



Marine Water Quality and Ecosystem Environmental Management Plan

For Sydney's Desalination Plant

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PLAN Marine Water Quality and Ecosystem Management Plan

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SECTION 1 INTRODUCTION

1.1 PURPOSE

The purpose of this Marine Water Quality and Ecosystem Management Plan (MWQEMP) is to provide a framework for:

- the analysis of monitoring data collected under MCoA 3.1
- comparison of monitoring results with environmental outcomes stipulated under the MCoA
- decision-making processes where environmental outcomes are not being met
- identification of any additional measures that may need to be applied where environmental outcomes are not being met.

The MWQEMP has been developed in accordance with applicable legislative and contractual requirements for the operation and maintenance of Sydney's Desalination Plant as defined in the Operate and Maintain (O&M) Contract and addresses the MCoA and SoC as detailed in Table 3 Compliance Obligations.

This MWQEMP also addresses the following desired outcomes from the SoC and requirements relevant to marine and estuarine monitoring for the project:

- no significant impacts on seawater quality or aquatic ecology from the seawater concentrated beyond near field mixing zone and minimised potential toxicity impact within the near field mixing zone during operation (SoCs 12 and 13)
- no significant impacts on visual amenity, seawater quality or aquatic ecology from solids discharged in seawater concentrate during operations (SoCs 14 and 15)
- no significant impacts on aquatic ecology from the seawater intake during operation (SoCs 16 and 18).

1.2 SCOPE

This MWQEMP is applicable to all Veolia activities during the operation and maintenance phase of Sydney's Desalination Plant.

In particular, this MWQEMP has been prepared to address the requirements of the compliance obligations from the Ministers Conditions of Approval (MCoA), Statement of Commitments (SoC), the O&M Contract TS-09, and the applicable legislation.

1.3 RELATIONSHIP WITH THE MEMP

SDP has developed and is implementing a Marine and Estuarine Monitoring Program (MEMP) which will generate the data required for this MWQEMP. The MEMP should be read in conjunction with this document.

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1.4 REFERENCES

Table 1 References

Document reference	Operational Environmental Management Documentation	Document Number
TIER 1		
Operational EMS	Integrated Business Management System (IBMS) Manual	MN-KDP-1-806
TIER 2		
EMP	Environmental Management Plan	MN-KDP-1-806 Section 14
TIER 3		
MWQEMP	Marine Water Quality and Ecosystem Management Plan	PL-KDP-4-809
NEMP	Noise Environmental Management Plan	PL-KDP-4-810
CAMP	Conservation Area Management Plan	PL-KDP-4-4828
SWGEMP	Surface Water and Groundwater Environmental Management Plan	PL-KDP-4-811
WEMP	Waste Environmental Management Plan	PL-KDP-4-812
BPP	Biodiversity Protection Plan	ST-ANZ-4-518
TIER 4		
CTR	Compliance Tracking Register	FM-KDP-4-777
EMPR	Environmental Monitoring Program	REG-KDP-4-920
MEMP	Marine and Estuarine Monitoring Program	SDP

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1.5 DEFINITIONS

Table 2 Definitions

Abbreviation	Definition
BWJV	Blue Water Joint Venture
DECCW	NSW Department of Environment, Climate Change and Water (formerly DECC)
DoP	NSW Department of Planning (formerly Department of Infrastructure, Planning and Natural Resources)
DPI	NSW Department of Primary Industries
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan (Section 14 of IBMS)
EMS	Environmental Management System (See IBMS)
EPA	Environment Protection Authority (DECCW)
EPL	Environment Protection Licence
EMSR	Environmental Management System Representative
IBMS	Veolia's Integrated Business Management System
MCoA	Ministers Conditions of Approval
MEMP	Marine and Estuarine Monitoring Program – (Detailed Design Version 3)
NPWS	National Parks and Wildlife Service
O&M	Operate and Maintain
ORP	Oxygen Reduction Potential
NSW	The State of New South Wales
RO	Reverse Osmosis
Schedule 5	Planning Approval Responsibilities Operate and Maintain Contract
Seawater Concentrate	Defined in the EPL as the concentrated seawater solution that is produced as a by-product of the desalination process, including the neutralised membrane preservation and cleaning solutions and treated backwash water that will also be discharged from the desalination plant. It does not include lime sludge or backwash solids.
SoC	Statement of Commitments
SSC	Sutherland Shire Council
SDP	Sydney Desalination Plant PTY LTD
SWC	Sydney Water Corporation
TS-09	Technical Schedule-09 Environmental Requirements – Operate and Maintain Contract

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SECTION 2 OPERATIONAL ENVIRONMENTAL MANAGEMENT DOCUMENTATION

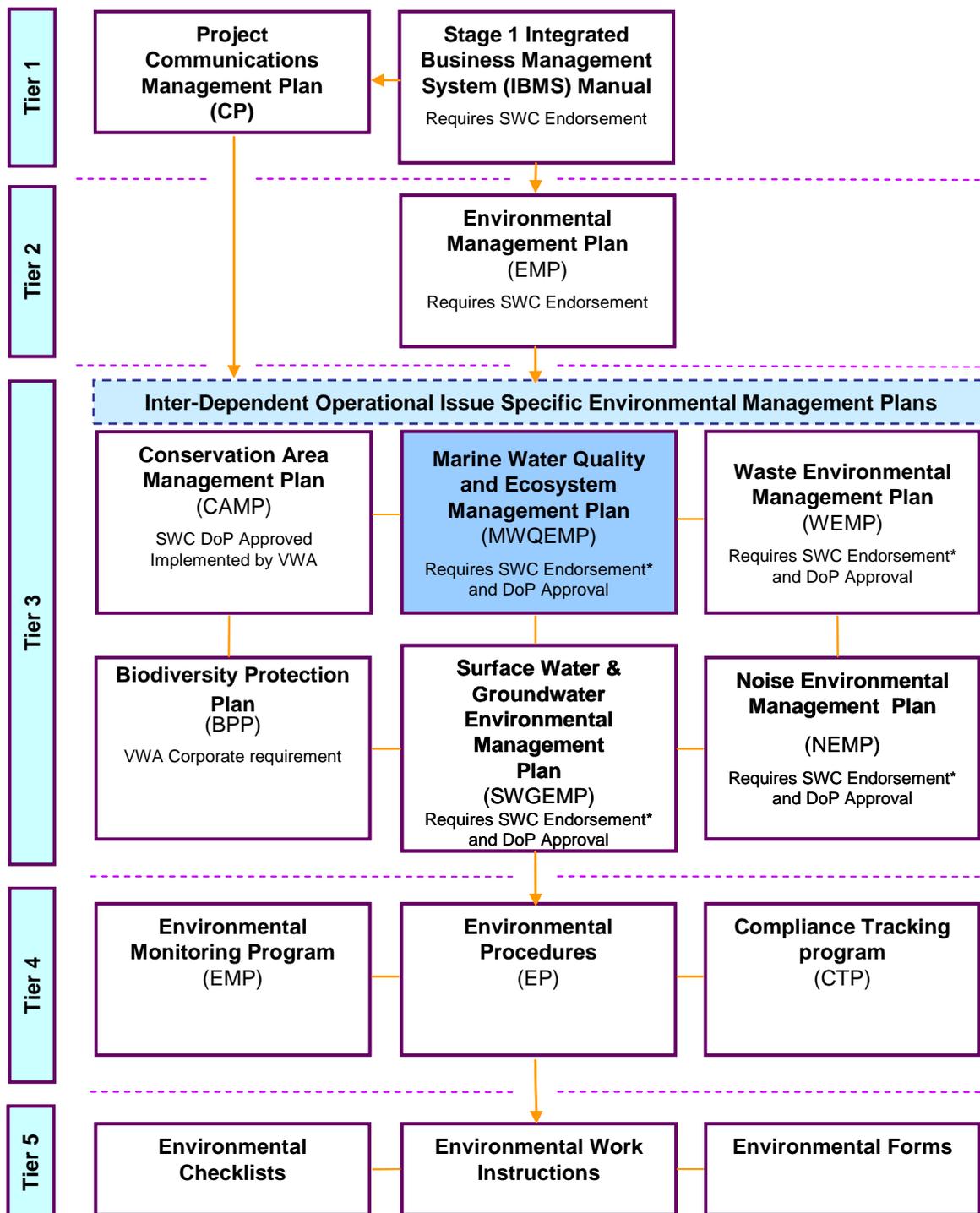


Figure 1 Environmental Documentation Flow Chart

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The Environmental Management System (EMS) for the operation and maintenance phase of Sydney's Desalination Plant is described in the Integrated Business Management System (IBMS) Manual MN-KDP-1-806 (Tier 1).

The Environmental Management Plan (EMP) MN-KDP-1-806 Section 14 (Tier 2) describes the process and environmental requirements that apply to the environmental aspects applicable to the operation and maintenance of Sydney's Desalination Plant. This Marine Water Quality and Ecosystem Management Plan (MWQEMP) PL-KDP-4809 (Tier 3) is part of the Veolia environmental management suite of documents required for Sydney's Desalination Plant as illustrated above.

The MWQEMP describes higher-level protocols, procedures and management measures that will be adopted to manage and mitigate potential impacts on the marine environment during operation and maintenance activities.

Specific environmental management measures will be incorporated into the relevant procedures and work instructions developed to guide activities on site.

2.1 DOCUMENT CONTROL

Control of all environmental management documents will be managed in accordance with section 12 of the IBMS Manual.

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SECTION 3 BACKGROUND

3.1 SITE DESCRIPTION

The Sydney Desalination Plant incorporates inlet and outlet locations in the Tasman Sea. These are connected to the desalination plant with tunnels that pass beneath the Botany Bay National Park and adjacent industrial land.

The inlet structures draw raw seawater in which is then pumped to the plant and the outlet structures return seawater concentrate to the ocean.

3.2 ENVIRONMENTAL ASSESSMENT

The Environmental Assessment of the Concept Plan for Sydney's Desalination Project (SWC, 2005) along with the Preferred Project Report (PPR) (SWC, 2006a) highlighted that there is the potential for impacts upon marine ecology due to construction and operations activities. The potential key impacts to marine ecology described in the EA and PRP relate to effects on water quality, marine habitat and marine biota. The EA identified the key environmental issues and also outlined generic management strategies for the project to mitigate key risks to marine ecology. Marine studies being undertaken by Sydney Water have been provided to BWJV and Veolia. These comprise:

- TEL (2006). Pilot Plankton Monitoring program for the Proposed Desalination Plant at Kurnell. Final December 2006
- SWC (2005). Environmental Assessment of the Concept Plan for Sydney's Desalination Project. November 2005.
- SWC (2006a). Preferred Project Report for Sydney's Desalination Project.
- SWC (2006b). Habitat Survey Kurnell Intake and Outlet Areas. August 2006
- SWC (2007a). Sydney's Desalination Project. Marine and Estuarine Monitoring Program. Detailed Design. June 2007 (Version 3).
- GHD (2005). Desalination Planning Study. Seawater Quality Assessment and Site Conditions – Kurnell. Project Information. September 2005.
- WRL (2007b). Coastal Oceanographic processes and Numerical Modelling for the Proposed Kurnell Desalination Plant. Technical Report 2007/02. Draft April 2007.
- SWC (2007b). Desalination Planning Study. Ocean Sampling Water Quality 2005-2006. Interim Report Final April 2007.
- Sanchez-Camara, Jaimie and Booth, David J (2007). Weedy seadragon *Phyllopteryx taeniolatus* : review of ecology and management. Unpublished report for Sydney Water Corporation.

3.3 DESIGN DOCUMENTS

BWJV has commissioned a number of environmental impact studies and has produced a number of design documents and plans which have been provided to

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Veolia. These documents provide a significant amount of background regarding the design and control philosophy of the intake and discharge structures, as well as the desalination plant to prevent or minimise potential impacts on marine water quality and ecosystems. This information can be accessed in the following documents:

- BWJV (2009a). Marine Biodiversity Protection Plan for Sydney's Desalination Project. BWJV-0-212-00 Revision 01. March 2009.
- BWJV (2009b). Environmental Report - Seawater Concentrate Discharge Design, Staged Submission 2: Discharge Point. Revision 2 September 2009.
- ESA (2009). Toxicity Assessment of Various Discharge Streams Comprising Desalination Plant Treatment Products. Test Report. January 2009.
- WRL (2009a). Physical Modelling of Sydney Desalination Outfall at 500 MI/Day Operation with Two Risers. WRL Technical Report 2009/07. June 2009.
- WRL (2009b). Physical Modelling of Sydney Desalination Outfall at 250 MI/Day Operation with Two Risers. WRL Technical Report 2009/15. July 2009.

3.4 SWC/ SDP MARINE AND ESTUARINE MONITORING PROGRAM

SWC/SDP implemented a Marine and Estuarine Monitoring Program (MEMP) in consultation with the NSW Department of Environment, Climate Change and Water (DECCW) and NSW Department of Primary Industries (DPI). The MEMP was a requirement of Condition 3.1 of the Ministers Conditions of Approvals – Intake and Discharge System. The program was not the responsibility of Veolia. It is now complete.

The main focus of the MEMP was to quantify the potential impacts of the operation of the plant on the marine and estuarine environment and to verify that those impacts are within acceptable limits.

The purpose of the MEMP is to

- monitor the impacts of the project on water quality and marine ecosystems
- validate and calibrate modelling presented in the documents referred to under MCoA 1.1
- monitor impacts associated with discharge of seawater concentrate from the project.

The MEMP details monitoring programs for all project stages from design, construction, commissioning to ongoing operations.

3.5 PLAN APPROVAL PROCESS AND STAKEHOLDER CONSULTATION

This MWQEMP was endorsed by SWC and approved by Department of Planning (DoP) prior to commencement of operation.

This Plan required no specific consultation with stakeholders. However, targeted consultation with applicable stakeholders may be undertaken should any specific concerns arise. Stakeholders considered for such consultation includes NSW Department of Environment, Climate Change and Water (DECCW) and Sutherland Shire Council (SSC).

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SECTION 4 LEGISLATIVE AND OTHER REQUIREMENTS

4.1 RELEVANT LEGISLATION

Veolia developed this MWQEMP in accordance with the requirements of the following relevant NSW and federal legislation, with regard to changes made to the legislation on the 28th of April 2008.

4.1.1 ACTS

The main state and federal legislation relevant to marine water quality and ecosystem management is as follows:

Protection of the Environment Operations Act 1997: The POEO Act enables the Government to set out explicit protection of the environment policies (PEPs) and adopt more innovative approaches to reducing pollution. PEPs are instruments for setting environmental standards, goals, protocols and guidelines. They provide both the framework for Government decisions that affect the environment, and are the means of adopting Australia-wide environment protection measures set by the National Environment Protection Council. Before a PEP can be made, the POEO Act requires public consultation on the draft PEP, and an analysis of the economic and social impact of the PEP.

Threatened Species Conservation Act 1995 (TSC Act): The NSW Threatened Species Conservation Act 1995 identifies and protects native plants and animals in danger of becoming extinct. The Act also provides for species recovery and threat abatement programs. More than 80 species of native plants and animals have recently become extinct in NSW and around 1000 more are threatened with extinction.

Fisheries Management Act 1997 (FM Act)

Environment Protection and Biodiversity Conservation Act 1999

(Commonwealth) (EPBC Act): The Environment Protection and Biodiversity Conservation Act 1999 (the EPBC Act) is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places — defined in the Act as matters of national environmental significance.

The objectives of the EPBC Act are to:

- provide for the protection of the environment, especially matters of national environmental significance
- conserve Australian biodiversity
- provide a streamlined national environmental assessment and approvals process
- enhance the protection and management of important natural and cultural places
- control the international movement of plants and animals (wildlife), wildlife specimens and products made or derived from wildlife
- promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources

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4.1.2 REGULATIONS

Protection of the Environment Operations (General) Regulations 2009:

Commenced on the 30th July 2009 and replaced *Protection of the Environment Operations (General) Regulation 1998*, the *Protection of the Environment Operations (Penalty Notices) Regulation 2004* and the *Protection of the Environment Operations (Savings and Transitional) Regulation 1998*.

4.1.3 GUIDELINES

National Water Quality Management Strategy (NWQMS)

The National Water Quality Management Strategy (NWQMS) has been jointly developed since 1992 by the Australian Government in cooperation with state and territory governments, currently under the Natural Resource Management Ministerial Council. The NWQMS is part of the Council of Australian Governments' (COAG) Water Reform Framework and is acknowledged in the National Water Initiative. The NWQMS aims to achieve the sustainable use of Australia and New Zealand's water resources by protecting and enhancing their quality while maintaining economic and social development. The NWQMS is a strategy developed jointly by two ministerial councils: the Australian and New Zealand Environment and Conservation Council (ANZECC), and the Agriculture and Resources Management Council of Australia and New Zealand (ARMCANZ).

ANZECC (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality:

The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ 2000) have been prepared as part of the NWQMS. and provide government and the community – especially regulators, industry, consultants, community groups and catchment and water managers – with a framework for conserving ambient water quality in our rivers, lakes, estuaries and marine waters.

Marine Water Quality Objectives for NSW Ocean Waters (2005): Are a way of assessing the environmental values and uses that the community places on NSW oceans. They identify the steps required to protect these values and uses. Five objectives apply:

- Aquatic Ecosystems
- Primary contact recreation
- Secondary contact recreation
- Visual amenity
- Aquatic foods

While the objectives are not regulatory or mandatory they are a useful tool for the development and planning of an effective assessment process for Veolia.

4.2 COMPLIANCE OBLIGATIONS

Sydney Water developed a Statement of Commitments (SoC) outlining safeguards and mitigation measures to avoid adverse impact on the environment and ensure legislative compliance. The SoC also outlines monitoring and reporting requirements.

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The SoC addresses all the phases of the project development process and provides management requirements for the entire site, including some that specifically apply to the marine water quality and ecosystem management. A complete list of the SoC can be found in the PPR. Commitments relevant to the management of the marine water quality and ecosystem management are listed in Table 3 Compliance Obligations.

The Minister for Planning has issued Minister’s Conditions of Approval (MCoA) for the seawater intake and discharge system project in November 2006 that impose requirements for management of marine water quality and ecosystems (Minister for Planning, 2006). This MWQEMP has been prepared as required under MCoA 4.6a. The Minister’s Conditions of Approval (MCoA) that this MWQEMP addresses are indicated in Table 3 Compliance Obligations.

Table 3 Compliance Obligations also contains a cross reference to where a MCoA or SoC is addressed in this Plan or other Veolia Sydney Desalination Plant management documents.

Overall environmental compliance will be managed in accordance with section 16 of the IBMS Manual. Records of environmental compliance will be submitted monthly in the Veolia Compliance Tracking Register (FM-KDP-4-777).

Table 3 Compliance Obligations

	No:	Requirement	Doc Ref:
MCoA Intake / Outlet	2.7 (b)	The Proponent shall: develop a strategy for the desalination plant design and operation to verify the targeted 30-times dilution of the seawater concentrate at the edge of the near field mixing zone, including where necessary, further water quality sampling of receiving waters and a program of toxicity testing on simulated seawater concentrate in association with pilot testing.	MEMP
MCoA Plant Intake / Outlet	3.1	Prior to the commencement of commissioning of the project, the Proponent shall prepare and implement a Marine Water Quality and Ecosystem Monitoring Program to monitor the impacts of the project on water quality and marine ecosystems, to validate and calibrate modelling presented in the documents referred to under condition 1.1, and to monitor impacts associated with discharge of seawater concentrate from the project. Implementation of the Program shall start prior to the commencement of commissioning of the project so that the pre- and post-commissioning states of the receiving environment can be compared. The Program shall continue until at least three years after the commencement of operation of the project, after which the Program shall be reviewed to establish on-going monitoring requirements. The Program shall be developed in consultation with the DPI and DECC	MEMP

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MCoA Plant	4.6a	<p>In addition to the general requirements of the Operation Environmental Management System, the Proponent shall prepare and implement the following project-specific Operation Environmental Management Plans during the operation of the seawater intake and discharge system project:</p> <p>a Marine Water Quality and Ecosystem Management Plan to provide a framework for the analysis of monitoring data collected under condition 3.1 of this approval, comparison of monitoring results with environmental outcomes stipulated under this approval, decision-making processes where environmental outcomes are not being met, and identification of an additional measures that may need to be applied where environmental outcomes are not being met.</p>	This Plan
SoC	12	<p>Designs will be developed so that the seawater concentrate meets water quality criteria for relevant chemical and non-chemical parameters (in particular salinity and treatment chemicals) at the edge of the near field mixing zone in line with the approach described in the ANZECC (2000) <i>Australian and New Zealand Guidelines for Fresh and Marine Water Quality</i> and protects DECC Water Quality Objectives where they are currently being achieved.</p> <p>This will include:</p> <p>(a) Development of a strategy for the desalination plant design and operation to verify the targeted 30 times dilution of the seawater concentrate at the edge of the near field mixing zone. This may include further receiving water quality sampling and a program of toxicity testing on simulated seawater concentrate in association with pilot testing.</p>	This Plan Section 6.4
SoC	13	<p>A Marine and Estuarine Monitoring Program will be developed for implementation prior to commencement of construction (with the aim of assembling at least 2 years of data prior to commissioning) and during operation to verify potential water quality and aquatic ecology impacts associated with the seawater concentrate. This will include:</p> <p>(a) Monitoring program scope to:</p> <ol style="list-style-type: none"> i. Characterise and quantify the volume of the seawater concentrate, types and concentrations of constituents (including toxicity) being discharged to the marine environment; ii. Confirm/verify the area of impact for the seawater concentrate; iii. Quantify changes in the quality of marine waters surrounding the outlet location; and iv. Monitor the potential changes in reef assemblages (large 	This Plan and MEMP

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	<p>mobile benthic invertebrates, sessile organisms and fish).</p> <p>(b) Collecting samples from impact sites and reference sites where relevant to enable comparison of water quality parameters and ecological changes.</p> <p>(c) Conducting monitoring during two phases:</p> <p>i. Baseline phase - to quantify the existing structure of the marine environment (for as long a period as possible prior to commissioning, ideally two years data collection); and</p> <p>ii. Post commissioning phase – for comparison of results with baseline data (for the first two years of operation, then reviewed); and</p> <p>(d) Measures to ensure the monitoring program is statistically valid;</p> <p>(e) Recommendations for ongoing monitoring to validate predictions; and</p> <p>(f) Peer review of the Marine and Estuarine Monitoring Program.</p> <p>Consultation with DECC and DPI on the Program.</p>	
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4.3 ENVIRONMENT PROTECTION LICENCE (EPL)

As the operator of the Sydney desalination Plant Veolia will comply with all of the requirements outlined in the Operational Environmental Protection Licence with regard to marine water quality and ecosystem management. EPL12904.

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SECTION 5 POTENTIAL MARINE WATER QUALITY & ECOSYSTEM IMPACTS

The potential impacts on the Marine environment during operation and maintenance of Sydney's Desalination Plant include those listed in Table 5 Project Impacts. The management and mitigation strategies for these potential impacts are described in Section 6 Management and Mitigation.

Table 5 Project Impacts

Source	Potential Impacts
General	
Anchorage hazard from marine structures	Potential for the marine structures to cause an anchorage hazard to recreational users.
Intake	
Entrainment and entrapment in intake structures	The entrainment or entrapment of marine organisms in the intake structures.
Cleaning the intake	The potential impacts of intake shaft cleaning chemicals on marine organisms found around the inlet structure.
Outlet	
Discharge of seawater concentrate	Potential effects from increased salinity in seawater concentrate on marine organisms found in and around the mixing zone .
Desalination treatment and cleaning chemicals	Potential effects from toxicity of chemicals and additives used in the pre-treatment and desalination process on marine organisms found in and around the mixing zone.
Discharge plume	Potential of impact on visual amenity from discharge plume.

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SECTION 6 MANAGEMENT AND MITIGATION

6.1 ANALYSIS OF MONITORING DATA

6.1.1 MEMP

The MEMP was conducted by SWC and SDP and is now complete. Results and reports reside with SDP.

6.1.2 EPL MONITORING

In addition to the monitoring conducted by SDP for the MEMP, Veolia conducts monitoring in accordance with the requirements of the EPL.

6.2 SWC/SDP AND BWJV PROGRAMS AND TIMING

Various monitoring programs have been conducted to provide a comprehensive plan for the protection of the Marine environment. The aspects and timing of these programs are outlined in Table 4 BWJV and SWC Marine Monitoring programs.

Table 4 BWJV and SWC Marine Monitoring programs

Program	Responsibility	Timing
Ecotoxicity	BWJV	Complete
Weedy Seadragon	BWJV	Complete
Reef Habitat	SWC/SDP	3 Years from commencement of operations. Complete
Recruitment of sessile organisms	SWC/SDP	3 Years from commencement of operations. Complete
Marine Water Quality	SWC/SDP	3 Years from commencement of operations. Complete
Fish Survey	SWC	1 Year from commencement of operations. Complete
Plume tracer experiments	BWJV	Prior to commencement of operations Complete

6.3 PLANT OPERATION

The plant has been designed and constructed to ensure compliance with all MCoA and the SoC. During operations, the management and mitigation of potential environmental impacts will involve operating the plant in accordance with the operating philosophy and making informed operational changes as described in **Error! Reference source not found. Error! Reference source not found..**

The key design, management and mitigation measures used to address each of the environmental impacts identified in Section 5 Potential Marine Water Quality & Ecosystem Impacts are as follows.

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6.3.1 ANCHORAGE HAZARD FROM MARINE STRUCTURES

The inlet and outlet are a minimum of 20 metres below the surface. The location of the structures is indicated on naval and marine charts.

6.3.2 ENTRAINMENT AND ENTRAPMENT IN INTAKE STRUCTURES

The seawater intake is designed to reduce potential for marine biota, including larval species, to be drawn into the intake structures during operation. The rate of intake near the intakes is less than ocean currents for most of the time, taking into consideration existing assessment based on reference design below 0.1m/s. The location and design of the intake minimises as far as practicable the amount of aquatic biota (fish and invertebrate larvae and juveniles) that are impinged on intake screens or entrained into the plant.

6.3.3 CLEANING THE INTAKE

The intake openings have 30cm grills to prevent the ingress of large objects and are designed to allow for removal (and replacement) by divers and off site cleaning.

The intake allows for shock chlorination within the intake tunnel and risers to minimise marine growth and maintain hydraulic performance. The chemicals used to clean the intake system, and the design of the cleaning systems minimise toxicity impacts on aquatic biota outside the intake structures.

Shock chlorine dosing will take place daily for about one hour when the plant is in operation.

The shock dosing treatment will be automatically controlled on a flow pacing basis. Oxidation Reduction Potential (ORP) and chlorine residual measurements will be taken for information and for control of the sodium bisulphite dosing. A dosing line magnetic flowmeter is used for monitoring the dosed flows.

The design of the shock chlorination delivery at the intake injection points is such that the sodium hypochlorite will not be able to leave the intake. It will be drawn into the intake and be returned with the seawater to the plant.

6.3.4 DISCHARGE OF SEAWATER CONCENTRATE

Veolia is required to operate the outlet system to achieve the required minimum dilution of 30 fold at the end of near field and a maximum terminal rise height that is below the seawater surface.

The outlet diffusers rely on a certain discharge velocity to achieve design dilution rates. For reduced plant capacity it may be necessary to close off discharge nozzles so that the required velocity can be achieved. Closing or re-opening discharge nozzles requires divers and where plant capacity is reduced for relatively short periods it is not practical to close off nozzles. In these cases seawater makeup is added to the

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discharge at the return flows chamber to ensure that the required velocity is achieved.

WRL have developed algorithms to predict the dilution rate and plume height based on real time salinity and flow data and the number of nozzles open. The algorithms will be used by the SCADA system to report on dilution and plume height at any time.

The predicted dilutions and plume heights will be used to provide the parameters within which Veolia process staff can effectively manage operations to maintain the required outlet dilutions and as a result, the protection of the marine ecosystem communities at the outlet locations.

Veolia will report daily on total discharge volume, TDS (derived from conductivity), number of nozzles open and makeup water flow in order to demonstrate compliance.

This will apply to dense plumes only, i.e. when the average TDS is greater than the seawater TDS. For neutral or buoyant plumes, eg during recommissioning of the plant after an extended shutdown, the EPL discharge limits will still apply but the dilution requirements are not relevant as the plume will not return to the sea floor.

Seawater makeup flow is monitored online on the SCADA system to demonstrate that the outlet system is achieving the design dilution rates.

6.3.5 DESALINATION TREATMENT AND CLEANING CHEMICALS

The neutralised membrane preservation and cleaning streams are a component of the seawater concentrate which is discharged from the plant through the outlets and have been assessed in the ecotoxicity studies.

The neutralised membrane preservation and cleaning streams are treated to comply with the EPL concentration limits before being discharged to sea.

Online monitoring of pH, ORP and residual chlorine on the neutralisation tank outlet and online monitoring of the combined discharge at the marine outlet are used to ensure chemicals have been effectively neutralised as required.

A program of ecotoxicity testing of simulated seawater concentrate for operating chemical dosing conditions, determined there was no potential for the seawater concentrate and treatment chemicals to cause acute toxicity at the edge of near-field.

Ecotoxicity testing of actual plant discharges was conducted during the first six months of operation to confirm the results of the simulated seawater ecotoxicity testing. This testing will be detailed in the Environmental Monitoring Program.

6.3.6 DISCHARGE PLUME

The design of the seawater concentrate discharge point ensures that the plume rise height remains below the sea surface. On site wastewater treatment removes solids from the seawater concentrate and the plume should therefore have little colour or turbidity. Turbidity at the outlet of the wastewater treatment system is monitored online and an alarm is triggered diverting wastewater to the plant inlet if required turbidity levels are exceeded. The alarm trigger point will be set to ensure EPL conditions are met.

Plume height will be monitored by SCADA using the algorithms discussed in 6.3.4.

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The diffusers are robustly constructed and real time monitoring of headloss provides an indicator of any potential issues with diffusers.

6.4 COMPLAINTS

Complaints regarding marine water quality and ecosystem management will be managed in accordance with the Project Communications Plan (Section 11.8 of the IBMS Manual).

6.5 PLANT OPERATION MANAGEMENT MEASURES

Table 5 provides an overview of the key operation and maintenance activities, responsibility and timing to ensure effective management of marine water quality and ecosystem impacts.

Table 5 Plant Operation Management Measures

Management and Mitigation Measures	Responsibility	Timing
General Operation and Maintenance Activities		
Operation of the plant within effective operating range	Operations Manager	At all times
Operation and maintenance of the plant components within effective operating range	Operations Supervisor / Maintenance Supervisor	At all times
In Situ Marine Structures causing a potential anchorage hazard to marine users to be indicated on marine charts	Environmental Management Systems Representative (EMSR)	Prior to Operations
Training and Awareness		
Implement awareness of operational range requirements and obligations of the MQWEMP as part of the Sydney Desalination Plant induction and training program to be provided to all staff and contractors	Environmental Management Systems Representative (EMSR) / Operations Manager	Ongoing training / Regular Inspection
Ongoing toolbox talks/meetings to reinforce MQWEMP obligations and requirements to all staff and contractors	Process Manager / Supervisors	At all times
Monitoring, Auditing and Reporting		
Monitoring of discharge, volume, TDS, Number of Nozzles used and Make-up water flow	Process Manager / Supervisors	Daily
Grab samples for TDS	Process Manager / Supervisors	Monthly
Daily reports of total discharge volume, TDS (derived from conductivity), number of nozzles open and makeup water flow are available in real time from online monitoring	Process Manager / Supervisors	As Required

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Management and Mitigation Measures	Responsibility	Timing
Inspection of intake and outlet structures by divers	Operations / Maintenance Supervisor	Periodically
Inspection of intake tunnel using ROV	Operations / Maintenance Supervisor	Periodically
Implementation of MEMP	SWC/SDP	As Specified in MEMP
Review of data from MEMP and other relevant monitoring programs	Process Manager / SDP	As Required
Comparison of monitoring results with environmental outcomes stipulated under the MCoA	Process Manager / SDP	As Required
Decision-making where environmental outcomes are not being met. Corrective Actions would be agreed in consultation with SDP and other relevant stakeholders and managed via the corrective action process.	Operations Manager / Process Manger / SDP	As Required
Identification of any additional measures that may need to be applied where environmental outcomes are not being met via the corrective action process.	Operations Manager / Process Manger /SDP	As Required

PLAN Marine Water Quality and Ecosystem Management Plan

SECTION 7 MONITORING, INSPECTION, AUDITING AND REPORTING

7.1 MONITORING AND REPORTING PROGRAM

Monitoring and reporting of marine discharge water quality will be undertaken in accordance with the Environmental Monitoring Program REG-KDP-4-920, EPL, MEMP and as follows:

- Regular visual inspections to ensure that controls are functioning correctly. Observations to be noted on the Site Daily Checklists and significant issues are to be raised at weekly meetings, reported to the EMSR.
- Weekly routine inspections, and reported on the Weekly Site Checklist.
- Periodic inspection of the diffuser nozzles and outlet structures by divers.
- Periodic inspection of intake structure by divers.
- Periodic inspection of intake tunnel using an ROV unit.

Parameters to be monitored online during the Sydney desalination plant operations include:

- TDS (derived from conductivity)
- Diffuser Nozzles in operation
- Volume of Make-up Water Flow
- Temperature
- ORP
- pH

SDP will implement and report on the outcomes of the MEMP.

PLAN Marine Water Quality and Ecosystem Management Plan

SECTION 8 PROJECT RESPONSIBILITIES AND TRAINING

8.1 ROLES AND RESPONSIBILITIES

In summary, the key responsibilities for marine water quality and ecosystem management are detailed in the table below.

Table 6 Roles and Responsibilities

Role	Responsibility
Operations Manager:	Responsible for ensuring that marine water quality and ecosystem management measures are implemented and maintained and, in the event of identified potential or actual breaches, to implement appropriate corrective or preventative actions to fulfil the requirements of this Plan. Responsible for advising applicable members of Sydney's Desalination Plant Team of complaints received pertaining to marine water quality and ecosystem management and facilitating the resolution of complaints.
Environmental Management Systems Representative (EMSR):	Responsible for ensuring this Plan is implemented by Sydney Desalination Plant personnel. Undertake and assess data from inspections, monitoring and reporting and provide project-wide advice to ensure consistent approach and outcomes are achieved. Responsible for providing necessary training for Sydney Desalination Plant personnel to cover marine water quality and ecosystem management issues.
Process Manager:	Responsible for fulfilling the requirements of this Plan and for ensuring that appropriate marine discharge management measures are implemented and maintained, and for reviewing performance of these measures.
Operations Supervisor:	Responsible for providing assistance to the Senior Environmental Representative to fulfil the requirements of this Plan and for ensuring that appropriate marine discharge management measures are implemented and maintained.
Maintenance Supervisor:	Responsible for providing assistance to the Senior Environmental Representative to fulfil the requirements of this Plan and for ensuring that appropriate marine discharge management measures are implemented and maintained.