendix 3 - Harvey Summit Tanks Structure Maps



DESIGN SURVEY NONE	VERTICAL DATUM A.H.D	DES CALC N/A	NORTH POINT	GHD CLIENTS | PEOPLE | PERFORMANCE	RECOMMENDED	WATER CORPORATION	ORIGINAL SHEET SIZE A2
	COORDINATE SYS MGA94–50	DES CHD N/A		GHD House, 239 Adelaide Terrace, Perth WA 6004 Australia T 61 8 6222 8222 F 61 8 6222 8555 E permail@ghd.com.au W www.ghd.com.au	CONSULTANT PROJECT MANAGER		
ASCON SURVEY NONE	DES REF GHD 61\21216	DRN P.J. SIMPSON			APPROVED	FILE PROJECT C–WO1783	PLAN 00–0–3 CAD ISSUE A
		Q.C. CHD R. CHESTER			CONSULTANT PROJECT DIRECTOR		MF

400
566

61\21216\CAD\REPORT (LOCALITY PLAN) 27/11/2007



OVERFLOW DISCHARGE TO CREEK
2ML SUMP
SCOUR DISCHARGE TO SUMP
EXISTING 132KV OVERHEAD POWER LINE
PROPOSED PROPERTY BOUNDARY (LAND TO BE AQUIRED)
LOT 554
25ML TANK FL 140.50
FUTURE 25ML TANK
FUTURE 25ML TANK
FUTURE 25ML TANK
PROPERTY BOUNDARY
DN1400 TRANSFER MAIN (TANK OUTLET)
DN1400 TRANSFER MAIN (TANK INLET)
EXISTING TOWER
EXISTING TOWER
PROPERTY BOUNDARY
LOT 3120
TO HONEYMOON ROAD
25m EASEMENT REQUIRED
TANK ACCESS ROAD
LOT 265
PROPERTY BOUNDARY
LOT 2521
(1:1000)
ISSUE DATE GRID REVISION DRN REC APPD
DESIGN SURVEY NONE
ASCON SURVEY NONE
VERTICAL DATUM A.H.D
COORDINATE SYS MGA94-50
DES REF GHD 61\21216
DES CALC N/A
DES CHD N/A
DRN P.J. SIMPSON
Q.C. CHD R. CHESTER
NORTH POINT
GHD CLIENTS | PEOPLE | PERFORMANCE
GHD House, 239 Adelaide Terrace, Perth WA 6004 Australia
RECOMMENDED
CONSULTANT PROJECT MANAGER
APPROVED
CONSULTANT PROJECT DIRECTOR
WATER CORPORATION
FILE
PROJECT C-W01783
PLAN 00-0-1
CAD ISSUE A
ORIGINAL SHEET SIZE A1
61\21216\CAD\REPORT (TANK SITE) 27/11/2007

Appendix 4 - Water Corporation Environmental Policy

Introduction

The Water Corporation provides essential water, wastewater and drainage services to the people of Western Australia. We take water from the environment and return drainage water and treated wastewater and its by-products back into the environment.

In doing this, we aim to provide sustainable, safe and reliable water services to customers and the community.

This policy applies to the Statewide operations of the Water Corporation, which includes all activities, services and products provided by the Corporation to its customers, in accordance with its operating licence.

All employees, and where practicable, 'second parties' (Water Corporation agents, alliance participants, contractors and suppliers) will comply with and support implementation of this policy.

Commitment

The Corporation is committed to:

- playing a leading role in the sustainable future of Western Australia's water resources;
- compliance with applicable environmental legal requirements and with other environmental requirements to which the Corporation subscribes;
- preventing pollution and minimising the adverse effects of our activities; and
- excellence and continual improvement in environmental performance, including conserving natural resources and ecological systems and enhancing them where practicable.

How

Our commitments will be met by:

- providing appropriate services, resources and infrastructure to meet our stated objectives;
- identifying, assessing and managing our environmental risks;
- developing and implementing environmental improvement programmes with measurable targets;
- regularly reviewing and auditing our environmental systems and performance;
- developing and maintaining appropriate incident response plans and minimising the adverse environmental consequences of any accidents; and
- promoting efficient use of resources and minimisation of waste.

Our Environmental Management System provides the framework for developing, implementing, monitoring and reviewing our environmental objectives, targets and actions.

PCY230 Environmental Policy
31 October 2007
CDMS#: 375822

Peter D Moore
Chief Operating Officer

DOCUMENT UNCONTROLLED IF PRINTED

Appendix 5 - Water Corporation's Statement of Environmental Conditions under the Environmental Protection Act 1986 (WA)

<to be inserted when issued>

Appendix 6 - Water Corporation's Permit to Interfere with Bed and Banks of Watercourses under the Rights in Water and Irrigation Act 1914 (WA)

<to be inserted when issued>

Appendix 7 - Water Corporation's Consent to Interfere with Registered Heritage Sites under the Aboriginal Heritage Act 1972 (WA)

<to be inserted when issued, if required>