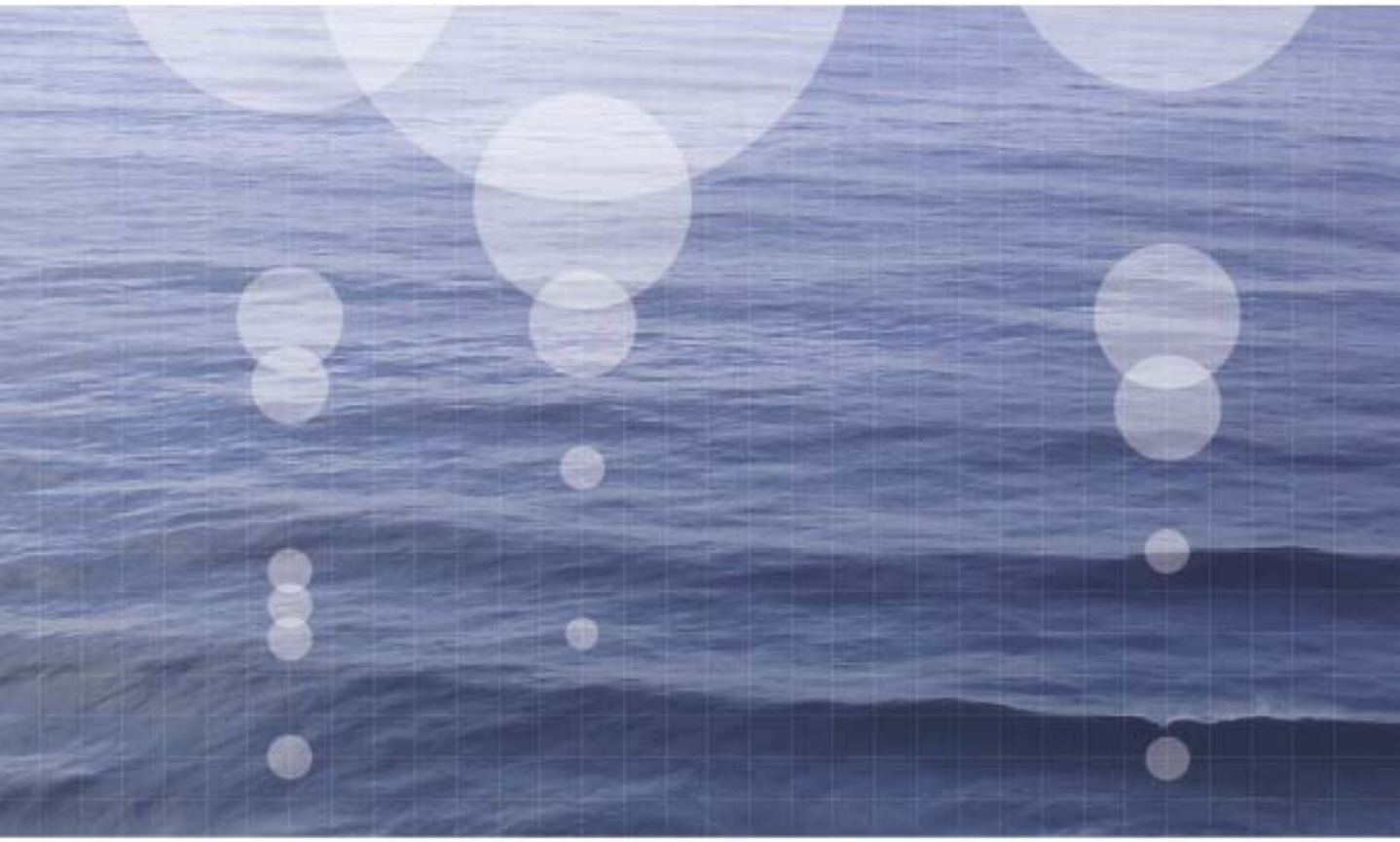
Sydney WATER

Preferred Project Report for

Sydney's Desalination Project



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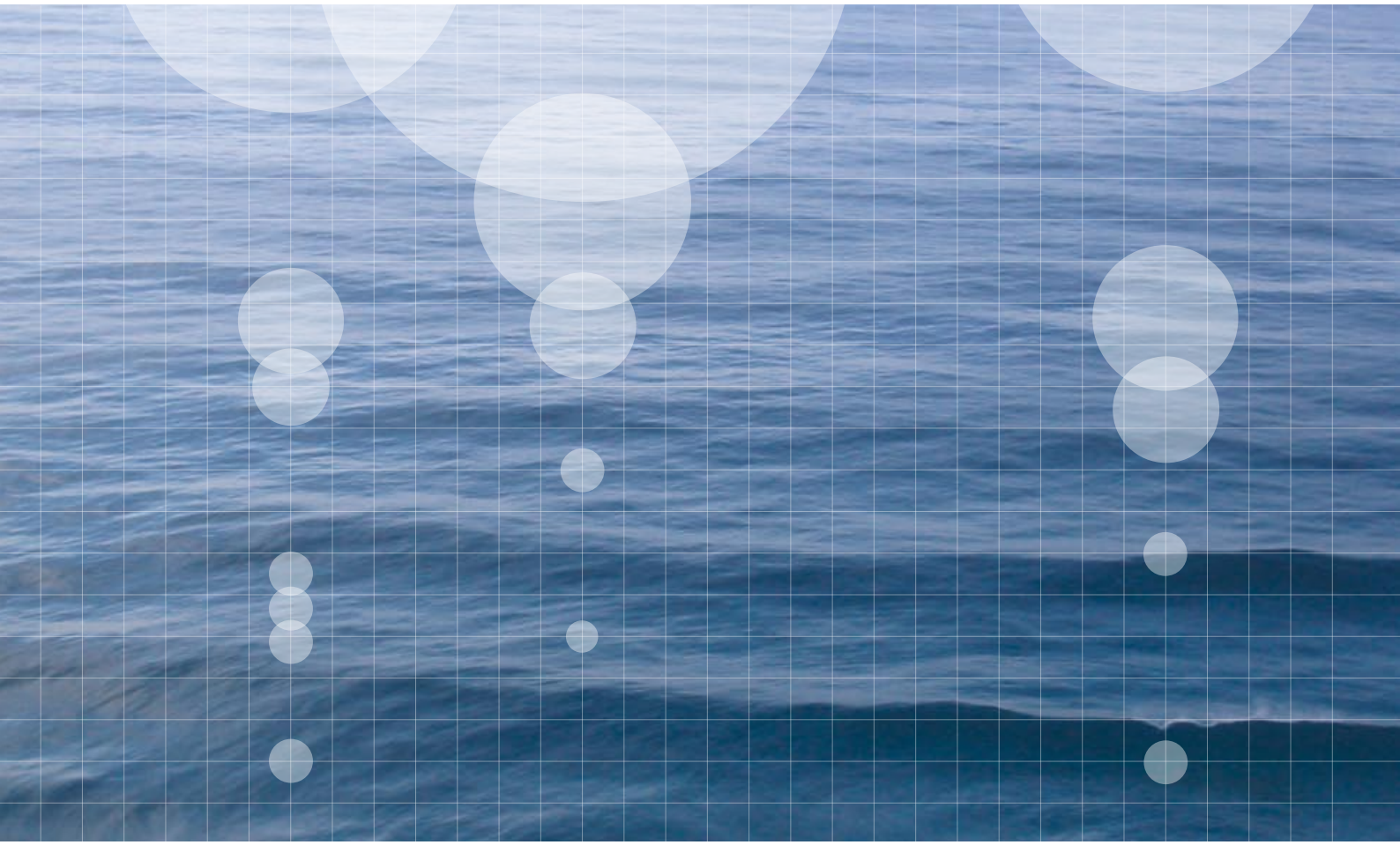
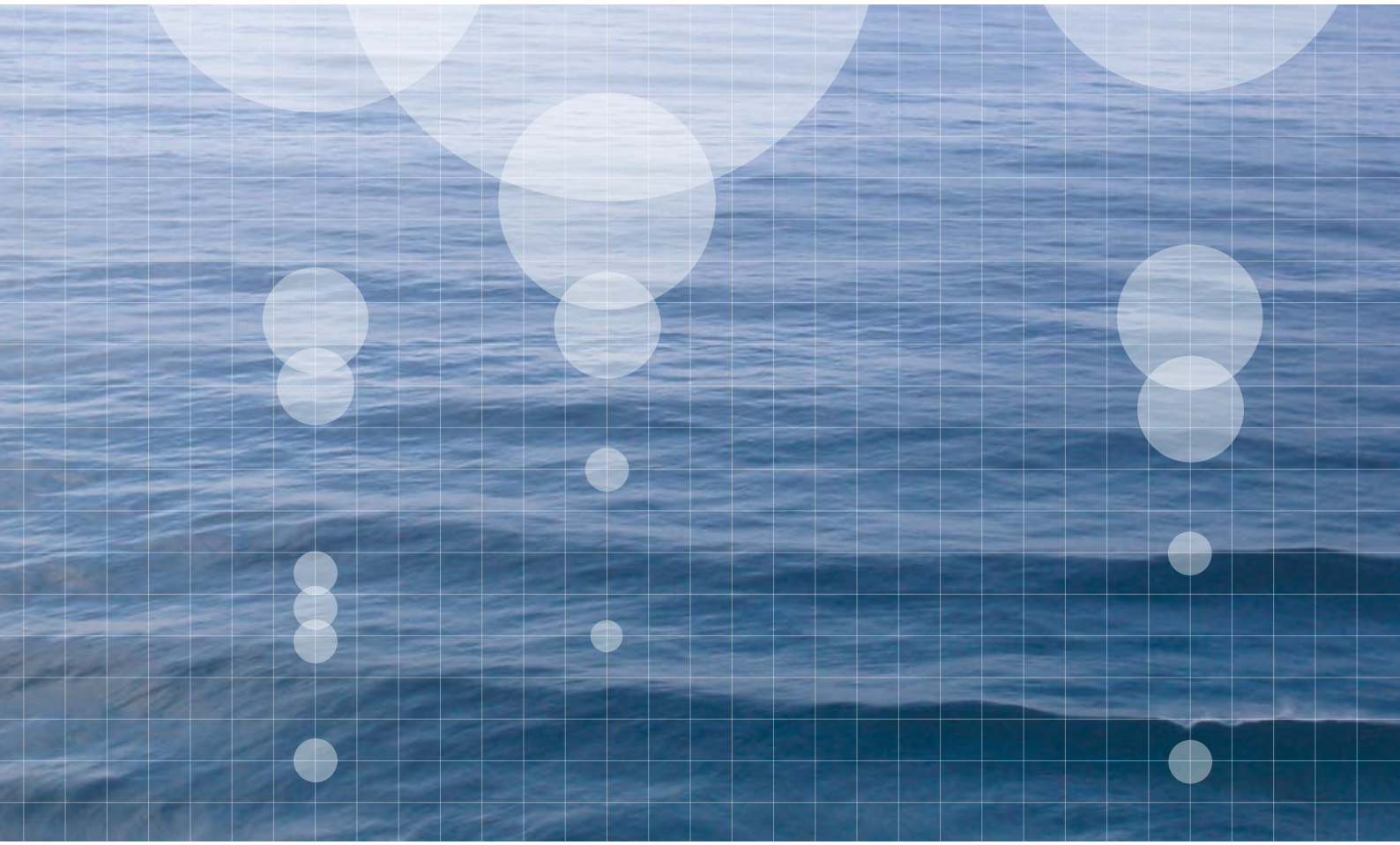


Appendix A



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1. Introduction

1.1 General

In November 2005, the NSW Department of Planning exhibited an Environmental Assessment of the Concept Plan for Sydney's Desalination Project. The Environmental Assessment responded to requirements from the Director General of the Department of Planning.

The Desalination Project was developed to supplement Sydney's water supply if there are significant droughts now or in the future.

On 8 February 2006, the Government released the Metropolitan Water Plan Progress Report. The report detailed progress in securing water supplies during normal times and further supplies during droughts. Due to these measures, the Government decided not to construct a desalination plant at this stage, but to be fully ready to construct a plant at short notice if storage levels drop to around 30 per cent.

Although a desalination plant is not needed immediately, planning activities, such as site investigations, infrastructure design, environmental assessments and planning approvals will continue to ensure that the plant can be built quickly if required. The fact that the Government would have the capability to construct and operate a desalination plant in the event of a severe and prolonged drought means that the system is absolutely secure. This capability is the essential factor – without the need to actually construct the plant itself.

The 2006 Metropolitan Water Plan stated that:

> "...Independent expert analysis of the supply and demand balance has indicated that being ready to construct and operate a desalination plant in response to extreme drought conditions is a necessary component of a multifaceted plan to secure Sydney's water supplies. However, construction of a desalination plant is not required to deliver security of supply: it is sufficient that the Government has the capacity to construct and operate a plant within a relatively short lead time. The Government now has the capacity to deploy desalination once extreme drought conditions emerge, rather than having to invest 'preemptively' in anticipation of critical (and improbable) drought conditions."
>
> "The Government's February 2006 *Progress Report* indicated that construction contracts for a desalination plant would be awarded if storages reach around 30%. This figure will inevitably be adaptively modified over time. This is because the mix of measures in the supply and demand balance will shift over time, thus changing the rate at which dam levels can be expected to fall in a future drought."
>
> "The probability of the Sydney storages falling to critical levels is low due to the system's considerable capacity, new recycling measures, increased water efficiency, and the capacity to use groundwater resources should the drought deepen."
>
> In short, the emergence of non-rainfall dependent options such as groundwater and desalination means that it is now possible to adopt a new approach to delivering security of supply in the face of deep drought. The fact that such options can be constructed with short lead times means that it is possible to deploy them once deep drought conditions emerge, rather than pre-emptively as in the past. This can deliver substantial cost savings by deferring investment until required, and can also enable us to make better use of our existing storage system.

The project's economic and social importance means that it is being assessed as critical infrastructure under Part 3A of the *Environmental Planning and Assessment Act 1979*.

This Preferred Project Report responds to issues raised in submissions to the Department of Planning and Sydney Water. These responses draw on the Environmental Assessment, new information gained since the Environmental Assessment was completed, changes in response to public inputs and the 2006 Metropolitan Water Plan.

This report will assist the Department of Planning in advising the Minister on whether to approve the Concept Plan for the overall desalination project and grant Project Approval for elements of the project.

1.2 Role and objectives of this Preferred Project Report

On 17 February 2006 the Director General of the Department of Planning advised that:

> *Under section 75H(6) of the Environmental Planning and Assessment Act 1979, the Director General requires that Sydney Water respond to the issues raised in submissions as part of a Preferred Project Report. The Preferred Project Report must:*
>
> - *Clearly indicate how Sydney Water has addressed the issues raised in each submission;*
> - *Provide a clear indication of the scope and components of the project, with an indication of how the project may have been amended by Sydney Water in response to issues raised in submissions or as a consequence of the environmental assessment process; and*
> - *Include an update Statement of Commitments, reflecting and clearly indicating where Sydney Water may have amended the Statement in response to issues raised in submissions or as a consequence of the environmental assessment process.*

The Preferred Project Report has been prepared to address these requirements. The methodology for identifying and addressing issues was discussed and agreed to with the Department of Planning.

1.3 The Concept Plan for the Desalination Project as exhibited

The project description that submissions are based upon is Chapter 2 of the Environmental Assessment. This is provided in Appendix A of this report and footnotes are provided where project circumstances have changed in the time elapsed since the exhibition. Since the Environmental Assessment was exhibited the project has been modified as outlined in Section 1.4 below.

In summary the Concept Plan for a Desalination Plant is a contingency measure which would only be constructed in times of extreme drought. The Concept Plan identifies that a desalination plant would be constructed on industrially zoned land at Kurnell. The plant would use reverse osmosis as the desalination technology. The seawater intake is about 300-400m off the coast of Kurnell and the outlet for the seawater concentrate is also about 250-300m off the coast. The connection of the intake and outlet to the Kurnell site would be by tunnels. The desalinated water would then be connected either by tunnel or pipe to Sydney Water's main distribution system.

1.4 Changes since Environmental Assessment exhibition

Some changes have been made to the project described in the Environmental Assessment. These changes reflect issues raised in submissions, changes in Government policy or as a consequence of the environmental assessment process. Changes arising from the 2006 Metropolitan Water Plan are also included.

The changes will reduce the overall environmental impact of the project.

The following sections describe the key changes to the project.

1.4.1 The project will only be implemented as a drought contingency

The 2006 Metropolitan Water Plan identifies that the desalination plant is a part of a multifaceted plan to secure Sydney's water supplies and that construction would commence should an extreme drought emerge and water storages reach around 30 per cent.

1.4.2 A tunnel may not be required for a plant greater than 125 ML/day

Methods to deliver greater than 125 ML/day include one or more pipelines once across Botany Bay or a tunnel, both of which were described in the Environmental Assessment.

1.4.3 A pipeline to Miranda/Caringbah will not now form part of the project

As water can be supplied across Botany Bay more cost effectively, the delivery pipeline to Miranda/Caringbah will now not form part of the project.

1.4.4 Lime treatment sludge will be beneficially reused or disposed of to land

Following further investigation, a decision has been made not to discharge lime process backwash sludge to the ocean, as beneficial reuse options are available.

1.4.5 The commitment to reduce greenhouse gas emissions has increased and the plant will use renewable energy

Concerns raised about the high energy use of a desalination plant will be addressed by effectively powering it with 100 per cent renewable energy, meaning no net greenhouse gas emissions.

1.5 Approval

As the proponent, Sydney Water is seeking approval for the Concept Plan detailed in Chapter 2 of the Environmental Assessment to construct, operate and maintain a seawater reverse osmosis desalination plant and associated infrastructure (the project). Sydney Water is also seeking Project Approval for specific components of the project that have been adequately defined and assessed. Chapter 11 of this report details these approvals including changes since the Environmental Assessment.

If a proponent can adequately define the project and undertakes adequate assessment, a 'project approval' can be sought allowing commencement of the works subject to conditions of approval.

1.5.1 Concept Approval

Sydney Water seeks Concept Plan Approval for all components and options of the Concept Plan documented in the Environmental Assessment, subject to the following changes (as itemised in Sections 1.4.2 and 1.4.3 above):

- Removal of the option to deliver up to 50 ML/day locally from the desalination plant by connecting to the water distribution system at Miranda/Caringbah; and
- A tunnel may not be required for a plant greater than 125 ML/day. Methods to deliver greater than 125 ML/day include one or more pipelines once across Botany Bay or a tunnel, both of which were described in the Environmental Assessment.

1.5.2 Project Approval

Project Approval is sought for the following components of the desalination project as outlined in the Environmental Assessment of the Concept Plan (as exhibited), and as described in Chapter 11 of this Preferred Project Report:

- Seawater intakes;
- Seawater concentrate discharge outlets;
- Tunnel(s) from the desalination plant to the intakes and outlets; and
- Development of a reverse osmosis desalination plant built in modules with a capacity of up to 500 ML/day on the Kurnell site.

Sydney Water will seek subsequent Project Approval/s, if it becomes necessary, for the remaining components of the desalination project, namely the desalinated water distribution routes and method of construction from the desalination plant.

It is necessary to define the preferred route(s) and undertake further studies, investigations and assessments before seeking Project Approval. This will be undertaken and reported on in a Desalinated Water Distribution Infrastructure Assessment, which will address the route(s) across Botany Bay and the route(s) for connection to the water supply system. The community would be provided with information regarding the selection process for the preferred route(s). Affected communities would be consulted as to the mitigation measures to be employed in their area. Given that Project Approval may not be required for a number of years, it is not being sought now as it is possible that factors such as new infrastructure, future land use or changes to pipeline technology may impact on the selection of the preferred route(s). Project Approval for these components would be sought at a time that would allow construction to commence when storages are depleted to around 30 per cent.

1.5.3 The Approval Process

In common with other major projects in New South Wales, a desalination plant is assessed under the *Environmental Planning and Assessment Act 1979* (EP&A Act). In accordance with the EP&A Act, the Minister for Planning has declared the desalination project to be critical infrastructure and authorised the submission of a Concept Plan for the development. Sydney Water's Environmental Assessment of the Concept Plan has since been publicly exhibited by the Department of Planning.

This Preferred Project Report has been prepared as a part of the assessment and approval process. Sydney Water is required to provide a Preferred Project Report to the Department of Planning. The Department then prepares an Assessment Report to the Minister for Planning, taking into account the Preferred Project Report. The Minister has appointed an Independent Panel to ensure community and stakeholder submissions are adequately addressed in the Preferred Project Report.

The Minister for Planning is responsible for assessing the desalination Concept Plan. In approving the Concept Plan, the Minister may issue conditions and may request further environmental assessment before granting approval to carry out those components requiring Project Approval. The desalination project can only be constructed after the Minister's Project Approval has been issued. The EP&A Act allows for separate Project Approvals to be issued for particular components of the desalination project.

1.6 Structure of the Preferred Project Report

Chapter 1 – Introduction

This chapter:

- Introduces the Preferred Project Report;
- Summarises the project presented in the Environmental Assessment;
- Describes how issues were identified from both formal and informal submissions; and
- Details changes that have been made since the Environmental Assessment was completed.

Each of the following chapters is presented as follows:

- A summary of information in the Environmental Assessment, noting any changes that have been made following exhibition of the Environmental Assessment;
- The key issues raised; and
- Responses to issues raised.

Chapters 2 and 3 – Background chapters

These chapters respond to issues raised during the consultation period, but are not strictly part of the Environmental Assessment. A response has been provided for these issues due to the level of public interest. These issues include:

- Issues related to the assessment process that has been followed, including the adequacy of the Environmental Assessment that was prepared under Part 3A of the EP&A Act and in accordance with Department of Planning requirements; and
- The consultation process.

Chapters 4 - 10 – Project specific response chapters

These chapters respond to issues that relate to various components of the project (during construction and operation stages), including:

- Construction of the plant;
- Construction of the intake and outlets;
- Construction of the delivery infrastructure;
- Operation of the plant;
- Operation of the intakes;
- Operation of the outlets; and
- Operation of the delivery infrastructure.

Chapters 11 - 12 – Summary chapters

These chapters conclude the Preferred Project Report by:

- Detailing the amended project. This includes those components where Project Approval is sought and those for which Concept Plan Approval is sought; and
- Providing an amended Statement of Commitments including modifications made since the Environmental Assessment was finalised.

Appendix A The Concept Plan for the Desalination Project as exhibited

Appendix B Issues Database Summary

Appendix C Matters relating to the need for and alternatives to Desalination

1.7 Submissions

The Environmental Assessment of the Concept Plan was publicly exhibited from 24 November 2005 to 3 February 2006. During this time submissions were invited from the community and other stakeholders.

This Preferred Project Report addresses issues raised in submissions to the Department of Planning and Sydney Water.

1.7.1 Types of submissions

Community input received by Sydney Water and Department of Planning about the project included:

- Formal written submissions to the Department and the online facility on the Sydney Water website; and
- Informal submissions, including:
  - Comments and inquiries to Sydney Water via a freecall 1800 number, mail and email;
  - Special Inquiries (correspondence received by the portfolio Minister's office and forwarded to Sydney Water from the public); and
  - Comments and inquiries received from members of the public, stakeholder groups and Government agencies, at information displays, community workshops, stakeholder meetings and Government agency meetings.

The types of submissions considered in this report are summarised in Table 1.1.

Table 1.1 Types of submissions

Formal submissions	Informal submissions	
	Input received directly by the consultation team	Input received via consultation activities
Written submissions to the Department of Planning and through the Sydney Water website	Phone	Information displays
	Mail	Community workshops
	Email	Stakeholder meetings
	Special inquiries	Agency meetings

1.7.2 Formal submissions

A total of 711 formal submissions were received during the exhibition period. The Department of Planning received 565 formal submissions and a further 146 submissions were received through the online facility on Sydney Water's website. The latter were provided to the Department of Planning.

A further 51 submissions were accepted by the Department of Planning following the exhibition period.

Of the formal submissions received, some 307 were pro-forma submissions.

Formal submissions were received from:

- State Government agencies including the Department of Environment and Conservation (DEC) and the Department of Primary Industries (DPI);
- Several Local Councils;
- Several non Government Organisations; and
- The General Public.

1.7.3 Informal submissions

Exhibition of the Environmental Assessment presented an opportunity for individuals in the community, Government agencies and stakeholder groups (including community and environmental groups) to input ideas, raise issues and provide feedback. Other forms of community input received directly by the consultation team or via consultation activities included:

- Phone calls to the 1800 number, letters and emails to Sydney Water

  Around 200 individual callers, 5 letters and over 100 emails were received during the exhibition period.

- Special inquiries

  'Special Inquiries' refer to correspondence received by the portfolio Minister's office and Sydney Water from the public and others. Around 60 Special Inquiries were received during the exhibition period.

- Information displays at eight regional shopping centres

  Comments were received at the information displays.

- Community workshops

  Issues raised in the workshops were documented and provided to the Department of Planning and the Independent Panel (refer to Section 1.9). Members of the public were able to view issues raised at all workshops via a summary report on Sydney Water's website.

- Meetings with stakeholders

  Sydney Water met with 22 stakeholder groups including local Councils, fishing industry groups, the Commonwealth Department of Environment and Heritage, community and environmental groups during the exhibition of the Environmental Assessment.

There were no issues raised in these informal submissions, which were not raised in the formal submissions.

1.8 Methodology for identifying issues

1.8.1 Formal submissions

Formal submissions were catalogued by the Department of Planning, given a unique number and, where appropriate, edited to remove the name and address of the author. These were assembled and given to Sydney Water each week during the exhibition period. Sydney Water prepared a Submissions File and entered the details of each submission in a database.

All formal submissions were rigorously reviewed to identify issues that required response by the proponent. This review process was carried out by GHD in conjunction with Sydney Water personnel.

To ensure a consistent approach, all formal submissions were analysed by two project team members. Issues raised in each submission were identified and entered into a database. A summary of issues raised in formal submissions is included as Appendix B.

1.8.2 Informal submissions

Informal submissions were reviewed by project team members to identify issues, coded and entered into a database. To ensure a consistent approach, all informal submissions were analysed by two project team members and cross-referenced against issues raised in formal submissions to identify any exceptions. No substantive exceptions were identified.

1.8.3 Issues raised in submissions

Nearly 200 issues were identified in the formal submissions. Approximately 570 authors specifically stated that they did not support the desalination plant. Around 30 indicated support for the desalination plant at Kurnell.

The most common issues were as follows:

- Over 600 submissions questioned the need for a desalination plant;
- Of those who questioned the need for the plant, most respondents preferred alternative processes (such as water recycling and stormwater harvesting), as well as education and demand management for conserving Sydney's water supply;
- Over 500 submissions raised concerns about the cost of the project and most felt that the cost of desalination was too high relative to alternatives such as recycling and stormwater harvesting;
- Nearly 550 submissions raised concerns about the operation of the plant, in particular energy consumption and greenhouse gas emissions;
- Over 400 submissions raised the consultation process as an issue of concern;
- Around 200 respondents felt that the consultation process was inadequate and expressed concern that the decision to proceed was a 'fait accompli'; and
- Nearly all submissions raised concerns about impacts on the natural environment.

1.8.4 Addressing issues

There are issues that are within Sydney Water's ability to control or influence. These include project components that can be altered through the Environmental Assessment process, including distribution routes, energy use and offset options, environmentally sensitive areas, spoil and traffic management and other more general issues. In these cases, more details are given if they are not already provided in the Environmental Assessment. Where necessary, Sydney Water has amended either the project or the Statement of Commitments.

There were a number of issues that have not been addressed in this report because they were outside the scope of the Environmental Assessment. These were either too general or beyond the scope of Sydney Water's responsibilities under Part 3A of the EP&A Act to address environmental impacts. These included:

- Alternative water supply sources;
- General concerns about Sydney Water;
- Broad concern about the NSW Government; and
- Procurement processes and associated costs.

Further information on some issues falling outside the scope of the Environmental Assessment are discussed in Appendix C.

Issues are addressed in one of two ways within this Preferred Project Report:

- Where a submission raised an issue that had been adequately addressed in the Environmental Assessment, the response refers to the original Environmental Assessment; or
- Where an issue was raised that was potentially unclear or dealt with too briefly in the Environmental Assessment, more information is given.

The methodology for consideration of issues varied according to the nature of the issue raised. Methods used to consider theses issues and develop a response for inclusion in this report, including project changes, included the following processes:

- Weekly meetings with key State Government agencies;
- Consultation with key stakeholder groups;
- Further technical investigations and reporting; and
- Establishment of an Interagency Greenhouse Reduction Working Party.

Responses were reviewed by project staff, or where appropriate, by external specialists.

Due to the common content of many submissions, issues of a like nature have been grouped together for the purposes of providing responses in this Preferred Project Report. Individuals and organisations are not identified in either issues or responses. Appendix B includes the identification number of each submission against issues raised.

Requests for a copy of the Environmental Assessment, for further information and for educational resources were dealt with as a matter of course during the exhibition.

1.9 Peer review of the Preferred Project Report

Sydney Water commissioned an independent review to audit how issues were identified and responded to in this report. In addition, the Minister for Planning appointed an Independent Panel to review the exhibition process and particularly Sydney Water's response to submissions.

2. The Assessment Process

2.1 Summary of the assessment process

A number of queries were raised about the assessment process. As outlined in Figure 2.1, and described below, the assessment involves a number of key processes and decision points.

2.1.1 Planning approval process

Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) was established through amendments to the EP&A Act in 2005. It provides an assessment and approval regime for all major projects previously assessed under Part 4 (Development Assessment) or Part 5 (Environmental Assessment) of the EP&A Act. In most cases, the earlier framework required all proponents of major projects or those with significant impacts to prepare an Environmental Impact Statement (EIS).

The Department of Planning recommended that the proposed project is essential to Sydney primarily in economic and social terms and that the Minister declare the desalination project to be a critical infrastructure project. On 16 November 2005 the Minister for Planning determined that the desalination project should be assessed under the critical infrastructure provisions of Part 3A of the EP&A Act and authorised the submission of a Concept Plan. Figure 2.1 summarises the general approach for assessment and approval of the desalination project.

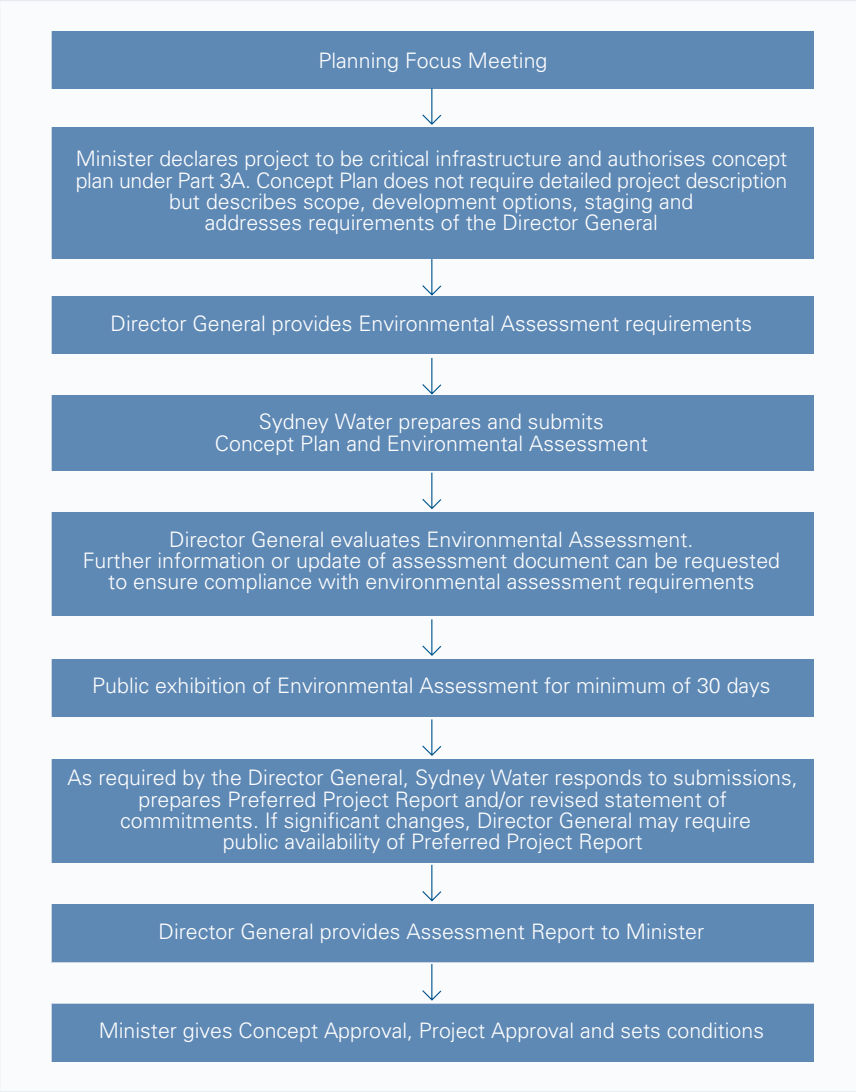
2.1.2 Environmental Assessment

As requested by the Director General of the Department of Planning, Sydney Water prepared an Environmental Assessment to accompany its application for Concept Plan Approval and Project Approval for the desalination project. The Environmental Assessment was displayed between 24 November 2005 and 3 February 2006, during which time the public, government agencies and other stakeholders could make submissions to the Department of Planning.

The Environmental Assessment:

- Described the overall concept of the project and its likely components;
- Identified project components, including alternative infrastructure routes, several potential construction methodologies, layouts and configurations;
- Complied with the Director General's environmental assessment requirements for the project and the Department of Planning's draft guidelines for the assessment of major projects under Part 3A;
- Assessed impacts with a specific focus on identified key issues; and
- Presented a Draft Statement of Commitments that defined the management, mitigation and monitoring regime that Sydney Water would implement to avoid, reduce and manage environmental issues.

Figure 2.1 The Part 3A process for the desalination project



2.1.3 Preferred Project Report

This Preferred Project Report has been prepared in accordance with the EP&A Act (Part 3A) assessment and approval process. The Preferred Project Report details Sydney Water's responses to issues raised during exhibition of the Environmental Assessment. Sydney Water is required to provide a Preferred Project Report to the Department of Planning.

The Department of Planning then prepares an Assessment Report to the Minister for Planning, taking into account the Preferred Project Report. The Minister has appointed an Independent Panel to ensure community and stakeholder submissions are adequately addressed in the Preferred Project Report.

2.2 Summary of issues raised

Submissions queried the assessment process. These included concern about the Part 3A process, that the decision to go ahead with the project had already been made and that the government is 'fast-tracking' the project without adequate studies or tests.

Concern was raised about the level of detail in the Environmental Assessment, particularly whether it provided a reasonable basis for approvals, given that it is based on a concept. Comments were made about a lack of detail with the construction and operation of the delivery infrastructure.

Some submissions also questioned the treatment of alternatives to desalination, lack of a cost-benefit analysis, and the methods used to assess particular environmental, economic, social and heritage impacts of the project.

Concern was also expressed about the level of detail provided in the Environmental Assessment about greenhouse gas offset options and how they would be implemented. Some respondents considered this to be a failure to address the Director General's requirements for the project.

Some respondents also questioned why the project was not referred to the Commonwealth Minister for Environment and Heritage under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

A number of submissions were concerned that the choice of Kurnell for the site of the desalination plant was made without consultation and that it should be placed elsewhere.

2.3 Response to issues raised in submissions relating to the assessment process

2.3.1 Issue: Concern over the classification of the project as Critical Infrastructure under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act)

Adequate access to safe drinking water is fundamentally important to any community. Australia is one of the driest continents in the world and it suffers from periodic droughts. During those times, governments have a responsibility to plan for the well being of the public.

Due to the project's importance as a contingency measure to address future drought conditions, the Minister for Planning has determined that it is critical infrastructure that should be assessed under Part 3A of the *Environmental Planning and Assessment Act 1979*. According to the NSW Planning Reform Fact Sheet, 4 August 2005 – Critical Infrastructure projects are those that:

> "From time-to-time, a proposed major infrastructure proposal may be considered an essential project for the economic, social or environmental welfare of the State of New South Wales.
>
> Projects may be considered to be essential to deliver an important government commitment, for example the construction of the stadium and facilities to host the Olympic Games. Other essential projects could include replacing a bridge destroyed in a natural disaster, or quickly remediating a major contamination spill that may put at risk an important water system.
>
> The Act provides a streamlined assessment and approvals process to ensure that critical infrastructure is delivered as quickly as possible without compromising on environmental outcomes."

Although a desalination plant is not needed immediately, planning activities, such as site investigations, infrastructure design, environmental assessments and planning approvals will continue to ensure that the plant can be built quickly if required. Having the capacity to deploy desalination in the shortest possible time in the event of an extreme prolonged drought means that construction can be deferred until absolutely necessary, avoiding bringing forward major outlays of community resources which otherwise may not be necessary at all.

The 2006 Metropolitan Water Plan stated that:

> "...Independent expert analysis of the supply and demand balance has indicated that being ready to construct and operate a desalination plant in response to extreme drought conditions is a necessary component of a multifaceted plan to secure Sydney's water supplies. However, construction of a desalination plant is not required to deliver security of supply: it is sufficient that the Government has the capacity to construct and operate a plant within a relatively short lead time. The Government now has the capacity to deploy desalination once extreme drought conditions emerge, rather than having to invest 'preemptively' in anticipation of critical (and improbable) drought conditions."

2.3.2 Issue: There is inadequate detail provided in the Environmental Assessment and an EIS should have been prepared which incorporated the 'do nothing option'

Projects assessed under Part 3A of the EP&A Act are not required to prepare or follow procedures normally associated with an Environmental Impact Statement. Instead Part 3A requires proponents to focus on the key environmental issues and show how they can be managed as well as seek community feedback on the main elements of a proposal. In these circumstances a publicly exhibited Environmental Assessment takes the place of an EIS.

The Environmental Assessment was prepared in accordance with the Director General's requirements and the Director General confirmed in writing that these requirements were met in the exhibited report. These requirements did not require an assessment of the 'do nothing' option.

2.3.3 Issue: The Environmental Assessment does not assess or compare alternative methods of water supply

The Metropolitan Water Plan gives a multi-faceted framework for Sydney's future water supply. The plan called for investment in a suite of supply and demand measures, including demand management, recycling and more effective use of existing infrastructure. One element was to diversify water supplies using desalination. This project, as explained in the Environmental Assessment, seeks approval to build, operate and maintain a desalination plant.

An explanatory note on alternatives to desalination is presented as additional information in Appendix C.

2.3.4 Issue: Environmental Assessment assesses the easy impacts and ignores key impacts

Section 5.2 of the Environmental Assessment outlines the process that was followed to identify key issues.

Some submissions questioned the choice of impacts assessed in the Environmental Assessment, suggesting that more important impacts were not addressed.

The Environmental Assessment was prepared in accordance with the Director General's requirements and was considered by the Director General to meet these requirements. Part 3A of the EP&A Act requires an Environmental Assessment to focus on key issues, supplemented by commitments made by the proponent to further studies, management protocols and mitigation measures. As stated in Section 3.1.2 of the Environmental Assessment, the Planning Focus Meeting attended by key agencies allowed Sydney Water to explain key technological and environmental issues associated with the main components of the proposal.

Participants were invited to identify any additional key issues that would need to be addressed. The Director General issued requirements for the Environmental Assessment with the benefit of all these inputs. The Environmental Assessment addresses the outcomes of the Planning Focus Meeting and advice from the Department of Planning on key issues consistent with the Director General's requirements.

The level of assessment applied to other issues was also consistent with the Director General's requirements (refer also to Section 2.3.2). The Minister for Planning has engaged an Independent Panel to "to ensure that all issues raised by the community and stakeholders in submissions to the publicly exhibited Environmental Assessment prepared by Sydney Water are adequately addressed and responded to by Sydney Water". Refer Section 3.4.1 for the Independent Panel's Terms of Reference.

2.3.5 Issue: Environmental Assessment does not compare economic and environmental costs or advantages or disadvantages of alternatives

The Environmental Assessment has been prepared in accordance with the Director General's requirements and was considered by the Director General to meet these requirements. The Director General's requirements did not require such an assessment in the Environmental Assessment.

An explanatory note on alternatives to desalination is presented as additional information in Appendix C.

2.3.6 Issue: Concern that the Environmental Assessment is designed to support the project

Environmental impacts were identified while the Concept Plan was developed and opportunities were investigated to:

- Avoid impacts;
- Mitigate impacts;
- Verify impacts; and
- Adapt the project.

The Environmental Assessment therefore documents the outcomes of investigations to avoid, mitigate and verify impacts and presents a viable project. For example, the Concept Plan included:

1. A prohibition on intakes or outlets in Botany Bay or near key marine areas;
2. Significant funding to reduce greenhouse impacts;
3. Site and route selection to avoid impacts on threatened species and endangered ecological communities where possible; and
4. Commitment to a significant marine monitoring program that would test predictions and inclusion of mitigation steps that can be taken (such as treatment of backwash waters) if predictions are not verified.

The environmental assessment requirements were prepared under Section 75F of the EP&A Act. Section 75H of the EP&A Act requires that an Environmental Assessment must adequately address the environmental assessment requirements of the Director General of Planning.

2.3.7 Issue: Concern that the impacts identified in the Environmental Assessment are not supported by an independent authority

The Minister for Planning, on advice from the Department of Planning, will determine whether the impacts identified in the Environmental Assessment and Preferred Project Report are appropriately addressed, as well as defining the statutory conditions that would apply to the project in the unlikely event that the plant is needed. The Minister will have access to all inputs offered by other authorities, stakeholders, interest groups and the general public. The Minister's consideration of the project will therefore have the benefit of a variety of independent sources outside of the proponent and the Department of Planning, including the Independent Panel appointed by the Minister for Planning (refer Section 3.4.1).

2.3.8 Issue: Concern about the adequacy of the requirements set down by the Director General of Planning

As stated in Section 2.3.4, the Planning Focus Meeting allowed Sydney Water to explain key technological and environmental issues associated with the main components of the proposal. Participants were invited to identify any additional key issues that would need to be addressed. With the benefit of these inputs, the Director General issued requirements for the Environmental Assessment. The Environmental Assessment addresses the outcomes of the Planning Focus Meeting and advice from the Department of Planning on key issues consistent with the issued Director General's requirements.

The following organisations were consulted and attended the meeting:

- Department of Planning (DoP) (Convenor);
- Sydney Water Corporation (Proponent);

- Department of Environment and Conservation (DEC);
- Department of Primary Industries (DPI);
- Department of Energy, Utilities and Sustainability;
- Energy Australia;
- Transgrid;
- Sutherland Shire Council; and
- Commonwealth Department of Environment and Heritage (DEH).

Refer also to Section 2.3.4.

2.3.9 Issue: Concern that the Environmental Assessment is based on a concept rather than a defined project

Part 3A of the EP&A Act provides for Concept Plans for complex projects, plans or programs so that overall provisions can be evaluated before details of the project(s) are available. The Director General of the Department of Planning confirmed the application of Part 3A to the project and the Minister for Planning authorised the submission of a Concept Plan in accordance with Part 3A. This provides for matters such as the compatibility of the project with environmental constraints to be resolved up-front and simplifies subsequent approvals where environmental impacts can be avoided or minimised.

The reader should refer to Chapter 11 for more detail.

Under Part 3A, proponents can seek a '*concept approval*'. According to the Department of Planning Fact Sheet NSW Planning Reforms, May 2005, "Investors proposing a major development or new infrastructure project will be able to seek an up-front 'concept approval' for their project – before investing in detailed assessment on identified issues. They will no longer risk spending millions of dollars on multiple assessments on a proposal that may ultimately be refused."

If a proponent can adequately define the project and undertakes adequate assessment, a '*project approval*' can be sought allowing commencement of the works subject to conditions of approval.

As explained in Section 2.3.4, the Environmental Assessment was prepared in accordance with the Director General's requirements and was approved for public exhibition when it was submitted. Part 3A of the EP&A Act takes the approach of requiring the Environmental Assessment to focus on key issues, supplemented by commitments made by the proponent about further studies, management protocols and mitigation measures.

Project Approval is sought for the following components of the desalination project as outlined in the Environmental Assessment of the Concept Plan (as exhibited) and as described in Chapter 11 of this Preferred Project Report:

- Seawater intakes;
- Seawater concentrate discharge outlets;
- Tunnel(s) from the desalination plant to the intakes and outlets; and
- Development of a reverse osmosis desalination plant built in modules with a capacity of up to 500 ML/day on the Kurnell site.

Sydney Water will seek subsequent Project Approval/s, if it becomes necessary, for the remaining components of the desalination project, namely the desalinated water distribution routes and method of construction from the desalination plant.

It is necessary to define the preferred route(s) and undertake further studies, investigations and assessments before seeking Project Approval. This will be undertaken and reported on in a Desalinated Water Distribution Infrastructure Assessment, which will address the route(s) across Botany Bay and the route(s) for connection to the water supply system. The community would be provided with information regarding the selection process for the preferred route(s). Affected communities would be consulted as to the mitigation measures to be employed in their area. Given that Project Approval may not be required for a number of years, it is not being sought now as it is possible that factors such as new infrastructure, or future land use or changes to pipeline technology may impact on the selection of the preferred route(s). Project Approval for these components would be sought at a time that would allow construction to commence when storages are depleted to around 30 per cent.

2.3.10 Issue: Concern that the draft Statement of Commitments lack detail and certainty

A draft Statement of Commitments as part of the Environmental Assessment is an integral part of the Part 3A approach. The refinement following public exhibition of these commitments in the Preferred Project Report is also a key step in the approval process. The Preferred Project Report must include an updated Statement of Commitments, reflecting and clearly indicating where Sydney Water may have amended the Commitments in response to issues raised in submissions or as a consequence of the environmental assessment process. The Preferred Project Report has been prepared to address these requirements. The methodology for identifying and addressing issues was discussed and agreed to with the Department of Planning. The amended Statements of Commitment outline strategies that Sydney Water would implement, in the unlikely event that a desalination plant is constructed, to appropriately manage potential environmental impacts. Once the Department of Planning has considered the Preferred Project Report, the draft and amended Statement of Commitments and presented its assessment report to the Minister for Planning, the Minister issues Conditions of Approval that are legally binding.

The Minister's Conditions of Approval may include obligations on the proponent to verify commitments, including auditing of construction and operation to ensure compliance with the Minister's Approval.

2.3.11 Issue: Concern about identification of the Kurnell peninsula as a terrorism target

Some submissions considered that the presence of the desalination plant in close proximity to the Caltex Oil refinery and Sydney Airport would increase the locality's potential as a terrorism target.

The NSW Government has factored in terrorism threats into security plans for utilities. As a result, security has been heightened at all energy and water utility sites. Each utility has detailed emergency response plans to manage emergency situations involving their assets. The Department of Energy Utilities and Sustainability coordinates the activities of infrastructure owners in developing Critical Infrastructure Protection strategies.

For security reasons, specific arrangements are not divulged publicly, however as on all Sydney Water sites, measures would be implemented to minimise security issues. These may include:

- Installation of security measures, surveillance systems, security patrols and multiple alarms;
- Planning for a wide range of terrorism incidents; and
- Restricting access to authorised personnel.

With these systems in place there is no reason that the desalination plant would increase the threat of terrorism.

2.3.12 Issue: Concern that the Director General's requirements are not answered in the Environmental Assessment with respect to greenhouse offset options

General information on various greenhouse-offset packages was provided in the Environmental Assessment. The greenhouse reduction relates to the operational life of the plant so offset options and packages in the Environmental Assessment needed to be able to accommodate changing energy and greenhouse regulatory requirements over the life of the plant.

After the publication of the Environmental Assessment, Sydney Water established an interagency committee to develop a Greenhouse Reduction Plan.

The Government announced on 8 February 2006 that if a desalination plant were built, it would be powered using 100 per cent renewable energy, meaning it would have no net greenhouse impact.

Further detail on the greenhouse approach is provided in Chapter 7 of this report.

2.3.13 Issue: Concern about the accuracy of the Environmental Assessment given the short time period to finalise it after the release of the Director General's requirements

The final Director General's requirements were issued four days before the Environmental Assessment was completed. However, draft requirements were made available shortly after the Planning Focus Meeting held in August 2005. Sydney Water prepared the Environmental Assessment based on the draft requirements, which were consistent with the final version.

2.3.14 Issue: Concern that the Environmental Assessment contains insufficient detail on the 'standard measures' to be implemented to manage 'other issues'

The Environmental Assessment was prepared in accordance with the Department of Planning's guidelines under Part 3A of the EP&A Act. The Director General's requirements for the Environmental Assessment focus on key environmental issues and also include a general environmental risk analysis for all components of the project.

Tables 6.8, 7.9, and 8.2 of the Environmental Assessment contain the general environmental risk analysis, which identifies the main issues during construction and operation, mitigation measures and the level of residual risk once mitigation measures are implemented. These measures are reflected in the draft Statement of Commitments (refer to Chapter 17 of the Environmental Assessment). As indicated previously, detailed management measures would be developed to ensure that the principles of the amended Statements of Commitment are achieved.

2.3.15 Issue: Concern about the threatened species amendments to the EP&A Act

It was suggested in submissions that an 'Assessment of Significance' should have been included in the Environmental Assessment, rather than an 'Eight Part Test'. Prior to recent amendments to the *Threatened Species Conservation Act 1995* (TSC Act), an "eight-part test" was required under Section 5A of the EP&A Act to determine whether there were likely to be any significant impacts on threatened species (including populations and ecological communities) from projects assessed under Part 4 or Part 5 of the EP&A Act.

Amendments to the TSC Act that commenced in October 2005 replaced the eight-part test with an "assessment of significance".

There is no statutory requirement for an eight-part test or assessment of significance to be prepared for the desalination project (either under Part 3A or the Director General's requirements). However, in liaison with the Department of Planning, Sydney Water included eight-part tests in the Environmental Assessment to assess the significance of project impacts on threatened species.

Sydney Water subsequently prepared assessments of significance for threatened species potentially impacted by the desalination plant, intake, outlets and a pipeline across Botany Bay. These assessments of significance show there is unlikely to be a significant impact on threatened species, which is consistent with the outcome of the eight-part tests. Once the delivery infrastructure routes have been refined more detailed assessment of relevant threatened species would be undertaken.

2.3.16 Issue: Why was the project not referred to the Commonwealth Department of Environment and Heritage under the *Environment Protection and Biodiversity Conservation Act 1999*

As indicated in Section 3.3 of the Environmental Assessment, the project was referred to the Commonwealth Department of Environment and Heritage (DEH). On 8 November 2005, DEH advised that the project is unlikely to have significant impact on any matters of National Environmental Significance and is therefore not a controlled action. The Commonwealth Minister for Environment and Heritage's decision is presented in Section 4.3.14 of this report.

3. The Consultation Process

3.1 Overview of the consultation process

Since the desalination project planning began in January 2005, Sydney Water has engaged with a range of stakeholders during the feasibility assessment, options development and preparation of the Environmental Assessment including:

- Key State Government agencies;
- Energy retailers;
- Alternative energy providers;
- Desalination experts;
- Alternative desalination technology providers;
- Local Government;
- Environmental groups;
- Representatives of potentially affected community facilities;
- Potentially affected recreational groups;
- Potentially affected groups/individuals with commercial interests;
- Landowners of potential sites;
- Representatives of the Local Aboriginal Land Council;
- Sydney Water's Corporate Customer Council; and
- The general public.

3.2 Exhibition of the Environmental Assessment

The Department of Planning exhibited the Environmental Assessment, including Sydney Water's draft Statement of Commitments, from 24 November 2005 to 3 February 2006. During the exhibition period the public were able to review the document, attend public workshops and forward submissions to the Department of Planning to help in its assessment of the project.

During the exhibition period, Sydney Water communicated with specific stakeholders and the wider community. This supplemented the formal Department of Planning exhibition process.

The Environmental Assessment exhibition gave the community, Government agencies and stakeholder groups an opportunity to input ideas, raise issues and provide feedback. The project communications related activities are also described in detail below.

Consultation Material:

- Environmental Assessment;
- Draft Statement of Commitments;
- Summary of the Environmental Assessment (produced in 5 community languages);
- Community newsletters (3);
- 24 fact sheets; and
- Samples of desalinated water for taste testing.

Events/meetings:

- Information displays at 8 regional shopping centres;
- Static displays at 11 locations;
- 3 community workshops;
- Meetings with 22 stakeholder groups;
- Meetings with Government Agencies; and
- Presentations and displays at community events.

Other activities:

- Newspaper and radio advertisements;
- Sydney Water website;
- Freecall 1800 number and fax;
- Email facilities: *desalination@sydneywater.com.au*; and
- Correspondence (special inquiries).
- Community newsletters: Three newsletters updating the community about the project were sent directly to households potentially affected by the project. Community Update 1 was sent to approximately 750 households in the suburb of Kurnell, Community Update 2 was sent to around 70,000 households in the Sutherland Shire and surrounding suburbs and Community Update 3 was sent to approximately 180,000 households within the Marrickville, Rockdale and Sutherland local government areas.
- Fact sheets and summary brochures: A series of 24 fact sheets were prepared by Sydney Water to inform the community about specific aspects of the project. A 10-page plain English summary of the Environmental Assessment was published with summaries in Arabic, Chinese, Greek, Italian and Vietnamese. The fact sheets and summary brochures were made available via the Sydney Water website, 1800 phone line, at information displays and the community workshops.
- Information displays were held in shopping centres at Miranda, Eastgardens, Hurstville, Ashfield, Marrickville, Parramatta, Liverpool and Penrith. These locations were selected to provide ready access for those who may be directly impacted and to cater for members of the broader Sydney community interested in the project. The displays were held on weekends in December 2005 and January 2006 in major shopping centres to ensure exposure to the highest numbers of people. The displays explained the Environmental Assessment, provided feedback to Sydney Water about the project, distributed information in both paper form and CDs, and allowed people to taste desalinated water. Written comments from the public were analysed and a summary of issues raised was developed. This information was given to the Department of Planning and the Independent Panel appointed by the Minister for Planning.

- Static displays: The Department of Planning exhibited the Environmental Assessment for public information and comment at Councils in the areas potentially impacted by the plant or associated infrastructure (Sutherland Shire Council, Rockdale City Council, Kogarah Municipal Council, Canterbury City Council, Ashfield Municipal Council, Council of the City of Botany Bay, Marrickville Council, and Sydney City Council). The Environmental Assessment was also available at the Department of Planning, Sydney Water and the Nature Conservation Council.
- Community workshops were conducted in Cronulla, Marrickville and Rockdale in January 2006. The workshops gave the public further information and an opportunity to comment on the Environmental Assessment. Those who attended the workshops (approximately 350 people) were able to ask questions and discuss key issues with the project team. The issues raised were documented and provided to the Department of Planning and the Independent Panel. Members of the public were able to view issues raised at all workshops via a summary report on Sydney Water's website.
- Meetings with key stakeholders: Over 120 letters were sent to stakeholder groups, inviting them to meet with representatives of the desalination project team at a time and venue of their choosing. Over 20 groups availed themselves of this opportunity, which in some cases included site visits. At each meeting issues raised were recorded and provided back to the stakeholder groups for their confirmation. Some groups took the opportunity to reflect on the matters raised in the meeting and provided additional comments in their written responses. All responses were considered in preparing the Preferred Project Report. The following groups met with members of the project team during the Environmental Assessment exhibition:
  - Local Councils – Ashfield Council, Sydney City Council, Marrickville Council, Rockdale Council;
  - Government Agencies – Department of Primary Industries, Department of Environment and Conservation, Interagency Greenhouse Reduction Working Group;
  - Community / Environmental and Fishing Industry Groups –

    Cape Solander Whale Research Team

    Cooks River Foreshore Working Group

    Cronulla Dunes & Wetlands Protection Alliance

    Kurnell Progress & Precinct Association

    Kurnell Residents Against Cogeneration Establishment

    National Parks Association (Southern Sydney Branch)

    North Cronulla Precinct Association

    Ocean Haul Management Advisory Committee (OHMAC)

    Ocean Trap & Line Management Advisory Committee (OTLMAC)

    Ocean Watch

    Oyster Farmers Association of NSW (Georges River Branch)

    Sutherland Shire Environment Centre

    Sydney Metro Catchment Management Authority

    Taren Point Wetland Group

    Wolli Creek Preservation Society.
- Meetings with Government Agencies: Sydney Water met with the Department of Planning and other Government agencies including the Department of Environment and Conservation (DEC) and the Department of Primary Industries (DPI) to discuss and resolve technical issues.

An interagency group was formed to consider greenhouse gas reduction options and develop a Greenhouse Reduction Plan. Representatives were from the Cabinet Office (Metropolitan Water Directorate), the Cabinet Office (Greenhouse Office), DEC, Department of Energy Utilities and Sustainability, Treasury, Greenhouse Gas Abatement Scheme Administration (IPART) and Department of Planning.

- Correspondence (special inquiries): 'Special Inquiries' refer to correspondence received by the portfolio Minister's office and Sydney Water from the public and others. Sydney Water responded directly to this correspondence.
- Phone, fax, email and website facilities: The community could comment on and obtain further information about the Desalination Project by contacting Sydney Water on 1800 685 833, a freecall number, sending an e-mail to *desalination@sydneywater.com.au* or logging on to the Sydney Water website at *www.sydneywater.com.au*. Sydney Water regularly updated the website with a range of Fact Sheets as topics emerged from the Environmental Assessment process. The issues raised in phone calls and e-mails were recorded in a database. This information was provided to the Department of Planning and the Independent Panel.
- Advertisements: Newspaper advertisements were used to notify the community about the exhibition of the Environmental Assessment, the information displays and community workshops. Advertisements were placed in local and mainstream press in December 2005 and January 2006 as follows:

Publication	Dates advertised
Daily Telegraph	3, 10 December 2005
	7, 11, 14, 21, 28 January 2006
Sunday Telegraph	4, 11 December 2005
	8, 15, 22, 29 January 2006
Sydney Morning Herald	3, 10 December 2005
	7, 11, 14, 21, 28 January 2006
Sun Herald	4, 11 December 2005
	8, 15, 22, 29 January 2006
Cooks River Valley Times	8 December 2005
	12, 19, 26 January 2006
Inner Western Suburbs Courier	6 December 2005
	10, 17, 24 January 2006
Koori Mail	18 January 2006
Southern Courier	6 December 2005
	10, 17, 24 January 2006
St George and Sutherland Shire Leader	8 December 2005
	12, 19, 26 January 2006
The Glebe	8 December 2005
	12, 19, 26 January 2006
Wentworth Courier	7 December 2005
	11, 18, 25 January 2006

3.3 Summary of issues related to the consultation process

A number of submissions stated that the consultation process was inadequate. A significant proportion of these were pro-forma submissions made available by the Nature Conservation Council.

Some believed that the decision to proceed was a *fait accompli* and the government was not 'listening' to public opinion.

The timing of the consultation process over the December/January holiday period also concerned some respondents.

3.4 Response to issues regarding the consultation process

3.4.1 Issue: The consultation process

Concerns about the adequacy of the consultation process included the following: issues:

Some submissions expressed concern that although information was provided, actual consultation did not occur

Consultation did occur through the input received from the community through community forums, information displays, stakeholder meetings; from phone, fax and email contact was considered and led to revisions of the proposal as outlined in this report. Section 3.2 details the consultation undertaken by Sydney Water that supplemented the formal Department of Planning exhibition process.

Some submissions questioned the value of consultation, because the plant seemed to be a 'fait accompli'

The Environmental Assessment must be considered by the Minister for Planning, before any decision to proceed is made. No planning approval for the project has been given. When assessing whether or not to give planning approval and the terms and conditions of that approval, the Minister for Planning considers public submissions received during exhibition of the Environmental Assessment. Submissions can influence the nature of any such approval.

Some submissions were concerned that the only opportunity for consultation was in response to the Environmental Assessment and that there was not an opportunity to comment on the actual need for a desalination plant

Exhibition of the Environmental Assessment and the supplementary consultation activities conducted by Sydney Water were aimed at allowing the community to comment on the Environmental Assessment of the Concept Plan to build and operate a desalination plant and associated infrastructure.

The consultation did not seek to engage on whether a desalination plant should be constructed. This matter was dealt with in the NSW Government's Metropolitan Water Plan, released in August 2004, which identified desalination as one of a mix options that could be implemented as a drought contingency measure. The relative merit of the options identified in the Metropolitan Water Plan is outside of the scope of the Environmental Assessment.

Some submissions expressed concern about the timing of the consultation process as the exhibition period aligned with the peak summer holiday season

In accordance with Part 3A of the *Environmental Planning and Assessment Act 1979*, the Environmental Assessment was publicly exhibited by the Department of Planning at key locations outlined in Section 3.2 above. The exhibition period was extended well beyond the statutory 30 day minimum to ensure that people had the opportunity to comment over the holiday period.

Sydney Water also undertook a range of communication and stakeholder engagement activities which were additional to the requirements set by the Director General's Environmental Assessment Requirements for the project.

The Minister for Planning has established an Independent Panel to advise him directly. The Terms of Reference for the Panel are:

1. "To ensure that all issues raised by the community and stakeholders in submissions to the publicly exhibited Environmental Assessment Report prepared by Sydney Water are adequately addressed and responded to by Sydney Water.
2. To monitor other forms of community input (other than direct written submissions), issue compilation and assessment, so as to ensure all relevant matters are adequately addressed by the Department of Planning in its advice to the Minister.
3. To ensure that issues raised in community stakeholder submissions and Sydney Water responses thereto are adequately addressed and included in the Department of Planning assessment of the proposal and in the Department's advice to the Minister."

3.4.2 Issue: The original online submission form favoured a positive response

A form was prepared to assist the public to make submissions to the Environmental Assessment using the Sydney Water website. After receiving comment early in the consultation process that the method of filling in the form appeared to favour a positive response to the Environmental Assessment, the form was withdrawn from the website on 28 November 2005. Very few submissions were received using the form and all were negative about the proposal.

3.4.3 Issue: Interest in future consultation for the project

Some submissions questioned whether consultation would be conducted later in the process, particularly during the pre-construction period and other submissions asked about the consultation process following project implementation.

If storages reach around 30 per cent and it is determined that a desalination plant needs to be constructed, details of the routes for delivery infrastructure would be finalised. Impacted communities would be notified and provided detailed information on the nature and timing of the proposed works at that time. Key local stakeholders would be identified and meetings held with them, either individually or in groups, to identify issues and concerns and develop strategies to mitigate impacts. The product of these meetings will be consolidated in a Community Liaison Plan, which would identify strategies, activities, timeframes, accountabilities and reporting requirements.

Additionally, each household in a potentially impacted area would be individually contacted to ensure household specific issues are identified, local level actions to minimise impacts are agreed upon and appropriate activities are incorporated into the Community Liaison Plan.

Some of the issues that are likely to be addressed in the Community Liaison Plan include access, local amenity, safety and traffic management.

Sydney Water is committed to effective communication as required in amended

Statements of Commitment 67 and 68 to ensure:

- The community and stakeholders have a high level of awareness of all processes and activities associated with the project;
- Provision of accurate and accessible information; and
- A high level of responsiveness to issues and concerns raised by the community.

3.4.4 Issue: The timeliness of responses to issues raised

Some submissions expressed concern about not having received an answer to an issue raised in the consultation period

This Preferred Project Report is Sydney Water's formal response to the issues raised throughout the exhibition period. Sydney Water provided information in response to issues raised throughout the consultation period via the consultation activities outlined earlier. Those people who provided their submissions early in the consultation period have had an extended period to wait for the Preferred Project Report to be completed and may therefore have assumed that their views were not being considered. This is not the case. The Minister for Planning has established an Independent Panel to advise him directly on this issue, (see Section 3.4.1 for the Terms of Reference).

3.4.5 Issue: The cost of the consultation process

The consultation process cost approximately $760,000, which is less than one per cent of the cost of the project to date. These costs included:

- Sydney Water internal labour, including overtime costs for weekend shopping centre displays;
- GHD-Fichtner support costs;
- Radio and print advertising;
- Shopping centre rental costs; and
- Workshop costs including facilitation.

During the exhibition period, Sydney Water sought to ensure that potentially impacted rate payers and the broader Sydney community had reasonable opportunity to access up to date information about the project, speak directly to members of the desalination project team and receive assistance to make formal submissions through avenues such as public information sessions, a regularly updated website, community forums and a freecall 1800 phone service.

4. Construction of the Plant at Kurnell

4.1 Summary of the Environmental Assessment

Since exhibition of the Environmental Assessment, the 2006 Metropolitan Water Plan has identified that the capacity to act quickly means that construction of a desalination plant can be deferred until absolutely necessary, and deliver significant savings relative to proceeding early. The plant is a drought contingency measure and part of a multifaceted plan to secure Sydney's water supplies. Construction would commence should an extreme drought emerge and water storages reach around 30 per cent.

The desalination plant is proposed near the corner of Sir Joseph Banks Drive and Captain Cook Drive in Kurnell. The site has existing development consent for industrial use and is distant from Captain Cook's Landing and other heritage locations (refer to Figure 4.1).

The site is zoned for industrial use and was largely cleared of vegetation by the previous owners. Remaining vegetation within an onsite conservation area is known to contain endangered ecological communities and will be retained and maintained as part of the project, consistent with previous development consents for this site by Sutherland Shire Council.

The total site area acquired by Sydney Water is approximately 44.5 hectares. This includes the retained conservation area of 15 hectares, which is approximately shown on Figure 4.2.

A 500 ML/day desalination plant would occupy approximately 30 hectares, of which approximately 20 hectares would be covered in impervious surfaces such as buildings, roads and hardstand areas.

Industrial landuses near the site include Caltex oil refineries and Continental Carbon. The closest communities to the north and northwest are people living in the village of Kurnell (approximately 750 metres) and Kurnell Primary School (approximately 1 kilometre), and to the south, Cronulla High School (approximately 4 kilometres) and residences in Cronulla (approximately 4.5 kilometres).

Electricity infrastructure already serves the area and Energy Australia has confirmed that the demand of a 500 ML/day desalination plant (110 MW) can be met from the grid.

Figure 4.1 Desalination site location map

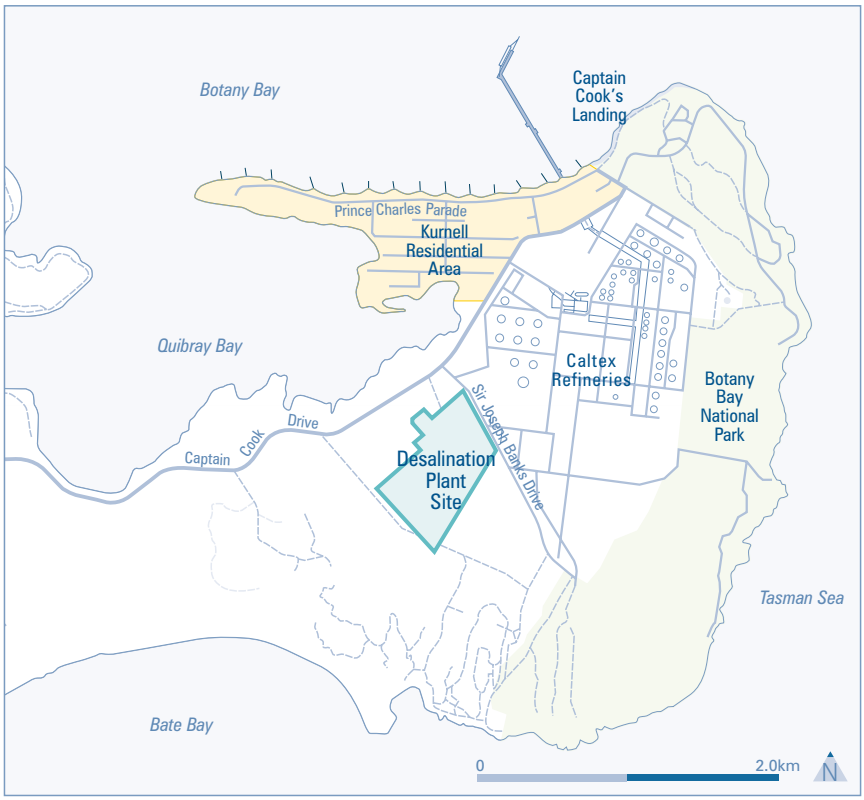


Figure 4.2 Desalination plant site

Source: Photo taken from a helicopter - July 2005

4.2 Summary of issues related to the construction of the plant at Kurnell

Issues relating to site selection and the construction of the plant were raised in submissions.

Concern was expressed about noise, traffic and access impacts during construction of the plant. Spoil management was also of concern to respondents.

The impact of construction activity on terrestrial ecology was of concern, particularly with regard to impacts on the Grey-headed Flying Fox, the Green & Golden Bell Frog and the Wallum Froglet. Concern that the conservation area at the site would be maintained and preserved was also raised.

Concern was raised about groundwater and surface water management, particularly with regard to the run-off from the site and the impact this may have on the Towra Point Nature Reserve which is a Ramsar listed wetland, and Towra Point Aquatic Reserve.

The Department of Environment and Conservation (DEC) considers that an opportunity exists for the proposal to include a corridor connecting the conservation area with the Botany Bay National Park to enhance habitat protection and increase the long-term viability of threatened species on the site.

Construction impacts on items of indigenous and non-indigenous heritage were raised in submissions. Concern was also expressed about an apparent lack of contingency plans should sites of indigenous and non-indigenous heritage be uncovered during construction. The extent of consultation with indigenous organisations was also questioned.

4.3 Response to issues related to the construction of the plant

4.3.1 Issue: Concern about siting the desalination plant at Kurnell. It was claimed that the decision to locate the desalination plant at Kurnell is flawed

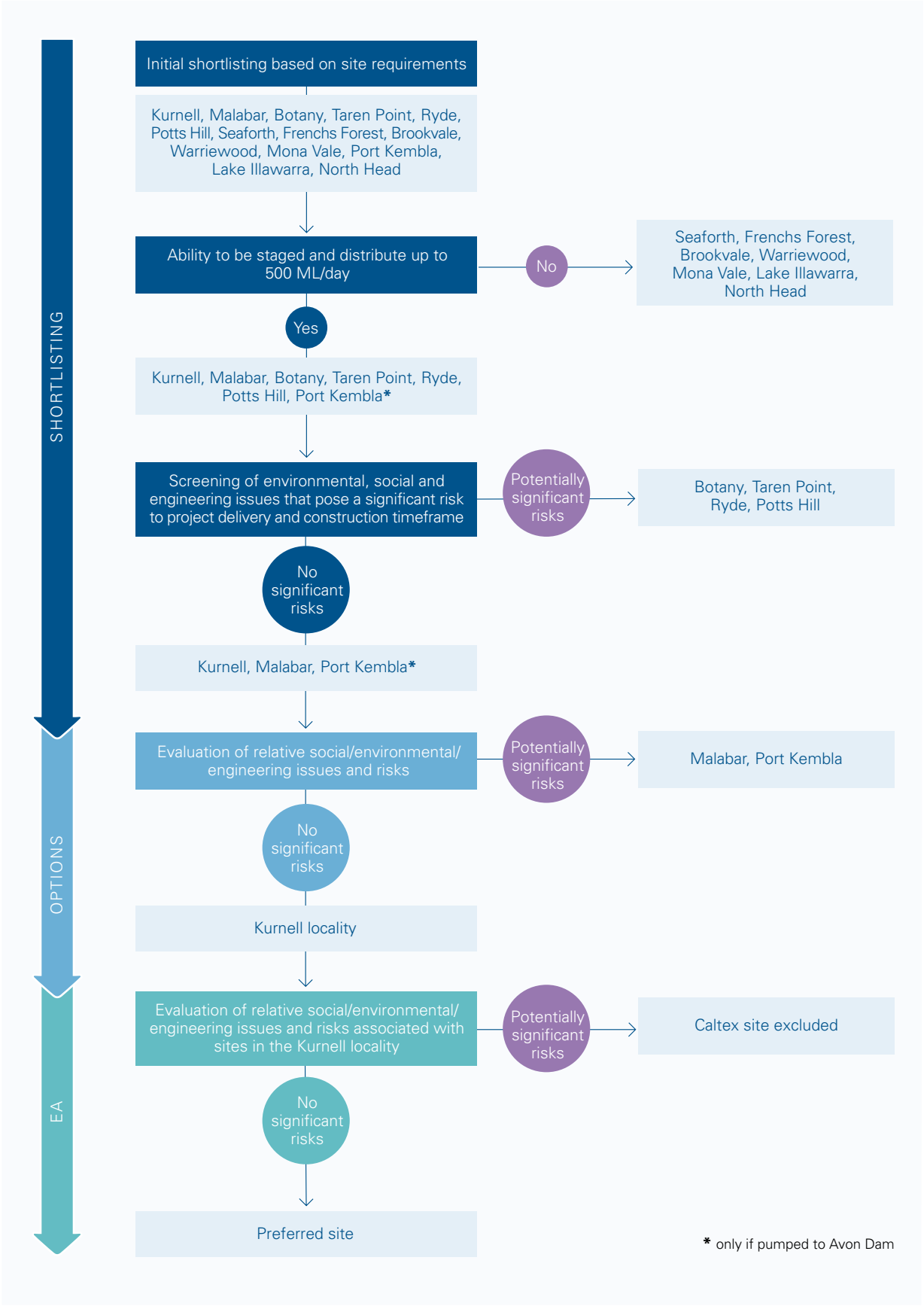
The decision to site the desalination project at Kurnell was the result of a detailed planning exercise that was undertaken in three distinct phases:

1. To shortlist possible sites based on broad project specific criteria. A total of 14 sites were identified and subsequently reduced to a shortlist of three;
2. A preliminary environmental impact assessment on the three sites to emerge from the first stage led to selection of a preferred locality; and
3. Undertake an Environmental Assessment to refine the selection of the site within the chosen locality.

Chapter 4 of the Environmental Assessment identified the fourteen shortlisted sites and the selection process. The following flowchart illustrates the process that was undertaken to select Kurnell.

Shortlisting of sites

The selection methodology considered a range of environmental, social, engineering, timing and commercial factors.


SHORTLISTING
OPTIONS
EA
Initial shortlisting based on site requirements
Kurnell, Malabar, Botany, Taren Point, Ryde, Potts Hill, Seaforth, Frenchs Forest, Brookvale, Warriewood, Mona Vale, Port Kembla, Lake Illawarra, North Head
Ability to be staged and distribute up to 500 ML/day
No
Seaforth, Frenchs Forest, Brookvale, Warriewood, Mona Vale, Lake Illawarra, North Head
Yes
Kurnell, Malabar, Botany, Taren Point, Ryde, Potts Hill, Port Kembla*
Screening of environmental, social and engineering issues that pose a significant risk to project delivery and construction timeframe
Potentially significant risks
Botany, Taren Point, Ryde, Potts Hill
No significant risks
Kurnell, Malabar, Port Kembla*
Evaluation of relative social/environmental/ engineering issues and risks
Potentially significant risks
Malabar, Port Kembla
No significant risks
Kurnell locality
Evaluation of relative social/environmental/ engineering issues and risks associated with sites in the Kurnell locality
Potentially significant risks
Caltex site excluded
No significant risks
Preferred site
* only if pumped to Avon Dam

The preliminary identification of potential sites considered parcels of land with an area greater than 5 hectares and less than 30 hectares. Land use types specifically excluded from the search of potential sites for the proposed plant included residential zoned land and commercial zoned land.

The primary criteria for short-listing sites for more detailed consideration were that they should be located:

- Close to the coast for consistently good quality source water and for the discharge of seawater concentrate. Intakes and outfalls in bays or estuaries were eliminated during the initial screening process due to poor and variable water quality;
- Close to available power; and
- Close to existing large water distribution mains.

The first phase identified potential sites in the following locations:

- North Head;
- Seaforth;
- Brookvale;
- Frenchs Forest;
- Warriewood;
- Mona Vale;
- Ryde;
- Potts Hill;
- Taren Point;
- Lake Illawarra;
- Botany;
- Malabar;
- Port Kembla; and
- Kurnell.

The second phase considered the suitability of the locations based on:

- The ability of the site to accommodate a plant that is able to be scaled up to 500 ML/day;
- Accessibility of a distribution network with a population that has a demand for water in excess of 500 ML/day; and
- A range of environmental, engineering or social issues that have the potential to pose a significant risk to delivery of the project within the required timeframe.

Sites in the northern suburbs, such as North Head, Seaforth, Brookvale, Frenchs Forest, Warriewood and Mona Vale were ruled out, due to the lack of suitable zoned land as well as the fact that up to 500 ML/day of water produced by the plant could not cost effectively be delivered in to the water distribution system.

Other sites such as Ryde, Potts Hill, Taren Point, Botany and Lake Illawarra were ruled out due to the requirement for long intakes and outlet tunnels needed to source and discharge the seawater. Botany was also ruled out because of uncertainties associated with tunnels and pipes near the contaminated groundwater plume.

Ultimately Kurnell, Malabar and Port Kembla were selected as three possible locations for the desalination plant.

Options assessment

The three locations, (Kurnell, Malabar and Port Kembla), were assessed in terms of their suitability for construction of a drought response plant. This involved a range of engineering and environmental investigations to assess the relative advantages and disadvantages of the three locations. The key outcomes of this assessment were that:

- A plant up to 500 ML/day could be constructed at Malabar. However, it presented higher risks of guaranteeing delivery to meet the water supply timeframe as a drought response plant. The extent and nature of any contamination at the Malabar site is unknown, as the site has been used for uncontrolled filling. The complexities of managing land use issues, potential contamination and ease of construction issues would have cost implications and could result in significant delays at the Malabar location. The site is close to residential areas which increases the sensitivity of the locality to the potential operational impacts such as noise and traffic;
- A plant at Port Kembla or elsewhere in Illawarra was ruled out, as the daily water demand was insufficient for a staged plant up to 500 ML/day. However, outside the context of a drought, Port Kembla is suitable for a small baseload plant of 50 ML/day. The cost of pumping the water from Illawarra to Lake Avon to supplement Sydney's supply was considered but ruled out due to the high pumping costs and energy use to pump water over the escarpment; and
- As a drought response measure, Kurnell is the preferred location for constructing a plant up to 500 ML/day.

Kurnell was selected as the preferred location for Sydney's desalination plant due to the following factors:

- The availability of land at Kurnell, which is of sufficient size for scaling up to a large plant means less risk to the timing;
- The cost of constructing the plant at Kurnell is on a par with the other short-listed sites;
- Ease of constructing the plant at Kurnell also means less risk to the timing;
- The Kurnell site is already zoned for industrial purposes;
- The industrial activity in and around Kurnell means the plant is more in keeping with other industrial activities in the same vicinity; and
- The Kurnell site is away from homes and schools.

4.3.2 Issue: Concern about another heavy industry at Kurnell

The Kurnell peninsula currently accommodates a number of "heavy industries" including the Caltex Oil Refinery, Continental Carbon, Boral Brickworks, sandmining and landfilling. Submissions indicated concern that the presence of these industries currently impact on the environment due to factors such as noise, odours, and traffic that affect the amenity of the area. There is a concern that the presence of a desalination plant would add another "heavy industry" that would also impact on the amenity of the area and give rise to cumulative environmental impacts.

During the operational phase, the desalination plant would not result in any impacts that would significantly impact on the amenity of the area. As detailed in Section 7.3.13 and 7.3.14, it is predicted that the respective operational and traffic noise levels will comply with relevant criteria. Section 7.3.16 indicates that if the plant were to be constructed it would be designed so as not to emit odorous emissions. The desalination plant would therefore have substantially different operational impacts relative to the "heavy industries" that currently operate on the peninsula.

During the construction phase there are impacts associated with noise, dust and traffic. These impacts would be minimised and limited to the short term and are discussed in Sections 4.3.6 (dust), 4.3.7 (construction noise), and 4.3.8 (traffic noise).

The proposed desalination plant site has already been significantly modified by previous activities and has recently been approved by Sutherland Shire Council for industrial subdivision. It is therefore considered an appropriate location for a desalination plant based on landuse considerations.

4.3.3 Issue: Concern that other sites such as the White Bay Power Station provide better options for siting the plant

Some submissions indicated that there are alternative locations for a desalination plant that are preferable to Kurnell. These include White Bay Power Station, Malabar and the Shoalhaven area

The White Bay Power Station site does not meet these criteria in that it would require intakes and outlets to be located in an estuary. It would not be economically feasible to construct intake and outlet tunnels from this site to the coast. The submission advocating White Bay Power Station as the site for the desalination plant was based on the opinion that a thermal process is preferable to reverse osmosis. As detailed in Section 6.2 of the Environmental Assessment, thermal processes were not selected due to high energy use and greenhouse gas emissions relative to reverse osmosis.

A site at Malabar was considered throughout the feasibility stage of the project but was ultimately rejected due to the proximity to residences, the zoning (open space) and construction issues associated with contamination and filling from previous activities and the resulting impact on construction time.

Sites in Shoalhaven were considered but were eliminated due to the cost of pumping treated water to where it could supplement Sydney's water supply.

4.3.4 Issue: Concern regarding impacts on the community

Potential impacts of disruption on the Kurnell community during the construction period have not been assessed

Construction could give rise to a range of local impacts on the Kurnell community. These impacts depend on the precise construction methodology for the plant and delivery infrastructure and they would be restricted to the construction phase.

The Environmental Assessment identifies potential impacts that could disrupt the community including:

- Noise from the site - refer Section 4.3.7;
- Traffic noise - refer Section 4.3.8;
- Traffic impact - refer Chapter 6; and
- Dust - refer Section 4.3.6.

Social impacts would be managed to minimise disruption to the community. Groups such as schools, childcare and recreational groups will be consulted during the design phase to ensure a clear understanding of concerns is gained. One method of consultation may be to establish a local community working group. Amended Statement of Commitment 67 requires a high level of responsiveness to issues and concerns raised by the community.

Specific issues that would require management include the potentially disruptive impacts of noise on community facilities such as schools and childcare centres. The impacts of increased construction traffic on safety and amenity will also require close management.

The draft Statement of Commitments presented in Chapter 13 of the Environmental Assessment identifies a range of measures that would be implemented to ensure that these impacts are minimised and do not have a significant impact on the environment. Amended Statements of Commitment 28-37 address this issue.

Protocols must exist to notify stakeholders of relevant activities and any incidents should they occur

Local communities would be notified of construction activities that have the potential to affect residents and businesses. This is reflected in amended Statement of Commitment 68. Sydney Water is required to operate a complaints and incident management system including notification of customers in case of incidents. Protocols exist in Sydney Water regarding the notification of customers impacted by activities and incidents. These protocols are reflected in formal arrangements with contractors. Such arrangements would exist with contractors delivering the desalination project.

The protocols, tailored to the specific circumstances and needs of each project, or project component, identify all stakeholders, contact details for the stakeholders, the nature of the issue(s) that the stakeholder needs and wishes to be advised on, the method of notification, the timing of notification and the frequency of notification. The protocols also specify incident management procedures and the requirements for the management and recording of complaints.

4.3.5 Issue: Concern that the Kurnell peninsula is the aerial gateway to Sydney and the desalination plant will create another blight on the landscape

The site is located within an industrial area and surrounding industrial development includes built industrial structures. Amended Statement of Commitment 51 indicates the desalination plant would be in keeping with these structures. The Environmental Assessment presented several images of a desalination plant without significant architectural enhancement (refer to Figures E2 and E3 in the Environmental Assessment). To minimise visual impact amended Statement of Commitment 50 requires that a program would be developed to minimise construction time and to progressively rehabilitate disturbed areas.

Amended Statement of Commitment 51 states that designs for the desalination plant would be consistent with the visual landscape from local and regional vantage points including views from the air. This would involve the use of colour, landscaping and retaining the conservation area to allow screening. This design is to;

- Support Sydney Water's commitment to restore and where possible enhance the site to meld into and support the natural communities of the surrounding peninsula;
- Acknowledge that the environmental condition of the areas surrounding the desalination plant site suggest that the plant should not be viewed in isolation, but should be viewed as part of a corridor connecting the bay to the beach. The beach to bay connection allows an appreciation of a range of environmental conditions within the peninsula; and
- The design of the facility shall respond to the natural environment by integrating with the landscape and hence informing the design of the buildings beyond the base technical requirements.

4.3.6 Issue: Concern that construction activities will generate dust that may impact on air quality

Construction activities that modify the surface of the land, such as excavation, have the potential to generate dust that may impact on air quality. These impacts are common to large construction projects and there are well developed mitigation measures to minimise impacts. Amended Statement of Commitment 36 requires that construction activities be undertaken in a manner that minimises dust generation. Measures commonly implemented to minimise dust generated by construction activities that may be considered include:

- Minimise exposed surfaces;
- Rehabilitate disturbed areas;
- Trafficable and vehicle manoeuvring areas would be moistened to minimise dust;
- Limit high dust-generating activities during adverse wind conditions, i.e. winds blowing directly towards the nearest sensitive receptors;
- Dust screening between construction activities and residences;
- Minimise the drop heights between front end loader buckets and trucks carrying excavated materials; and
- Water exposed surfaces.

4.3.7 Issue: Concern that construction activities would impact on the acoustic environment and amenity of the surrounding area

Construction of the plant would generate noise associated with, but not limited to:

- Deliveries of plant and materials;
- Staff movements; and
- General construction activities including excavation of shafts and erection of buildings and related infrastructure.

There is the potential for these activities to temporarily impact on the local acoustic environment. It should be noted that this environment is dominated by noise from the Caltex Oil Refinery and Kingsford Smith Airport. A construction noise assessment will be prepared and project specific noise goals would be calculated before construction commences. This would include measures to minimise noise impacts, as required in amended Statement of Commitment 31 which requires a Construction Noise Management Plan be prepared.

4.3.8 Issue: Concern regarding traffic noise

What impact would construction traffic have on the local noise environment?

Construction vehicles travelling to and from the site would impact on the local noise environment. These vehicles will deliver plant and materials, dispose of spoil, and convey staff to and from the site.

The main component of the local transport network is Captain Cook Drive that links Kurnell to the remainder of the Sutherland Shire and conveys heavy vehicles associated with industrial activities on the Kurnell peninsula.

The amount of traffic noise generated by construction vehicles accessing the site is highly dependent on factors such as the size of the plant and construction methodology selected. This impact would be temporary and limited to the construction period for the desalination plant. Refer amended Statement of Commitment 31 which requires a Construction Noise Management Plan be prepared.

4.3.9 Issue: Concern regarding potential impacts on terrestrial ecology

Threatened species and endangered ecological communities are present on the site and may be impacted

Section 6.3 and Appendix A4 of the Environmental Assessment assess the potential impact of the project on threatened species and endangered ecological communities on the site. The Environmental Assessment draws upon available previous survey data for the site. The conservation area is to be retained and managed to protect endangered ecological communities and threatened species.

The desalination plant site has been substantially modified by previous activities and the Environmental Assessment concludes that there are unlikely to be any significant impacts on threatened species and endangered ecological communities.

Other more specific concerns are discussed below.

In order to minimise impacts on the Grey-headed Flying Fox colony, it is necessary to know the proximity of the proposed works to the colony and what the anticipated noise levels would be, both with and without mitigation measures

It is acknowledged that the proximity and associated noise during construction has the potential to impact on the Grey-headed Flying Fox. To this end, Sydney Water would adopt appropriate management practices throughout all stages of the project. This is as required in amended Statement of Commitment No. 4. An assessment of construction noise is also required under amended Statement of Commitment 31.

Clearing vegetation along the western boundary of the site that connects the conservation area to other areas of habitat for the Grey-headed Flying Fox should be avoided

Only vegetation affected by security fencing is proposed to be cleared along the western boundary of the site and would be minimised in accordance with amended Statement of Commitment 3.

Previous consents for the site provided buffer areas between the conservation areas and the building lines. There is no assurance that these would be maintained

Amended Statements of Commitment 3 and 6 identify the intention to retain and maintain the conservation area, ensuring that construction and operation activities are managed to protect endangered ecological communities and habitat for threatened species.

Configure the components of the plant to ensure that biodiversity loss is avoided. Where biodiversity loss is inevitable it must be minimised and biodiversity offset options developed

The plant will be constructed on land which has been previously cleared thereby eliminating any risk of further biodiversity loss. It should be noted that biodiversity will be maintained in the existing conservation area, that the plant will not encroach on this area, and that management measures would be implemented to minimise impacts on biodiversity. This is reflected in amended Statements of Commitment 3 and 4.

Assess the habitat connection between the conservation area and areas of vegetation to the east of the site and the Botany Bay National Park to enhance the long term viability of the communities present in the conservation area

An assessment would be undertaken to determine whether a habitat connection can be retained in the southern portion of the site. It should be noted that this vegetation is currently highly degraded and contains noxious weeds such as Bitou Bush. This assessment would be undertaken as part of the detailed design of the desalination plant as required in amended Statement of Commitment 3.

Minimise impacts on the Grey-headed Flying Fox Colony

Potential impacts on the Grey-headed Flying Fox were assessed in the Environmental Assessment and amended Statements of Commitment 4 and 6 seek to minimise impacts to the colony particularly from noise and light.

Habitat for the Green and Golden Bell Frog, Wallum Froglet and Large-footed Myotis should be protected

As indicated in Section 6.3.2 of the Environmental Assessment, the conservation area is the only portion of the site that provides potential habitat for the Golden Bell Frog, Wallum Froglet and Large-footed Myotis. As works within the conservation area will be limited to maintaining and improving the habitat through weed management, habitat for these species would be protected. Management measures to protect threatened species are detailed in amended Statement of Commitment 6.

Protect all areas of Nature Reserve, National Park and Aquatic Reserves in the vicinity of the proposal

The project has been planned to avoid impacts to Nature Reserves, National Parks and Aquatic Reserves in the vicinity of the proposal. Amended Statements of Commitment 3, 4 and 26 address this issue.

4.3.10 Issue: Concern that construction activities would disturb the land surface and erosion may lead to stormwater from the site impacting on water quality in sensitive downstream environments such as Quibray Bay and the Towra Point Ramsar wetland

Reference should be made to Section 6.3.4 of the Environmental Assessment for a discussion of the measures that would be implemented to ensure that impacts associated with stormwater are minimised. Amended Statement of Commitment 5 requires a Construction Stormwater Management Plan to be prepared and include measures to avoid sediment laden stormwater runoff from construction activities at the site entering Quibray Bay and a program of monitoring stormwater quality exiting the site.

4.3.11 Issue: Concern regarding site contamination

Sydney Water obtained a site audit statement for Lot 102 prior to purchase of the property. This concludes that the site is suitable for industrial use.

Sydney Water carried out contaminated site assessments on Lot 101 prior to acquisition. These indicate that the site is suitable for industrial use.

As required by amended Statements of Commitment 27 and 41, a Contaminated Soil and Acid Sulphate Soil Management Plan would be prepared. This would include field investigations to confirm the presence of soil contamination and to classify spoil for disposal in accordance with *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Waste* (EPA, 1999).

4.3.12 Issue: The preferred option for spoil management has not been clearly defined

Chapter 9 of the Environmental Assessment outlines options that are available to manage spoil generated by the project. The preferred option would be selected following completion of the detailed design and is not able to be clearly defined at this stage as it depends on the construction methodology selected and availability of sites for reuse or disposal at the time of construction. As indicated in amended Statement of Commitment 27, a strategy will be developed to reuse all suitable spoil to reduce the volumes disposed of to landfill and to manage contaminated spoil in accordance with guidelines.

4.3.13 Issue: Concern regarding impacts on the indigenous heritage of the Kurnell peninsula

The assessment concentrates solely on the desalination plant site with no assessment of impacts of pipes to or from the site

Chapter 6 of this Preferred Project report discusses indigenous heritage considerations for the delivery infrastructure. Project Approval for a pipeline route from the plant to Silver Beach will be sought at a later date and will be based on a specific route chosen to minimise impacts.

Which Aboriginal groups were consulted during preparation of the Environmental Assessment?

Representatives of the La Perouse Local Aboriginal Land Council were consulted during preparation of the indigenous heritage assessment for the Environmental Assessment. The site lies within the boundaries of the La Perouse Local Aboriginal Land Council.

The desalination plant is offensive to the indigenous interests of the Sutherland Shire, Sydney and Australia

The potential impacts on sites of indigenous and heritage significance were considered in Chapter 6 of the Environmental Assessment. Amended Statements of Commitment 9 and 10 indicate that the plant design and layout will retain the conservation area to avoid potential impact on indigenous archaeological values.

In addition, all contractors working on the project would be required to complete an induction. This would include a briefing on the identification of objects that may be of significance to the indigenous community and notification procedures to be followed if an object of potential significance is encountered during construction.

Amended Statement of Commitment 46 establishes that a heritage assessment will be undertaken for infrastructure routes and temporary construction sites.

4.3.14 Issue: Concern regarding impacts on the non-indigenous heritage significance of the Kurnell peninsula

The assessment concentrates solely on the desalination plant site with no assessment of impacts of pipes to or from the site

The reader should refer to Section 6.3.7 of this Preferred Project Report for a response concerning delivery infrastructure.

The desalination plant is offensive to the heritage interests of the Sutherland Shire, Sydney and Australia

As indicated in Section 2.3.16 of the Environmental Assessment, the project was referred to the Commonwealth Department of Environment and Heritage under the EPBC Act. The referral addressed the potential for the project to impact on matters protected under the EPBC Act, including items on the National Heritage List, such as the portion of the Botany Bay National Park on the Kurnell peninsula. The Commonwealth Minister for Environment and Heritage assessed the referral and advised that the project was unlikely to have a significant impact on any matters protected under the EPBC Act. Amended Statement of Commitment 45 indicates that measures will be developed to protect the national heritage values of Botany Bay National Park.

Indigenous and non-indigenous heritage studies were completed as part of the Environmental Assessment. The results of these investigations indicate that the project will not have a significant impact on any items of local, state or national heritage significance. Amended Statement of Commitment 46 establishes that a heritage assessment will be undertaken for infrastructure routes and temporary construction sites.

The Commonwealth Minister's response to the referral is presented below. As indicated in Section 10.3 of the Environmental Assessment, on 8 November 2005, the Minister for Environment and Heritage advised that the project is unlikely to have a significant impact on any matters protected under the EPBC Act and is therefore not a controlled action.

COMMONWEALTH OF AUSTRALIA

ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999
DECISION THAT ACTION IS NOT A CONTROLLED ACTION

I, IAN GORDON CAMPBELL, Minister for the Environment and Heritage, decide that the proposed action, set out in the Schedule, is not a controlled action.

SCHEDULE

The proposed action to construct and operate a seawater reverse osmosis desalination plant at Kurnell, NSW, to supply up to 500 megalitres per day of treated water, and associated infrastructure to supply drinking water to Sydney (Sydney Desalination Plant), and as described in the referral received from the Sydney Water Corporation under the Act on 26 September 2005 (EPBC 2005/2331).

Dated this 8TH day of November, 2005.

MINISTER FOR THE ENVIRONMENT AND HERITAGE

4.3.15 Issue: Concern regarding the potential for stormwater from the site to impact on water quality in downstream environments

Potential impact on oyster leases in Quibray Bay due to stormwater runoff discharged from the site

The potential for stormwater discharges to impact on water quality in Quibray Bay was considered in the preparation of the Environmental Assessment. Amended Statement of Commitment 5 requires a Construction Stormwater Management Plan to be prepared to ensure that stormwater is managed in accordance with Managing Urban Stormwater: Soils and Construction (Landcom, 2004). Implementation of these mitigative measures during construction would minimise potential impacts on water quality in Quibray Bay and ensure that oyster leases are not impacted by stormwater runoff from the site. Stormwater exiting the site would be monitored and work practices will be developed for implementation during construction to manage surface water and stormwater from disturbed areas, including use of appropriately sized stormwater controls.

4.3.16 Issue: Concern regarding changes to the groundwater regime

There is the potential for groundwater flows to be altered and for this to impact on downstream environments, in particular wetlands

Concern was raised that there was not sufficient area to accommodate infiltration on site

Amended Statement of Commitment 8 relates to managing potential impacts on groundwater at the desalination plant site. This commitment has been designed to minimise the potential for changes in groundwater flows to impact on downstream environments and requires a Stormwater and Groundwater Management Plan for the developed site be prepared.

Amended Statement of Commitment 3 requires sufficient areas to be maintained for stormwater control and groundwater recharge. Quantification of these areas would generally follow the recommended practices contained in Landcom, Managing Urban Stormwater (2004), Soils and Construction and other relevant guidelines.

4.3.17 Issue: Concern regarding impacts on the local transport network

What impact would construction of the plant have on traffic volumes?

Vehicle movements generated during construction of the plant will depend on the size of the plant, construction methodology selected and machinery, material and staffing requirements. These factors would not be defined until the detailed design is undertaken. The potential impact of vehicle movements during the construction phase would be minimised as part of the detailed design process. This would involve development of work practices to minimise potential impacts on the road network, (refer amended Statement of Commitment 34). These impacts will be temporary as they will be restricted to the construction phase.

What impact would there be on road safety from construction of the plant?

Road safety risks associated with construction of the plant would primarily be related to increased traffic movements. Amended Statement of Commitment 34 requires a Construction Traffic Management Plan be prepared to minimise the impact of construction activities on the surrounding road network and ensure road safety is not compromised. These impacts would be temporary as they would be restricted to the construction phase. Work practices would specifically address the need for restrictions on routes and times travelled by heavy vehicles.

The construction of the desalination plant would see short-term traffic impacts on the local road network. The main impact would arise from vehicular movements to and from the site. As Captain Cook Drive is the only road leading to the plant site, the impacts would be concentrated at the intersection of Captain Cook Drive and Sir Joseph Banks Drive and at the site entry point on Sir Joseph Banks drive. The design of the intersection to the site would be key in reducing impacts. Following confirmation of the construction methodology, detailed assessments of the intersection would be carried out to inform the design to ensure this intersection continues to function effectively. This may include consideration of traffic control devices such as dedicated right turn lanes, traffic lights, slip lanes, roundabouts and seagull intersections.

Maintaining access for emergency vehicles, private vehicles and public transport to Kurnell along Captain Cook Drive is essential. The local bicycle and pedestrian route also provides important access in addition to a significant recreation facility and should be maintained throughout construction where practical

The main works that would affect Captain Cook Drive would be pipeline works to Silver Beach from the desalination plant site. Sydney Water is committed to consulting with local communities potentially impacted by preferred tunnel/ pipeline routes and the location of associated tunnel shafts to mitigate local issues of access, amenity, safety and traffic management as required in amended Statements of Commitment 34 and 35. All efforts would be made to ensure that severance of routes does not occur.

4.3.18 Issue: Site and its regional context

Department of Environment and Conservation raised the issue of the potential that exists to enhance the Kurnell Peninsula in conjunction with the development of the desalination plant. Sutherland Shire Council also noted the opportunity for the plant site to provide positive regional outcomes through design, visual amenity and the vegetation programs associated with the project.

Sydney Water is committed to appropriate design and landscaping of the desalination plant and the site at Kurnell to protect and enhance ecological and social values.

Designs of the desalination plant would be developed that are consistent with the visual landscape from local and regional vantage points including the use of colour, landscaping and retaining the conservation area to provide screening (refer amended Statement of Commitment 51).

Reference should also be made to Section 4.3.5 for a discussion of the visual impact of the desalination plant and the measures that would be implemented to integrate it into the surrounding landscape.

The current Environmental Planning Instrument (EPI) that applies to the Kurnell Peninsula is State Regional Environment Plan 17 - Kurnell Peninsula (SREP 17). This EPI forms the basis for statutory planning guidance within the Peninsula. Part 1, Section 2 of SREP 17 outlines the following aims and objectives of the plan:

(1) The general aims and objectives of this plan are:

(a) to conserve the natural environment of the Kurnell Peninsula and ensure that development is managed having regard to the environmental, cultural and economic significance of the area to the nation, State, region and locality,

(b) to apply environmental performance criteria which will ensure that the environment is not adversely affected by development,

(c) to promote, encourage and facilitate opportunities for commercial, industrial and tourist development consistent with the conservation of the unique ecological and landscape attributes of the Kurnell Peninsula,

(d) to ensure that development is co-ordinated to allow the economic and efficient provision of public services and amenities having regard to the environment,

(e) to promote the sharing of responsibility for environmental planning on the Kurnell Peninsula between the Council, the Department of Planning, the National Parks and Wildlife Service, the Department of Agriculture, the Water Board and the Department of Water Resources, and

(f) to protect, enhance and utilise the tourism, leisure and recreation potential of the Kurnell Peninsula so far as it is consistent with the conservation of its ecological and heritage value.

(2) The particular environmental planning aims and objectives of this plan are:

(a) to preserve and protect the wetland areas of the Kurnell Peninsula in the environmental and economic interest of the State, region and locality,

(b) to identify lands having high value and strategic importance as local or regional open space and national park or nature reserve areas and to facilitate bringing these lands into public ownership,

(c) to protect the health, well-being and safety of the local community,

(d) to identify and conserve areas, sites and features of natural, ecological, historic or cultural significance,

(e) to conserve and manage the aquatic environment and its resources in the interests of the community and the oyster, prawn and fishing industries,

(f) to identify and protect lands having regional and international significance as wildlife habitats,

(g) to ensure that the recommendations of any relevant risk assessment or transportation studies are implemented,

(h) to control and progressively phase out sand mining and to facilitate the rehabilitation of degraded lands, and

(i) to conserve the environmental heritage of the Kurnell Peninsula.

The project is considered to be consistent with the general aims and objectives of Part 1 Section 2 of SREP 17.

The project would conserve existing natural attributes through the creation and ongoing management of a Conservation Area. This Conservation Area would be managed in accordance with strict environmental performance criteria through the adoption of an Environmental Management Plan as outlined in amended Statement of Commitment 6, including measures for the Grey-headed Flying Fox colony. This demonstrates that the project is consistent with SREP 17 Section 2, Clause 1 (a) (b) and (c) and Clause 2 (d) (f) and (i).

The project would contribute to public water security. It has been developed with ongoing statutory consultation with relevant government agencies and with the community. This demonstrates compliance with SREP 17 Section 2 Clause 1 (d) and (e).

Locating the plant on industrial land and the tunnelling technology for intakes and outlets minimises environmental damage. This demonstrates consistency with Section 2 Clause 1 (c) (f) and Clause 2 (b) (c) (d) and (f).

Locating the delivery pipe towards the eastern end of Silver Beach and the implementation of stormwater management controls (for example amended Statements of Commitment 18 and 37), demonstrates that the project has considered the potential impacts on sensitive aquatic environments and is therefore consistent with SREP 17 Section 2 Clause 2 (a) and (e).

In addition, the project undertook detailed risks assessment based on a range of criteria including economic, environmental and societal risks. Recommendations from specialist consultants, including adopting vigorous monitoring studies and management plans (e.g. Construction Traffic) demonstrates consistency with Section 2 Clause 2 (g) of SREP 17.

Although, the desalination plant does not strictly match the objectives of the zoning objectives within the SREP in that the S9, Zone 4(a) (c) objective is to promote "industrial park" type development, it is suggested that the visual character of the desalination plant would be similar to an industrial park.

4.3.19 Issue: Concern regarding hazards and risks

There it the perception that construction of the desalination plant would impact on access to and from the Kurnell peninsula and that this may impact on the ability to evacuate residents of Kurnell in the event of an incident at the Caltex Oil Refinery

During construction of the desalination plant and the associated infrastructure in the Kurnell area there would be some impact on access into and out of the area. The construction activities would require a substantial workforce during peak activities for construction of the inlet and outlet tunnels, and construction and installation on the plant site. This would temporarily increase the number of people and vehicles on the Peninsula during the working hours of the various sites.

Sydney Water and contractors undertaking the construction would follow incident management procedures in accordance with our normal practice (refer amended Statements of Commitment 34 and 52). These procedures would identify all risks, mitigation measures and procedures required throughout the construction activities and would include integration with emergency response authorities. Consequently impacts of the desalination plant and infrastructure construction on evacuation of Kurnell in the event of an incident at Caltex would be minimised.

A hazard analysis should be undertaken to consider issues associated with natural disasters such as bushfire, earthquakes, rising sea levels and tidal waves

The potential for the site to be subject to events such as bushfires has been considered, particularly given the proximity of the site to bushland that has been mapped as being a high bushfire hazard. Amended Statement of Commitment 55 indicates that measures to reduce the bushfire hazard risks would be developed during the design phase.

Risks associated with factors such as earthquakes, rising sea levels and tidal waves would be addressed in the detailed design as is typical on other Sydney Water infrastructure projects.

4.3.20 Issue: Waste should be managed in accordance with relevant guidelines

A waste management plan should detail practical measures to be used for the classification of waste in accordance with the EPA's Environmental Guidelines: Assessment, Classification and Management of Liquid and non-Liquid Waste

The need to classify and manage waste in accordance with the EPA Environmental Guideline: Assessment, Classification and Management of Liquid and non-Liquid Waste (EPA 1995) during all stages of the project is reflected in amended Statement of Commitment 57 which requires a Waste Management Plan be prepared.

4.3.21 Issue: Substances of economic value may be able to be recovered from the seawater concentrate.

Is it possible to recover substances such as salt, manganese salt, magnesium or titanium from the seawater concentrate?

Sydney Water is not considering any further treatment or reuse of the seawater concentrate stream as the desalination plant would only see this stream concentrated in the order of 1.5-2 times. Extraction of salts or other substances is unlikely to be economically viable given the relatively low concentration of the discharge stream.

4.4 Summary of issues related to the financial cost of the project

Concern about the cost of the project was raised in a number of submissions. The majority of submissions contained unspecified concerns about the cost of the project. This included submissions that expressed the view that the desalination plant is an expensive option and those that declared the project is a 'waste of money'.

The impact of the project's construction and operation on property values was also raised in some submissions.

4.5 Response to issues related to the financial cost of the project

4.5.1 Issue: Unspecified concern about the cost of the project and the costs of construction

A 500 ML/day plant and infrastructure is estimated to have a capital cost of $2.5 billion.

For a 125 ML/day desalination plant, with infrastructure to serve a future 500 ML/day plant, the estimated capital cost is $1.3 billion. These estimates are the costs of the project if it were completed at the end of 2008. They were prepared for the Environmental Assessment in September 2005.

The Independent Pricing and Regulatory Tribunal (IPART) reviews the prudence and efficiency of expenditure and determines any price increase to Sydney Water's customers. As the desalination plant would be constructed in response to severe drought, it is anticipated its cost would be recovered in the IPART process. IPART will determine whether the costs are recovered primarily as a fixed or variable (based on usage) charge. If the costs are recovered through the usage charge, the increase for those customers that use less water would be proportionally less.

For an average family, which is a household that uses approximately 250 kilolitres per annum, the increase in charges would likely be about $60 per annum for a 125 ML/day plant. For a 500 ML/day plant the increase for an average household would be about $150 per annum. The increase would be greater for those customers who used larger quantities of water.

Should the final cost of the project vary from the estimated cost, IPART would determine what proportion of those costs can be passed onto Sydney Water's customers as part of its efficiency review.

4.5.2 Issue: Concern about impacts on property values

The concern that long-term property values would be impacted related to the perception that a desalination plant would result in direct operational impacts similar to those of other industries on the peninsula, such as the Caltex Oil Refineries, Continental Carbon, Boral Brickworks, sandmining and landfilling.

The desalination plant at Kurnell is to be located on land already zoned for industrial purposes with a Council approved industrial development prepared to go ahead on the site prior to its purchase by Sydney Water. Given that the desalination plant emits no noxious odours, generates no significant noise and causes no significant impacts on the terrestrial or marine ecology, it is likely to have less consequence on the property market than would already be factored in by the potential for other industrial uses which could have been located on the site.

Sydney Water sought an independent valuers opinion, Whareiki Investments Pty Ltd, on the impact, if any, of the possible future development of the desalination plant on land values in the Kurnell residential area. It was the conclusion of the registered valuer that;

> '…the design and nature of the plant together with its location will have no detrimental impact on the value of the surrounding lands and in particular the residential area of Kurnell' and that '…the establishment of the desalination plant, in contrast with the proposed subdivision, could well enhance the amenity of the suburb particularly in terms of traffic management.'

During the period of construction of the desalination plant and associated infrastructure there is likely to be some short term impact on the amenity of the area due to factors such as noise, traffic, and dust. These short term impacts would minimised by implementation of management measures commonly utilised on other projects in urban areas, such as pipelaying. As a result, any potential impact on property values due to construction would be short term. Reference should be made to the following sections for a response to these issues:

- Section 4.3.6 – dust emissions;
- Section 4.3.7 – construction noise; and
- Section 4.3.8 – traffic noise.

5. Construction of Intake and Outlet

5.1 Summary of the Environmental Assessment

The volume of desalinated water produced from a seawater reverse osmosis process is normally in the range of 40 to 45 per cent of the feedwater flow. Therefore, between 55 and 60 per cent of the feedwater would be returned to the ocean as seawater concentrate.

The seawater intake and discharge outlet will be tunnelled some 50 to 70 metres under the Kurnell Headland and beneath the surface of the Botany Bay National Park, and approximately 30 metres under the seabed, avoiding disturbance to the land and seabed during construction and operation. Figure 5.1 shows the nature of the seabed off Kurnell.

The intake would draw seawater from the Tasman Sea at a point some 300-400 metres offshore of the Kurnell Peninsula and in water depths of approximately 20-25 metres on a large reef shelf. Some small patches of boulders and sand are also present.

The seawater concentrate outlet would be approximately 250-350 metres offshore and in water depths of approximately 20-30 metres. The area is characterised by a large reef shelf with extensive boulder field (boulders 0.3-2 metres diameter) overlaying bedrock. Drop-offs of 1-3 metres are present and sand has accumulated in the gutters. Shallower areas (20 metres depth) consist of flat bedrock.

The outlet is likely to be some 500-1,000 metres south of the intake as shown in Figure 5.2.

Tunnels would be about 50-70 metres below the surface of the Botany Bay National Park. The exact routes of the tunnels are yet to be determined. The final locations would be determined during the detailed design stage. The approximate intake and outlet locations are identified in Figure 5.2.

5.2 Summary of issues related to the construction of intakes and outlets

Issues and concerns relating to the location and construction of intakes and outlets focused on spoil management and the impact on groundwater of constructing shafts for the intake and outlet tunnels. Impacts on marine ecology, particularly whales, were raised in a number of submissions. The selection of the locations for the intakes and outlets was also raised. There were also concerns about the ecological impacts of changes to groundwater levels, in particular impacts on groundwater dependent ecosystems.

Figure 5.1 Characteristics of the seabed offshore Kurnell

- Medium to coarse grained orange coloured sand with 40% shell
- Fine grained grey coloured sand with 5% to 20% mud and 30% to 40% shell
- Fine grained fawn coloured sand with 30% shell
- Fine to medium grained, golden coloured sand with 10% shell (and can be up to 60%)
- Rocky reef

Figure 5.2 Intake and outlet locations

5.3 Response to issues related to the construction of intakes and outlets

5.3.1 Issue: Concern that construction of the intakes and outlets would generate noise underwater

As indicated in Chapter 7 of the Environmental Assessment, construction of the intakes and outlets would require drilling which would generate noise underwater. The potential for underwater construction noise to temporarily impact on the marine environment is assessed in Chapter 7 of the Environmental Assessment and discussed further in Section 5.3.5 following.

5.3.2 Issue: Concern that construction may impact on groundwater levels and this may impact on terrestrial ecology

How would construction of the intake and outlet tunnels, including the shafts, impact on groundwater? The Environmental Assessment does not detail how these impacts would be managed. Dewatering shafts have the potential to impact on groundwater dependent ecosystems and wetlands including endangered ecological communities

Construction of the intake and outlet tunnels is likely to require shafts to be dewatered and this has the potential to impact on groundwater movement if not appropriately managed. As the form and extent of the impact would depend on a survey of groundwater levels and the design of the shafts and tunnels, this impact would be investigated as part of the detailed design phase. These construction impacts would be temporary and limited to the construction phase when shafts and tunnels are dewatered. This subsequent investigation would involve development of mitigation measures to manage potential impacts on groundwater.

The design would seek to limit the rate of groundwater inflow into all tunnels or shafts during construction or operation in order to not adversely affect the groundwater levels and flow regime experienced by adjoining properties.

The final tunnel alignment would seek to minimise interfaces with dykes that have been detected at frequent intervals along that section of the Sydney coastline. Extensive probe drilling and use of grouting to seal fractures in rock, and monitoring the rate of groundwater inflow, may be required to determine and prevent groundwater/seawater inflow into the tunnel during and post construction. Measures such as use of concrete diaphragm walls may be used to seal shafts in sand.

Amended Statements of Commitment 42, 43 and 44 outline strategies that would be implemented to minimise potential impacts on groundwater during construction and operation.

As required in amended Statement of Commitment 8, a Stormwater and Groundwater Management Plan for the developed site will be prepared. The plan would include strategies to recharge the groundwater system at the desalination plant site during operation by capturing and mobilising stormwater runoff through infiltration devices and to monitor groundwater and any changes in the water table over time. These strategies would be determined based on site conditions and the final shaft designs and construction methodology. The size of these areas would follow the recommended practices contained in Landcom, Soils and Construction, Managing Urban Stormwater (2004). The range of amended commitments will minimise the potential to impact on groundwater dependent ecosystems and wetlands.

5.3.3 Issue: Concern that the preferred option for spoil management has not been clearly defined

Chapter 9 of the Environmental Assessment outlines indicative options that are available to manage spoil generated by the project. The preferred option would be selected following completion of the detailed design and is not able to be clearly defined at this stage as it would depend on the construction methodology selected and availability of sites for reuse or disposal at the time of actual construction. Amended Statement of Commitment 27 states that a Construction Spoil Management Plan will be prepared to reuse all suitable spoil, particularly waste classified as Virgin Excavated Natural Material (VENM), to reduce the volumes disposed of to landfill and to manage contaminated spoil in accordance with guidelines.

Section 6.3.6 of this report confirms the spoil volume calculations presented in the Environmental Assessment made allowance for bulking factors.

5.3.4 Issue: The desalination plant is offensive to the heritage/ indigenous interests of the Sutherland Shire, Sydney and Australia

General concern was raised regarding the potential for the project to impact on the heritage significance of the Kurnell peninsula, including the indigenous and non-indigenous heritage aspects

Reference should be made to Chapter 4 of this Preferred Project Report (Sections 4.3.13 and 4.3.14) for a discussion of the potential for construction of the plant to impact on items of indigenous and non-indigenous heritage significance.

The Maritime Heritage Online register indicates that there have been around 20 shipwrecks in the Kurnell and Botany Bay region. The intake and outlet locations were inspected by divers as part of the aquatic ecology investigations which did not identify any shipwrecks. Further investigations would be undertaken as part of studies to refine the intake and outlet locations. This would involve a study to determine the potential presence of shipwrecks, in the path of the works in Botany Bay and offshore from Kurnell, as required in amended Statement of Commitment 46.

5.3.5 Issue: Concern about impacts on whales

The Environmental Assessment states that construction may impact whale migration. If whales do not come near the coast because of construction how would you know if this is happening?

Five species of marine mammals (Australian fur seal, New Zealand fur seal, blue whale, southern right whale and humpback whale), one species of cartilaginous fishes (grey nurse shark), one species of fish (black cod), three species of marine reptile (loggerhead turtle, green turtle and leathery turtle) in the endangered or vulnerable species schedules of the TSC Act or the FM Act were identified for assessment (Table 5 of Appendix A3 to the Environmental Assessment). The eight-part tests for these species are presented Appendix A3. In all cases, the eight-part tests determined that it is highly unlikely that the proposal would affect these species and, as such, no Species Impact Statements was required.

Whales are known to avoid large, stationary noise producing structures in the ocean, such as oil drilling platforms. As a result, whales may avoid the area in the vicinity of the intake and outlet structures during construction. This impact would be temporary and would only be present for one migration season.

No significant impact on threatened, protected or migratory species would be caused during construction. The activity may potentially cause some whales to move further offshore, and as a consequence, could temporarily affect shoreline whale watching. During construction, appropriate measures would be put in place during the whale migration period. As required in amended Statement of Commitment 19, a Construction Noise Management Plan for Marine Mammals would be prepared. This would involve, where practicable, stopping or scaling down at risk activities when whales are approaching the area of construction.

What mitigation measures are used in similar circumstances, such as oil drilling platforms? The Cape Solander Whale Research Team have requested that measures used to mitigate impacts on whales in similar circumstances are reviewed in terms of their potential application to the desalination plant

The potential impacts on whales from man-made structures include excessive noise, collisions (i.e. mobile vessels) and entanglement.

The change in behaviour of whales is now recognised and mechanisms to mitigate against such effects are becoming increasingly used. For example, there are procedures that whale-watching vessels must follow to minimise disturbance to whales and procedures that vessels conducting seismic operations must follow when whales are in a potentially affected area. As whales appear to show avoidance behaviour to large stationary objects and noise producing structures in the ocean (i.e. oil-drilling platforms), no mitigation measures should be needed. The area that whales may avoid is small relative to the whole migratory corridor.

Entanglements have led to the development of alarms (acoustical protection of fishing gear) that enhance the echo and visual characteristics of the gear (Lien et al. 1989, in Volgenau et al. 1995). Such alarms are used in NSW to help prevent entanglement of whales in the Beach Meshing (Shark Exclusion) Program (Internet Reference 1). At this point they are considered unnecessary due to the relatively small potential for entanglement.

There is the potential for the weedy seadragon to be impacted

Potential impacts of the project on the weedy seadragon are assessed in Section 8.2 and Appendix A3 of the Environmental Assessment. The weedy seadragon inhabits rocky reefs in central and southern NSW and extending further south. It typically occurs around the edges of kelp beds and there are populations at the entrance to Botany Bay, including Henry Head on the north and Inscription Point extending to Kurnell on the south.

The intakes and outlets are to be located on rocky reef that provides habitat for weedy seadragons. As the intake and outlet locations are refined, further investigations would be undertaken to estimate potential impacts on this species if encountered. As required in amended Statement of Commitment 11, management measures would be developed as part of this subsequent investigation.

5.3.6 Issue: Concern that the Environmental Assessment did not justify the intake and outlet locations in terms of alternative locations

There is the perception that alternative locations may be available that would result in fewer environmental impacts and reduce the potential for intake water being affected by point sources of pollution

As noted in the Environmental Assessment, selection of the intake and outlet locations was based on a balance of issues including ease of construction, depth of location, ecological impact and location with respect to currents. The proposed rocky reef locations would allow effective dilution of outflows and minimise the intake of sands and sediments.

The final locations will be refined during the detailed design stage and the following text explains the process that resulted in the selection of the intake and outlet locations.

Some submissions asked that the relative impacts in the near field on rocky reef as opposed to sand bed environments be presented. To locate the intake and outlet on a sandy bed would extend the connecting tunnels to 1.3 kilometres offshore, add significant time and cost to construction and result in commencing plant construction earlier. The plant is a drought contingency measure and construction would only commence in the unlikely event of dam levels reaching around
30 per cent. Having the capacity to act quickly means that construction can be deferred until absolutely necessary, delivering significant savings relative to proceeding early. Longer intake and outlet infrastructure would have the effect of significantly bringing forward major outlays of community resources which otherwise may not be necessary at all.

The assessment considered the locations in terms of environmental impacts, engineering constraints, operational issues and social impact. In addition to time and cost increases, locating the outlets and intakes on sandy beds some 1.3 kilometres offshore also results in an increase in the size of the "near field" zone, potentially has greater impact on whale migration, impact from the Botany Bay tidal effect, and could result in sediment/sand being drawn into the plant. The current locations are considered to be the most suitable given the time and risk constraints and the amended Statements of Commitment 11, 12, 13, 14, 15, 16, 17 and 18 ensure that measures are taken to minimise impacts on water quality and aquatic ecology in the intake and outlet area.

Reasoning behind intake location

Intakes within bays, rivers and estuaries were ruled out in the planning stage of the project due to the variable water quality.

Possible initial intake locations considered for Kurnell were:

- Sub-surface beach intake along Bate Bay beaches;
- Fractures in rocky seabeds; and
- Deepwater reef off headland.

Sub-surface or dune or beach well intakes along Bate Bay beaches were rejected as being suitable for large plants because they require an extensive length of beach for sufficient inflow. A 500 ML/day plant would require sub-surface intake pipes and concrete caissons extending 3-6 kilometres along Wanda Beach. Other important issues relate to the practical maintenance and life of the fine intake screens and the investigation time required to prove their viability. Beach well intakes are generally used for plants of less than 40 ML/day capacities.

Intakes from the rocky seabed relying on fractures either naturally occurring or created by blasting were also examined and ruled out. Cliff face or shoreline intakes have not been recommended due to the unacceptable risk associated with all elements including construction, impact on water quality and operation and maintenance. These risks are due to the large wave energies, large sediment/kelp transport potential and difficulties in maintaining an intake in these conditions.

Pipelines across the surface of the Botany Bay National Park were ruled out for ecological reasons and because there would be a need for pump stations on or near cliff faces. Pipes laid on the seabed were ruled out due to concerns over the stability of such pipes during storms, construction difficulty and possible effects on sand movement and coastal processes.

Water quality was fundamental to the intake location selection. The Kurnell area has a number of existing outlets that affect the location of a seawater intake, including:

- Sewage effluent (tertiary treated) cliff face outfall near Doughboy Head (Potter Point);
- Caltex outfalls near Cape Solander (Tabbagai Gap and Yena Point); and
- Cooling water intake and outfall for Caltex in Botany Bay off Silver Beach near the loading wharf.

The intake has been located approximately 500-1,000 metres north of the proposed seawater concentrate outlet and midway between the sewage effluent and Caltex cliff face outfalls to reduce the potential for recirculation. The depth of the intake and the distance from the deep ocean outfalls also means that the influence of these sources of effluent on water quality is minimal.

The potential for interaction of the seawater concentrate plume with the intake and other discharges has been reviewed by Water Research Laboratory in the Environmental Assessment (Ocean Modelling Report Appendix A2) and the results of the analysis have allowed the conclusion to be made that any impact of these influences can be accommodated in the reverse osmosis design.

Reasoning behind outlet location

It is proposed to locate the seawater concentrate outlets directly off the headland from the plant in water depths of the order of 20-30 metres. This would be at the base of the steep nearshore reef approximately 1.6 kilometres from the plant and approximately 0.5-1 kilometres south of the intake.

The decision to locate the outlets was influenced by the following requirements:

- Avoidance of Bate Bay;
- Avoidance of the Boat Harbour Aquatic Reserve;
- Avoidance of popular surfing beaches; and
- A seawater concentrate outlet into Botany Bay was not considered acceptable given the sensitive ecology near to Silver Beach.

Outlets at cliff faces or shorelines were not recommended for the principal environmental reason that adequate dispersion of the discharge could not be achieved. Use of the existing sewage ocean outfalls was not adopted, mainly because of the existing capacity of the outfalls and the impact on plume behaviour due to the change in density and salinity of the discharge.

Research into the sensitivities of marine habitats to the effects of desalination plants indicates that the most suitable sites are the shores of the ocean, in regions of high-energy oceanic coasts, rocky or sandy, with coast-parallel currents (Hopner and Windelberg, 1996). The outlet location is therefore considered to be suitable given the high-energy environment and presence of coast-parallel currents.

Moving the intake or outlet further toward land

Several factors would alter if the intake or outlet were moved further landward:

- Construction in the surf zone would cause difficulties particularly in heavy seas with a jack up barge involved – this was ruled out on risk grounds;
- Reducing the depth of intake/outlet would reduce the depth of shaft and length of tunnel required. While costs could decrease, the construction difficulty may increase;
- The impact of the intake on marine life could potentially increase, particularly with species such as lobster;
- Locating the intake in shallower water may be detrimental to intake water quality as more effects from surface slicks and Caltex discharges could occur. In addition, the presence of kelp would increase closer to shore;
- Dilutions/dispersion from the outlet would not be as effective as a shallower and more lateral plume would occur; and
- Given the discharge plume is expected to reach a height of approximately 20 metres above the bed, the location of the diffuser would need to be placed seaward enough to ensure adequate depth for dispersion.

Moving the intake or outlet further out to sea

Several factors would alter if the intake or outlet were moved seaward into the sandy area:

- Sandy bottom occurs some 1.3 kilometres offshore, in water depths of 50-80m that would increase construction difficulties;
- Location in deeper water would cause construction difficulties, however, these can be overcome as long as there is no work in any shipping channels;
- Increasing the depth of the intake and outlet would increase the depth of shaft and length of tunnel required. Costs would increase proportionally as would the amount of spoil requiring disposal;
- The time required to construct outlet/intake in the sandy area would increase beyond the current 26 month period by an estimated 6-8 months;

- As the time to construct is significantly longer it would be necessary to commence construction earlier than currently identified in the Metropolitan Water Plan. The intake and outlets are both time path critical. Given that the plant is only intended to be built as a drought contingency, the longer intake and outlet tunnels would not only be significantly more expensive, in the order of $50 million, but the need to commit to them early would likely result in commitment of substantial expenditure that may not otherwise be necessary;
- Impacts on whales may increase during construction as the work moves further into their migration zone;
- Moving the intake closer to the influence of the mouth of Botany Bay may cause more interaction with the tidal emptying of the Bay. While influences from Caltex and the local sewage treatment plant discharges would decrease, the intake of sediment/sands would increase;
- There is likely to be more influence from the Malabar deep ocean outfall discharges;
- The size of the near field would increase which is contrary to the aim of minimising marine impacts, refer Chapter 9.3 of this report;
- Far field modelling has already shown that the proposed location of the outlet has adequate current movement to avoid plume accumulation or stagnation. The improved dilution by moving seaward would be minimal when compared to:
  - The extra near field dilution that could be achieved through nozzle/diffuser design if so required; and
  - The extra dilution (above the design values) likely due to discharge into a moving current field.

On balance, the proposed intake and outlet zones are considered preferable to an option closer to land or further out to sea. The proposed locations would allow effective dilution, would minimise sand and sediment intake, and would ensure that the plant could be fully commissioned within 26 months.

The viability of various options and combination of options depends on the distance of the plant from the ocean and hence the lengths of the intake and outlet systems. Site constraints also influence the selection of construction access declines and shafts. Time to construct the inlet and outlet remains critical in the final selection. For the purposes of the Environmental Assessment, the positions were selected based on seabed topography, absence of sediments, ecology, sea current and flow modelling, time for construction and cost.

5.3.7 Issue: Waste should be managed in accordance with relevant guidelines

A waste management plan should detail practical measures to be used for the classification of waste in accordance with the EPA's *Environmental Guidelines: Assessment, Classification and Management of Liquid and non-Liquid Waste*

The need to classify and manage waste in accordance with the EPA *Environmental Guideline: Assessment, Classification and Management of Liquid and non-Liquid Waste* (EPA 1999) during all stages of the project is reflected in amended Statement of Commitment 57 which requires a Waste Management Plan be prepared.

Waste generated during construction of the intakes and outlets will generally be restricted to spoil from the tunnels and shafts. This material is likely to be classified as Virgin Excavated Natural Material and would be managed as described in Section 4.3.12. There would also be some general domestic waste generated by construction workers on the site.

Section 9.3 of the Environmental Assessment identifies the types of spoil that may be encountered and the various disposal options.

6. Construction of Delivery Infrastructure

6.1 Summary of the Environmental Assessment

Since exhibition of the Environmental Assessment, changes have been made to the delivery infrastructure and these are identified in Section 1.4 of this Preferred Project Report. These changes are:

- The pipeline to Miranda/Caringbah is no longer part of the project; and
- A tunnel may not be required for a plant greater than 125 ML/day. Alternatives have been found to deliver greater than 125 ML/day and so a tunnel or pipeline(s) could be the distribution method once across Botany Bay.

Sydney Water proposes that the desalination plant be built in stages ranging from 125 to 500 ML/day as and if the need arises. The distribution system will be sized to the built capacity of the desalination plant.

This flexibility results in a number of possible distribution routes with differing construction methods. The following options describe some of the various routes and likely impacts. It should be noted that the actual routes may change but the types of impacts would be similar.

Options include:

- 125 ML/day plant with local distribution from Kyeemagh;
- Plant initially built at 125 ML/day and then expanded in modules to 500 ML/day; or
- 500 ML/day plant initially constructed with distribution to City or Pressure Tunnels.

Pipeline construction may involve the use of trenchless technologies such as micro tunnelling and Horizontal Directional Drilling (HDD).

Figures 1.2 and 1.3 in Chapter 1 of this Preferred Project Report show the indicative water distribution systems.

6.2 Summary of issues related to the construction of delivery infrastructure

Concerns were raised about the construction of delivery infrastructure. Issues raised in submissions relating to construction of delivery infrastructure generally fell into three categories:

i. Issues relating to the construction of the route from the desalination plant to Silver Beach, Kurnell;

ii. Issues relating to the construction of the route from Kyeemagh to the water supply network; and

iii. Issues relating to the construction of the Botany Bay pipeline.

Issues raised in relation to the construction of the distribution routes, from the desalination plant to Silver Beach and/or from Kyeemagh to the water supply network, included local impacts of construction noise, spoil management and associated traffic movements, amenity and air quality. These issues were raised in various submissions, including those from Wilkins Public School Parents and Citizens Association and Cooks River Foreshore Working Group. The potential impact of construction of pipelines and/or tunnels on terrestrial ecology, items of indigenous and non-indigenous heritage significance, flood prone land, receiving waters due to erosion and sedimentation, and contaminated soils near Cooks River were also raised. Questions were raised regarding when the actual delivery infrastructure routes would be known.

Issues raised in relation to the construction of delivery infrastructure across Botany Bay related to the impact that construction works may have on water quality and aquatic ecology in the Bay, including potential impacts on seagrass beds (eg, submission from the Department of Primary Industries, the Council of the City of Botany Bay, Nature Conservation Council). The potential impact of sheet piles on coastal processes in Botany Bay was also raised in submissions. Alternative alignments and methods of constructing the pipeline across Botany Bay were questioned in some submissions.

6.3 Response to issues related to the construction of delivery infrastructure

6.3.1 Issue: Construction noise impacts

The Environmental Assessment notes that noise from construction, its location, duration or volume is not currently known. There is no information on current background noise levels at these potentially affected sites

Noise from constructing the delivery infrastructure would depend on the methodology selected and could include, but not be limited to:

- Deliveries of plant and materials;
- Staff movements;
- General construction activities that may include excavation and backfilling of trenches and shafts; and
- Activities at construction compounds.

There is the potential for short-term noise impacts in the vicinity of the route for the delivery infrastructure. At some locations, such as at properties adjoining construction compounds, the potential exists for longer-term construction noise impacts. These impacts would be mitigated using a range of strategies such as noise shielding and restricted hours of operation. These impacts would be temporary and, in the case of pipework, would move progressively along the route of the delivery infrastructure. Sydney Water has significant experience in the installation of pipes in urban areas and has well developed policies and procedures that would be implemented to manage issues such as construction noise.

Project specific construction noise goals would be calculated before any construction commenced. This would include identification of measures to be implemented to minimise noise impacts. Amended Statements of Commitment 29, 30 and 31 identify strategies to be implemented to minimise potential impacts associated with noise from construction of the delivery infrastructure. These strategies are in accordance with relevant EPA guidelines. As required in amended Statement of Commitment 31, consultation with local communities would be undertaken where construction activities (such as pipelaying along roadways) occur, to mitigate local issues of noise, access, working hours, safety and disruption to traffic movements. A Construction Noise Management Plan would be prepared as required by amended Statement of Commitment 31.

Specific location, duration and level of noise impacts would not be precisely known until the delivery routes are established. However, as the installation of pipelines for water and wastewater delivery is one of Sydney Water's core business activities and the impacts are well known and predictable, generic situations can be explained in the context of typical operations.

Although the delivery infrastructure routes are not yet known, it is likely that in some areas they would pass in close proximity to noise sensitive properties (e.g. in residential areas). Accordingly, it is probable that there would be short term noise impacts due to construction activities such as pipeline trenching.

Background noise levels along the route for the delivery infrastructure, at Kurnell, are approximately 41-42 dBA (depending on the location) as described in the Environmental Assessment. As pipeline construction works would move progressively along the route, noise impacts are unlikely to affect individual properties for more than four weeks. This results in the project specific construction noise goals being in the order of 61-62 dBA (i.e. not more than 20 dBA above background).

Based on this preliminary noise assessment, it is likely that construction of the delivery infrastructure would exceed the project specific noise goals by up to 25 dBA under a worst case scenario where the property is in the line of sight of the construction activity and will require mitigation measures to be applied. The predicted noise levels would be less than this if the line of sight is broken by intervening topography or man-made barriers such as buildings, fences or screens. As indicated above, this short term impact would be mitigated by implementation of noise management measures routinely used by Sydney Water as part of pipeline installation in urban areas and outlined in the Construction Noise Management Plan.

The EPA has published guidelines in its Environmental Noise Control Manual (Chapter 171-1) for the control of construction noise. The approach in these guidelines to control construction noise involves level restrictions, time restrictions and silencing and would guide the desalination project.

6.3.2 Issue: Concern that the Environmental Assessment does not provide an indication of noise generated by additional vehicle movements during the construction phase and that the community has not been consulted regarding these impacts

Potential for construction traffic, such as those transporting spoil, to impact on the acoustic environment along transport routes

Increases in traffic noise are likely to be restricted to the construction phase due to additional vehicular movements to transport spoil, materials, plant and construction staff.

As identified in amended Statements of Commitment 31 and 34, an assessment of construction and traffic noise at the plant site and delivery infrastructure worksites would be undertaken once the route for the delivery infrastructure has been selected and mitigation measures would be identified.

Also, in accordance with amended Statements of Commitment 31 and 34, consultation with local communities would be undertaken where construction activities occur, including pipelaying along roadways, to mitigate local issues of noise, access, working hours, safety and disruption to traffic movements. Construction Noise and Construction Traffic Management Plans would be prepared. Furthermore amended Statement of Commitment 28 requires a Construction Spoil Traffic Management Plan.

6.3.3 Issue: Concern about impact of construction on terrestrial ecology

Ecological constraints of the proposed routes are poorly known

Preliminary ecological assessments have been undertaken along indicative routes for the delivery infrastructure, which indicate that there are unlikely to be any significant environmental impacts associated with the use of those routes. Finalisation of the routes would take into consideration a range of engineering, environmental and social constraints. Routes would be located to avoid impacts on threatened species, endangered ecological communities and remnant vegetation and management measures would be developed to minimise impacts as indicated in amended Statement of Commitment 26.

Will detailed studies of the flora and fauna be undertaken along the chosen distribution route, and if so when?

Preliminary ecological investigations have been undertaken along the routes for delivery infrastructure assessed in the Environmental Assessment. This included routes to deliver water to Allawah and Marrickville via surface pipelines. These investigations concluded that there are unlikely to be any significant ecological impacts provided that the recommended mitigation measures are implemented.

Trenching impacts on mangroves and the intertidal zones in the Cooks River will require careful management if impacted.

Further flora and fauna assessments would be undertaken as part of the process for selecting the preferred delivery infrastructure route.

Sydney Water has undertaken terrestrial ecology assessments on distribution routes with particular attention to threatened species and endangered ecological species. These are presented in Appendix A4 of the Environmental Assessment and were used to inform the route selection to this point.

Sydney Water will seek subsequent Project Approval/s, if it becomes necessary, for the remaining components of the desalination project, namely the desalinated water delivery infrastructure.

It is necessary to define the preferred route(s) and undertake further studies, investigations and assessments before seeking Project Approval. This will be undertaken and reported on in a Desalinated Water Distribution Infrastructure Assessment, which will address the route(s) for connection to the water supply system. The community would be provided with information regarding the selection process for the preferred route(s). Affected communities would be consulted as to the mitigation measures to be employed in their area. Given that Project Approval may not be required for a number of years, it is not being sought now as it is possible that factors such as new infrastructure, or future land use or changes to pipeline technology may impact on the selection of the preferred route(s). Project Approval for these components would be sought at a time that would allow construction to commence when storages are depleted to around 30 per cent. Furthermore, as stated in Section 13.8 of the Environmental Assessment, and amended Statement of Commitment 26, detailed flora and fauna assessments would be undertaken to assist in selection of the final route(s) during design (i.e. in the months before construction commences).

Impact on rehabilitation projects undertaken by the Cooks River Foreshore Working Group

As indicated above, the route for the delivery infrastructure is yet to be defined. Should construction activities impact on areas that have been or are planned to be rehabilitated, strategies would be developed to rehabilitate these areas following completion of construction works. Sydney Water would continue to liaise with the Cooks River Foreshore Working Group on rehabilitation strategies if the delivery infrastructure route impacts their projects. This is consistent with amended Statements of Commitment 26 and 67.

A number of Councils have environmental monitoring programs in place and the project has the potential to impact on these programs

Sydney Water would continue to seek to engage Councils on the project and ideally would like to utilise their knowledge and current systems. It is considered unlikely that the project would detrimentally affect any such programs. Refer to amended Statements of Commitment 67 and 68.

6.3.4 Issue: Concern regarding impacts on water quality due to erosion and sedimentation

Construction activities have the potential to result in sediment being transported from the worksite and for this to impact on the water quality of the receiving waterbody

As part of its routine operations, Sydney Water installs pipelines in urban areas close to waterbodies and often in or across waterbodies. As a result, Sydney Water has well developed mitigation measures to ensure that potential impacts on water quality from erosion and sedimentation are minimised. These mitigation measures would be implemented where appropriate. Amended Statement of Commitment 38 indicates soil erosion and sedimentation would be controlled to protect nearby waterways. This would be of particular importance along sections of the delivery infrastructure that are in the immediate vicinity of waterways such as Cooks River or Quibray Bay. Amended Statement of Commitment 38 also requires that an Erosion and Sedimentation Management Plan be prepared.

Construction activities have the potential to result in sediments in the water column adjacent to the proposed Botany Bay dredging activities. This could compromise aquaculture and oyster cultivation in the immediate vicinity.

There is a fish farm adjacent to the Caltex Wharf, some 300 metres from the pipeline route proposed in the Environmental Assessment. However, if the route is moved further to the east to minimise direct impacts on seagrass, the pipeline route would pass within 100-150 metres of the fish farm.

The nearest oyster leases are more than 1 kilometre away from the proposed Bay pipeline route.

Pipelaying activities have been described in Section 8.6 of the Environmental Assessment and elsewhere in this report and would consist of dredging within sheet piled walls, silt curtains or similar, to allow laying of a pipeline. Following pipelaying, excavated sediments would be placed back in the trench.

Dredging is typically carried out using either a barge mounted grab excavator or a cutter-suction dredge. The grab method utilises a closable 'scoop' to remove sediments. Cutter suction dredges are essentially a vacuum system with a rotating cutting head used. In both cases the waters associated with the dredging operation are returned to the water body within silt curtains designed to prevent the spread of sediments. In some operations it is possible to treat the waters before return to minimise sediment return.

In most controlled dredging operations it is possible to confine any spread of fine plumes to within 10 metres of the operation. It is expected therefore that there would be no impact on either fish farms (aquaculture operations) or oyster farming activities.

The recent Port Botany EIS (URS 2003) predicted that water quality from the relocation of some 7.5 million m^3 of sediment from the bed of Botany Bay could be readily confined by the use of silt curtains. The Bay Pipeline may generate up to 340,000m^3 of excavated material, which would be mainly returned as trench cover.

Amended Statement of Commitment 20 requires a Seagrass Management Plan be prepared, incorporating measures to ensure that dredging activities are carried out to minimise turbidity in Botany Bay.

6.3.5 Issue: Concern about contamination

There is the potential for contaminated land to be present along the route for the delivery infrastructure, in particular near Cooks River

The routes for the delivery infrastructure are likely to pass through areas that have been subject to a variety of landuses and have the potential to be contaminated. Sydney Water acknowledges that there is the potential for contaminated soil to be present along these routes. As detailed in Statement of Commitment 41, a Contaminated Soil and Acid Sulfate Soil Management Plan is required to identify and manage contaminated soils during the construction phase.

What impact would dredging in Botany Bay in the vicinity of the mouth of Cooks River have on contaminated sediments known to be present in this location?

Although the construction methodology for the Botany Bay crossing has yet to be finalised, the current methodology involves placing the pipeline on the bed of the dredged area that lies to the west of the north/south runway. Contamination of sediments in Botany Bay has occurred as a result of past activities. In particular there is an area containing contaminated sediments as a result of the discharge of Cooks River into the Bay. The presence of these contaminants has been identified and is the subject of further testing as part of the geotechnical program to assess distribution routes.

Subject to the findings of this testing, mitigation and management measures would be developed to minimise disturbance of these sediments and may include least impact construction dredging and the use of controls such as silt curtains. Amended Statement of Commitment 41 requires the development of measures to avoid disturbing and mitigate impacts on any known contaminated soils (including in Botany Bay).

Should the Botany Bay pipeline be selected to transport desalinated water across the Bay, amended Statement of Commitment 20 requires a Seagrass Management Plan be prepared in consultation with Department of Primary Industries. The plan would identify measures to minimise turbidity immediately adjacent to dredging and includes monitoring of water quality immediately adjacent to the dredging area. Amended Statement of Commitment 22 indicates a Marine and Estuarine Monitoring programme will be developed and water quality will be monitored during construction of the pipeline across Botany Bay (see Section 9.3.7).

As indicated in Section 6.3.4, the increase in turbidity would be localised. There is an aquaculture operation adjacent the Caltex Wharf, some 300 metres from the pipeline route proposed in the Environmental Assessment. The nearest oyster farming to the proposed Bay pipeline is over 1 kilometre away. It is also unlikely to force any restrictions on activities in Botany Bay such as recreational fishing or oyster cultivation.

6.3.6 Issue: Calculation of spoil volumes

It was suggested that there is an error in the calculation of spoil volume on page 9.3 and Table 9.1 of the Environmental Assessment, as these calculations do not appear to include a bulking factor

The volumes of spoil detailed in Table 9.1 of the Environmental Assessment and referred to on page 9.3 include a bulking factor of 1.6 i.e. 277,000 tonnes (175,000m^3) is the bulked volume of spoil generated from excavation of the intake and outlet tunnel at Kurnell. The volumes presented are therefore correct.

Spoil generated from ventilation tunnels and the terminal shaft is not dealt with in the Environmental Assessment

Spoil generated by excavation of the terminal shafts is included in Table 9.1 of the Environmental Assessment.

Spoil associated with ventilation tunnels has not be included in the calculations as they depend on the length of the route and construction methodology selected. Ventilation tunnels would have a small diameter and would not generate significant spoil.

6.3.7 Issue: Concern about indigenous and non-indigenous heritage along the route of the delivery infrastructure

How will Sydney Water design work practices to protect heritage items?

Detailed investigations were not undertaken along the potential routes for the delivery infrastructure as this element of the proposal would not be confirmed until further investigations have been completed. As indicated in amended Statement of Commitment 46, an Aboriginal Cultural Heritage Impact Assessment, involving the relevant indigenous groups, would be undertaken to assist selection of the preferred route(s) for the distribution infrastructure. These investigations would be undertaken to identify potential areas of sensitivity and modify work practices to avoid or otherwise limit impacts on indigenous heritage values.

Amended Statement of Commitment 47 indicates that works would cease and the Department of Environment and Conservation and the relevant Local Aboriginal Land Council would be contacted if an Aboriginal object is encountered during construction.

Non-indigenous heritage investigations were undertaken as part of the Environmental Assessment, including the Kurnell site and potential tunnel shaft locations. The investigation concluded that:

- The project will not significantly impact on the environment of Botany Bay National Park, Cape Bailey Lighthouse or Sydney Airport pursuant to referral or approval requirements of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- Construction activities at Silver Beach have some potential to change the current westerly views from and ambience of, on a temporary basis, the Meeting Place precinct in Botany Bay National Park and to disturb 'relics' in Botany Bay and perhaps historical road surfaces at Kurnell;
- Works at Waterloo Pumping Station could have an adverse heritage impact on the Pressure Tunnel system, and Building 17. The work will have some adverse heritage impact on the Pumping Station as a whole, but limiting works to basement chambers will only have a minor affect on the overall cultural heritage values of the place; and
- The Tunnel to Marrickville would connect the existing water supply directly to the City Tunnel, which is a heritage item. While details of the connection are not known, any adverse heritage impact could be mitigated by sensitive design during the project's design finalisation and development.

A non-indigenous heritage study would be undertaken to inform selection of the preferred route for the distribution infrastructure (refer to amended Statement of Commitment 46). This would identify any areas that are potentially significant and work practices at these locations would be designed to avoid impacts. If impacts are unable to be avoided, work practices would be designed to minimise impacts.

It is acknowledged that there could be non-indigenous heritage items along the routes for the delivery infrastructure, however the works would be consistent with those performed by Sydney Water on a regular basis i.e. installation of pipework. Sydney Water has well developed procedures for managing work practices to protect heritage items during the course of these works and the same principles would be employed on this project.

Amended Statement of Commitment 48 requires that if unexpected historical relics are discovered during construction, all work likely to affect the relic would cease and the NSW Heritage Office would be notified.

6.3.8 Issue: Concern that the route for the delivery infrastructure would pass through flood prone land

Delivery infrastructure could pass through land that is flood prone, particularly adjacent to Cooks River. Whilst there is limited potential for above ground structures to alter the behaviour of floodwaters and increase the risk of flooding in the surrounding area, amended Statement of Commitment 39 outlines measures to deal with such issues for all work sites.

6.3.9 Issue: Concern that construction activities have the potential to impact on water quality in adjoining water bodies

Sediment controls should be put in place to ensure that stormwater from the site is managed and water quality impacts are minimised

As part of its routine operations, Sydney Water installs pipelines in urban areas close to waterbodies. As a result, Sydney Water has well developed mitigation measures to ensure that potential impacts on water quality from erosion and sedimentation are minimised. Amended Statement of Commitment 38 indicates soil erosion and sedimentation would be controlled to protect nearby waterways. This would be of particular importance along sections of the delivery infrastructure that are next to waterways such as Cooks River.

Sediment controls should be put in place to ensure that ANZECC criteria are met immediately adjacent to the dredging area in Botany Bay

Amended Statement of Commitment 22 indicates that water quality will be monitored during construction of the pipeline across Botany Bay. This would include developing water quality criteria appropriate for the Bay, in line with the ANZECC (2000) approach, and ensuring that appropriate work practices are implemented to generally meet these criteria.

6.3.10 Issue: Concern about spoil management and traffic impacts

Spoil generated from ventilation tunnels and the terminal shafts are not dealt within the Environmental Assessment. As such, these traffic movements have not been considered

Spoil generated from the excavation of terminal shafts is included in calculations in Table 9.1 of the Environmental Assessment. Section 9.4 of the Environmental Assessment discusses the potential impact of disposal of this spoil. It should be noted that the assessment presented in the Environmental Assessment assumes that tunnelling would be selected as the construction methodology. This assumption was adopted because tunnelling would generate a larger volume of spoil and require more traffic movements relative to a pipeline. Should a pipeline be selected, there would be significantly fewer truck movements due to the reduction in the volume of spoil that would need to be disposed of.

There is an error in Table 9.1 of the Environmental Assessment and the heading "Botany Bay Pipeline and Waterloo Tunnel" appears twice. The second of these should read "Bay Pipeline and Waterloo Tunnel" as the figures beneath this row estimate the volume of spoil to be generated if a tunnel were constructed from the desalination plant site at Kurnell to Waterloo.

Ventilation tunnels would have a small diameter and generate relatively small volumes of spoil. These volumes have not been included in the spoil calculations and traffic movement calculations, as the need for ventilation tunnels depends on the route and methodology selected.

It should be noted that ventilation tunnels would only be required for options that require tunnelling and amended Statement of Commitment 70 states that tunnelling under urban areas would be subject to further Ministerial approval. Management of spoil associated with ventilation shafts would be assessed as part of a Tunnelling Impact Investigation Report prepared in accordance with amended Statement of Commitment 69.

Sydney Water indicates that consideration of disposal of spoil would not be done until final selection of route and construction methodology. This is not acceptable as there is significant potential for traffic impacts on roads in the vicinity of the Kurnell site and surrounding area

Amended Statement of Commitment 28 requires a Construction Spoil Traffic Management Plan be prepared to minimise traffic impacts from spoil transportation. Amended Statements of Commitment 34 and 35 outline additional strategies, including a Construction Traffic Management Plan, to be prepared to minimise impacts on traffic and access, and maintain access along Captain Cook Drive.

As detailed in Statements of Commitment 69 and 70, tunnelling under urban areas would be subject to a Tunnelling Impact Investigation Report and further Ministerial approval.

The Environmental Assessment notes that the transport of spoil would impact on the operational performance of some intersections during the AM and PM peaks, but it does not identify the intersections or severity of impact

Chapter 9 of the Environmental Assessment assesses impacts associated with spoil generation and disposal and is based on a scenario that involves construction of a tunnel under Botany Bay to deliver 500 ML/day to the Pressure or City Tunnel. This option was assessed as it that would generate the largest volume of spoil compared to all other options. The traffic assessment therefore represents a worst-case scenario that is based on all spoil from tunnelling operations on the northern side of Botany Bay being transported to a disposal site on the Kurnell peninsula.

Should construction involve pipelines and not tunnels, the volume of spoil requiring disposal would be significantly reduced. As such, there would also be significantly fewer traffic movements.

As indicated in amended Statements of Commitment 69 and 70, further environmental approvals would be required if tunnelling is to be undertaken under urban areas. As a result, impacts associated with spoil and traffic movements from tunnelling operations on the northern side of Botany Bay would be considered as part of a subsequent environmental approval process if this option is pursued.

Potential impacts of transporting spoil to Kurnell from tunnelling operations on the northern side of Botany Bay have been assessed and are summarised below. It should be noted that these impacts are based on a 500 ML/day plant being constructed and tunnelling being the method used to construct the delivery infrastructure.

[1] aaSIDRA2.0 – Computer modelling package which analyses the operation of intersections controlled by traffic signals, priority signs and roundabouts.

Performance of the existing road network is largely determined by the capacity of key intersections, which are critical control points on the road network. The aaSIDRA[1] traffic model was used to assess the existing peak hour operating performance of the following intersections:

- Captain Cook Drive and Taren Point Road;
- Captain Cook Drive and Gannons Road;
- Captain Cook Drive and Elouera Road; and
- Captain Cook Drive and Sir Joseph Banks Drive.

Criteria for evaluating the operational performance of intersections are provided by the *RTA Guidelines to Traffic Generating Developments* as reproduced in Table 6.1. The criteria for evaluating the operational performance of intersections is based on a qualitative measure (i.e. level of service), which is applied to each average vehicle band.

Table 6.1 Performance criteria at intersections

Level of service	Average delay per vehicle (secs/vehicle)	Traffic signals, roundabouts	Give-way and stop signs
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity; at signals incidents will cause excessive delays	At capacity and requires other control mode
F	Greater than 70	Roundabouts require other control mode	

The performance of the subject intersections during the morning and evening peak periods resulting from the aaSIDRA analysis are presented in Table 6.2.

Table 6.2 Existing intersection performance

Intersection	Peak period	Average delay (seconds) (a)	Level of service (LOS) (b)	Degree of saturation (DS) (c)	Comments
Captain Cook Drive and Taren Point Road (traffic signals)	AM PM	82.2 54.8	F D	1.05 0.92	Delays for all approaches
Captain Cook Drive and Gannons Road (roundabout)	AM PM	114.8 19.1	F B	1.34 1.00	Delays for left turn movement on Gannons Road (south) approach
Captain Cook Drive and Elouera Road (roundabout)	AM PM	7.9 9.4	A A	0.49 0.38	All movements satisfactory
Captain Cook Drive and Sir Joseph Banks Drive (signed)	AM PM	9.2 9.4	A A	0.21 0.19	All movements satisfactory

Notes:

a) The average delay for sign controlled intersections and roundabouts are selected from the movement with the highest average delay. The average delay for intersections under traffic signal control is the average delay for all movements.

b) The level of service for sign controlled intersections and roundabouts are based on the highest average delay per vehicle for the most critical movement during peak conditions. The level of service for intersections under traffic signal control is the average delay for all movements.

c) The Degree of Saturation is defined as the ratio of the arrival flow (demand) to the capacity of each approach.

The results of the intersection assessment in Table 6.2 indicate current traffic conditions at key intersections along Captain Cook Drive. The key findings from this assessment are as follows:

- The signalised intersection of Captain Cook Drive with Taren Point Road is operating with a poor level of service during both AM and PM peak periods, with delays for all approaches under existing weekday peak hour conditions;
- The roundabout of Captain Cook Drive with Elouera Road and the sign controlled intersection of Captain Cook Drive with Sir Joseph Banks Drive are operating with a good level of service during AM and PM peak periods; and
- The roundabout of Captain Cook Drive with Gannons Road is operating with a poor level of service during the AM peak period, however, it operates satisfactorily during the PM peak period. The critical movement is identified to be the left turn movement from Gannons Road.

Chapter 9 of the Environmental Assessment estimates traffic movements based on all spoil from tunnelling operations north of Botany Bay being transported to the Holt's receival site on Kurnell peninsula. Table 6.3 summarises the impact that traffic movements from spoil disposal are predicted to have on the performance of key intersections along Captain Cook Drive.

Table 6.3 Intersection performance during construction

Intersection	Peak period	Average delay (seconds) (a)	Level of service (LOS) (b)	Degree of saturation (OS) (c)	Comments
Captain Cook Drive and Taren Point Road	AM PM	82.2 57.9	F E	1.05 0.91	Delays for all approaches
Captain Cook Drive and Gannons Road	AM PM	125.9 21.9	F B	1.38 1.00	Delays for left turn movement on Gannons Road (south) approach
Captain Cook Drive and Elouera Road	AM PM	8.2 9.6	A A	0.52 0.39	All movements satisfactory
Captain Cook Drive and Sir Joseph Banks Drive	AM PM	9.7 10.1	A A	0.21 0.21	All movements satisfactory

Notes:

a) The average delay for sign controlled intersections is selected from the movement with the highest average delay. The average delay for roundabouts is selected from the movement on the approach with the highest average delay.

b) The level of service for sign controlled intersections is based on the highest average delay per vehicle for the most critical movement during peak conditions. The level of service for roundabouts is based on the highest average delay per vehicle for the most critical movement.

c) The Degree of Saturation is defined as the ratio of the arrival flow (demand) to the capacity of each approach.

The intersection of Captain Cook Drive and Elouera Road and the intersection of Captain Cook Drive and Sir Joseph Banks Drive are operating with a good level of service during both AM and PM peak periods with construction traffic. The results in Table 6.3 indicate that there would be a minor increase in average delay (up to a 1 second increase) and degree of saturation at both intersections during both the AM and PM peak periods in comparison with the existing conditions.

Based on these findings it is apparent that the movement of spoil between the proposed desalination plant sites and the Holt site could occur during both AM and PM peak periods with minimal impact on the operation of the surrounding road network.

The intersection of Captain Cook Drive and Taren Point Road is operating with a poor level of service during both AM and PM peak periods with or without construction traffic. A review of the results for existing conditions and those with construction traffic indicates that there is only a minor increase in average delay and degree of saturation during both AM and PM peak periods compared to the existing conditions.

The intersection of Captain Cook Drive and Gannons Road is operating with a poor level of service during the AM peak period with or without construction traffic. A review of the two sets of results for the AM peak hour indicates that the average delay to traffic at the intersection would increase by 11.1 seconds. Under the PM peak the intersection performs satisfactory with a good level of service both with and without construction traffic, with the average delay for traffic at the intersection increased by approximately 3 seconds. It is apparent from the review of AM peak conditions that the performance deficiency is driven by additional delays to traffic turning left from Gannons Road.

Based on these findings it is apparent that the movement of spoil between Waterloo and Mascot or Botany South and the Holt receival site would have a minor impact on the operational performance of key intersections during both AM and PM peak periods. It should be noted that if the Port Botany expansion could be utilised for disposal of spoil then this would remove the potential impact on these poorly performing intersections situated along the western section of Captain Cook Drive.

As indicated in amended Statement of Commitment 28, a Construction Spoil Traffic Management Plan would be prepared to minimise traffic impacts associated with spoil transportation.

The Environmental Assessment states that additional traffic volumes during peak periods would be avoided if adequate storage can be found at work sites. However, the Environmental Assessment also states that stockpiling on-site would not be utilised in an attempt to minimise the area of disturbance. This is conflicting.

Amended Statement of Commitment 28 indicates that measures would be implemented to minimise traffic impacts from spoil transportation during construction. The decision to adopt stockpiling or immediate transfer of spoil would be made at the detailed design stage and would consider the site specific constraints at each location. For example, in cases where spoil generation sites are in residential areas it may cause less impact to stockpile spoil and transfer the material evenly over a longer period than to allow concentrated truck movements at the time of spoil generation which may impact on the efficiency of the road network.

Has Sydney Water done any environmental and traffic studies for all the roads they are going to dig up for the new pipes?

Detailed ecological, indigenous heritage and non-indigenous heritage investigations and traffic studies will be undertaken following selection of the route for the delivery infrastructure. These studies would assess the potential environmental impacts of the works and recommend mitigation measures to be implemented to avoid or otherwise minimise impacts.

Following finalisation of the delivery infrastructure routes, work practices would be developed to minimise construction traffic impacts on the surrounding road network and disruptions from works within road reserves. This is reflected in amended Statement of Commitment 34.

6.3.11 Issue: Concern about the impact of constructing a pipeline on the floor of Botany Bay

What construction methodologies have been considered to deliver water from Kurnell to the northern side of Botany Bay?

Four options for conveying water across Botany Bay were considered including:

1. A tunnel across Botany Bay Heads which would connect the plant to the distribution system around the Malabar area;
2. A land option consisting of pipelaying around the western edge of Botany Bay. This would require significant pipelaying works from the desalination plant site potentially as far as Ashfield;

3. A tunnel under Botany Bay consisting of a 4 metre tunnel (3.5 metres finished internal lined diameter) from the plant to the northern side of Botany Bay; or
4. A pipeline on the floor of Botany Bay consisting of a 7.9 kilometres sub-sea pipeline(s) across Botany Bay from Silver Beach to Kyeemagh. This pipeline would link with either a tunnel or pipelines extending to the major distribution network – there were three techniques considered within this option including:
    a. trenching a pipe across the floor of Botany Bay (the current proposal);
    b. a combination of bay floor pipeline and trenchless technologies, for going beneath the seagrasses, such as:
        i. microtunnelling (pipe jacking) or
        ii. horizontal directional drilling (HDD).

The type of technique used and the most appropriate route are influenced by the existing features of Botany Bay which include:

- The Shipping Channels for Port Botany Container Terminal;
- The LP Gas Cavern beneath the Bay floor off Molineaux Point;
- Kingsford Smith Airport;
- Paleochannels (ancient glacial channels) in the Bay floor which significantly restrict the method and route available for tunnel options;
- Towra Point Ramsar Wetland;
- Caltex tanker wharf and associated shipping channel;
- Caltex cooling water return pipeline close to and west of the tanker wharf;
- Caltex Bay floor product pipeline that extends from the Caltex tanker wharf north across the bay to the Orica chemical plant, east of the Airport;
- Aquaculture in Botany Bay to the north west of the Caltex wharf; and
- Seagrass beds off Silver Beach.

Relative analysis of options

The four base options have different impacts on time, cost and the environment.

Table 6.4 presents an analysis in terms of the extent of impact on seagrass, other environmental impacts, time of construction and the cost of implementation.

Ruling out a tunnel across the Heads of Botany Bay

The presence of paleochannels in the Bay floor ruled out any tunnels crossing the heads of Botany Bay toward La Perouse. Paleochannels are ancient glacial channels carved in the bedrock, which have subsequently filled with sediments to create the current Bay floor. These channels significantly restrict the method and route available for tunnel options due to their depth and the rock stresses they create.

One major paleochannel parallels the northern side of Botany Bay and runs from the airport to the mouth of the bay. As this channel passes between La Perouse and Kurnell it is more than 100 metres deep. A large tunnel or Horizontal Directional Drilling between La Perouse and Kurnell would have to be deeper than this to ensure it was founded in sound bedrock and avoided any associated fractured rock zones. This feature of Botany Bay made tunnelling options between La Perouse and Kurnell effectively unviable as they were uneconomical and involved significantly greater risk of hitting fractured rock that would allow water to flood the tunnel. The associated construction risks with such a tunnel gave rise to significantly greater chance of delays that would impact the project completion date compared with other available options.

The option of Horizontal Directional Drilling between La Perouse and Kurnell was ruled out as its length and the required pipe size far exceeded current drilling experience and capability.

Ruling out land based pipeline options

A land based pipeline option was ruled out principally based on the level of disruption, the long construction time and significantly greater expense compared with the preferred option. For the 500 ML/day plant the desalinated water needs to be delivered to the City or Pressure Tunnel. This would require a pipeline to be laid from the desalination plant at Kurnell around the perimeter of Botany Bay to Ashfield.

A tunnel option across the Bay to Waterloo

This option involves construction of a large diameter tunnel using a Tunnel Boring Machine along a route that avoids the most significant paleochannels, most likely from the plant site to Waterloo. This tunnel would have an intermediate shaft at Botany and terminal shafts at both Kurnell and at Waterloo. Time constraints dictate that it would require four Tunnel Boring Machines to excavate it, all operating concurrently, one northbound from Kurnell, two from Botany, one southbound and the other northbound, and the fourth southbound from Waterloo. There is greater risk with this option compared to the Bay pipeline, as the tunnelling conditions are unknown and there is the potential to cross many geological features such as dykes which could allow water to flood the tunnel causing lengthy delays.

The Botany Bay pipeline option

The currently preferred option involves pipeline(s) up to 1.8 metre diameter trenched into the bed of Botany Bay and re-covered with sediment. The pipeline would extend from Silver Beach to Kyeemagh. Construction would also include infrastructure such as jetties at each end of the pipe route. This option posed the least construction risk and the environmental impacts could be mitigated. Alternatives to laying the pipeline through seagrass beds at Silver Beach were also investigated as sub-components to this option. This included:

- Microtunnelling (pipe jacking) under the seagrass beds, or
- Horizontally Directional Drilling under the seagrass beds.

These are discussed later in this section.

Rationale for selection of the preferred Bay Pipeline option

The time required to construct a tunnel from Kurnell to Waterloo or to lay a pipe from Kurnell to Ashfield on land would be longer than that required to construct the Bay pipeline and any associated onward component of delivery infrastructure. The time risk to the project is also significantly higher with a tunnel option, as construction progress could be impacted by a number of unquantifiable geological conditions.

The factors affecting the selection of the Bay pipeline as the preferred construction method are outlined below:

- Tunnelling beneath Botany Bay would have a high risk of encountering zones of significant water ingress through fractured rock zones, faults, dykes and joint planes;
- The lead time to obtain multiple Tunnel Boring Machines, as well as the potential risk of failure of one machine during construction elevates the overall risk of tunnelling compared to pipeline(s);
- Tunnelling would require the construction of major (10 metre diameter) shafts and associated sophisticated headworks at all three shafts to service Tunnel Boring Machines;

- The time required to construct a tunnel from Kurnell to Sydney's existing major water distribution network would be longer than that required to construct the Bay pipeline and any associated onward component of delivery infrastructure; and
- The time required to lay a pipeline from Kurnell to Ashfield in road reserves would be significantly longer than laying a pipeline across Botany Bay and would result in significantly greater community disturbance.

In light of the above factors and the project constraints, the advantages of a pipeline across Botany Bay outweigh those of a tunnel or land based pipeline. As required in Statement of Commitment 71, a Desalinated Water Distribution Infrastructure Assessment will be undertaken and will include the assessment of the various distribution options, mapping of the constraints, identifying the preferred route(s) and mitigation measures. Then as required in amended Statement of Commitment 20, if a Botany Bay pipeline is selected as the preferred route, designs and management practices would be developed in consultation with the Department of Primary Industries and incorporated into a Seagrass Management Plan for this aspect of the Project.

Table 6.4 Analysis of options

Option	Description	Estimated extent of seagrass impact (ha approx)	Other key factors	Total water delivery construction time	Relative cost ($)
Option 1	**Tunnel across Botany Bay Heads** Tunnel across Botany Bay from Kurnell to La Perouse	Nil	Not feasible due to paleochannels	Unquantifiable as not currently feasible	Unquantifiable as not currently feasible
Option 2	**Land based option** Land based option via western edge of Botany Bay to Sutherland and Ashfield	Nil	Extensive disruption to road network due to pipe laying in road reserves	In the order of 30 months	Up to 100 per cent more than base case
Option 3	**Tunnel across Botany Bay** Consists of a 4 metre tunnel (3.5 metres finished internal lined diameter) from the plant to Waterloo	Nil	Spoil and traffic impacts. Social amenity impacts near shaft sites as well as potential delays due to unknown geological conditions	27 months	Comparable but more expensive than Option 4a with significantly higher risk profile
Option 4(a)– currently preferred	**Trenched pipeline across Botany Bay** Pipeline(s) across Botany Bay to Kyeemagh on the northern side of Botany Bay	0.25 - 0.5 ha depending on route chosen	Direct and indirect seagrass impacts. Disruption through Kurnell Village and Silver Beach – noise, construction traffic etc	Around 22 months	Base case
Option 4(b) i	**Microtunnelling (pipe jacking) under the seagrass beds and then trenched pipeline across Botany Bay**	Nil	Disruption through Kurnell Village and at a significant Silver Beach launch site (1 ha) – noise, construction traffic etc	Unquantifiable as not currently feasible	Unquantifiable as not currently feasible
Option 4(b) ii	**Horizontal directional drilling under seagrass beds and the trenched pipeline across Botany Bay.**	Nil	Disruption through Kurnell Village and at a significant Silver Beach launch site (>1 ha) – noise, construction traffic etc	Unquantifiable as not currently feasible	Unquantifiable as not currently feasible

Why was Kyeemagh selected as the landing point?

Landing the pipeline at Kyeemagh was selected for the following reasons:

- It avoids the commercial shipping operations at Port Botany;
- The pipeline route to Kyeemagh follows the shallowest section of Botany Bay, making construction easier;
- It would be less affected by ocean swells and storms than other locations further south along the beach at Brighton-Le-Sands;
- It has a site available for construction activities that offers lower community impact than other locations along Lady Robinson's Beach; and
- It offers the best location to distribute water onwards into Sydney's existing water supply system for a number of desalination plant staging options.

Is it possible to use an alternative construction methodology to avoid impacts on seagrasses?

Alternative construction methodologies to cross the seagrass were considered, as follows:

- Trenching across Botany Bay (the current proposal); and
- Utilising trenchless technologies such as microtunnelling (pipe jacking) and Horizontal Directional Drilling (HDD), to tunnel under the seagrass beds, and then a trenched pipeline across the remainder of the Bay.

Trenching across Botany Bay (the current proposal)

To mitigate impacts on seagrass beds and on the shoreline, trenching through the seagrass beds would be carried out within temporary sheet pile shoring approximately 10 metre wide to minimise the area disturbed. Dredging works would be carried out within silt curtains (or similar) to minimise the impact of silt plumes on the seagrass beds in Botany Bay. This methodology has been selected to minimise potential water quality impacts and disturbance to seagrass beds. Amended Statement of Commitment 20 requires a Seagrass Management Plan be prepared in consultation with the Department of Primary Industries.

The trenching works could be carried out with excavators or grabs operating from barges or by a cutter suction dredge. The dredged material would be returned to the trench as backfill. Surplus dredged material would be managed appropriately. As required in amended Statements of Commitment 27 and 41, management plans to manage spoil would be developed before construction begins.

Microtunnelling (pipe jacking)

Microtunnelling involves pushing a small tunnelling machine between two excavated pits – the launching pit and the receival pit. These pits are required to install and then remove the tunnelling machine. Pipes are placed into the launching pit behind the tunnelling machine and both are then pushed forward by a set of hydraulic jacks. Additional sections of pipe are progressively added until the tunnel machine reaches the receival pit.

The risks and disadvantages associated with a microtunnel include:

- The complexity of sealing the launch pit;
- The complexity of boring through soft sand material;
- The potential for lubricant dispersion to the Bay from the soft ground bores;
- The impact of launch site preparation;
- Costs associated with the increased complexity of operations;
- This type of construction has not been undertaken for a similar situation; and
- The risk of leaking at the point of connection of the tunnelled section to the trenched pipe.

Other risks from this technique are the need for a coffer dam (a dry enclosure) to exclude seawater when the microtunnelled section of pipeline is joined to the trenched section of pipeline. This coffer dam would be 9 metres deep in Botany Bay. Construction of this coffer dam presents significant challenges and safety concerns, given the need to bring the trenched steel pipeline into it in some manner to allow it to be joined to the microtunnelled pipeline, or potentially by constructing the coffer dam over the top of the trenched pipeline after it is installed.

Horizontal Directional Drilling (HDD)

HDD involves an initial bore that is then back-reamed to a larger diameter. The reaming process is continued until the desired bore diameter is reached. A liner pipe is then pulled into the reamed hole to carry the water.

There are significant risks associated with this approach when applied to tunnelling under seagrasses. HDD within a water body poses significant challenges, some of which may not be able to be overcome.

Current technology is able to construct HDDs up to 1 metre diameter. The proposal requires a pipeline that is 1.8 metre in diameter or three HDDs of 0.8 metre in diameter to achieve the same hydraulic capacity.

A work compound on Silver Beach to construct three parallel directional drills would take up a sizable portion of the beach and there is insufficient room on Silver Beach to lay out a 0.8 metre diameter by 800 metre long section of liner pipe to enable it to be pulled into the bored hole.

Other disadvantages associated with HDD in this application include:

- A coffer dam at the exit point in the Bay. This presents similar risks to the microtunnelling option;
- The problem of lubricant dispersion into the Bay from the soft ground bores;
- Costs associated with the increased complexity of operations;
- This type of construction has not been undertaken for a similar situation; and
- The risk of leaking at the point of connection of the tunnelled section to the trenched pipe.

Both microtunnelling and HDD under the seagrass beds and connecting to a pipeline trenched in Botany Bay were considered unfeasible.

Are there any alternative pipeline routes that would reduce the area of seagrass to be impacted?

The Marine Ecological Assessment undertaken for the Environmental Assessment (Appendix A2) by The Ecology Lab (November 2005) investigated a range of issues including the potential impacts from a pipeline across Botany Bay. The pipeline route gives the general location of the proposed pipeline to deliver water from Kurnell to the north west of Botany Bay.

Field inspections of the seagrass beds off Silver Beach revealed that the pipeline route would pass through a mixed bed of *Posidonia australis* and *Zostera capricornii*. A preliminary inspection of the area to the east of the pipeline route indicated that it would be possible to refine the alignment to reduce the area of seagrass that would be impacted. It was also noted that detailed inspection of the seagrass beds may identify an alternative route that would further reduce the area of seagrass habitat that would be directly impacted.

Additional investigations following exhibition of the Environmental Assessment have identified a more easterly route that would pass through a section of seagrass approximately 200 metres long. This is significantly shorter than the route assessed in the Environmental Assessment (which was approximately 475 metres) and should result in a significantly reduced impact if proven to be practicable.

Sydney Water is committed to ensuring further assessment of alternate routes are undertaken to define the optimal route through the seagrass beds in conjunction with the most appropriate construction techniques to minimise disturbance. Amended Statement of Commitment 20 outlines the measures that would be implemented to minimise potential impacts on seagrass beds.

Protecting commercial and recreational activities

The pipeline routes currently under consideration are located to the west of Sydney Airport and avoid affecting the Airport as well as Port Botany and Caltex Refineries. Oyster farms in Botany Bay are sufficiently distant from the proposed pipeline and are unlikely to be affected by construction. Appropriate turbidity management would avoid any adverse effects on aquaculture located well to the east of the proposed pipeline.

During construction, recreational fishers would be able to use other areas in Botany Bay and the area affected by construction would be a very small percentage of the total resource. Once the pipeline is completed, recreational fishing would return to normal. Amended Statement of Commitment 60 identifies that measures would be developed to limit disruption to boating, fishing and oyster leases and aquaculture activities in Botany Bay.

As outlined in amended Statement of Commitment 61, navigation obligations and safeguards would be discussed with the relevant authorities including NSW Maritime and Sydney Ports Corporation.

How would sheet piling through seagrass beds impact on coastal processes?

The Environmental Assessment was based on a concept that involved sheet piling being installed through the seagrass beds off Silver Beach in sections approximately 50-100 metres long. This length was based on minimising the potential impacts on coastal processes at Silver Beach, such as wave action, tidal currents and storms.

Subsequent, more detailed engineering investigations undertaken following exhibition of the Environmental Assessment, indicate that it may not be possible to reduce sheet piling to lengths of 50-100 metres if more traditional steel pipe materials were used. Limiting sheet piling to these lengths restricts the pipeline to one particular type of material (i.e. polyethylene) and would require multiple pipelines to be installed to achieve the required hydraulic capacity due to current manufacturing limits with this material.

Confirmation of the construction methodology and long-term performance of the pipeline material is yet to be finalised. The use of steel pipe has the benefit of being well understood in terms of performance and durability. The longer length of sheet piling required for a steel pipeline is due to constraints imposed by the curvature of the steel pipeline of the size required for the project and the associated length of trench that would need to be open at any one point in time.

Restricting sheet piled sections to 50-100 metres lengths is expected to increase the construction timeframe in the seagrass zone due to the time involved in placement, extraction and replacement of the sheet piles.

If the length of sheet piling were to be significantly increased, the potentially increased impact on coastal processes and seagrasses would need to be assessed. Further engineering and environmental investigations will be undertaken during detailed design to refine the construction methodology to ensure that there is an appropriate balance between impacts on coastal processes, seagrass impacts and the need to minimise construction time to reduce the risk of encountering adverse sea conditions. This would involve further consideration of alternative construction methodologies and the potential direct and indirect impact of construction on coastal processes and seagrass beds off Silver Beach. Amended Statement of Commitment 20 identifies that such considerations would be undertaken in consultation with the Department of Primary Industries.

The outcome of the additional engineering and environmental investigations would be to ensure that the environmental impact of the alignment and construction methodology does not exceed that presented in the Environmental Assessment.

What impact would there be on coastal processes due to the works at Kyeemagh?

A jetty would be built from the northern region of Lady Robinson's Beach near Kyeemagh. This region of the bay is protected from direct ocean swells by runways and previous dredging. The sheet-pile structures proposed at Silver Beach would also be used at Kyeemagh to mitigate impacts on Lady Robinson's Beach. The impacts would be much smaller than at Silver Beach because of the lower currents and wave conditions. However, there are no groynes on this shoreline and some temporary impacts may occur. These impacts would diminish quickly as construction moved offshore.

The issue of the pipeline being uncovered by coastal processes has been addressed in the design and the depth of the cover.

What impact would there be on coastal processes due to the section of pipeline that is exposed on the bed of Botany Bay?

Currents

Flood and ebb tide current speeds in the dredged basin to the west of the north south runway are very low. Fine silts which have accumulated over the past three decades cover the bottom of the dredged-basin. The sources of these sediments are likely to be freshwater flows from the Cooks River.

Given the low current regime, it is possible that the near seabed water column is somewhat stratified with anoxic conditions (no oxygen present) near the seabed. That is, the flows are not strong enough to force denser seawater that may accumulate there out of the basin. Another issue relates to the construction phase and the potential for the fine sediment deposited within the dredged basin to be disturbed during pipeline installation. A suspended sediment plume might develop, mainly near the seabed, with some potential to be visible near the surface. Amended Statement of Commitment 20 outlines management practices which would be developed to minimise turbidity in Botany Bay, immediately adjacent to the dredged area.

Waves

The section of pipeline on the seabed offshore from Kyeemagh would not impact on wave patterns given the low energy of waves in this part of Botany Bay and the alignment of the pipeline.

Transplanting seagrass is a mitigation measure, however transplanting *Posidonia* has had limited success

Sydney Water acknowledges that there has been limited success in transplanting some species of seagrass, such as *Posidonia*, within Botany Bay. As required in amended Statement of Commitment 20, Sydney Water, in consultation with Department of Primary Industries, would establish a program of seagrass restoration and/or offsets to compensate for seagrass loss.

Concern about *Caulerpa taxifolia*

Concern was raised about the potential dispersion of noxious aquatic weeds and existing contaminated sediments during construction should the Botany Bay pipeline be selected. As required in amended Statement of Commitment 23, work practices would be developed to control the potential dispersion of *Caulerpa taxifolia* located along the pipeline route, including in relation to seagrass restoration activities.

Construction of the pipeline through the seagrass beds may impact on the Weedy Seadragon

Potential impacts of the project on the Weedy Seadragon are assessed in Section 8.2 and Appendix A3 of the Environmental Assessment. The Weedy Seadragon inhabits rocky reefs in central and southern NSW and extending further south. It typically occurs around the edges of kelp beds and there are populations at the entrance to Botany Bay, including Henry Head on the north and Inscription Point extending to Kurnell on the south. Weedy Seadragons would be unlikely to live in habitats along the pipeline route in Botany Bay.

Seagrass is a suitable habitat for *Syngnathids* (e.g. seahorses and pipefish) and these may be impacted by construction of the pipeline

The route for the delivery infrastructure would be inspected before construction begins. Any *Syngnathids* observed in the immediate vicinity would be relocated to a suitable habitat as required in amended Statement of Commitment 20.

Impacts on the oyster industry

Oyster leases are found in Woolooware Bay and Quibray Bay and farmers are concerned that a pipeline across Botany Bay may impact on water quality that would in turn affect their operations.

Section 8.2 and Appendix A3 of the Environmental Assessment assessed the potential for works in Botany Bay to impact on water quality and aquatic ecology. It concludes that oyster farms are sufficiently removed from the pipeline to not be affected during construction. A range of mitigation and management measures were recommended to ensure that potential impacts are minimised and these are included in amended Statement of Commitment 20.

6.3.12 Issue: Concern that private property could be damaged during construction

Will landholders be compensated for damage to property arising from construction of the delivery infrastructure?

Sydney Water has significant experience in building pipelines in urban areas and has well developed construction practices to ensure that the potential for damage to adjoining properties is minimised. Amended Statement of Commitment 62 outlines the measures, including dilapidation surveys, that would be implemented to minimise potential construction damage.

6.3.13 Issue: Concern that the location of the distribution infrastructure is yet to be resolved

There was concern that the location for the delivery infrastructure is yet to be resolved. The timing of this decision was also questioned

The process for selecting the final distribution routes is as follows:

- The Concept Plan as assessed in the Environmental Assessment and environmental constraints identified in potential distribution routes;
- If Concept Approval is given, Sydney Water will refine designs and select a preferred route. Additional environmental and engineering investigations will inform this decision; and
- Should a desalination plant be required Sydney Water will seek Project Approval for the final routes selected. The Department of Planning would be provided with an assessment of the routes, and a process of community information targeted at communities along the affected route would commence, including consultation to minimise construction impacts.

As required in new Statement of Commitment 71, a Desalinated Water Distribution Infrastructure Assessment will be undertaken and include the assessment of the various distribution options, mapping of the constraints, identifying the preferred route(s) and mitigation measures.

6.3.14 Issue: Will pipelines be laid under houses at Kurnell?

The final location of the delivery infrastructure, including pipelines through Kurnell, will be confirmed as part of the detailed design. Pipelines would not be constructed under houses, but would follow existing streets, other public spaces and easements. In the unlikely event that a tunnel option is selected as the preferred option, it would be located in deep bedrock to avoid any surface impacts. Amended Statements of Commitment 69 and 70 define the further assessment and approvals proposed for any tunnel under urban areas.

6.3.15 Issue: What public scrutiny would be available for tunnelling approvals?

As indicated in Chapter 11, Project Approval is not currently being sought for any tunnelling under urban areas for the delivery infrastructure. Project Approval is sought for the tunnels to connect the intake and outlet to the Desalination Plant at Kurnell. These tunnels do not go beneath urban areas. Should a tunnel under urban areas be selected for the delivery infrastructure, amended Statements of Commitment 69 and 70 require a Tunnel Impacts Investigation Report developed in consultation with affected communities and Project Approval from the Minister for Planning. Public scrutiny would therefore be available via consultation with affected communities during preparation of the Tunnel Impacts Investigation Report.

Note: Commitments 69 and 70 apply only to tunnels under urban areas comprising houses and other buildings but does not include trenchless pipelaying technology such as micro-tunnelling or drilling under roads, railways or creeks in order to minimise environmental impact or social disruption.

6.3.16 Issue: Waste management in accordance with relevant guidelines

A waste management plan should detail practical measures to be used for the classification of waste in accordance with the EPA's *Environmental Guidelines: Assessment, Classification and Management of Liquid and non-Liquid Waste*

The need to classify and manage waste in accordance with the EPA *Environmental Guideline: Assessment, Classification and Management of Liquid and non-Liquid Waste* (EPA 1999) during all stages of the project is reflected in amended Statement of Commitment 57 which requires a Waste Management Plan to be prepared.

6.3.17 Issue: Construction impacts on public open space and cycle paths

Impacts on public open space due to construction of the delivery infrastructure would depend on the option that is ultimately selected. Potential impacts would be temporary and all areas of public open space would be rehabilitated. As required in amended Statement of Commitment 35, arrangements would be developed to ensure public safety and to minimise disruption to property access, parking, access to recreational areas, bus services, pedestrians and cyclists at all times where feasible during construction.

6.3.18 Issue: Concern about air quality impacts during construction

Dust generated by construction activities to impact on amenity and human health

Potential air quality impacts during construction would primarily come from dust that is generated by earthworks. Sydney Water routinely installs pipelines in urban areas and has well developed mitigation measures to minimise impacts. Amended Statement of Commitment 36 requires that a Construction Dust Management Plan be prepared.

7. Operation of the Plant

7.1 Summary of the Environmental Assessment

Amended Statement of Commitment 2 to reduce greenhouse emissions has been strengthened since the Environmental Assessment was exhibited. If built, the desalination plant energy use would be offset to ensure no net greenhouse gas emissions. With this exception, the remainder of the plant operations are as described in the Environmental Assessment.

The reverse osmosis desalination technology consumes significantly less energy than the thermal technology alternatives considered. The most efficient thermal process requires more than three times the energy of a reverse osmosis plant. The plant would incorporate energy recovery and energy efficient devices. Development of these devices has seen a reduction in the energy demand of the reverse osmosis process by approximately 40 per cent over the last 10 to 15 years.

The desalination plant and infrastructure would be powered by electricity sourced from the grid. The electricity network has sufficient capacity to supply the project and does not require augmentation. A 500 ML/day plant would have a peak electricity demand of approximately 110 mega watts (MW) and generation of this power would produce greenhouse gases, which would be offset to ensure no net greenhouse gas emissions.

7.2 Summary of issues related to the operation of the plant

Energy use was raised in a significant number of public submissions. Submissions noted that the plant would use a large quantity of energy and would hence produce significant greenhouse gas emissions. Submissions stated that this energy use would add to global warming and potentially reduce rainfall.

The effectiveness of and commitment to offset energy use was raised in numerous submissions.

The capacity of the energy network to deal with increased load on the system and the potential for the plant to cause power blackouts was raised in submissions. The extent to which alternative energy sources had been investigated was questioned.

The quality and treatment of drinking water was raised as an issue. A number of these submissions raised concerns about the proximity of seawater intakes to sewage ocean outfalls. Other issues were associated with the chemicals used and stored on site, the noise associated with traffic and operations, the operational regime of the plant, and a view that the plant would contribute to the general degradation of Kurnell.

7.3 Response to issues related to the operation of the plant

7.3.1 Issue: Thermal processes should be preferred to a reverse osmosis process

Thermal and reverse osmosis processes were assessed against the key criteria of energy consumption and greenhouse gas emissions.

For the assessment, thermal processes were considered in the context of dual-purpose configurations where additional energy is produced for export to the grid in order to provide sufficient heat energy (steam) for the thermal process. This option makes efficient use of thermal energy. The calculation of energy consumption for desalination by the reverse osmosis process is straightforward, as all the energy input is used in the desalination process. This is not the case for the thermal process (due to its dual purpose) where the energy input is distributed between the production of water and the production of surplus electricity.

Thermal desalination processes require both heat and electricity. To generate the necessary heat in the form of steam, the power plant arrangement is less efficient (due to thermodynamic rules) than an equivalent power plant used to produce electricity only.

The most efficient thermal process requires more than three times the energy of a reverse osmosis plant. This also means that the greenhouse gas emissions from thermal processes are more than three times those for a reverse osmosis plant.

7.3.2 Issue: Concern about energy use

This issue relates to concerns about the large volume of energy that a desalination plant will require and the source of the energy being the grid. As a large proportion of energy supplied to the grid is generated by coal-fired power stations, there were concerns about greenhouse gas emissions from this energy source

How much energy would the desalination plant consume?

Operating at a maximum capacity of 125 ML/day, the desalination plant would have a peak electricity demand of approximately 30 MW. A 500 ML/day plant operating at a maximum capacity would have a peak electricity demand of 110 MW. Generally speaking, a 125 ML/day plant would require around 225 GWh of electricity and a 500 ML/day plant around 900 GWh of electricity per year. This is based on the plant operating at maximum capacity all year. The 500 ML/day plant would more than double Sydney Water's current energy consumption. There would be no net increase in greenhouse gas emission from Sydney Water's activities as the plant would be effectively powered using renewable energy. Sydney Water will also volunteer the plant as an 'interruptible' supply during peak demand periods. This would mean switching off or scaling down the plant for short periods during high peak demand periods such as summer.

In accordance with Sydney Water's Operating Licence, Environment Plan and Energy Management Plan, Sydney Water is acting to reduce environmental impacts resulting from its operations and in particular is:

- Minimising energy consumption and cost;
- Increasing use and/or generation of renewable energy;
- Reducing greenhouse gas emissions; and
- Complying with relevant legislation.

The first three actions are addressed in amended Statements of Commitment 1 and 2 in so far as the desalination plant will have efficient use of energy in operations and mitigate greenhouse gas emissions. The plant will incorporate energy recovery systems and energy efficient equipment will be mandatory and the plant will be powered effectively by 100 per cent renewable energy resulting in no net greenhouse emissions. Also, as required in amended Statement of Commitment 2, a Greenhouse Reduction Plan will be prepared and submitted to the Department of Planning. This plan would comprise a monitoring program to audit compliance, including complying with relevant legislation.

How will the desalination plant and infrastructure be powered?

In the unlikely event that a plant is constructed, the desalination plant and infrastructure would be connected to the electricity grid and powered using 100 per cent renewable energy. The current electricity network has the capacity to supply the project and would not need to be upgraded as a result of the project.

The government should be providing leadership to reduce energy usage and associated greenhouse gas emissions

This issue was raised in submissions in the context of energy being sourced from the grid that is predominantly supplied by coal fired power stations that generate greenhouse gas emissions. As detailed in the Environmental Assessment, these emissions were to be offset by 50 per cent. In the 2006 Metropolitan Water Plan the Government states that if a desalination plant were built, it would be powered from renewable energy, meaning that leadership is being provided by committing to an energy source that results in no net greenhouse gas emissions.

The desalination plant and all associated equipment would be designed using best available technology, such as energy recovery and energy efficient devices. Such devices have reduced power requirements in the seawater reverse osmosis process by 40 per cent over the last 10 to 15 years.

The NSW Government has made a commitment to cutting greenhouse emissions by 60 per cent by 2050 and a return to year 2000 greenhouse emissions in NSW by 2025. The NSW Greenhouse Plan released in November 2005 aims to achieve the following while sustaining a prosperous economy:

- Raise awareness of climate issues within the broader community, gain support for action and build partnerships across the economy;
- Achieve a better understanding of climate change and its impacts on NSW and start the preparation of strategies for adaptation;
- Limit the growth of greenhouse emissions and enhance the establishment of offsets such as trees;
- Place NSW on a long-term pathway to reduce emissions to levels required to avoid dangerous climate change;
- Facilitate industry take-up of new business opportunities in growing international markets for low-emission goods and services; and
- Work with other governments (both nationally and internationally) towards a coordinated global solution.

The plan states that the Government will lead by example "using its significant purchasing power to drive the uptake of new technologies and setting targets for improvements in efficiency of Government use of water, energy and transport."

Alternative energy sources have not been explored, such as nuclear and solar energy

A broad range of energy sources were considered for the plant, including electricity from the grid, gas fired generation and renewable energy using wind. Section 6.6.2 of the Environmental Assessment discussed alternative energy sources. The plant would now be powered through the grid by effectively using renewable energy.

Nuclear energy was not considered, as Australia does not have any nuclear power stations.

Options for on-site solar power generation on the roof of the buildings should be considered

The possibility of installing solar panels on the roof of the desalination plant has been considered.

Solar panels are capable of an output of approximately 0.14 kWh/m^2 for each hour of solar radiation input (data from the manufacturer). There are almost 39,000m^2 of roof available to install solar panels at a 125 ML/day desalination plant. Therefore the maximum solar power output would be about 5.44 MW. In Sydney, there is an annual average of 5.1 hours of peak sunlight daily. Hence the power that can be supplied by solar panels is 10,123 MWh/annum. The power requirement of a 125 ML/day plant is 225,000 MWh/annum. Solar energy could therefore supply 4.5 per cent of the plant's power requirements. The remaining 95.5 per cent would need to be sourced off-site.

In terms of costs, the panels, with associated electrical cabling, cost approximately $2,000/m^2. Therefore, the cost of solar panel installation supplying only 4.5 per cent of the total power requirement would be about $77.7 million. If annualised over their lifetime of 30 years at an interest rate of 7 per cent, this would be $6,260,435/annum.

The cost of using solar energy at the plant site is $618 per MWh compared to the cost of sourcing renewable power at approximately $93 per MWh.

7.3.3 Issue: Concerns about capacity of the electricity network

Is there sufficient capacity within the electricity network to meet the requirements of the desalination plant?

Sydney Water has been advised by Energy Australia that there is sufficient capacity in the electricity generation and distribution systems to accommodate the desalination plant's requirements for up to 500 ML/day. The desalination plant can operate with an interruptible power supply, if required, to assist in lessening peak electricity loads at times of high demand such as summer. This would minimise any adverse impact to the electricity network and the need to invest in additional peak load power generation.

Would the plant be damaged by a power failure?

The plant would not be damaged by a power failure. Electricity for operation of the plant would normally be supplied from the grid at 132 kV, with a back-up supply at 33 kV. If the 132 kV supply fails, the 33 kV back up supply would be used to safely shut the plant down. If both 132 kV and 33 kV supplies were to fail, essential equipment would be powered by a back-up battery supply or by an on-site generator.

Will the plant cause power blackouts during heatwaves when water and energy demand is high?

Sydney Water advised electricity distributors that the desalination plant would not need to operate when Sydney's power requirements are at their highest. That is, the desalination plant could operate with an interruptible power supply, if required, to assist in lessening peak electricity loads at times of high demand such as on hot summer days. As such, the desalination plant would not cause blackouts during heatwaves when water and energy demand is high. This is reflected in amended Statement of Commitment 64.

I have heard that there is not enough green power available in NSW to offset the greenhouse emissions, is this true?

As announced by the Premier, the desalination plant if built would effectively be powered by renewable energy. There is currently enough renewable energy through packages such as "Green Power" to power a 500 ML/day plant. As noted in 6.2.3 of the Environmental Assessment, the current sales of "Green Power" is about 480,000 MWh. To power a 500 ML/day plant with "Green Power" would require tripling of these sales and there is currently nationally installed capacity of 1,500,000 MWh, indicating there is currently enough installed capacity.

7.3.4 Issue: Concern about greenhouse gas emissions

Issues raised in relation to greenhouse gas emissions focused on concern that long term impacts associated with greenhouse gas emissions are not assessed in the Environmental Assessment, that energy use can only add to global warming that will reduce rainfall, and that the greenhouse gas offsets are not sufficient or there is insufficient capacity to meet the requirements of the project

The fundamental nature of this issue has changed since the Environmental Assessment was exhibited. The submissions responded to a proposal that greenhouse gas emissions were to be 50% offset. As outlined in the Metropolitan Water Plan (February 2006) the NSW Government is now committed to powering the plant using 100% renewable energy such that no net greenhouse gas emissions result. As stated in the Plan:

> *"In the event that construction of a desalination plant becomes necessary, the Government has planned that the desalination plant will be powered using 100 percent renewable energy.*
>
> *This does not mean that 'green electrons' will be delivered to the plant – this would be problematic, since renewable energy sources such as wind power are intermittent, while a desalination plant requires constant supply of power. However, as with the voluntary Green Power Scheme, an equivalent amount of renewable energy will be generated to match the amount of grid electricity used by the plant. The effect will be that the plant will have no net greenhouse impact".*

Consequently, many of the issues raised in submissions have been resolved by this change in Government Policy. This is acknowledged in amended Statement of Commitment 2 that requires a Greenhouse Reduction Plan be prepared identifying how the desalination plant would be powered to achieve no net greenhouse impact.

Greenhouse gas reduction options

Greenhouse gas emissions from a desalination plant can be reduced through:

- Mitigation to reduce the emissions associated with the plant at source; and
- Reducing the emissions by using energy from a range of other sources such as renewable energy.

Mitigating the emissions associated with the operation of the desalination plant can be achieved by reducing the energy requirements of the plant hence reducing the emissions generated.

The desalination plant and all associated equipment would be designed using best available technology, such as energy recovery and energy efficient devices. Such devices have reduced power requirements in the seawater reverse osmosis process by 40% over the last 10-15 years. Over time opportunities to retrofit new energy reducing technology may also become available to further reduce energy use.

As part of its standard practices, Sydney Water is acting to reduce environmental impact resulting from its operations and in particular:

- Minimising energy consumption and cost;
- Increasing use and /or generation of renewable energy; and
- Complying with relevant regulation.

To meet the target of no net emission of greenhouse gases, one option is to purchase renewable energy supply (from the grid) from a variety of renewable energy sources or from a scheme such as "Green Power". This can be procured by contract.

Another option is to secure a dedicated supply of electricity to a plant from a specific generator (e.g. through a Power Purchase Agreement) for renewable energy such as wind power. This is not the preferred option currently as it is difficult to exactly match generator output with the plant electricity requirement as the operating regime of both the desalination plant and the power generator needs to be flexible.

Proposed Greenhouse Reduction Plan

The preferred option to meet the target of no net emission of greenhouse gases would be to purchase "Green Power". The "Green Power" scheme clearly defines what is acceptable renewable energy generation and is easily verifiable. There is currently enough installed capacity of "Green Power" for a 500 ML/day plant.

The greenhouse reduction target applies for the operational life of the desalination plant. Contracts in the electricity market can generally be negotiated for up to 4 years and there is uncertainty in the State and Federal "Green" markets beyond 2012. The Greenhouse Reduction Plan will be updated as market conditions become known.

If the plant is built, it would most likely be run for a period until the drought was broken and at varying capacities to prove performance. After that, the plant operations would be variable depending on the most economic regime for running the plant, which is dependent on dam levels and the costs associated with mothballing and re-commissioning the plant. If the plant were to be shut down for extended periods, "mothballed" or run at less capacity, then greenhouse gas emissions reductions would reduce proportionally. The flexibility in respect of operations means that any future power agreement must also be flexible.

In updating the Greenhouse Reduction Plan, the evaluation criteria upon which renewable energy would be selected may include:

- Cost – measured in terms of $/tonne greenhouse gas abated;
- Certainty of delivery – contractual certainty;
- Flexibility to accommodate desalination plant operating regimes;
- Adaptability to future policy and market environments;
- Management complexity of implementation (for Sydney Water);
- Transparency and verifiability;
- Competitiveness of markets; and
- Additionality.

Additionality may be classified in two ways: emissions additionality and project additionality.

A project has "emissions additionality" if the emissions are reduced from what they would have been in the absence of the project.

"Project additionality" addresses the more difficult question of "would the project have happened anyway?" or, "is there certainty of a change in atmospheric outcome (greenhouse gas emissions) relative to business as usual?"This question has many aspects and numerous "tests" have been proposed to assess project additionality. A sample of these include:

- A financial test (is the project viable without income from the sale of greenhouse gas abatement "credit"?);
- Regulatory additionality (is the project being implemented beyond regulatory requirements?); and
- Technology test (is the project demonstrably utilising technology beyond common practice or best practice?).

Each of the additionality tests has limitations. Applying such tests too liberally (or not at all) may result in providing recognition and possibly financial reward to projects that would have proceeded anyway. Applying the tests too harshly however, may result in raising the barrier so high that development of projects is prevented.

Due to the difficulty in applying additionality criteria, Sydney Water has considered that suitable options are those that may be measured and verified under a transparent and publicly accountable scheme. Additionality criteria form part of this process.

The Greenhouse Reduction Plan will need to be somewhat flexible to accommodate the changing energy and greenhouse regulatory requirements over the life of the plant. This is acknowledged in amended Statement of Commitment 2 which requires a Greenhouse Reduction Plan be prepared identifying how the desalination plant would be powered using renewable energy.

Energy recovery devices should be mandatory, not optional

Energy recovery devices and energy efficient equipment would be used within the plant. These devices have reduced power consumption of the reverse osmosis process by approximately 40 per cent in the last 10 to 15 years.

As stated in Section 6.2.3 of the Environmental Assessment and amended Statement of Commitment 1, energy recovery systems would be mandatory and used to optimise energy efficiencies. Energy recovery devices identified in the Environmental Assessment include:

- An energy recovery turbine (such as a Pelton impulse turbine);
- A pressure and work exchanger; and
- A hydraulic turbo booster system.

Specific energy recovery devices will be determined as part of the detailed design phase. As the desalination plant would not be constructed until dam levels fall to around 30%, there may be an improvement in the energy recovery devices and the best available proven technology would be implemented.

7.3.5 Issue: Concerns about the general degradation of Kurnell

Concern was raised that Kurnell has been degraded by previous development and the desalination plant will add to this degradation

The site at Kurnell is zoned for industrial purposes and Sutherland Shire Council has approved it for industrial subdivision. As a result, the site is suitable for industry and the desalination plant is consistent with this landuse. Surrounding industrial developments include Caltex Oil Refinery, sand mines, Continental Carbon, landfill and Boral Brickworks.

From an operational perspective, the reverse osmosis desalination plant would be a relatively clean industry. It would not generate air emissions and noise would not have a significant impact on the environment. There would also be few vehicle movements during operation.

Sydney Water has committed to maintain and rehabilitate the conservation area. This requirement is detailed in amended Statement of Commitment 6. The following amended Statements of Commitment also reflect Sydney Water's commitment to ensuring that operation of the plant does not significantly impact on Kurnell's amenity:

- Amended Statement of Commitment 33 – noise emissions;
- Amended Statement of Commitment 37 – odour emissions; and
- Amended Statement of Commitment 51 – visual impacts.

7.3.6 Issue: Concern about the water quality produced by the plant

Is desalinated seawater safe to drink?

Seawater desalination can supply water that is clean, safe, healthy and pleasant to drink. Desalination is widely used in other parts of the world, including Europe, the USA, Singapore and the Middle East, to provide a safe and reliable supply of high quality drinking water. It is also used as a source of water for ships and the Australian Defence Forces.

The seawater around Sydney is suitable for desalination purposes. The seawater intake would be located well away from sewage treatment plant ocean outfalls. A complex filtration system would prevent contamination from disturbed sediments or other solids that may enter the plant through the seawater intake.

A seawater desalination plant will produce water that meets NSW Health requirements and the Australian Drinking Water Guidelines published by the National Health and Medical Research Council (NHMRC), and that can be directly integrated into Sydney's existing drinking water network.

Sydney Water has a strict monitoring and reporting process for water quality and test results are reported to customers through daily, quarterly and annual reports. Summary water quality reports are also sent to all customers with their water accounts each quarter and a summary of test results is provided each year in Sydney Water's Annual Report on Drinking Water Quality.

How is desalinated water treated?

This high quality drinking water is achieved by a complex multi-barrier treatment process, which includes screening, filtering and forcing seawater through reverse osmosis membranes under high pressure. The membranes act like a microscopic filter, allowing freshwater to pass through while retaining salt and other impurities.

How do I know it's safe to drink and use around the home? Will the desalinated water contain fluoride? What other chemicals will it contain and will they be harmful to us?

The water will comply with the Australian Drinking Water Guidelines published by the NHMRC. Close monitoring for compliance with a range of quality controls and testing in accordance with the Australian Drinking Water Guidelines will ensure the quality of the drinking water. As with Sydney's existing drinking water, it would be disinfected, stabilised and fluoride would be added to protect against dental decay.

Would the discharge from the Cronulla Sewage Treatment Plant ocean outfall affect the quality of the water?

The seawater intakes are well away from the Cronulla Sewage Treatment Plant ocean outfall (approximately 2.8 kilometres). Modeling indicates that although effluent from the ocean outfall at Potter Point may on occasion reach the intake zone, the dilutions are high and the effluent is treated to a tertiary level. The reverse osmosis process is robust enough to remove impurities. As such, tertiary treated discharges from Cronulla Sewage Treatment Plant would not impact on the quality of water produced by the desalination plant.

Will it taste or smell different to Sydney's existing water?

The desalinated water is treated in the same way as Sydney's existing water so there would be no perceptible change in the taste and smell of the water.

Is it suitable for people with special needs?

As is the case with Sydney's existing drinking water, people with special health needs, such as those with a severely weakened immune system – including some people with HIV and AIDS, transplant recipients, and dialysis and cancer patients – may wish to talk to their doctor about taking special care in how they use water.

7.3.7 Issue: Concern about the visual impact of the plant

Sydney Water is committed to appropriate design of the desalination plant itself and landscaping the site at Kurnell. Amended Statement of Commitment 51 indicates designs of the desalination plant will be consistent with the visual landscape from local and regional vantage points including the use of colour, landscaping and retaining the conservation area to allow screening.

As indicated in Section 4.3.5, the plant would be designed to minimise potential visual impacts. This design will:

- Support Sydney Water's commitment to restore and where possible enhance the site to meld into and support the natural communities of the surrounding peninsula;
- Acknowledge that the environmental condition of the areas surrounding the desalination plant site suggest that the plant should not be viewed in isolation but should be viewed as part of a corridor connecting the bay to the beach. The beach to bay connection allows an appreciation of a range of environmental conditions within the peninsula; and
- The design of the facility will respond to the natural environment by integrating with the landscape and hence informing the design of the buildings beyond the base technical requirements.

7.3.8 Issue: The benefit of producing 500 ML/day has not been presented. Why not a greater volume?

A plant with a capacity of 500 ML/day would supply up to a third of Sydney's drinking water needs. In combination with other initiatives, this volume is sufficient to stabilise Sydney's water supplies in events similar to the 2003/04 drought.

7.3.9 Issue: Hazards and risks, such as the need to evacuate Kurnell if there is an incident at Caltex

Incident management measures including evacuation procedures will be developed to ensure that the desalination plant does not adversely affect existing strategies to evacuate Kurnell in an emergency. Given the limited number of staff at the desalination plant, it is unlikely that this additional traffic will impact on existing evacuation plans for the peninsula.

As required in Statements of Commitment 65 and 66, an Environmental Management System (EMS) will be developed for the construction, operation and maintenance of the desalination plant and all associated infrastructure. A requirement of an EMS is to have Incident Management Plans including Emergency Evacuation Plans.

7.3.10 Issue: Concern about chemical use and storages on-site

The Environmental Assessment identifies chemicals that may be used in the process. When will a decision be made on the chemicals that will be used? Without details on the type of chemicals that will be used, including volumes and concentrations, it is not possible to determine the impacts

The Environmental Assessment identifies chemicals that are commonly used in reverse osmosis desalination plants. During the course of pilot testing and detailed design, Sydney Water will refine treatment processes and identify preferred chemicals (refer amended Statement of Commitment 54).

The Environmental Assessment notes that the contractor will determine where chemicals are stored on-site and will be responsible for bunding arrangements. A chemical storage plan will be required to ensure safe use and storage of all chemicals, particularly flammable liquids on the project site

Amended Statement of Commitment 53 requires that further hazard screening be undertaken during detailed design to ensure that chemical use and storage during operation is in accordance with relevant guidelines.

Amended Statement of Commitment 54 requires that measures be implemented to manage chemical use and storage risks during design and operation in accordance with relevant legislation, standards and guidelines. Any contractor engaged on the project will be required to adhere to the requirements identified.

7.3.11 Issue: What is the impact from chemicals used to preserve the membranes?

The Environmental Assessment does not identify what chemicals will be used to preserve the membranes during shutdowns or what impact these chemicals will have on the environment

A 40 per cent solution of sodium bisulfite is typically used to preserve the membranes. The preservation solution once used will either be gradually bled into the ocean discharge or taken off site in tankers. If discharged to ocean, the solution will be oxidised then neutralised prior to discharge through the outlet to ensure there is no impact on the receiving waters.

7.3.12 Issue: The reverse osmosis process is not adequately described

The reverse osmosis process was described in Chapter 6 of the Environmental Assessment. The major features of the technology were presented, though further details are available in published literature. The process description documented was sufficient to allow the project to be assessed under Part 3A of the EP&A Act.

Is it a one-pass or two-pass process?

It is likely that a two-pass reverse osmosis process will be adopted to meet Sydney Water's current drinking water quality standards.

7.3.13 Issue: Concern about operational noise

What impact would operation have on the local noise environment?

Sydney Water has undertaken a preliminary investigation to determine the likely operational noise impacts. Modelling predicts that, based on the background noise levels on the Kurnell peninsula, operational noise levels would be more than 11dB(A) below the project specific noise goals as shown in Table 7.3. Noise goals for sleep disturbance would also be met. Any adverse noise impacts on Kurnell residents from operation of the desalination plant are highly unlikely.

Unattended background noise monitoring was conducted between Thursday 4 August 2005 and Wednesday 17 August 2005 at two locations with low existing ambient noise in Kurnell village and surrounds, and at a third location potentially most affected by traffic noise during the construction phase. An environmental noise logger was used to record noise levels continuously at each monitoring location over the survey period.

Data from periods with any rainfall and/or wind speeds in excess of 5 m/s (approximately 10 knots) were discarded to ensure the information is representative of existing conditions.

Results of the background noise survey are summarised in Table 7.1 for daytime, evening and nighttime periods.

Table 7.1 Summary of existing $L_{A90\ (15\ minutes)}$ Rating Background (RBLs) and existing $L_{Aeq\ (period)}$ ambient noise levels

Monitoring location	$L_{A90\ (15\ minute)}$ rating background noise level			$L_{Aeq\ (period)}$ existing ambient noise level		
	Daytime 0700 - 1800 hours	Evening 1800 - 2200 hours	Nighttime 2200 - 0700 hours	Daytime 0700 - 1800 hours	Evening 1800 - 2200 hours	Nighttime 2200 - 0700 hours
BG1 Horning Street, Kurnell	41	43	40	67	58	55
BG2 Torres Street, Kurnell	42	43	40	57	54	51
BG3 Cronulla High School	54	47	40	65	60	60

Note: The L_{A90} represents the level exceeded for 90 per cent of the time and is referred to as the average minimum or background noise level.
The L_{Aeq} is the equivalent continuous noise level defined as the level equivalent to the energy average of noise occurring over a measurement period.

Operator-attended (15 minute) noise surveys were conducted at each of the above locations in Table 7.1 on Wednesday 17 August 2005 to determine the character of the existing background noise levels during daytime, evening and nighttime periods. Results are presented in Table 7.2 together with a description of the noise sources and weather conditions.

Table 7.2 Operator-attended background noise survey results – 17 August 2005

Location (Start time conditions)	Measurement description	Primary noise descriptor (dBA re 20 µPa)					Description of noise emission and typical maximum levels (L_{Amax})
		L_{Aeq}	L_{A1}	L_{A10}	L_{A50}	L_{A90}	
Location BG1 Horning Street, Kurnell 1650 hours 0 okta SW 2-4 m/s gust 16^{0}C, 67 per centRH	Ambient	54	64	57	51	47	Passing vehicles 55 - 65 Planes overhead 65 - 75 Caltex Refinery 46 - 51 Birds 45 - 55
Location BG1 Horning Street, Kurnell 1950 hours 0 okta S 1-4 m/s gust 14^{0}C, 71 per centRH	Ambient	56	69	56	50	48	Passing vehicles 55 - 63 Planes overhead 65 – 74 Caltex Refinery 46 - 50
Location BG1 Horning Street, Kurnell 2250 hours 0 okta SE 1-3 m/s gust 13^{0}C, 77 per centRH	Ambient	49	59	52	46	43	Distant traffic 50 - 60 Caltex Refinery 43 - 46
Location BG2 Torres Street, Kurnell 1710 hours 0 okta SW 1-4 m/s gust 16^{0}C, 71 per centRH	Ambient	51	68	53	46	44	Vehicles on Torres St 58 - 61 Planes overhead 65 - 70 Pedestrians 55 - 60 Caltex Refinery 44 - 46
Location BG2 Torres Street, Kurnell 2010 hours 0 okta S 1-4 m/s gust 13^{0}C, 75 per centRH	Ambient	56	66	60	50	46	Vehicles on Torres St 58 - 65 Planes overhead 65 - 70 Caltex Refinery 44 - 47
Location BG2 Torres Street, Kurnell (Front Yard) 2310 hours 0 okta SE 1-3 m/s gust 12^{0}C, 80 per centRH	Ambient	50	59	55	48	46	Vehicles on Torres St 55 - 60 Distant traffic 45 - 55 Caltex Refinery 44 - 46
Location BG3 Cronulla High School (Captain Cook Dr) 1745 hours 0 okta SW 1-3 m/s gust 17^{0}C, 65 per centRH	Ambient	67	76	71	64	56	Vehicles on Capt Cook Dr 65 - 75 Distant traffic 55 - 65 Birds 50 - 55
Location BG3 Cronulla High School (Captain Cook Dr) 2045 hours 0 okta S 1-3 m/s gust 14^{0}C, 70 per centRH	Ambient	59	69	62	55	50	Vehicles on Capt Cook Dr 60 - 75 Distant traffic 50 - 60
Location BG3 Cronulla High School (Captain Cook Dr) 2345 hours 0 okta SE 1-3 m/s gust 13^{0}C, 73 per centRH	Ambient	59	67	63	54	50	Vehicles on Capt Cook Dr 60 - 70 Distant traffic 50 - 60

Note: With reference to the Table above, an okta is a measure of cloud cover (in fractions of eight).

The measured background noise levels at BG1 and BG2 are fairly typical of those of a suburban environment with some local traffic noise, aircraft noise contributions associated with Sydney Airport and industrial noise contributions from the nearby Caltex Refinery, which lies approximately 500 metres southeast of both locations.

At both BG1 and BG2, the noise emissions from the Caltex Refinery tended to control the background noise level, with contributed levels of approximately 45 dBA at both locations.

At BG3, the ambient noise environment was dominated by traffic noise from Captain Cook Drive and Elouera Road.

The operational noise emission criteria for the desalination plant and associated infrastructure have been estimated in accordance with the Department of Environment and Conservation's NSW *Industrial Noise Policy*. Establishing the operational noise criteria includes an assessment of rating background levels (RBLs), the intrusiveness criteria and the amenity criteria.

The intrusiveness criteria have been set for various hours of operations based on the RBLs at the monitoring locations. The residences in the village of Kurnell are conservatively best described by the "suburban" receiver type and the amenity criteria have been set using the $L_{Aeq\ (period)}$ contribution from industrial noise in conjunction with the amenity criteria.

The resulting external operational intrusive and amenity noise emission criteria are given in Table 7.3. Any adverse impacts on Kurnell residents as a result of operational noise from the desalination plant are highly unlikely.

Table 7.3 External operational noise emission criteria - dBA

Receiver	Intrusiveness criterion $L_{Aeq\ (15\ minute)}$			Amenity criterion $L_{Aeq\ (period)}$		
	Daytime 0700 - 1800 hours	Evening 1800 - 2200 hours	Nighttime 2200 - 0700 hours	Daytime 0700 - 1800 hours	Evening 1800 - 2200 hours	Nighttime 2200 - 0700 hours
BG1 Horning Street, Kurnell	46	48	45	57	48	45
BG2 Torres Street, Kurnell	47	48	45	47	44	41
BG3 Cronulla High School	59	n/a	n/a	45[2]	n/a	na/

Note 1: Controlling daytime, evening and nighttime noise criteria are shaded.
Note 2: The amenity criterion assumes a 10 dBA insertion loss from inside classrooms to outside.

The controlling operational noise criteria for all assessment periods at BG1 and BG2 are the intrusiveness and amenity criteria respectively whereas the controlling criterion for BG3 during the daytime assessment period is the amenity criterion.

Based on the output from the noise modelling and on the noise emissions criteria presented in Table 7.3, the 'worst case' predicted $L_{Aeq\ (15\ minute)}$ noise level contributions from the proposed desalination plant are expected to be less than 30 dBA at the nearest residential residences, significantly below the most stringent night-time criteria of 45 dBA and 41 dBA at BG1 and BG2, respectively. It is considered that any adverse impacts on Kurnell residents as a result of noise emissions from operation of the desalination plant are highly unlikely.

In relation to the potential for sleep disturbance, the Department of Environment and Conservation's Environmental Noise Control Manual Chapter 19 dated 22 March 1985, suggests that the $L_{A1\ (60\ second)}$ noise level from any specific noise should ideally not exceed the background noise level by more than 15 dBA.

A review of noise from operations similar to the proposed desalination plant shows that maximum, or $L_{A1\ (60\ second)}$, noise levels are typically less than 10 dBA above the $L_{Aeq\ (15\ minute)}$ intrusive level. Hence, if the $L_{Aeq\ (15\ minute)}$ intrusive criteria (i.e. background plus 5 dBA) are achieved then the Department of Environment and Conservation's sleep disturbance criteria would also be met.

As indicated in Amended Statement of Commitment 33, an operational noise assessment would be undertaken in accordance with the *Industrial Noise Policy* and an Operational Noise Management Plan would be prepared. This would identify project specific noise criteria that the project would be designed to comply with at noise sensitive locations such as residences and recreational reserves. This would also include an assessment of the potential for noise emissions to cause sleep disturbance.

7.3.14 Issue: Concern about traffic noise

What impact would operational traffic have on the local noise environment?

The desalination plant would be fully automated. The worst-case traffic generation by a 500 ML/day plant is expected to be as follows:

- 10 employees travelling to the site by private vehicles and parking on-site;
- A typical working week consisting of 9am to 5pm shifts from Monday to Friday;
- 2 to 3 employees working at the plant outside of these periods;
- Up to 13 trucks trips (26 movements) on a normal weekday; and
- Worst case peak hour movement of truck traffic is likely to be 4 truck movements during the AM and PM peak period.

A truck movement is one way, either leaving or arriving at the plant site. It is anticipated that chemicals would be transported in bulk to the site to limit the number of deliveries.

Based on the above worst case traffic generating assumptions, the daily traffic generated by the site is likely to be 26 light vehicle movements and 26 truck movements. The worst case peak hour flow is likely to consist of 13 light vehicle movements and up to 4 truck movements. Given the low number of vehicle movements compared to those on the local traffic network, operational vehicles would not significantly impact on the noise environment.

Amended Statement of Commitment 33 indicates that, where possible, heavy vehicle movements would be scheduled during the daytime hours.

7.3.15 Issue: Concern that stormwater runoff from the site may impact on water quality in Quibray Bay

The potential for stormwater discharges to impact on water quality in Quibray Bay was considered in the preparation of the Environmental Assessment. Amended Statement of Commitment 7 indicates that a Stormwater and Groundwater Management Plan would prepared to protect natural ecosystems from stormwater pollution. These mitigative measures would minimise potential impacts on water quality in Quibray Bay.

7.3.16 Issue: Concern about air emissions generated by the plant

There is a perception that operation of the plant would contribute to air quality problems in the Sydney Basin due to power generation

The plant would source energy from the grid and effectively from renewable sources, most of which are either wind of hydroelectric schemes outside the Sydney basin that result in no air emissions. Consequently there is not expected to be an impact on the air quality in the Sydney Basin.

The potential for odorous emissions from the water treatment process at stages beyond removal of marine debris has not been discussed. If there is a potential for emission of odorous chemicals then this should be characterised and control strategies proposed

Statement of Commitment 37 requires that the desalination plant be designed to minimise the intake of marine debris and that it meet the *Protection of Environment Operations Act 1997* provisions for no offensive odours during operations. In addition, Sydney Water operates a complaints register on all of its water and wastewater treatment plants which helps to identify any odour issues should they occur.

Chemicals would be used in the water treatment process. Odorous emissions are not anticipated as the chemicals used would be the same as for other existing water treatment plants and these do not cause odour issues in adjoining communities.

7.3.17 Issue: Concern about the operational costs of the project

Issues related to the operational costs of the project were concerned with the actual operating costs and the costs to the consumer

The price of water for Sydney Water's customers is set by IPART. When IPART determines the price of water it considers the impact of any increase in price on Sydney Water's customers. Sydney Water has in place a number of initiatives that assist pensioners and low-income households who have difficulties paying their water bills.

The likely increase in the average water bill as a result of the construction and operation of a desalination plant would be in the order of $60 per annum for a 125 ML/day plant and $150 per annum for a 500 ML/day plant.

Should this increase in any customer's bill result in their experiencing hardship in paying, a range of assistance schemes are available including:

- Alternative payment arrangements can be implemented including deferring the payment for a short time, arranging a suitable payment instalment plan or providing a 'flexipay' card which enables customers to make small ongoing payments;
- Sydney Water offers payment vouchers for people in financial difficulty. Assessment of these payments is done through accredited community agencies;
- Pensioners receive a rebate on their bill; and
- Customers with financial difficulties are eligible to obtain a No Interest Loan to purchase water efficient washing machines.

7.3.18 Issue: Notifying the community

Protocols must exist to notify stakeholders of relevant activities and any incidents should they occur

Amended Statement of Commitment 68 requires communication processes to be specifically developed at the appropriate time for impacted communities. Sydney Water is also required as a condition of its operating licence to operate a complaints and incident management system, including notifying of customers in case of incidents.

Additionally, Sydney Water operates a complaints and incident management system, including notification of customers in case of incidents. Protocols exist in Sydney Water regarding the notification of customers affected by activities and incidents. These protocols are reflected in formal arrangements with contractors. Such arrangements would exist with contractors delivering the desalination project.

The protocols, tailored to the specific circumstances and needs of each project, or project component identify all stakeholders, contact details for the stakeholders, the nature of the issue(s) that the stakeholder needs and wishes to be advised on, the method of notification, the timing of notification and the frequency of notification. The protocols also specify incident management procedures and the requirements for the management and recording of complaints.

7.3.19 Issue: Concern about flora and fauna

The project has the potential to impact on groundwater and hydrology. This may impact groundwater dependent ecosystems, such as wetlands

As required in amended Statement of Commitment 8, strategies for groundwater recharge would be developed to maintain the water balance at the site to protect sensitive groundwater dependent ecosystems during operation.

The project has the potential to impact on threatened species such as the Grey-headed Flying Fox during operation

Potential operational impacts on the Grey-headed Flying Fox were considered in the Environmental Assessment. Amended Statement of Commitment 6 requires that management measures be developed as part of overall property maintenance to ensure the conservation area within the desalination plant site is maintained and rehabilitated to protect endangered ecological communities and habitat for threatened species. This includes measures to minimise impacts on the seasonal roosting colony of the Grey-headed Flying Fox.

7.3.20 Issue: The Kurnell peninsula is the aerial gateway to Sydney and the desalination plant would create another blight on the landscape

This is discussed primarily in Section 4.3.5. The site is located within an industrial area and is surrounded by industrial developments. Amended Statement of Commitment 51 indicates that the desalination plant would be designed to be consistent with the visual landscape from local and regional vantage points including the use of colour, landscaping and retaining the conservation area to allow screening.

7.3.21 Issue: Concern regarding the lack of detail on the operational regime for the plant

Do you need to repair the desalination plant if it is switched off for 6 months?

The desalination plant does not need to be 'repaired' after it is switched off. The plant would follow a decommissioning sequence before being switched off. This would include cleaning and filling the membranes with a solution to preserve them.

Recommissioning the plant would include removing the preserving solutions from the membranes and testing all components of the plant.

The Environmental Assessment notes that water production may be "reduced, suspended and recommenced as required". Recent experiences with desalination plants suggest that this is not a simple process and can result in considerable expense and additional chemical usage that has not been assessed in the Environmental Assessment

Reducing or suspending operation of a desalination plant whilst not simple is a routine process that would result in additional expense. A decision to turn the plant on or off would balance available storage volumes and supply security with the economics of operating the plant. The Environmental Assessment covers the use of chemicals under all circumstances.

How is pre-treatment and potabilisation performed under reduced capacity operation?

At a reduced load, the flow velocity through the pre-treatment units is less than the design velocity. Pretreatment units can also be operated alternately to keep them in operation, which means that no preservation is required at all.

The potabilisation plant and associated equipment can also operate at a reduced load, which ensures the required minimum flow remains and all associated equipment remains fully operational.

Will the operational level of the plant influence the operational level of the intake?

Detailed design would determine whether the operational level of the plant influences the operational level of the intake. It is most likely that the plant intake would be designed to operate at a reduced rate.

Will boron, which occurs naturally in seawater, be a problem?

The concentration of boron in treated desalinated water would be less than half the Australian Drinking Water Guidelines published by the NHMRC. The NSW Department of Health has confirmed that it endorses the Australian Drinking Water Guidelines guideline for boron.

Citrus trees are known to be susceptible to boron at relatively low concentrations, although at the specific target levels for the desalinated supply there is unlikely to be any adverse effects.

7.3.22 Issue: Waste should be managed in accordance with relevant guidelines

A waste management plan should detail practical measures to be used for the classification of waste in accordance with the EPA's *Environmental Guidelines: Assessment, Classification and Management of Liquid and non-Liquid Waste*

The need to classify and manage waste in accordance with the EPA *Environmental Guideline: Assessment, Classification and Management of Liquid and non-Liquid Waste* (EPA 1999) during all stages of the project is reflected in amended Statement of Commitment 57 which requires a Waste Management Plan to be prepared.

8. Operation of the Intake

8.1 Summary of the Environmental Assessment

The assessment of impacts on water quality and aquatic ecology considered aquatic ecosystems, recreation, aquaculture and visual amenity. The intake would be located on rocky reef in the Tasman Sea remote from swimming beaches or sensitive marine areas.

Marine water quality was assessed against the Proposed Marine Water Quality Objectives for NSW Coastal Waters (EPA, 2002) using relevant indicators from the Australia and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2000).

8.2 Summary of issues related to the operation of the intake

Submissions raised issues related to the operation of the seawater intake. The quality of water at the seawater intake, including the impacts of sewage outfalls and runoff from the Caltex oil refinery on water quality, were raised in submissions.

The effects of the intake on aquatic ecology were also raised in submissions. The potential impacts that the intake may have on whales were identified as were considerations related to intake design.

8.3 Response to issues related to the operation of the intake

8.3.1 Issue: Concern about intake water quality

There is insufficient information relating to background water quality and potential discharges in the vicinity of the intake and outlet structures to provide for a robust assessment of impacts

Sydney Water commenced a sampling program in April 2005, collecting and analysing seawater samples at the proposed intake location. The objectives of the Seawater Quality Assessment Study are:

- To characterise seawater quality, determining seasonal variations, the influence of freshwater flows and the effect of hydrodynamic conditions; and
- To prepare an inventory of point and diffuse pollution sources (e.g. nearby industry, agricultural run-off, frequency of shipping or other marine activities etc.) and to determine any impacts on water quality.

The Seawater Quality Assessment Study Program is following ASTM D4195 – 88 Standard Guide for Water Analysis for Reverse Osmosis Application (Volume 11.02 of Annual Book of ASTM Standards). Additional parameters would be added in the future according to the latest design experience with reverse osmosis. Sampling and analysis is divided into the following programs:

- Physical and aggregate parameters (temperature and salinity);
- Cations and anions (scaling prediction etc);
- Pollution assessment (e.g. oil and grease); and
- Marine effects - to determine impact of marine conditions on water quality.

Sydney Water has undertaken a survey to identify discharges in the vicinity of the proposed intake location. The survey showed that the key inputs were from locally treated industrial wastewater and sewage effluent outfalls including the Cronulla Sewage Treatment Plant Potter Point outfall, and Tabbagai Gap and Yena Gap associated with the Kurnell Oil Refinery. Modelling indicates that the impact of these outfalls at the Kurnell Peninsula is low because outflows are highly diluted (Environmental Assessment Appendix A2).

On a broader scale, inputs to the coastline and oceanic waters off Sydney include stormwater and sewer overflows during major storms from Botany Bay, and sewage effluent from the deep ocean outfalls. There is some influence of the flood and ebb tide from Botany Bay around the northern end of the headland on the Kurnell peninsula, however, modelling of storm flows from Botany Bay indicate that these are likely to bypass the intake. The deepwater ocean outfalls discharge approximately 1,000 ML/day through three outfalls at North Head, Bondi and Malabar between 2.2 and 3.7 kilometres offshore in water depths between 50 and 80 metres.

The primary goal of Sydney's desalination project is to produce drinking water that is safe, hygienic and pleasant to drink. To achieve this, the entire reverse osmosis desalination plant is designed as a multi-barrier system to remove pathogenic agents such as bacteria, viruses, and protozoa comprising the following steps:

- Dual media filtration;
- Cartridge filtration;
- First pass desalination through reverse osmosis membranes;
- Second pass desalination through brackish water reverse osmosis membranes; and
- Final disinfection by chloramination.

The use of high rejection reverse osmosis membranes would produce drinking water of a very high and consistent quality. The membranes are capable of removing practically all contaminants in the source water; turbidity, taste, odour, colour, viruses, salts etc. Substantial removal of natural organic matter by the membranes would limit disinfection by-product (DBP) formation and results in very low DBP concentrations in the drinking water.

Target drinking water quality is the key driver in desalination design. The reverse osmosis desalination system meets the target levels for total dissolved solids concentration (TDS), bromide, chloride and other constituents. Reverse osmosis product water (permeate) is adjusted for pH, alkalinity and hardness (referred to as potabilisation) and also to protect downstream water supply infrastructure from corrosion. The water is also disinfected and fluoridated in accordance with current Sydney Water practices.

The desalination technology proposed would be able to cope with some fluctuations in intake quality without affecting treated water quality. The impact of discharged seawater concentrate on water quality at the intake site was also modelled. This showed that for a seawater concentrate of 65 ppt discharging into seawater of 35 ppt, the salinity elevation at the intake would be less than 0.25 ppt. This is within the natural levels of salinity variation. A detailed seawater sampling program for the Kurnell intake location has been ongoing since mid-2005 with results for six months showing little variation in seawater quality for process parameters.

Potential impact of algae on inlet water quality

Excessive growth of phytoplankton (algae, dinoflagellates etc.) can occur in coastal seawater and estuaries. Most marine algal blooms are harmless, resulting only in a discolouration of the water. However, some blooms can be toxic to aquatic organisms and humans or potentially harmful by decreasing oxygen levels in the water.

Of the two main algal species that might be expected at Kurnell, *Trichodesmium* occurs predominantly in spring, summer and early autumn and is particularly prevalent in calm and stable weather conditions. *Noctiluca* occurs predominantly in spring and summer especially after heavy rainfall. Blooms tend to peak in December through to March although the frequency is very difficult to predict. *Noctiluca* feed voraciously off diatoms. These blooms can contain up to 10^6 dead cells/L but are generally present only as surface slicks of dead cells. After storms and large weather variations blooms tend to die off.

The seawater intake point for the desalination plant would be approximately 20 to 25 metres deep. It is not expected to be impacted by algae near the water surface.

Amended Statement of Commitment 17 identifies further seawater quality sampling to confirm the adequacy of intake water quality.

Potential impact of radionuclides from ANSTO discharges at Potter Point

ANSTO has a trade waste agreement with Sydney Water and as such the Cronulla STP system licence addresses discharge of radionuclides. Part of the licensing regime considers the impact of all deleterious elements in the waste stream. This obligation also extends to Sydney Water's licence with the DEC. Modelling of point source discharges showed that any effluent drawn into the desalination inlet would be subject to further dilution, ensuring adequate quality of incoming seawater.

Appendix A2 of the Environmental Assessment indicates that discharges from the Potter Point outfall would be diluted by greater than 320 times for 99 per cent of the time, and 1,350 times for 90 percent of the time. The desalinated water would be of a quality which meets the NSW Health requirements and the Australian Drinking Water Guidelines published by the NHMRC.

The potential for discharges from the Caltex Oil Refinery to be drawn into the intake?

The treatment processes proposed are extremely robust and capable of providing appropriate drinking water quality under a variety of seawater conditions. Nonetheless, this issue was considered as part of the Ocean Modelling report presented in Appendix A2 of the Environmental Assessment. Discharges from the Caltex Oil Refinery at Tabbagai Gap and Yena Gap, have some impact on the intake. These intermittent, licensed discharges are highly dilute at the point of intake, with dilutions in the order of 200 to 500. The intake would draw from the lower part of the water column whereas the discharges are surface based.

Ongoing water quality sampling at the intake location (refer to amended Statement of Commitment 17) would be used to validate these modelling predictions. The water quality sampling to date shows water quality with little variation.

The potential impact of the ebb tide from Botany Bay on water quality at the inlet

One of the influences on water quality at the intake location may be the tidal emptying of Botany Bay.

The ebb tide discharge from Botany Bay is well mixed over the entrance depth. As it leaves Botany Bay, these waters mix with the surrounding ocean waters which are generally moving southward or northward. This mixing process could be expected to dilute waters from Botany Bay with the surrounding seawater by a factor between 2 and 10 by the time they reach the proposed intake.

Preliminary modelling of a plume from Botany Bay indicated dilution of around 10. A worst case scenario for dilution at the intake would be on the peak of the ebb discharge with slow oceanic currents moving southward, for which there may be no dilution of the Botany Bay discharge. However, given that this is only likely to occur right on the peak discharge from the Bay and the oceanic currents are generally sweeping more water past this area, then the percentage occurrence of low dilutions would be small. The treatment process would be sufficiently robust enough to accommodate variations in water quality.

During flooding from the Georges River, a freshwater discharge would be included with the ebb tide discharge from Botany Bay. The presence of winds or waves is likely to mix this freshwater from the upper 10 metres of the ocean waters through the water column. However, there has been no measurements made of a freshwater plume leaving Botany Bay in a 1 in 1 year flood or greater and it is likely that winds or waves would occur at the same time as floods. One of the main aims of the ongoing Seawater Quality Assessment Study Program is to determine the impacts of storms on water quality. Whilst the present understanding is that the plant would adequately cater for this natural variability, this would be confirmed during detailed design. This is reflected in the amended Statement of Commitment 17.

Concern that the intakes may draw in the discharges from STP outfalls, effectively meaning that the plant would be recycling treated effluent

Sewage Treatment Plant (STP) discharges have some potential to influence water quality at the intake location. The Ocean Modelling Report prepared by the Water Research Laboratory (2005) as part of the Environmental Assessment (Appendix A2) considered the potential for discharges from point sources of pollution to impact on the quality of water drawn into the intake. This included point sources such as the Cronulla, North Head, Bondi and Malabar STP outfalls.

The impact at the Kurnell intake from the deepwater ocean outfalls from the North Head, Bondi and Malabar STPs is negligible with extremely high dilutions in all but a small percentage of the time. The Potter Point Outfall does impact this site up to 26 per cent of the time but dilutions are high and the STP effluent is treated to a tertiary level.

Plumes from these point sources were simulated for a 12 month period, 1 January 1995 to 31 December 1995. For 99 per cent of the time the deepwater ocean outfall effluent would be diluted more than 1,500 times before reaching the Kurnell intake. The tertiary treated effluent from the Cronulla STP outfall at Potter Point would reach the intake for a greater percentage of time, however, the dilution is greater than 1,350 times for 90 per cent of the time and 320 for 99 per cent of the time. The design would safely cater for such diluted feedstock and ensure there would be no danger to health from harmful organisms.

Amended Statement of Commitment 17 identifies further investigations to consider the potential impacts of STPs on water quality.

8.3.2 Issue: Impacts on aquatic ecology due to impingement and entrainment of biota

What sort of screens will be installed on the intakes to minimise the entrainment and entrapment of marine organisms?

Amended Statement of Commitment 16 states that measures would be developed to ensure that there are no significant impacts on aquatic ecology from the seawater intake during operation. This includes refining the location of the intake and developing design measures to minimise as far as practicable the amount of biota that are impinged on intake screens or entrained into the plant.

The following sections outline options that may be considered in the design of screens for the intake.

Passive Screens

There are a number of intake designs that can be incorporated into a large desalination facility. Most designs stem from a long history of electric power facility intake designs.

Recent advances in offshore intake screens include Cylindrical Wedgewire Screens, also known as Passive Screens, which avoid high levels of impingement and entrainment. These are designed to enable large water intakes at low velocity and physical exclusion of marine biota with screen mesh sizes ranging from 0.5-10mm.

Passive Screens have a proven ability to reduce impingement and entrainment. Their effectiveness is related to their slot width and low through velocity. It has been demonstrated that 1mm openings are highly effective for larval exclusion and to reduce entrainment (Pankratz 2004).

If screens of this type can be used there is potentially no need for further protection upstream of the intake.

Velocity caps and travelling screens

A velocity cap consists of a cover placed over a vertical terminal of an offshore intake pipe. The aim of the cover is to convert vertical flow surrounding the intake pipe to horizontal flow. It has been noted that fish would avoid rapid changes to horizontal flow and velocity cap intakes have been shown to provide 80 to 90 per cent reduction in fish impingement at two California power stations. However, velocity caps do not reduce the entrainment of eggs and larvae.

Travelling screens are equipped with revolving wire mesh panels that rotate through the water and are cleaned by a high-pressure water spray. These technologies are designed to prevent debris from entering the system rather than to minimise impingement and entrainment.

Screen maintenance

There have been incidences of single intake structures being completely blocked (e.g. by an abandoned fishing net followed by a mass of dead kelp). If there is no periodical cleaning of the screens, the slot-holes would block within a relatively short period of time, thus increasing the velocity and energy requirements of the intake waters.

To protect the intake from large debris, piled structures can be constructed around single intakes.

Depending on final design, some form of air or water blasting may be periodically used to assist in screen maintenance. Air blasting is common on large screens to prevent marine build up.

An air blasting system can be installed through pipes placed in the intake screen system.

Providing several separate risers would reduce the risk of total blockage. For the intake for a 500 ML/day plant to be effective, it would require five (four duty, one reserve) inlet tubes, or risers.

Concluding summary

Examples of technology described above indicate that screens for low velocity intake of seawater and/or physical exclusion of marine biota are potentially suitable for a desalination plant at Kurnell. Final design of the intake structure would be subject to data collected from pilot testing and final detail designs.

The need for further studies to assess impingement and entrainment indicates deficiencies in the existing assessment

The Environmental Assessment included a desktop review of the potential impacts of the project on aquatic ecology and site inspections undertaken by The Ecology Lab. Issues considered included impacts due to the impingement and entrainment of fish, fish larvae and plankton. However, the assessment of impacts was restricted by a lack of information on local fish and plankton and more generally a lack of similar projects within Australia which might provide data on marine habitats and biota.

To address this issue, amended Statement of Commitment 18 requires a preliminary plankton study to be undertaken as part of pilot plant trials to further investigate potential impacts and allow the development of a refined and feasible monitoring program.

A smaller-scale pilot plant intake located close to the proposed intake for the main desalination plant provides an opportunity to fill some of the gaps required to predict the impacts of a 500 ML/day plant on aquatic ecology, particularly those related to optimal screen sizes and abundance, composition of planktonic communities in the area and water quality. The preliminary plan for the plankton study would comprise two parts: in situ sampling using plankton nets towed by boats and/or divers using underwater scooters, and collecting plankton samples from an access port in the water intake stream from land.

Has the potential for whales to collide with the intake and outlet structures been considered in the assessments for the Environmental Assessment?

The Environmental Assessment recognised that during migration some species of whale can pass near the shore at Kurnell where the intake and outlet for the desalination plant would be located. The Environmental Assessment concluded that whales would potentially be disturbed during construction but there would be no adverse effects of ongoing operations.

The weight of evidence suggests that if whales were to swim at a depth where they could potentially collide with the intake and outlet structures, it is likely that they would be able to navigate around (or over) the structures in the same way as they are known to do around stationary man-made objects such as boats or oil drilling platforms, or natural raised area of isolated reef (bomboras). Bomboras would be common (in similar depths as proposed for the outlet and inlet) along whale migratory routes.

Has the potential for whales to become entangled been considered in the assessments for the Environmental Assessment?

Entanglements have led to the development of alarms (acoustical protection of fishing gear) that enhance the echo and visual characteristics of the gear (Lien et al. 1989, in Volgenau et al. 1995). Such alarms are used in NSW to help prevent entanglement of whales in the Beach Meshing (Shark Exclusion) Program (Internet Reference 1).

There is potential for these types of alarms to be used on any buoys connected to the inlet and outlet structures of the desalination plant, but at this point they are considered unnecessary due to the relatively small potential for entanglement. It is considered that entanglement would be unlikely to occur, due to the compact design of the structures and it is unlikely that there would be ropes or other linear extensions attached to the structures during ongoing operations.

8.3.3 Issue: What chemicals would be used to clean the intake pipes?

Chlorine would be the active ingredient in any chemical used to clean intake pipes, most likely in the form of sodium hypochlorite. This would be dosed into the intake so as to suction it into the desalination plant i.e. the solution would not be discharged to ocean. This type of treatment is similar to that used to keep swimming pools clean.

8.3.4 Issue: Is there a need for exclusion zones?

Factors such as protection of structures drive the necessity to have exclusion zones. Maritime structures (including the intake and outlet) would be designed to minimise impacts on navigation, fishing and recreation where practicable. This would include consideration of Engineering Standards and Guidelines for Maritime Structures (NSW Maritime, 2005), notification procedures, navigation signs and confirmation of the need for no anchoring zones and/or fishing exclusion zones in consultation with NSW Maritime and Sydney Ports Corporation (refer to amended Statement of Commitment 61).

9. Operation of the Outlet

9.1 Summary of the Environmental Assessment

Since exhibition of the Environmental Assessment, changes have been made to the operation of the plant that affects the outlet. Following further investigation, a decision has been made not to discharge lime process backwash sludge to the ocean, as beneficial reuse options are available.

The assessment of impacts on water quality and aquatic ecology considered aquatic ecosystems, recreation, aquaculture and visual amenity. The outlet would be located on rocky reef in the Tasman Sea and would be designed to maximise dispersion of the seawater concentrate. The outlet has been located away from swimming beaches or sensitive marine areas.

Marine water quality was assessed against the *Proposed Marine Water Quality Objectives for NSW Coastal Waters* (EPA, 2002) using relevant indicators from the *Australia and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000).

An inventory of indicative waste streams and their constituents generated at a reverse osmosis desalination plant is shown in Figure 7.4 and Table 7.1 of the Environmental Assessment. A conservative pre-treatment design has been assumed. Wastewater from the desalination plant would consist mainly of elevated salinity seawater, backwash water from the pre-treatment filters and from the cleaning of the reverse osmosis membranes. These wastewaters are collectively referred to as seawater concentrate.

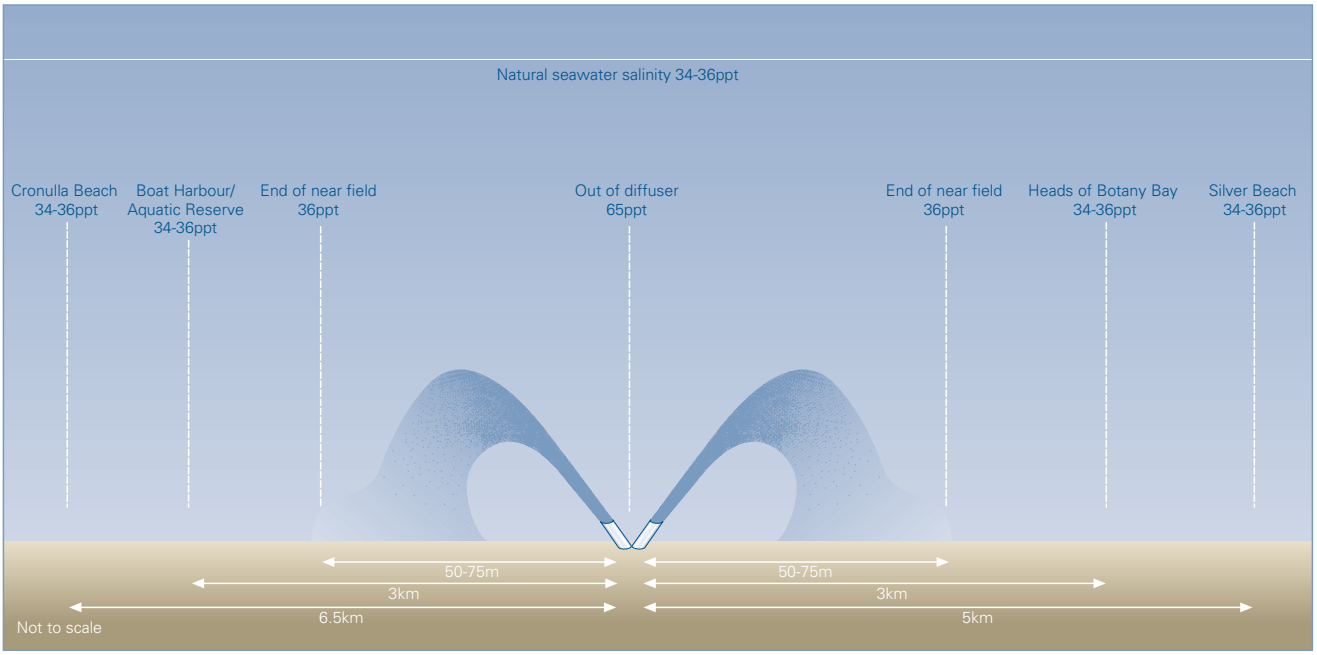
Modelling shows that adequate dilution of the seawater concentrate can be achieved in a relatively short distance from the discharge point. The seawater concentrate would be dispersed so as not to affect water quality or aquatic ecology beyond the initial near field mixing zone[2]. Figure 9.1 illustrates how the seawater concentrate dilutes in the near field mixing zone and beyond. Salinity at around 50-75 metres from the outlets is expected to be within approximately one part per thousand of background seawater salinity, which itself is within the natural variation in salinity experienced off the coast.

[2] The near field mixing zone is the area within 50 to 75 metres of the seawater concentrate outlet. The seawater concentrate is mixed with seawater in this zone.

Table 7.4 of the Environmental Assessment shows the results of the ambient seawater monitoring of key constituents in the discharge, as well as the estimated concentration or characterisation of the constituents in the final discharge from the plant and at the edge of the mixing zone. The table shows that all constituents are predicted to be at background levels at the edge of the mixing zone. Chemicals used in the desalination process are not expected to have impacts on marine water quality due to the nature of the chemicals, dilutions achieved and decomposition in seawater. Toxicity testing of the seawater concentrate would be used to confirm the prediction that no significant impacts would occur at the edge of the mixing zone on aquatic ecology.

A marine monitoring program would also be implemented to identify any long-term impacts from the discharge of seawater concentrate on water quality or marine life. Comparisons of marine ecosystem quality would be made before and after commissioning of the desalination plant at reference sites and the seawater concentrate outlet.

Figure 9.1 Dilution of seawater concentrate



9.2 Summary of issues related to the operation of the outlet

A number of issues were raised in submissions in relation to the operation of the outlet. The impact that seawater concentrate may have on marine ecosystems in general was raised and the impact that seawater concentrate may have on whales and the Weedy Seadragon in particular were also questioned.

Concern was expressed about the effects of the operation of outlets on recreational activities such as swimming and fishing and on seawater quality. Disposal of backwash, bioaccumulation of chemicals and toxic metals in fish stock were also raised in submissions.

Ocean modelling is of particular interest to the DEC and DPI who raised specific comments in relation to the choice of outlet locations and operation of the outlet.

9.3 Response to issues related to the operation of the outlet

9.3.1 Issue: What effect would the discharge structures and discharge of seawater concentrate have on fishing?

Potential impacts on commercial and recreational fishing associated with operation of the outlet were considered in Section 7.3 and Appendix A3 of the Environmental Assessment. These assessments conclude that there is unlikely to be a significant impact on fishing activities. Amended Statement of Commitment 12 requires that the location and design of the outlet be refined to minimise impacts on water quality and aquatic ecology as far as practicable. This would include minimising impacts on recreational and commercial fishing target species.

Maritime structures (including the intakes and outlet) would be designed to minimise impacts on navigation where practicable. This would include consideration of *Engineering Standards and Guidelines for Maritime Structures* (NSW Maritime, 2005), notification procedures, navigation signs and confirmation of the need for no anchoring zones in consultation with NSW Maritime and Sydney Ports Corporation (refer to amended Statement of Commitment 61).

9.3.2 Issue: What effect would discharge of seawater concentrate have on recreational use of the area in the vicinity of the outlet?

The outlet would be located on rocky reef in the Tasman Sea away from swimming beaches or sensitive marine areas. The outlet would be designed to maximise dispersion of the seawater concentrate.

Salinity at the edge of the near field from the outlet is expected to be within the natural variation in salinity experienced off the coast. Therefore it is likely that there would be negligible impact on recreational use of the area.

As stated in the Environmental Assessment, marine water quality objectives in the mixing zone will not be met. It would be factors such as protection of structures and safety that influence considerations over possible exclusion zones for recreational divers.

9.3.3 Issue: Concern regarding impacts on marine ecology due to discharge of seawater concentrate

What is the impact on marine ecology within the near field or mixing zone?

As indicated in Section 7.2.2 of the Environmental Assessment:

The mixing zone is the area or volume where the initial dilution of a discharge occurs. Water quality criteria apply at the boundary of the mixing zone. The near field in simple terms is effectively the mixing zone. It is estimated that the near field may extend some 50-75 metres.

The size of the mixing zone is estimated to be less than half a hectare in an environment of no flow. This will vary in size depending on tidal effects and current flow. In quiescent flow, the size of the impact zone will tend to be smaller, however, the concentration of the plume will tend to be higher due to lower currents to assist entrainment and flow into the far field. Conversely, during periods where currents occur, i.e. most of the time, the size of the mixing zone will be larger but the plume will be lower in concentration.

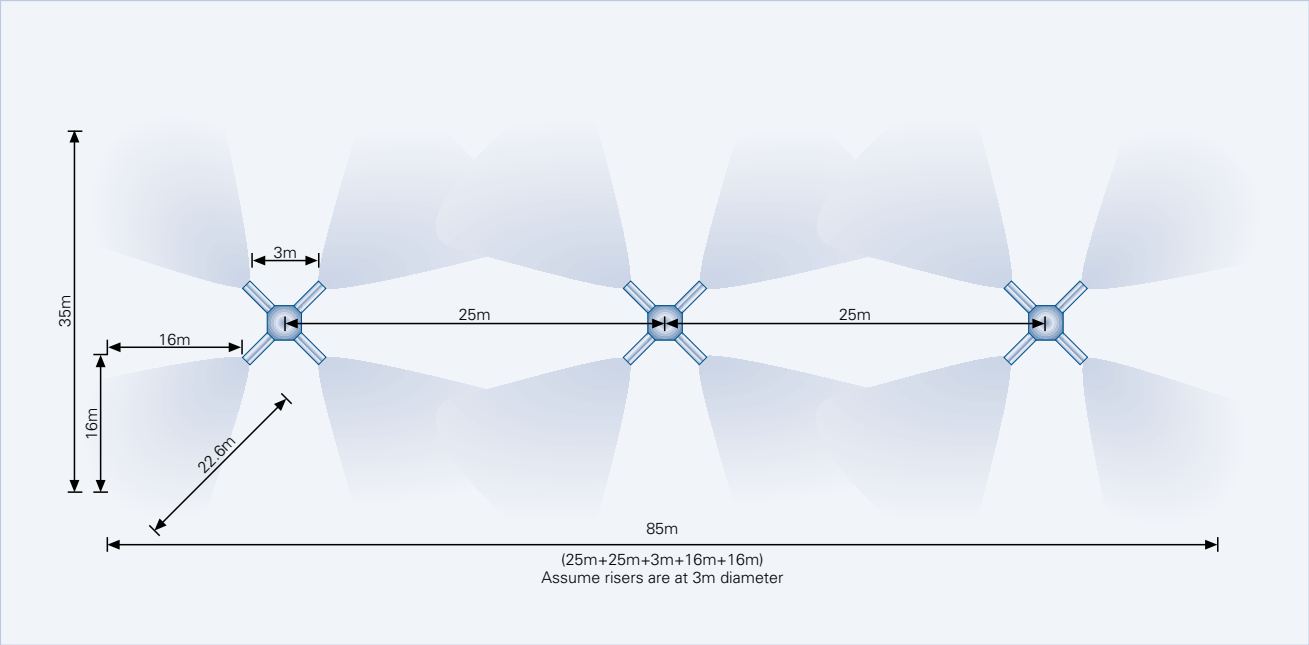
Section 7.3 of the Environmental Assessment also states that:

Inside the mixing zone, the salt concentration in the seawater concentrate will initially be approximately 65 ppt, compared to background levels in the order of 34 to 36 ppt. The temperature of seawater concentrate discharge will be about 1 to 2^{o}C above ambient conditions. This may attract some biota more suited to this slight increase, which could affect the structure of animal assemblages around the outlet.

Figure 9.2 shows what the near field plume might look like in a still water situation. It is based on the following assumptions:

- There are three risers operating at a time;
- The two end risers are 25 metres from the central riser;
- Risers are 3 metres in diameter; and
- Seawater concentrate is diluted until it is 1 ppt above background levels at a point 22.6 metres from the riser.

Figure 9.2 Near field plume in still waters



This results in a near field zone that is 85 metres long and 35 metres wide, equating to an area of approximately 0.3 hectares.

As the outlet site is likely to be on a reef, the discharge plume is likely to affect reef-dwelling organisms to a greater extent than those living in or near soft sediment habitats. Larger, mobile biota such as fish would be able to avoid higher salinity near the discharge point, but smaller invertebrates and some species of fish living in or near reefs and bottom sediments inside the mixing zone could be affected. These include fan corals, sponges, stalked and sessile ascidians, anemones and attached algae. Little information is available on the salinity tolerances of these species or their responses to treatment chemicals.

Appendix A3 of the Environmental Assessment indicates that conditions within the mixing zone have the potential to have a minor adverse impact on some aspects of the ecological assemblage. This impact is unlikely to be significant given the small area of habitat affected relative to the availability of habitat in the Kurnell area and wider Sydney region. The outcome of amended Statement of Commitment 12 would be to minimise potential toxicity impact within the near field mixing zone.

Detailed studies of desalination plant discharges in coral seas of the Caribbean (Hammond et al, 1998) showed no impact on seagrass meadows or the main fish species that grazed upon them. A weak but statistically significant correlation did exist between plume density and the coverage of one particular seagrass species.

The study concluded that the brine discharges "had no detectable effect on the chlorophyll concentration (biomass) and numerical abundance of the benthic microalgal community in this area". "The most abundant fish species and two species of macro-epiflora were repeatedly found within 2 metres of the discharge…" "…no obvious stress or mortality was observed in the relatively long-lived and sedentary species such as soft coral… or in the hard corals". The study authors further state "the results of this study can be applied to other regions and be generally interpreted as indicative of elevated salinity impacts on benthic microalgal communities."

The proposal should avoid direct discharge on ecologically significant areas and sensitive ecosystems, such as significant rocky reef areas. The seawater concentrate plume may impact on Boat Harbour Aquatic Reserve

At this stage, from field surveys for the Environmental Assessment, no ecologically significant rocky reef areas have been identified within the mixing zone.

There would not be direct discharge on the ecologically significant, Boat Harbour Aquatic Reserve as it is located 1.25 kilometres beyond the edge of the mixing zone. Similarly, there would be no direct discharge to ecologically sensitive areas within Botany Bay as the heads of Botany Bay are located approximately 3 kilometres north of the outlet.

The WRL report, Appendix A2 of the Environmental Assessment, indicates that salinity would be within the natural variation at the edge of the near field; therefore there is not expected to be any impact in the far field on places such as Boat Harbour or Botany Bay.

Amended Statement of Commitment 12 outlines measures to optimise the location and design of the outlet so as to avoid impacts on areas of ecological significance.

DEC recommends the project demonstrate that the area within the mixing zone will not contain material in concentrations that cause acute toxicity to aquatic life

It is acknowledged there is the potential for seawater concentrate to cause toxicity to aquatic life in some areas within the mixing zone where there is low dilution (representing areas in close proximity to the outlet).

In order to minimise any toxicity experienced within the mixing zone, a literature review on the potential treatment chemicals and testing of the seawater concentrate from pilot investigations would be performed to identify the most appropriate chemicals (and concentrations) to minimise toxicity to aquatic life within the mixing zone. Testing of the seawater concentrate from pilot plant investigations would allow the prediction of the dilution factor at which zero toxicity would be achieved and accordingly the potential extent of area impacted. This is required by amended Statement of Commitment 12.

The Environmental Assessment Table 7.4 identifies the chemicals used in the desalination process and recognises the limited information available on the potential impact of such chemicals on marine life. Precautionary responses to the potential impact on marine life include commitments to undertake toxicity testing during the design stage, (refer amended Statement of Commitment 12), and implementing a Marine and Estuarine Monitoring Program during the design and operational stages of the project (refer to amended Statement of Commitment 13).

The need for further studies to assess ecological tolerances to the seawater concentrate indicates deficiencies in the existing assessment

The assessments undertaken for the Environmental Assessment are in accordance with the Director General's requirements for the project and are sufficient to conclude that the discharge is unlikely to have a significant impact on aquatic ecology outside of the near field zone. As indicated in amended Statements of Commitment 12 and 13, further detailed studies are proposed to refine the location and design of the outlet. A monitoring programme would also be developed to verify potential impacts of seawater concentrate discharge (refer to amended Statement of Commitment 13).

As stated in the Environmental Assessment, little information is available on the potential effects of the discharge of seawater concentrate into near shore waters. While the potential impacts of discharge from desalination plants have been identified (Hopner and Windelberg 1996, Hoepner 1999, Hoepner and Lattemann 2002, Einav et al. 2002, Raventos et al 2006) few studies have been published in the scientific literature that examined the actual effects of discharge from desalination plants on marine biota. While seawater concentrate from a reverse osmosis plant in Santa Barbara, California was found to be toxic to kelp spores (ABC Labs, 1992) the Bay and Greenstein (1992) study found no toxic effects of desalination plant seawater concentrate in laboratory experiments on amphipods, kelp spores or fertilised sea urchin eggs at concentrations expected to occur in the field.

Detailed studies of desalination plant discharges in coral seas of the Caribbean (Hammond et al, 1998) showed no impact on seagrass meadows or the main fish species that grazed upon them. A weak but statistically significant correlation did exist between plume density and the coverage of one particular seagrass species.

The study concluded that the brine discharges "had no detectable effect on the chlorophyll concentration (biomass) and numerical abundance of the benthic microalgal community in this area". "The most abundant fish species and two species of macro-epiflora were repeatedly found within 2 metres of the discharge..." "...no obvious stress or mortality was observed in the relatively long-lived and sedentary species such as soft coral… or in the hard corals". The study authors further state "the results of this study can be applied to other regions and be generally interpreted as indicative of elevated salinity impacts on benthic microalgal communities."

Detailed studies of desalination brine discharges in the north west Mediterranean (Raventos etc al 2006) found that the discharges had no effects on the benthic community. This may have been a result of the natural variability and mobility of the species. The paper concluded that desalination plants should equip the discharges with multiple perforation (diffusers) and to locate the diffusers in hydrodynamically active areas (areas swept by strong currents or wave action). Rapid dilution of the discharges helps to minimise any impact on benthic communities.

No studies on the effects of toxicants in desalination plant discharge on benthic communities or species have been found to date. The responses of fish, fish larvae and other planktonic biota to fronts or plumes of concentrated seawater are also unknown, while their response to freshwater plumes associated with tidal flux from estuaries and sewage effluent disposal in the marine environment are better understood (Gray et al. 1992, Gray 1996, Kingsford and Suthers 1996). It can be expected, however, that some mortality of biota would occur due to exposure to high salinity, but detailed information on tolerances of common species to hypersalinity is limited.

While the salinity of the seawater discharge is not precisely known, it is assumed that a dilution of approximately 30 fold would be required to achieve salinity of background concentrations and thus logically minimise or eliminate impacts. Larger, mobile biota such as fish are likely to be able to avoid the zone of higher salinity in the immediate area of the discharge point, but smaller invertebrates and some species of fish living in or near reefs and bottom sediments would be unable to escape its influence. Little is known about the salinity tolerances of marine species living in habitats likely to be affected by increased salinity.

In order to confirm and ultimately minimise any toxicity experienced within the mixing zone, a literature review on the potential treatment chemicals and testing of the seawater concentrate from pilot investigations would be performed to identify the most appropriate chemicals (and concentrations) to minimise toxicity to aquatic life within the mixing zone. Testing of the seawater concentrate from pilot plant investigations would allow the prediction of the dilution factor at which zero toxicity would be achieved and accordingly the potential extent of area impacted.

Amended Statement of Commitment 12 identifies the further studies that would be undertaken to verify the assessment.

What would happen if toxicity studies show that local marine life would be killed by the plant discharges?

Should the results of the toxicity testing indicate that there is an unacceptable impact on marine organisms, within the near field mixing zone, Sydney Water would investigate measures to reduce this impact to acceptable levels. These measures may include:

- Modifying the design of the outlets to increase the rate of dispersion. This may be achieved by increasing the velocity at which the seawater concentrate is discharged so it reverts to background levels more rapidly; and
- Modifying the treatment process and the chemicals chosen to reduce the toxicity of the discharge.

This approach is outlined in amended Statement of Commitment 12.

What impact will the increased salinity within the near field have on whales?

Concerns were raised about the potential for seawater concentrate to damage the skin and eyes of whales, particularly calves.

Modelling of the plume of seawater concentrate indicates the area of increased salinity (i.e. the area of the near field) would be small (i.e. extend only 50-75 metres north and south of the outlet). If individuals were to dive through the plume on occasions, it would be unlikely to cause physical damage because the salinity would be at a maximum of only 65 ppt and contact would only be for a brief period before the whales returned to the surrounding water with normal salinity. There are however no studies to reference this matter.

Has the impact on whales of bubbles and noise from the outlet structure been considered in the assessment in the Environmental Assessment?

Concerns have been raised about the potential for noise and bubbles from the inlet and outlet structures to have adverse effects on the behaviour of whales.

Suction at the inlet and dispersion of water and bubbles at the outlet are likely to cause some low frequency noise. The low frequency and low intensity of the noise would suggest that it is unlikely to damage the auditory systems of whales. There is some potential for noise from the structures to mask the communication signals of baleen whales and other acoustic environmental signals, which may also lead to stress (Perry 1998) but the weight of evidence suggests that noise and bubbles from ongoing operations would cause some temporary disturbance only to whales passing in the immediate vicinity of the structures.

The biological significance of a brief change in behaviour, as may occur at Kurnell, is not clear (Perry 1998), but as there is potential for a minor disturbance only, this is unlikely to adversely affect whale migration.

DEC recommends the project demonstrate that the area within the mixing zone would not contain substances in concentrations which encourage undesirable aquatic life or result in the dominance of nuisance species

It is possible that there may be a shift in community structure for sub tidal organisms living within the mixing zone. During design, Sydney Water would attempt to identify any species that may proliferate in an environment of elevated salinity and thus may have the potential to become a nuisance species (refer to amended Statement of Commitment 12).

Algal blooms are not anticipated to occur as the seawater concentrate would be discharged into a high-energy mixing zone. Additionally, a localised increase in nutrients is not anticipated (Table 7.4 of the Environmental Assessment).

As indicated in Appendix A3 of the Environmental Assessment, there may be some attraction of biota more suited to conditions which could affect the structure of animal assemblages in a very small area around the outlet. As required by amended Statement of Commitment 13, a monitoring program would be developed to verify potential water quality and aquatic ecology impacts associated with discharge of the seawater concentrate. This would identify if there are any changes in the species assemblage in the vicinity of the outlet.

9.3.4 Issue: Concern regarding the impact of seawater concentrate on seawater quality

The DEC recommends the project demonstrates how wastewater management and outfall design will ensure the ANZECC 2000 water quality criteria for relevant chemical and non-chemical parameters (in particular salinity and treatment chemicals) are met at the edge of the initial mixing zone of the discharge from the desalination plant to the ocean, and that any impacts in the initial mixing zone are demonstrated to be reversible. Beyond the mixing zone, the proposal should protect Water Quality Objectives where they are currently being achieved

The terms "near field" and the "mixing zone" are equivalent. The Environmental Assessment refers to the "near field" as the "mixing zone", and this is estimated to extend 50-75 metres from the point of discharge (Figure 6.5 of Environmental Assessment). Amended Statement of Commitment 12 requires Sydney Water to meet water quality criteria in line with the approach described in the ANZECC guidelines. ANZECC provides indicators and a guideline approach to derive trigger values, rather than specifying criteria.

Table 7.2 of the Environmental Assessment identifies the relevant water quality indicators as ANZECC is applied. Additionally, Table 7.4 of the Environmental Assessment shows the assessment of key constituents in the discharge based on preliminary ambient seawater monitoring at the location of the seawater intake. All constituents are predicted to be at background levels at the edge of the mixing zone. Further monitoring of the ambient seawater is currently being undertaken before such criteria can be fully developed. Additionally, testing of seawater concentrate from pilot plant investigations in conjunction with toxicity testing would provide further information as to the development of specific trigger values for chemicals that are not specified in the ANZECC guidelines. This approach is reflected in amended Statement of Commitment 12.

Given the nature of the discharge, it is not expected that irreversible impacts such as bioaccumulation would occur. Specific investigations to ensure key impacts are understood and described elsewhere in this section. Sydney Water has also commissioned an international research project to assess comparative knowledge from existing desalination plants (refer to amended Statement of Commitment 12).

Furthermore, chemicals that are known to bioaccumulate would not be selected for the treatment process. Therefore it is anticipated that the local environment within the mixing zone would return to a similar state in the long term[3]. However, there may be permanent physical impacts such as physical structures remaining.

[3] When the discharge of seawater concentrate has ceased.

The proposal should also avoid plumes hugging the bottom of the ocean

Mixing/dispersion models demonstrate that the constituents of the seawater concentrate would be well mixed and diluted throughout the water column within the mixing zone rather than hugging the bottom of the ocean as a dense and highly saline plume. Amended Statement of Commitment 12 recognises that outlet design would seek to avoid such bottom hugging plumes.

When would you know which chemicals would be used in the pre-treatment and desalination process?

Chemicals typically used in the pre-treatment and reverse osmosis process have been identified and form the basis of the assessments undertaken as part of the Environmental Assessment (refer to Table 7.1). The pilot testing and design phase would determine which chemicals should be used in pre-treatment and other processes.

The proposal should also avoid sedimentation of solids, for example from filter backwash

No lime sludge would be discharged into the ocean in accordance with amended Statement of Commitment 15. Solids from the filter backwash are not expected to settle out within the mixing zone, due to the high-energy environment and the settlement characteristics of the seawater concentrate. Beyond the edge of the mixing zone, any additional suspended solids would be on average significantly less than 1 mg/L above background levels (as stated in Table 7.4 of Environmental Assessment). Therefore, if these suspended solids did settle out, no detectable environmental impact is anticipated.

As required in amended Statement of Commitment 14, further studies would be carried out to confirm ferric hydroxide would not cause adverse impacts. The mixing zone and in the far field should not contain:

- Ferric floc that can re-entrain in high energy conditions; and
- Ferric floc in concentrations that settle to form harmful deposits.

This may include a literature review and laboratory examination of the settleability of ferric floc.

DEC recommends the project demonstrate that the area within the mixing zone would not contain substances that can bio-accumulate

Chemicals that are known to bio-accumulate would not be selected for the treatment process. This is required by amended Statement of Commitment 12.

DEC recommends the project demonstrate that the area within the mixing zone would not contain:

- Substances that can re-entrain in high-energy conditions (also in the far field, i.e. beyond the mixing zone); and
- Material in concentrations that settle to form harmful deposits (also in the far field).

As required by amended Statements of Commitment 12 and 14, further studies would be undertaken to confirm the shear stress of the ferric floc and that ferric floc would not re-entrain or settle to form harmful deposits. This may include a literature review and laboratory examination of the settleability of ferric floc.

DEC recommends the project demonstrate that the area within the mixing zone will not contain floating debris, oil scum and other matter in concentrations that could form nuisances

No floating debris, oil scum and other matter are expected in concentrations that could form nuisances within the mixing zone because physical barriers would be in place to prevent the discharge of those items. Additionally, mixing/dispersion models demonstrate that the constituents of the seawater concentrate would be well mixed and diluted throughout the water column rather than on the surface (Section 7 of Environmental Assessment). Suspended material is non-buoyant so is not expected to float to the surface. Finally, oils or low-density hydrophobic compounds would not be added during the treatment process so would not be present in the seawater concentrate. Amended Statement of Commitment 12 identifies the need for design to minimise the potential for such nuisances.

The DEC recommends the project demonstrate that the area within the mixing zone will not contain substances in concentrations that produce problematic colour, odour, turbidity or undesirable aesthetic impacts (also in far field)

Statement of Commitment 14 requires Sydney Water to manage pre-treatment filter backwash from the plant so that there are no significant visual impacts from the seawater concentrate.

Substances that produce problematic colour, odour, turbidity or undesirable aesthetic impacts are unlikely to occur within the mixing zone because the mixing/dispersion models demonstrate that the constituents of seawater concentrate would be well mixed and diluted throughout the water column rather than on the surface (Section 7 of Environmental Assessment). As noted above, suspended material is non-buoyant so is not expected to float to the surface creating undesirable aesthetic impacts even beyond the high-energy mixing zone (i.e. in the far field). As outlined in amended Statement of Commitment 14, further studies are planned to confirm ferric hydroxide would not result in adverse visual impacts and mitigation measures would be triggered if needed.

Alternative management of lime sludge should be sought to prevent discharge

The Environmental Assessment indicated that the lime sludge was to be discharged as part of the seawater concentrate. Sydney Water has subsequently investigated a range of options for the management of lime sludge produced by the desalination plant. Amended Statement of Commitment 15 has been added to reflect investigations into the alternative management of lime sludge such as beneficial reuse for land-based applications.

The Environmental Assessment does not detail management strategies to be implemented if components of the seawater concentrate, such as ferric hydroxide, settle on the bottom and accumulate

Concern was raised that accumulated flocs (basically particles) of ferric hydroxide may be re-suspended through current and wave activity causing visual discoloration or that the initial dispersion may cause a visual plume. Ecological impacts of concern include risks of settling, smothering and loading generated from the pre-treatment filter backwash discharge within the seawater concentrate.

The Environmental Assessment found that excellent dispersion of the seawater concentrate can be achieved and result in minimal impact on seawater quality at the end of the near field (pp 7.13). Settlement of ferric sludges around the discharge locations is unlikely due to the low shear strength of the ferric hydroxide flocs and the dynamic ocean environment off Kurnell. If settlement does occur in the far field then re-suspension of flocs to the surface in concentrations that would cause visual discoloration is unlikely, as any accumulated floc would be progressively diluted by hydrodynamic conditions before reaching the surface.

As required by amended Statement of Commitment 14, further studies would be undertaken to confirm that ferric hydroxide would not result in significant impacts. This may include a literature review and laboratory examination of the settleability of the ferric floc. Should the further planned testing of floc behaviour and the monitoring program show that predictions made in the Environmental Assessment cannot be confirmed, then mitigation measures are available and would be triggered.

As stated in the Environmental Assessment and amended Statement of Commitment 14, arrangements to manage pre-treatment filter backwash from the plant would be developed so that there are no significant impacts associated with the sedimentation of solids discharged in the seawater concentrate during operation, including:

- Further studies to confirm ferric hydroxide would not result in adverse visual impacts;

- Development of design measures to mitigate effects of backwash in the seawater concentrate if needed, and assessment of environmental impacts including:
  - Increasing the discharge rate to create more dispersion; and/or
  - Treating filter backwash water, transportation and land-based disposal,
- Peer review of the Marine and Estuarine Monitoring Program. Consultation with DEC and DPI on the Program.

Alternative management measures for ferric hydroxide are available by treating backwash water to remove sludge. However the sludge would then be directed to landfill which poses other environmental and expenditure constraints. Beneficial reuse potential such as land based application, is limited by the high salt content and iron load of the sludge. For a 500 ML/day plant, about 5,300 to 21,000 tonnes of sludge per year would be landfilled at a cost of some $2 to 3 million. A significant number of truck movements would be involved. Ocean discharge has advantages in areas of construction, operation and maintenance cost, operational transport and infrastructure development. For these reasons, Sydney Water's preferred desalination backwash management is for ocean discharge.

9.3.5 Issue: Concern that there are deficiencies in the modelling report

There is insufficient background data on coastal processes including current direction and strength to accurately model dispersal of discharge

Background data on coastal processes have been gathered through many projects on the Sydney coastline including the Environmental Monitoring Program for the Sydney Deepwater Outfalls, 1988-1993. This information is sufficient to model and predict the dispersal of seawater concentrate in the far field in an appropriate level of detail for this project. Verification has not yet been possible, specifically at the proposed outfall site, but the patterns of currents are expected to be correct. Amended Statement of Commitment 12 identifies further work required to refine the outlet location and verify the dispersal of seawater concentrate in the far field.

A current meter was installed at the intake location in 2005 and the data has been used to verify the modelling outputs. Preliminary data from the current meter was used as part of the modelling undertaken for the Environmental Assessment (refer to Appendix A2). Further current meters are proposed to be installed as part of the survey of current movements to refine numerical models, as identified in amended Statement of Commitment 12.

The WRL report and results presented in the Environmental Assessment (Appendix A2) were based on very conservative assumptions, in the absence of site-specific data. Since the Environmental Assessment was published, a current meter located at the proposed site of intake has provided additional data that has allowed the far field model to be calibrated. Data from this current meter has subsequently been modelled and shows the results of the modelling undertaken for the Environmental Assessment to be reasonably accurate. The model slightly over-predicted the shore parallel (north south) component and under-predicted the shore normal (east-west) component. This leads to the overall shape of the far field plume being slightly more football shaped and less pencil shaped. This is a minor change and does not alter the overall conclusions of the modelling undertaken for the Environmental Assessment, nor the conclusions of the ecological assessments. None of the predictions in the Environmental Assessment have altered as a result of this work. Data would continue to be collected and model predictions further verified.

Has the eddy current in Bate Bay been included in the modelling of the dilution of the seawater concentrate?

This issue is important and was considered very early when assessing the potential impacts of seawater concentrate discharge. The presence of the eddy current was included in the modelling for the project.

Issue raised regarding quality control of the Ocean Reference Station (ORS) data

The only issue regarding quality control related to the supply of ORS data for the period August to September 2005. This data was rejected and not used, as it had gaps that did not allow accurate comparisons with actual current meter data from July to August 2005. The year of ORS current data used in the simulation was 1995, had no gaps and was quality controlled.

All reports associated with the Environmental Assessment have been subjected to rigorous quality control. In addition, Statement of Commitment 12 requires that Sydney Water obtain peer review and maintain consultation with DEC and DPI for ongoing marine and estuarine monitoring (and modelling) programs and results.

There is enough background data on the coastal processes to allow predictive modelling. This background has been gathered through many projects on the Sydney coastline including the Environmental Monitoring Program for the Sydney Deepwater Outfalls. It is acknowledged that there has been limited verification specifically at the proposed outfall site, but the regional current data is expected to apply. The installation of up to four more current meters would continue this process of verification.

The science of predicting near field distributions of dense plumes has not been greatly studied

The statement from WRL's report appended to the Environmental Assessment (page 14 WRL) is relevant of the state of knowledge for predicting near field dispersion:

> "It must be noted that the science of predicting near field dilutions of dense plumes has not been greatly studied. There have been physical modelling experiments undertaken to determine the near field dilution of seawater concentrate discharged into quiescent currents, but little is known as to the additional mixing processes of receiving water velocities and wave activity."

During the planning study it was decided that any discharge from the plant would need to be diluted to background concentrations as soon as possible to avoid potential impacts. The point when salinity returns to concentration within natural variation is defined as the edge of the near field.

The Roberts (1997) model has been developed for dense plumes based on validation by building a physical model and confirming behaviour of the discharge plume into quiescent (stationary) seawater. This model assumes discharges are into quiescent (stationary) seawater. This approach is considered "conservative" because the presence of currents would further aid dilution reducing the potential environmental impacts.

Although it is known that the discharges off Kurnell would be into moving waters, there had been no appropriate work on modelling into moving seawater, which could be used to estimate the dilution in the near field zone.

In reality, the distance to the edge of the near field (and hence the size of the impact zone) would depend on the ocean currents passing the outlet. In quiescent waters, the size of the impact zone would be smallest (as shown in Appendix A2 of the Environmental Assessment) and would be as low as one third of a hectare. However, discharging into quiescent waters would also achieve the least dilution within the near field zone.

Discharging into moving currents would achieve greater dilutions of the plume within the near field zone. It is estimated that under these conditions the size of the mixing zone would be larger but the plume would be lower in concentration.

This modelling approach has been adopted as a starting point to derive estimates of the extent of the near field to form the basis of water quality and marine ecology assessments. Additional work would be undertaken during the detailed design phase to refine the model. This would be based on site specific current survey data that would input to physical modelling of the discharge into currents.

The extent of the near field has been under represented in the Environmental Assessment

The edge of the near field is defined as when initial fast mixing is complete. Conceptually, the desalination outlet diffuser approach was proposed so that the edge of the near field would have salinity returned to levels within the natural variation off Kurnell.

The distance to the edge of the near field (and hence the size of the impact zone) would depend on the ocean currents passing the outlet. In quiescent currents, the size of the impact zone would be smallest (as shown in Appendix A2 of the Environmental Assessment) and would be as low as one third of a hectare. However, discharging into quiescent currents would also achieve the least near field dilution (but still within background variations).

Figure 9.2 shows what the near field plume might look like in a still water situation and Section 9.3.3 outlines of how the area of the near field was calculated.

Discharging into moving currents would achieve faster dilutions of the seawater concentrate plume within the near field. During periods where currents occur (i.e. most of the time), the size of the mixing zone would be larger but the plume would be lower in concentration. It is conservatively estimated that the near field may extend up to 75 metres (instead of the 35 metres on Figure 9.2), from the outlet location in the fastest currents observed at the site. It is only in the case of the fastest currents observed at the site that the extent of the near field has been under represented in the Environmental Assessment.

9.3.6 Issue: Consideration of diffuser technology

There is a range of possible diffuser technologies that need to be evaluated

The detailed design would consider a range of different diffuser designs and technologies and select the most appropriate option. Amended Statement of Commitment 12 confirms that designs would be developed so that the seawater concentrate meets water quality criteria at the edge of the near field in line with the approach described in the ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. This would include development of a strategy for the desalination plant design and operation to verify the targeted 30 fold dilution of the seawater concentrate at the edge of the near field mixing zone.

9.3.7 Issue: Concern over a lack of detail regarding the proposed monitoring programs

Amended Statement of Commitment 13 requires the proponent to develop a Marine and Estuarine Monitoring Program for implementation prior to commencement of construction and during operation to verify potential water quality and aquatic ecology impacts associated with the seawater concentrate.

Sydney Water is continuing to liaise with DPI and the DEC on the detail of this program and to address issues raised in their submissions on this point.

Table 9.1 provides a summary of the draft Marine and Estuarine Monitoring Program that has been developed and has been peer reviewed. This program would be finalised in consultation with DEC and DPI, as recognised by amended Statement of Commitment 13.

Table 9.1 Summary of the Draft Desalination Plant Marine and Estuarine Monitoring Program

Component	Phase	Desired outcomes and commitment	Monitoring objective	Monitoring approach
Intake				
Seawater (intake) water quality	Design	Intake water of adequate quality for treatment by the desalination plant - SOC[4] 17.	Better understanding of seawater quality in the vicinity of the intake to refine intake location and elevation, confirm intake water is of adequate quality, inform pilot plant testing, intake and process designs and reduce risk to operations.	Continuation of routine and event based seawater quality sampling from the intake location. Include physical and chemical parameters as these relate to relevant guidelines. Updated sanitary survey.
	Baseline and post-commissioning	Intake water of adequate quality for treatment by the desalination plant - SOC 17.	Baseline monitoring to reconfirm anticipated seawater quality characteristics and monitoring post-commissioning to inform desalination plant operations.	Developed as part of contract arrangements for the plant, but likely to be similar to design phase monitoring approach. Additional parameters to be added according to the latest design experience with reverse osmosis.
	Construction	No significant impacts on seawater quality or aquatic ecology during construction of the intake and outlet - SOC 11.	Assess mitigation of potential water quality impacts during design investigations and construction work associated with intake works.	Water quality and ecological monitoring to be developed as part of design investigation and construction environmental management systems.
	Ongoing operations	No significant impacts on seawater quality or aquatic ecology from the seawater concentrate (abbrev) - SOC 13.	Recommendations for ongoing monitoring to validate predictions to be an outcome of baseline/ post commissioning monitoring.	To be determined.
Oceanography and modelling	Design	No significant impacts on aquatic ecology from the seawater intake during operation - SOC 16. Intake water of adequate quality for treatment by the desalination plant - SOC 17.	Confirm ambient ocean currents to enable design of intake flow rate to minimise entrainment. Determine likelihood of STP, other discharges (including outlet) and influences on water quality interacting with the intake under various ambient oceanographic conditions to enable refinement of intake location and designs.	Further detailed assessment of the physical processes in the region of the intake via current meters, transects and CTD profiles. Incorporate data generated to refine and calibrate the numerical models.
	Baseline and post-commissioning	Intake water of adequate quality for treatment by the desalination plant - SOC 17.	Identify likelihood of seawater concentrate interacting with the intake under various ambient oceanographic conditions and inform plant commissioning and operation.	Re-assess the physical processes through oceanographic survey. Incorporate monitoring data generated and field verification assessments with numerical modelling to assess interactions with water quality. Comparison with monitored intake water quality.
	Ongoing operations	No significant impacts on seawater quality or aquatic ecology from the seawater concentrate (abbrev) - SOC 13.	Recommendations for ongoing monitoring if appropriate, to validate predictions to be an outcome of baseline/post commissioning monitoring.	To be determined.

[4] Statement of Commitment (SOC).

Table 9.1 Summary of the Draft Desalination Plant Marine and Estuarine Monitoring Program (cont'd)

Component	Phase	Desired outcomes and commitment	Monitoring objective	Monitoring approach
Ecological assessment (impingement/ entrainment, habitat survey)	Design	No significant impacts on aquatic ecology from the seawater intake during operation - SOC 16. No significant impacts on seawater quality or aquatic ecology during construction of the intake and outlet - SOC 11.	Identify and quantify plankton (targeting key commercial and recreational fish and invertebrate larvae and juveniles) that may be impinged on intake screens or entrained into the plant to consideration of screen designs and intake location and elevation above seabed. Further investigation to identify presence of the Weedy Seadragon, to enable development of management measures if necessary.	Pilot plankton study to investigate potential abundance and composition of key commercial plankton in the field and allow the development of a refined and feasible monitoring program. Field survey of ecological habitat and species at refined intake location.
	Baseline and post-commissioning	No significant impacts on aquatic ecology from the seawater intake during operation - SOC 18.	Estimate the distribution and mortality of planktonic larvae (targeting key commercial and recreational species) caused by the desalination intake process.	Field survey procedure to be developed following pilot study.
	Construction	No significant impacts on seawater quality or aquatic ecology during construction of the intake and outlet - SOC 11.	Assess mitigation of potential aquatic ecology impacts during design investigations and construction work associated with intake works.	Habitat survey approach to be developed as part of design investigation and construction environmental management systems.
	Ongoing operations	No significant impacts on aquatic ecology from the seawater intake during operation - SOC 18.	If studies show there is potential for severe entrainment impacts consideration would be given to ongoing intake monitoring.	To be determined.
Outlet				
Receiving water quality	Baseline and post-commissioning	No significant impacts on seawater quality or aquatic ecology from the seawater concentrate (abbrev) - SOC 12.	Quantify potential changes in the quality of marine waters surrounding the outlet location.	Measure concentrations of specific water quality parameters at varying distances from the outlet (including physico-chemical, nutrients and analytes related to treatment by products). Sampling to be based around a "Before, After, Control, Impact " (BACI) design.
	Construction	No significant impacts on seawater quality or aquatic ecology during construction of the intake and outlet - SOC 11.	Assess mitigation of potential water quality impacts during design investigations and construction work associated with outlet works.	Water quality monitoring to be developed as part of design investigation and construction environmental management systems.
	Ongoing operations	No significant impacts on seawater quality or aquatic ecology from the seawater concentrate (abbrev) - SOC 13.	Recommendations for ongoing monitoring if appropriate, to validate predictions to be an outcome of baseline/post commissioning monitoring.	To be determined.

Table 9.1 Summary of the Draft Desalination Plant Marine and Estuarine Monitoring Program (cont'd)

Component	Phase	Desired outcomes and commitment	Monitoring objective	Monitoring approach
Oceanography and modelling	Design	No significant impacts on seawater quality or aquatic ecology from the seawater concentrate beyond the near field mixing zone and minimised potential toxicity impact within the near field during operations - SOC 12.	Predict behaviours of discharge plume and likely near field and far field area of impact under various ambient oceanographic conditions to enable refinement of outlet location, optimal design of outlet facility and effective plume dispersion.	Further detailed assessment of the physical processes in the region of the outlet via current meters, transects and CTD profiling. Physical modelling of outlet to assess hydrodynamic characteristics and determine its likely impact area. Incorporate data generated to refine and calibrate numerical the model.
	Baseline and post-commissioning	No significant impacts on seawater quality or aquatic ecology from the seawater concentrate (abbrev) - SOC 13.	Confirm/verify the area of impact for the seawater concentrate through understanding the behaviour of the discharge under a range of environmental conditions.	Re-assess the physical processes through oceanographic survey. Incorporate monitoring data generated and field verification assessments with numerical modelling to assess outlet dilution performance, physical processes and interactions with water quality. Comparison with monitored receiving water quality, toxicity testing and ecological changes.
	Ongoing operations	No significant impacts on seawater quality or aquatic ecology from the seawater concentrate (abbrev) - SOC 13.	Recommendations for ongoing monitoring if appropriate, to validate predictions to be an outcome of baseline/post commissioning monitoring.	To be determined.
Seawater concentrate characterisation, toxicity testing and pre-treatment backwash investigations	Design	No significant impacts on seawater quality or aquatic ecology from the seawater concentrate (abbrev) - SOC 12. No significant impacts on visual amenity, seawater quality or aquatic ecology from solids discharged in seawater concentrate during operations - SOC 14.	Assist in verifying the targeted 30 times dilution of the seawater concentrate at the edge of the near field mixing zone and inform development of measures to minimise within the near field mixing zone potential for the seawater concentrate to cause acute toxicity. Provide information so that treatment chemicals that are known to bioaccumulate are not selected. Confirm ferric hydroxide will not result in significant impacts. Undertake in conjunction with near field dispersion models to determine area of impact of seawater concentrate and fate of suspended solids.	Measure/estimate physico-chemical and other parameters in seawater concentrate simulated in association with pilot plant testing. Program of toxicity testing. Undertake program of toxicity testing. Literature review of proposed chemicals. Literature review and laboratory examination of the settleability of ferric floc.
	Baseline and post-commissioning	No significant impacts on seawater quality or aquatic ecology from the seawater concentrate (abbrev) - SOC 13.	Characterise and quantify the volume of the seawater concentrate, types and concentrations of constituents (including toxicity) being discharged to environment. Combine with outlet dilution data to provide estimates of concentrations at edge of the near field mixing zone.	Measure/estimate physico-chemical and other relevant indicator substances in seawater concentrate discharged. Undertake program of toxicity testing in accordance with ANZECC protocols.

Table 9.1 Summary of the Draft Desalination Plant Marine and Estuarine Monitoring Program (cont'd)

Component	Phase	Desired outcomes and commitment	Monitoring objective	Monitoring approach
Seawater concentrate characterisation, toxicity testing and pre-treatment backwash investigations (cont'd)	Ongoing operations	No significant impacts on seawater quality or aquatic ecology from the seawater concentrate (abbrev) - SOC 13	Recommendations for ongoing monitoring if appropriate, to validate predictions to be an outcome of baseline/post commissioning monitoring.	To be determined.
Ecological assessment (habitat survey, outlet)	Design	No significant impacts on seawater quality or aquatic ecology from the seawater concentrate (abbrev) - SOC 12	Further assessment of impacts on ecology to enable refinement of design and location of the outlet.	Habitat survey of the selected location, including assessing the suitability of habitat at the site and identifying threatened species if they are encountered.
	Baseline and post-commissioning	No significant impacts on seawater quality or aquatic ecology from the seawater concentrate (abbrev) - SOC 13.	Assess the potential changes in reef assemblages (large mobile benthic invertebrates, sessile organisms and fish) due to discharges from the outlet.	Measure differences in reef assemblages before and after discharge commences at varying distances from the outlet, and between putatively impacted and reference locations. Use of settlement panels to identify the effect of discharge on the recruitment of selected sessile communities, and habitat survey to assess other biota.
	Construction	No significant impacts on seawater quality and aquatic ecology during construction of the intake and outlet - SOC 11.	Assess mitigation of potential aquatic ecology impacts during design investigations and construction work associated with outlet works.	Habitat survey approach to be developed as part of design investigation and construction environmental management systems.
	Ongoing operations	No significant impacts on seawater quality or aquatic ecology from the seawater concentrate (abbrev) - SOC 13.	Recommendations for ongoing monitoring if appropriate, to validate predictions to be an outcome of baseline/post commissioning monitoring.	To be determined.

Table 9.1 Summary of the Draft Desalination Plant Marine and Estuarine Monitoring Program (cont'd)

Component	Phase	Desired outcomes and commitment	Monitoring objective	Monitoring approach
Botany Bay Pipeline				
Ecological assessment (transfer pipeline)	Design	Seagrass habitat loss minimised and the remaining large bed of *Posidonia* at Silver Beach protected; no significant or irreversible impacts from dredging on sensitive natural ecosystems, oyster leases or aquaculture activities should Botany Bay pipeline be selected - SOC 20.	Further surveys of alternative routes to best define the optimal route through seagrasses (ie. to minimise the area of disturbance to *Posidonia*, as priority and *Zostera*). Estimate area of seagrass impacted to enable development of management practices and offset needs to compensate for loss of seagrasses. Further investigation of coastal processes along the proposed route to assess issues of stabilisation of seagrass habitat.	Seagrass habitat mapping and diver surveys of the patchiness and morphological characteristics of alternative seagrass routes. Desktop study of wave regimes.
	Baseline and post-construction	Seagrass habitat loss minimised; no significant or irreversible impacts from dredging (abbrev.) - SOC 20, 21, 22.	Assess the recovery/stabilisation and restoration of seagrass habitat including potential direct and indirect impacts of construction. Identify appropriate procedures necessary to minimise seagrass habitat loss as a consequence of disturbance. Verify whether *Caulerpa* is present to avoid transferring to unaffected area during seagrass restoration activities. Identify *Syngnathids* in the immediate vicinity of the area of impact to enable relocation.	Seagrass patchiness survey / habitat mapping before and after construction including seagrass recovery along the pipeline route off Silver Beach; effects on seagrass habitat adjacent to sheet piling (ie outside the path) and establishment of transplanted seagrass. Visual inspection to identify presence of *Syngnathids* or *Caulerpa*.
	Construction	Seagrass habitat loss minimised; no significant or irreversible impacts from dredging (abbrev.) - SOC 20.	Assess the impact on seagrass habitat including potential direct and indirect impacts of construction. Identify appropriate procedures necessary to minimise seagrass habitat loss as a consequence of disturbance.	Seagrass habitat inspections to ensure no unnecessary damage of seagrass habitats.
Water quality (transfer pipeline)	Construction	Seagrass habitat loss minimised; no significant or irreversible impacts from dredging (abbrev.) - SOC 20, 22.	Assess potential water quality impacts from mitigation measures implemented as part of dredging activities. Identify appropriate procedures necessary to prevent sediment deposition over seagrass beds and minimise turbidity in the Botany Bay area immediately adjacent to the dredging area.	Monitor water quality inside (including within the main Posidonia bed) and outside the area of sheet pipeline to ensure containment of plumes of undisturbed sediment. Water quality triggers to be developed in relation to the local environment (ie compared to background variability) or alternatively compared to water quality guidelines (ANZECC 2000).
Sediments assessment (transfer pipeline)	Baseline and post-construction	Seagrass habitat loss minimised; no significant or irreversible impacts from dredging (abbrev.) - SOC 20, 21, 22.	Assess impact on and recovery/ stabilisation of sediments (in the seagrass area). Identify appropriate procedures necessary to ensure no significant impacts on sediment as a consequence of disturbance (in the seagrass area).	Visual assessment of the sediment in the seagrass areas before and after construction.

10. Operation of the Delivery Infrastructure

10.1 Summary of the Environmental Assessment

Delivery infrastructure refers to pipes, pumps, valves and other facilities typically associated with the transport of water. Operation will include routine maintenance carried out on the delivery infrastructure.

10.2 Summary of issues related to the operation of the delivery infrastructure

Three issues were raised in relation to the operation of delivery infrastructure.

Impacts associated with the pipe under Botany Bay were raised. Potential for the pipe to rupture and leak was a particular issue of concern.

Impacts on traffic and access and the terrestrial ecology at Kyeemagh were also raised.

10.3 Response to issues related to the operation of the delivery infrastructure

10.3.1 Issue: What happens if the pipes under Botany Bay start leaking?

The pipeline will be maintained under pressure and this will prevent seawater from seeping into the potable water supply. Water pressure in the pipeline will be monitored to ensure that any leaks from the pipeline are identified quickly. Should a leak be detected, action will be taken to rectify the issue.

The durability of the pipes and risk of leaks and ruptures will be considered in the detailed design of the pipeline and will be a key factor in selection of the pipe material.

10.3.2 Issue: What works will remain at Kyeemagh and what impact will this have on traffic and access?

The Kyeemagh site will be rehabilitated following completion of works in accordance with amended Statement of Commitment 26. An access shaft would be located below a concrete pad approximately 15 metres by 15 metres at Kyeemagh. Access would only be required occasionally for maintenance. As a result, there would be very few traffic movements associated with the presence of the access shaft during operation.

10.3.3 Issue: Will the pipes rust because of the high levels of salt in desalinated water?

The treatment processes proposed will achieve levels of Total Dissolved Solids (TDS) well below those specified in the Australian Drinking Water Quality Guidelines. Consequently desalinated water will not have high salt levels.

11. The Preferred Project

11.1 Description of the Concept Plan and Project for which Sydney Water is seeking approval from the Minister for Planning

Under Part 3A, proponents can seek a '*Concept approval*'. According to the Department of Planning Fact Sheet NSW Planning Reforms May 2005, "Investors proposing a major development or new infrastructure project will be able to seek an up-front 'concept approval' for their project – before investing in detailed assessment on identified issues."

If a proponent can adequately define the project and undertakes adequate assessment, a '*project approval*' can be sought allowing commencement of the works subject to conditions of approval.

11.1.1 Concept Plan approval

Sydney Water seeks approval for the Concept Plan as described in Chapter 2 of the Environmental Assessment, subject to the following change:

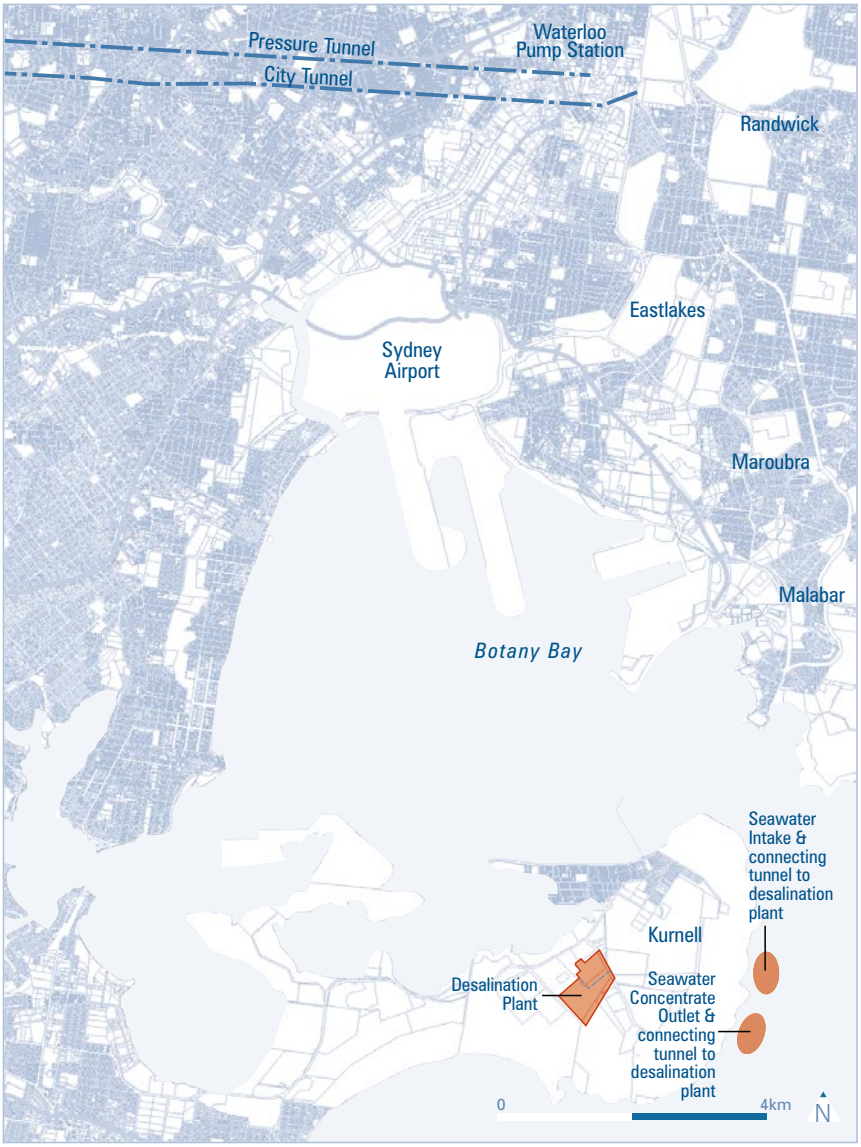
- Removal of the option to deliver up to 50 ML/day locally from the desalination plant by connecting to the water distribution system at Miranda/Caringbah; and
- A tunnel may not be required for a plant greater than 125 ML/day. Methods to deliver greater than 125 ML/day include one or more pipelines once across Botany Bay or a tunnel, both of which were described in the Environmental Assessment.

11.1.2 Project Approval

Sydney Water has defined several components of the Concept Plan in further detail and seeks Project Approval for these components as described below. These components are identified in Figure 11.1, being the desalination plant and intakes and outlets with connecting tunnels.

Sydney Water will seek subsequent Project Approval/s for the remaining components of the desalination project, namely the desalinated water distribution methods (that is, distribution route and method of construction) from the desalination plant. This will be sought at a time that would allow construction to commence when storages are depleted to around 30 per cent. Further studies, investigations and assessments will occur to better understand constraints and identify the preferred delivery route(s).

Figure 11.1 Components for which Project Approval is sought



Components for which project approval is sought

Desalination plant

Construction, commissioning, operation and maintenance of a desalination plant on the Kurnell Peninsula.

The desalination plant would:

- Be built in modules to deliver up to 500 ML of desalinated water per day;
- Be constructed on Lot 2 in DP 1077972 and Lot 1 in DP 1088703 (shown as Lot 101 and Lot 102 respectively in Figure 1.1 of this Preferred Project Report) such that no plant components occur within the conservation area;
- Require a range of construction related facilities such as temporary laydown areas, site compounds, spoil stockpiles, utility services, environmental controls etc.
- Other ancillary buildings, structures, facilities, services and associated infrastructure;
- Operate using the treatment process generally shown in Figure 1.4 of this Preferred Project Report including:
  - screening and pre-treatment of seawater sourced from an intake in the Tasman Sea. Pre-treatment would involve coagulation and flocculation, filtration followed by;
  - reverse osmosis membrane treatment;
  - discharge of seawater concentrate including pre-treatment filter backwash, to an outlet in the Tasman Sea; and
  - treatment of desalinated water to satisfy the requirements of the Australian Drinking Water Guidelines, NSW Department of Health requirements and Sydney Water's Operating Licence which will include treatment of desalinated water with ammonia solution, chlorine gas, fluoride, lime and carbon dioxide before storage onsite ready for pumping into the drinking water system. Lime sludge from this process would be beneficially reused, where practicable, and not discharged to the ocean.
- Be powered from the electricity grid;
- Be largely contained within buildings similar to large warehouses generally 15-18 metres high;
- Store and use chemicals typical of those used in water treatment which could include ferric chloride/sulphate, polyelectrolyte, sulphuric acid, anti-scalant, caustic soda, lime, hydrofluosilicic acid, sodium bisulfite, carbon dioxide, citric acid, sodium hypochlorite, biocide, ammonia solution and chlorine gas;
- Have facilities for treatment, storage and outloading of sludges and screenings for disposal off-site; buildings and structures associated with the production units; temporary laydown areas; and other ancillary buildings, structures, facilities, services and associated infrastructure;
- Have activities associated with the management and the rehabilitation of the conservation area identified above;
- Require feasibility and pre-construction investigations, likely to include geotechnical, groundwater, soil and sediment studies along with other surveys and minor tasks; and
- When in operation, operate on a continuous (24 hours per day, 7 days per week) basis.

Intakes and outlets

Construction, commissioning, operation and maintenance of intakes and outlets and associated tunnel(s) between the desalination plant and the Tasman Sea as shown in Figure 11.1 and including:

- Tunnels approximately 50-70 metres beneath the Kurnell headland and approximately 30 metres under the seabed, sized for a desalination plant capacity of 500 ML per day;
- Seawater intake located on a large reef shelf in the Tasman Sea approximately 300-400 metres offshore Kurnell, at water depths approximately 20-25 metres;
- Discharge outlet located on a large reef shelf in the Tasman Sea approximately 250-350 metres offshore Kurnell, at water depths approximately 20-30 metres;
- Discharge of seawater concentrate including filter backwash, via outlets in a manner to allow effective dilution at the end of the near-field;
- Feasibility and pre-construction investigations, likely to include onshore and offshore geotechnical, groundwater, soil and sediment studies along with other surveys and minor tasks;
- Require a range of construction related facilities such as temporary laydown areas, site compounds, offshore barges, spoil stockpiles, utility services, environmental controls etc; and
- Management, reuse and disposal of tunnel spoil on and off site.

It should be noted that tunnels connecting the intakes and outlets to the desalination plant are not under urban areas.

12. Statement of Commitments

12.1 Summary of the Environmental Assessment

Since the exhibition of the Environmental Assessment, Sydney Water has revised the Statement of Commitments in response to issues raised in submissions or as a consequence of the environmental assessment process. The Environmental Assessment of the desalination plant and associated infrastructure provided a draft Statement of Commitments proposed by Sydney Water outlining the range of environmental outcomes and management measures that would be required to avoid or reduce the environmental impacts of the project.

Following approval of the project, the commitments will guide the subsequent phases of the project development process to reduce impacts on the environment. Any contractor involved in the design, construction and/or operation phases will be required to undertake the works in accordance with these commitments.

A summary of the desired outcomes for the Statement of Commitments is provided in Figures 12.1, 12.2 and 12.3. Any amendments since the Environmental Assessment exhibition are in green text.

Figure 12.1 Summary of desired outcomes for overarching issues

Desired outcomes of construction/operation

Environmental Management Systems	**Management systems in place to protect the environment**
Communications Process	**The community and stakeholders have a high level of awareness of all processes and activities associated with the project** **Provision of accurate and accessible information** **A high level of responsiveness to issues and concerns raised by the community**
Further approval of Tunnelling Options	**Details of tunnels under urban areas investigated in consultation with affected communities and subject to further Minister's approval**
Desalinated Water Distribution Infrastructure Assessment	**The community and stakeholders have a high level of awareness of the basis of final distribution route(s) selection**

Figure 12.2 Summary of desired outcomes for key issues

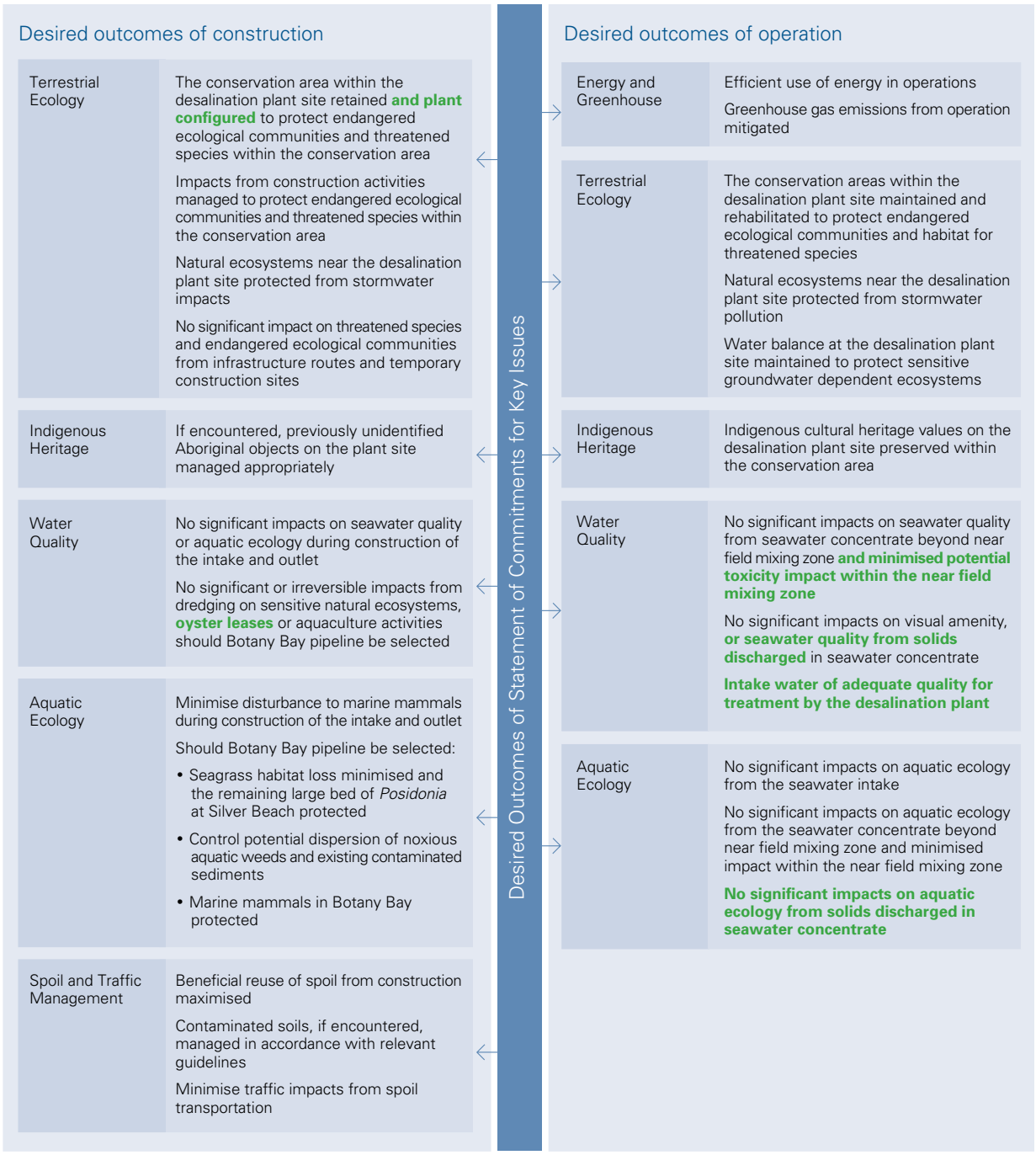
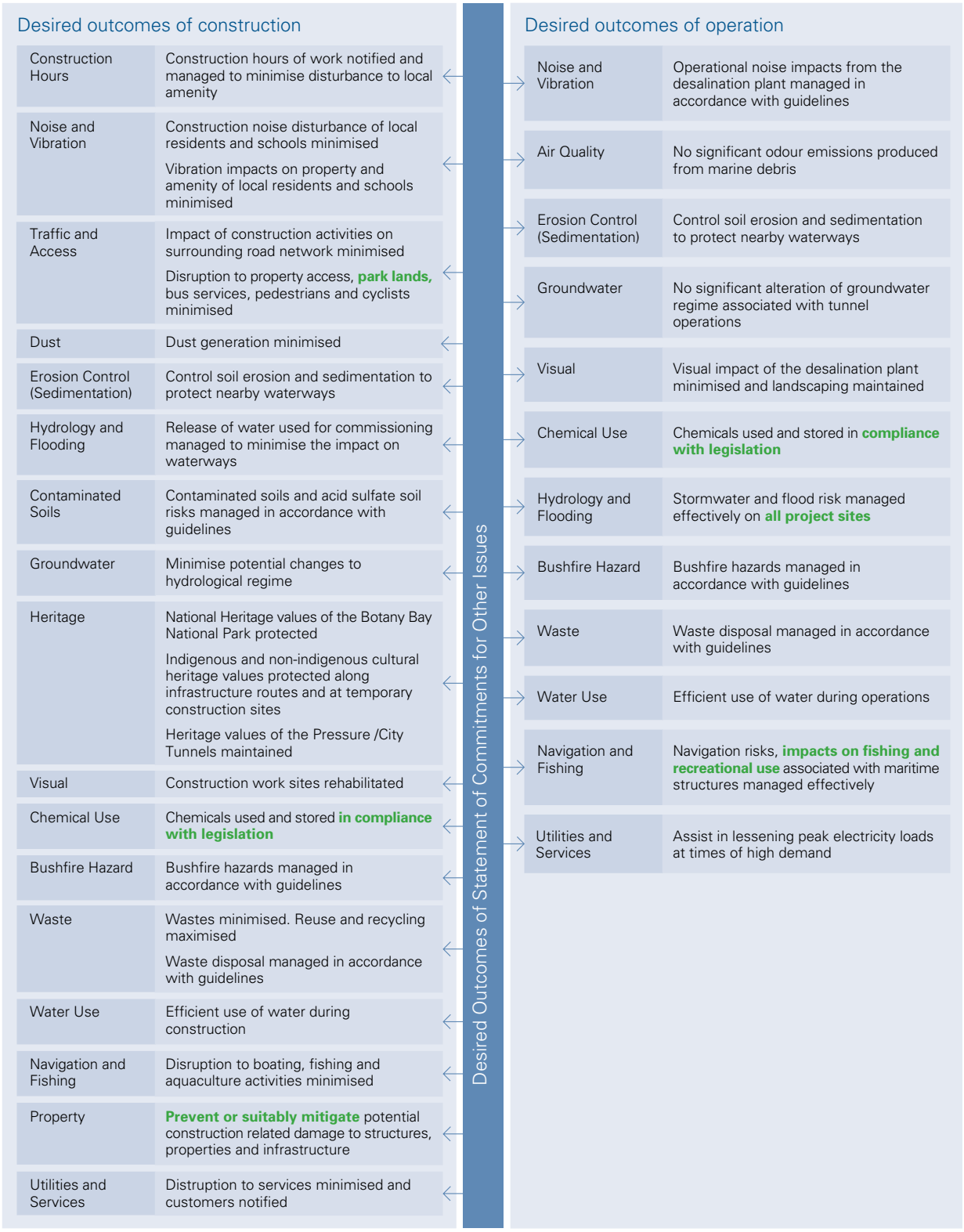


Figure 12.3 Summary of desired outcomes for other issues



12.2 Summary of the issues related to the draft Statement of Commitments

A number of submissions raised concerns about the draft Statement of Commitments in a general sense. As outlined in Section 2.3 of this Preferred Project Report, general matters raised included concern that further studies should be done up front and not as a future commitment, concern that the commitments are not sufficiently detailed or defined and that they do not give any certainty of implementation.

As explained in the response to these general issues in Section 2.3, the level of detail presented is considered to be consistent with the approach under Part 3A of the EP&A Act, the level of definition of the project and the anticipated conditions of approval. Where possible, Sydney Water has amended commitments to provide greater detail and definition of the management measures to be developed and implemented.

As outlined throughout this Preferred Project Report Chapters 4 to 10, submissions also raised concerns regarding specific environmental impacts, proposed management measures and provided suggested commitments. In considering and responding to these specific concerns, Sydney Water has identified various amendments to improve the draft Statement of Commitments.

12.3 Amended Statement of Commitments.

This section provides a guide to Sydney Water's amended Statement of Commitments in two separate rows showing:

i) the draft commitment as exhibited in the Environmental Assessment; and

ii) the amended commitment reflecting amendments made.

Any amendments since the Environmental Assessment exhibition are in green text.

Amended commitments for the management of key issues identified in the environmental assessment (Part A) are outlined in Table 12.1. Amended commitments for the management of all other environmental matters that are not identified specifically as key issues for this project (Part B) are included in Table 12.2. Amended commitments for overarching issues relating to the management of the project as a whole (Part C), are identified in Table 12.3.

The Statement of Commitments includes the entire row of the tables and consists of:

- Commitment topic heading (highlighted in blue bold);
- Desired outcome of the commitment;
- Proposed actions to be undertaken by the proponent (numbered); and
- Timing requirements of the commitment.

The commitments propose measures for environmental mitigation, management and monitoring for the project. Where possible, the measures have been based on achieving a defined performance standard or implementing a proposed process.

Specific actions are identified in the Statement of Commitments which aim to deliver the desired outcomes where practicable based on:

- Developing project designs that are capable of achieving the outcomes;
- Developing environment management and mitigation measures during the planning and design phase; and
- Implementing, monitoring and reviewing these measures during the construction and operational phases.

With reference to the timing:

- Design includes:
  - the preparation and updating of blueprint designs to be ready to proceed with the project if required;
  - pre-construction design during the project development and tender stage; and
  - detailed design prior to and during construction.

These three phases of design will be completed at different timings. The work required in the Statement of Commitments for design work will occur at the appropriate stage of the design phase.

- Construction: includes all work relating to construction of the project other than establishment and investigative activities determined to have minimal environmental impact, eg. survey, acquisitions, fencing, investigative drilling or excavation, building/road dilapidation surveys, minor clearing (except where threatened species or ecological communities would be affected), establishing site compounds or other activities with minimal environmental impact. Commissioning activities are also considered to be part of the construction phase;
- Operation: includes the operation of the project but does not include commissioning trials of equipment or temporary use of parts of the project during construction; and
- Property Maintenance: includes activities to manage and maintain the desalination plant site that contributes to the achievement of the desired outcomes, such as conservation area rehabilitation.

The following figure provides an indication of when management plans would be prepared and submitted to the Department of Planning (as relevant) in the design phase.

Figure 12.4 Schedule for management plans

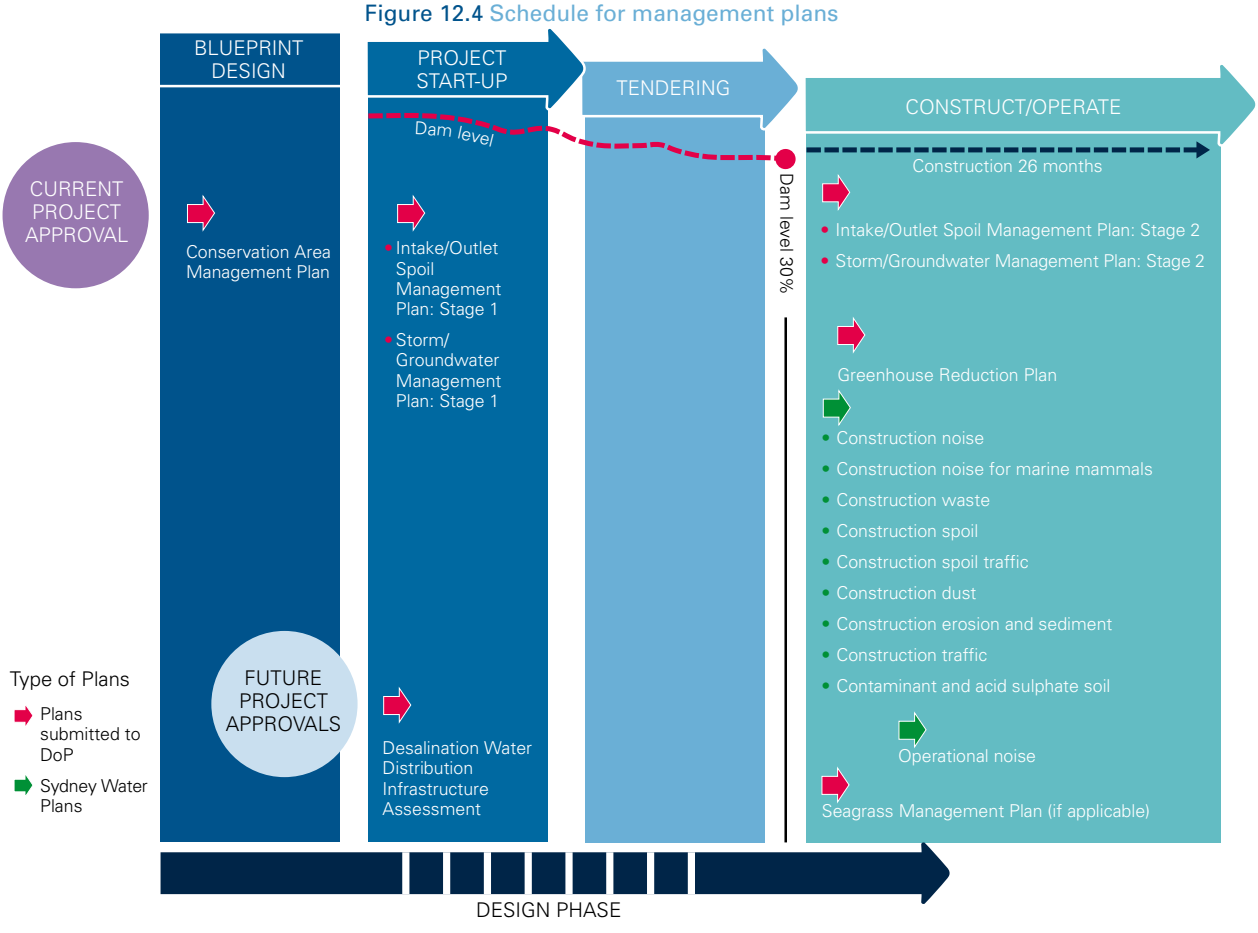


Table 12.1 Amended Statement of Commitments Part A: Key Issues

Desired Outcome		Action	Timing
Energy and Greenhouse (Desalination Plant)			
Draft SOC	Efficient use of energy in operations.	1. Energy efficient design measures, including energy recovery systems and energy efficient equipment, will be developed to optimise energy efficiencies of the desalination plant operations.	During design (before operation commences).
Amended SOC	Efficient use of energy in operations.	1. **Incorporation of energy recovery systems and energy efficient equipment will be mandatory and used** to optimise energy efficiencies of the desalination plant operations.	During design (before operation commences).
Draft SOC	Greenhouse gas emissions from operation mitigated.	2. A cost effective portfolio of greenhouse gas mitigation measures will be developed to effectively reduce the greenhouse gas emissions associated with operating the desalination project from grid sourced power (coal fired) by 50 per cent, including: (a) Purchasing renewable energy and / or lower greenhouse gas emission energy; and / or (b) Purchasing offsets mechanisms such as: i. Renewable energy certificates; ii. Forest sequestration; iii. NSW greenhouse abatement certificates. (c) Monitoring of energy consumption and offset proportion annually, public reporting of monitoring results and comparison to the energy efficiency and greenhouse gas mitigation target, such as through *Sydney Water's Annual Report*.	Before the end of the first year of operation. During operation.
Amended SOC	Greenhouse gas emissions from operation mitigated.	**2. A Greenhouse Reduction Plan will be prepared to ensure that the desalination plant will be effectively powered by 100% renewable energy resulting in no net greenhouse emissions. The plan will:** **(a) Identify how renewable energy will be purchased, such as using "green power" or equivalent;** **(b) Need to be somewhat flexible in approach to accommodate the changing energy and greenhouse regulatory requirements over the life of the plant;** **(c) Include a monitoring program to audit compliance. This will be publicly reported through Sydney Water's Annual Report; and** **(d) Be submitted to the Department of Planning.**	Before the **commencement** of operation.

Table 12.1 Amended Statement of Commitments Part A: Key Issues (cont'd)

Desired Outcome		Action	Timing
Terrestrial Ecology (Desalination Plant)			
Draft SOC	Conservation area within the desalination plant site retained and impacts from construction activities managed to protect endangered ecological communities and threatened species within the conservation area.	3. The design and layout of the desalination plant will retain the identified conservation area (of approximately 15 ha) that contains the largest and most currently intact area of significant vegetation communities on the site and protect habitat and movement corridors for threatened fauna.	During design (before construction commences).
Amended SOC	Conservation area within the desalination plant site retained **and plant configured** to protect endangered ecological communities and threatened species within the conservation area.	**3. A configuration of the design** and layout of the desalination plant **will be developed, incorporating future expansion, to protect endangered ecological communities and threatened species within the conservation area. This will include:** (a) Retaining the identified conservation area (of approximately 15 ha), that contains the largest and most currently intact area of significant vegetation communities on the site, **to avoid biodiversity loss;** **(b) Assessment to identify opportunities for habitat connection on the site between the conservation area and areas of vegetation adjoining the site along the south-eastern boundary, if practicable;** **(c) Measures to minimise clearing of vegetation for fencing along the conservation area boundaries; and** **(d) Provision of sufficient site area for effective stormwater controls and groundwater recharge without adversely impacting upon the conservation area, in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004).**	During design (before construction commences).
Draft SOC	Conservation area within the desalination plant site retained and impacts from construction activities managed to protect endangered ecological communities and threatened species within the conservation area.	4. Management practices will be developed for implementation during construction to reduce impacts on biodiversity and in particular to protect the conservation area, including: (a) Developing work practices (such as fencing and construction worker education) to reduce damage to vegetation communities and fauna during construction; (b) Measures such as directing light away from the flying fox colony and reducing short, sharp noises such as sirens or the use of compressed air, to mitigate noise and light impacts; (c) Weed management measures focusing on early identification of invasive weeds and determining effectiveness of management controls; (d) Onsite landscaping approach incorporating plants of local provenance and trees that provide additional fauna foraging habitat; and (e) Auditing program of construction work practices to ensure there is no impact on threatened species or their habitats.	During design (before construction commences).
Amended SOC	**Impacts from construction activities managed to protect endangered ecological communities and threatened species within the conservation area.**	4. Management practices will be developed for implementation during construction to reduce impacts on biodiversity and in particular to protect the conservation area, including: (a) Developing work practices (such as fencing and construction worker education) to reduce damage to vegetation communities and fauna during construction; (b) Measures such as directing light away from the flying fox colony and reducing short, sharp noises such as sirens or the use of compressed air, to mitigate noise and light impacts; (c) Weed management measures focusing on early identification of invasive weeds and determining effectiveness of management controls; (d) Onsite landscaping approach incorporating plants of local provenance and trees that provide additional fauna foraging habitat; and (e) Auditing program of construction work practices to ensure there is no impact on threatened species or their habitats.	During design (before construction commences).

Table 12.1 Amended Statement of Commitments Part A: Key Issues (cont'd)

Desired Outcome		Action	Timing
Terrestrial Ecology (Desalination Plant) (cont'd)			
Draft SOC	Natural ecosystems near the desalination plant site protected from stormwater impacts during construction.	5. Work practices will be developed for implementation during construction to manage surface water and stormwater from disturbed areas, including use of appropriately sized stormwater controls, in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004). This will include a program of monitoring stormwater quality exiting the site.	During design (before construction commences).
Amended SOC	Natural ecosystems near the desalination plant site protected from stormwater impacts during construction.	5. **A Construction Stormwater Management Plan will be prepared for implementation** during construction to manage surface water and stormwater from disturbed areas, including use of appropriately sized stormwater controls, in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004). This will include **measures to avoid sediment laden stormwater runoff from construction activities at the site entering Quibray Bay** and a program of monitoring stormwater quality exiting the site.	During design (before construction commences).
Draft SOC	Conservation area within the desalination plant site maintained and rehabilitated during operations to protect endangered ecological communities and habitat for threatened species.	6. Management measures for the conservation area will be developed for implementation as part of the overall operational management of the plant site, including: (a) Developing a vegetation management program based on maintenance and rehabilitation of intact vegetation communities; (b) Methods in line with standard bush regeneration techniques such as the Bradley method where appropriate; (c) Measures such as directing light away from the flying fox colony and reducing short, sharp noises such as those associated with sirens or the use of compressed air, to mitigate impacts associated with noise and light; and (d) Monitoring the condition of the conservation area.	Before operation commences.
Amended SOC	Conservation area within the desalination plant site maintained and rehabilitated to protect endangered ecological communities and habitat for threatened species.	6. **A Conservation Area Management Plan will be prepared that incorporates** management measures for the conservation area for implementation as part of the overall **property maintenance** and operational management of the plant site, including: (a) Developing a vegetation management program based on maintenance and rehabilitation of intact vegetation communities; (b) Methods in line with standard bush regeneration techniques such as the Bradley method where appropriate; (c) Measures **to minimise impacts on the seasonal roosting colony of the Grey-headed Flying Fox,** such as directing light away from the colony and reducing short, sharp noises such as those associated with sirens or the use of compressed air, to mitigate impacts associated with noise and light; **(d) Measures to protect the habitat within the conservation area for the endangered Green and Golden Bell Frog, Wallum Froglet and the Large-footed Myotis;** (e) Monitoring the condition of the conservation area **for a sufficient period to take into account seasonal variability;** and (f) **Submission of the Plan to the Department of Planning.**	**During design (at commencement of property maintenance activities)**

Table 12.1 Amended Statement of Commitments Part A: Key Issues (cont'd)

Desired Outcome		Action	Timing
Terrestrial Ecology (Desalination Plant) (cont'd)			
Draft SOC	Natural ecosystems near the desalination plant site protected from stormwater pollution during operation.	7. Stormwater management design measures on the desalination plant site will be identified so that stormwater from the site does not pollute sensitive natural ecosystems during operations, including: (a) Source control methods to reduce sediment load, and separate and divert water streams on the site; (b) Measures to direct all hardstand areas to a first flush system and consider measures to shut off the site stormwater connection; (c) Structural mitigation measures such as gross pollutant traps or wetlands; and (d) Bunding of chemical storages.	During design (before construction commences).
Amended SOC	Natural ecosystems near the desalination plant site protected from stormwater pollution during operation.	7. **A Stormwater and Groundwater Management Plan will be prepared for the desalination plant site so that stormwater from the** site does not pollute sensitive natural ecosystems during operations, including: (a) Source control methods to reduce sediment load, and separate and divert water streams on the site; (b) Measures to **avoid contaminated stormwater runoff from the site entering Quibray Bay such as** directing all hardstand areas to a first flush system and considering measures to shut off the site stormwater connection; (c) **Use of appropriately sized** structural mitigation measures such as **artificial** wetlands, **sedimentation basins** or gross pollutant traps; (d) Bunding of chemical storages; and (e) **Submission of the Plan to the Department of Planning.**	During design (before construction commences).
Draft SOC	Water balance at the desalination plant site maintained to protect sensitive groundwater dependent ecosystems during operation.	8. Strategies for groundwater recharge will be developed as part of the desalination plant stormwater management designs to protect sensitive groundwater dependent ecosystems, including: (a) Stormwater retention and infiltration-based management such as onsite wetland where site conditions permit; (b) Measures to provide for use of stormwater for irrigation on site if practicable; and (c) Groundwater level monitoring at the site to establish baseline conditions and assess effects for a period post-construction.	During design (before construction commences).
Amended SOC	Water balance at the desalination plant site maintained to protect sensitive groundwater dependent ecosystems during operation.	8. **A Stormwater and Groundwater Management Plan will be prepared for the desalination plant site. This will include strategies for groundwater recharge to minimise impacts on groundwater and** protect sensitive groundwater dependent ecosystems, including: (a) **Artificial recharge through** stormwater retention and infiltration-based management such as onsite wetland where site conditions permit; (b) Measures to provide for use of stormwater for irrigation on site if practicable; (c) **Groundwater monitoring program** to establish baseline conditions **(ie groundwater level, quality and flows at the desalination plant site) and asses level and flows;** and **(d) Submission of the Plan to the Department of Planning.**	During design (before construction commences).

Table 12.1 Amended Statement of Commitments Part A: Key Issues (cont'd)

Desired Outcome		Action	Timing
Indigenous Heritage (Desalination Plant)			
Draft SOC	Indigenous cultural heritage values on the desalination plant site preserved within conservation area.	9. The design and layout of the desalination plant will retain the identified conservation area to avoid potential impact to indigenous archaeological values.	During design (before construction commences).
Amended SOC	Indigenous cultural heritage values on the desalination plant site preserved within conservation area.	9. The design and layout of the desalination plant will retain the identified conservation area to avoid potential impact to indigenous archaeological values.	During design (before construction commences).
Draft SOC	If encountered, previously unidentified Aboriginal objects on the plant site managed appropriately.	10. If previously unidentified Aboriginal Objects are discovered during construction on the plant site, all work likely to affect the object(s) will cease and the DEC informed. An investigation will be undertaken by a suitably qualified archaeologist to identify measures to be implemented to reduce impact on the objects discovered, prior to recommencing works.	During construction.
Amended SOC	If encountered, previously unidentified Aboriginal objects on the plant site managed appropriately.	10. If previously unidentified Aboriginal Objects are discovered during construction on the plant site, all work likely to affect the object(s) will cease **immediately** and the DEC and **La Perouse Local Aboriginal Land Council** informed. An investigation will be undertaken by a suitably qualified archaeologist to identify measures to be implemented to reduce impact on the objects discovered, prior to recommencing works.	During construction.
Water Quality and Aquatic Ecology (Seawater Intake and Outlet)			
Draft SOC	No significant impacts on seawater quality or marine ecology during construction of the intake and outlet.	11. Work practices will be developed for implementation during design investigations and construction associated with the intake and outlet works to mitigate potential impacts on seawater quality and aquatic ecology in line with the principles of the ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.	During design (before construction commences).
Amended SOC	No significant impacts on seawater quality or **aquatic** ecology during construction of the intake and outlet.	11. Work practices will be developed for implementation during design investigations and construction associated with the intake and outlet works to mitigate potential impacts on seawater quality and aquatic ecology criteria in line with the **approach described in the** ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. **As the intake and outlet locations are refined, further investigation will be undertaken to identify presence of the Weedy Seadragon, and management measures will be developed if necessary.**	During design (before construction commences).

Table 12.1 Amended Statement of Commitments Part A: Key Issues (cont'd)

Desired Outcome		Action	Timing
Water Quality and Aquatic Ecology (Seawater Intake and Outlet) (cont'd)			
Draft SOC	No significant impacts on seawater quality or marine ecology from the seawater concentrate beyond near field mixing zone during operation.	12. Designs will be developed so that the seawater concentrate meets water quality criteria in line with the principles of the ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. This will include: (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; and (b) Measures to optimise the location and design of the desalination plant outlet to minimise impacts on water quality and ecology as far as practicable. These could include physical modelling of the near field dilution and habitat survey.	During design (before construction commences).
Amended SOC	No significant impacts on seawater quality or **aquatic** ecology from the seawater concentrate beyond near field mixing zone **and minimised potential toxicity impact within the near field mixing zone** during operation.	12. 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) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* **and protects DEC Water Quality Objectives where they are currently being achieved. This will include:** (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.** **(b) Measures to minimise within the near field mixing zone potential for the seawater concentrate to cause acute toxicity. These measures may include:** **i. Modifying the design of the outlets to increase the rate of dispersion; and** **ii. Modifying the treatment process and the chemicals chosen to reduce the toxicity of the discharge.** (c) Measures to **refine** the location and design of the desalination plant outlet to minimise impacts on water quality and ecology as far as practicable. **This may include further surveys of current movements to refine numerical models, physical modelling of the near field dilution, and habitat survey of the selected location.** **(d) Treatment chemicals that are known to bioaccumulate will not be selected, based on a literature review of proposed chemicals; and** **(e) Peer review of the Marine and Estuarine Monitoring Program. Consultation with DEC and DPI on the Program.**	During design (before construction commences).

Table 12.1 Amended Statement of Commitments Part A: Key Issues (cont'd)

Desired Outcome		Action	Timing
Water Quality and Aquatic Ecology (Seawater Intake and Outlet) (cont'd)			
Draft SOC		13. A marine monitoring program will be developed for implementation during design and operation to verify potential water quality and marine ecology impacts associated with the seawater concentrate. This will include: (a) Monitoring program scope to: 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 mobile benthic invertebrates and sessile organisms). (b) Collecting samples from impact sites and reference sites where relevant to enable comparison of water quality parameters. (c) Conducting monitoring during two phases: 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 ii. Post commissioning phase – for comparison of results with baseline data (for the first two years of operation, then reviewed); and (d) Peer review of the modelling and monitoring programs and results.	During design (with the aim of assembling at least 2 years of data prior to commissioning)
Amended SOC		13. 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: (a) Monitoring program scope to: 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 mobile benthic invertebrates, sessile organisms **and fish).** (b) Collecting samples from impact sites and reference sites where relevant to enable comparison of water quality parameters **and ecological changes.** (c) Conducting monitoring during two phases: 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 ii. Post commissioning phase – for comparison of results with baseline data (for the first two years of operation, then reviewed); and **(d) Measures to ensure the monitoring program is statistically valid;** **(e) Recommendations for ongoing monitoring to validate predictions; and** (f) Peer review of the **Marine and Estuarine** Monitoring Program. **Consultation with DEC and DPI on the Program.**	**During design** (with the aim of assembling at least 2 years of data prior to commissioning)

Table 12.1 Amended Statement of Commitments Part A: Key Issues (cont'd)

Desired Outcome		Action	Timing
Water Quality and Aquatic Ecology (Seawater Intake and Outlet) (cont'd)			
Draft SOC	No significant impacts on visual amenity from seawater concentrate during operations.	14. Arrangements to manage pre-treatment filter backwash from the plant will be developed so that there are no significant visual impacts associated with the seawater concentrate during operation, including: (a) Further studies to confirm ferric hydroxide will not result in adverse visual impacts; (b) Development of design measures to mitigate effects of backwash in the seawater concentrate if needed, and assessment of environmental impacts including: i. Increasing the discharge rate to create more dispersion; and / or ii. Treating filter backwash water, transportation and land-based disposal.	During design (before operation commences).
Amended SOC	No significant impacts on visual amenity, **seawater quality or aquatic ecology from solids discharged in** seawater concentrate during operations.	14. Arrangements to manage pre-treatment filter backwash from the plant will be developed so that there are no significant **impacts on** visual **amenity, seawater quality or aquatic ecology** associated with **solids discharged in** the seawater concentrate during operation, including: (a) Further studies to confirm ferric hydroxide will not result in **significant** impacts. **This may include a literature review and laboratory examination of the settleability of ferric floc.** (b) Development of design measures to mitigate effects of backwash in the seawater concentrate if needed, and assessment of environmental impacts including: i. Increasing the discharge rate to create more dispersion; and / or ii. Treating filter backwash water, transportation and land-based disposal.	During design (before operation commences).
New SOC	As above.	**15. Alternative management of lime sludge, such as beneficial reuse in land application, will be investigated to prevent discharge.**	**During design (before operation commences).**
Draft SOC	No significant impacts on marine ecology from the seawater intake during operation.	15. Seawater intake designs will be developed to reduce potential for marine biota, including larval species, to be drawn into the intake structures during operation, including: (a) Developing designs so that 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 0.1 m/s; and (b) Developing design measures to minimise as far as practicable the amount of biota that are impinged on intake screens or entrained into the plant, including consideration of screen designs and intake elevation above the seabed.	During design (before construction commences).
Amended SOC	No significant impacts on **aquatic** ecology from the seawater intake during operation.	16. Seawater intake designs will be developed to reduce potential for marine biota, including larval species, to be drawn into the intake structures during operation, including: (a) Developing designs so that 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 0.1 m/s; and (b) **Refining the location of the intake and** developing design measures to minimise 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, including consideration of screen designs and intake elevation above the seabed; **(c) Assessment of chemicals to clean the intake system to minimise acute toxicity impacts on aquatic biota outside the intake structures; and** **(d) Identifying management measures for marine debris caught up in the screens and intake system.**	During design (before construction commences).

Table 12.1 Amended Statement of Commitments Part A: Key Issues (cont'd)

Desired Outcome		Action	Timing
Water Quality and Aquatic Ecology (Seawater Intake and Outlet) (cont'd)			
New SOC	**Intake water of adequate quality for treatment by the desalination plant.**	**17. Seawater intake location and designs will be refined to confirm intake water is of adequate quality considering impacts from sewage treatment plant and other discharges in the vicinity and other influences on water quality.** **This will include further seawater quality sampling, pilot testing, and a survey of current movements to refine numerical models.**	**During design (before construction commences).**
Draft SOC	No significant impacts on marine ecology from the seawater intake during operation.	16. A program of marine monitoring will be developed for implementation during design to assess marine ecology impacts associated with the seawater intake and inform designs. This will include: (a) Monitoring program to estimate the distribution and mortality of planktonic larvae caused by the desalination intake process through field surveys; and (b) Peer review of the monitoring program and results.	During design (before construction commences).
Amended SOC	No significant impacts on **aquatic** ecology from the seawater intake during operation.	18. A program of marine monitoring will be developed for implementation during design to assess **aquatic** ecology impacts associated with the seawater intake and inform designs. This will include: (a) Monitoring program to estimate the distribution, and mortality of planktonic larvae caused by the desalination intake process through field surveys; **(b) Measures to ensure the monitoring program is statistically valid;** **(c) If studies show there is potential for severe entrainment impacts consideration would be given to ongoing monitoring; and** (d) Peer review of the **Marine and Estuarine** Monitoring Program. **Consultation with DEC and DPI on the Program.**	During design (before construction commences).
Draft SOC	Minimise disturbance to marine mammals during construction of the intake and outlet.	17. Management measures will be developed to minimise disturbance to marine mammals during construction of the intake and outlet, thereby minimising the impact to whale watching and the NSW National Parks and Wildlife Cape Solander Whale Migration Study. This will involve, as practicably as possible, stopping or scaling down operations works when marine mammals are approaching the area of construction.	During design (before construction commences).
Amended SOC	Minimise disturbance to marine mammals during construction of the intake and outlet.	19. **A Construction Noise Management Plan will be prepared** to minimise disturbance to marine mammals during construction of the intake and outlet, thereby minimising the impact to whale watching and the NSW National Parks and Wildlife Cape Solander Whale Migration Study. This will involve, as practicably as possible, (a) Stopping or scaling down **at risk activities** when marine mammals are approaching the area of construction.	During design (before construction commences).

Table 12.1 Amended Statement of Commitments Part A: Key Issues (cont'd)

Desired Outcome		Action	Timing
Water Quality and Aquatic Ecology (Delivery Infrastructure)			
Draft SOC	Seagrass habitat loss minimised and the remaining large bed of *Posidonia* at Silver Beach protected should Botany Bay pipeline be selected. No significant or irreversible impacts from dredging on sensitive natural ecosystems or aquaculture activities should Botany Bay pipeline be selected.	18. Designs and management practices will be developed for implementation during and post-construction to minimise impacts of the pipeline crossing of Botany Bay on the aquatic environment as far as practicable, in liaison with DPI. This will include: (a) Further surveys to best define the optimal route through seagrasses (i.e. minimal disturbance to *Posidonia*, as priority, and *Zostera*); (b) The remaining large bed of *Posidonia* at Silver Beach to be protected; (c) Use of sheet piling within seagrass habitat, with turbidity screens at the ends of each segment of construction, as a means of minimising habitat loss and controlling turbidity; (d) Construction to occur over the shortest possible time to minimise disturbance and reduce the risk of exposure to storms; and (e) Establishing a program of seagrass restoration along the disturbed route to compensate for the loss of seagrasses, to commence prior to construction.	During design (before construction commences).
Amended SOC	Seagrass habitat loss minimised and the remaining large bed of *Posidonia* at Silver Beach protected should Botany Bay pipeline be selected. No significant or irreversible impacts from dredging on sensitive natural ecosystems, **oyster leases** or aquaculture activities should Botany Bay pipeline be selected.	20. **If required, a Seagrass Management Plan will be prepared, in consultation with DPI, for implementation during,** and post-construction, to minimise impacts of the pipeline crossing of Botany Bay on the aquatic environment as far as practicable. **This Plan will be linked to the construction contract and will include:** (a) Further assessment of **alternative routes** to best define the optimal route through seagrasses (i.e. to **minimise the area of disturbance to** *Posidonia*, as priority, and *Zostera*); (b) The remaining large bed of *Posidonia* at Silver Beach to be protected; (c) Use of sheet piling within seagrass habitat, with turbidity screens at the ends of each segment of construction, as a means of minimising habitat loss and controlling turbidity; **(d) Dredging activities to be carried out to prevent sediment deposition over the seagrass beds and minimise turbidity in Botany Bay immediately adjacent to the dredging area;** **(e) Monitoring of water quality immediately adjacent to the dredging area;** (f) Construction to occur over the shortest possible time to minimise disturbance and reduce the risk of exposure to storms **and identify measures to be taken during adverse weather conditions**; (g) Establishing a program of seagrass restoration **and/or offsets** to compensate for the loss of seagrasses to commence prior to construction; **(h) Relocation to suitable habitat of any syngnathids, if observed in the immediate vicinity of the area of impact;** (i) Measures to minimise adverse impacts on coastal processes; and **(j) Submission of the Plan to the Department of Planning.**	During design (before construction commences).

Table 12.1 Amended Statement of Commitments Part A: Key Issues (cont'd)

Desired Outcome		Action	Timing
Water Quality and Aquatic Ecology (Delivery Infrastructure) (cont'd)			
Draft SOC	Seagrass habitat loss minimised and the remaining large bed of *Posidonia* at Silver Beach protected should Botany Bay pipeline be selected. No significant or irreversible impacts from dredging on sensitive natural ecosystems or aquaculture activities should Botany Bay pipeline be selected.	19. A program for maintaining seagrass restoration will be developed for implementation for 12 months post-construction including: i. Inspection of the pipeline to ensure it remains below the seabed; ii. Maintaining transplanted *Posidonia* and *Zostera*, such as fertilising or pegging of transplanted seagrasses; and iii. Minimising disturbance of sediments adjacent to unvegetated segments of the pipeline route to minimise loss of benthic invertebrates and enhance recovery (by lateral expansion of seagrass).	Prior to completion of construction.
Amended SOC	Seagrass habitat loss minimised and the remaining large bed of *Posidonia* at Silver Beach protected should Botany Bay pipeline be selected. No significant or irreversible impacts from dredging on sensitive natural ecosystems, **oyster leases** or aquaculture activities should Botany Bay pipeline be selected.	21. A program for maintaining seagrass restoration will be developed **in consultation with DPI** for implementation for 12 months post-construction including: i. Inspection of the pipeline to ensure it remains below the seabed; ii. Maintaining transplanted *Posidonia* and *Zostera*, such as fertilising or pegging of transplanted seagrasses; and iii. Minimising disturbance of sediments adjacent to unvegetated segments of the pipeline route to minimise loss of benthic invertebrates and enhance recovery (by lateral expansion of seagrass).	Prior to completion of construction.
Draft SOC	As above	20. A program for monitoring water quality and ecological impacts will be developed for implementation during construction and 12 months post-construction.	During design (before construction commences).
Amended SOC	As above	22. A **Marine and Estuarine Monitoring** Program for monitoring water quality and ecological impacts will be developed **in consultation with DPI** for implementation during construction and 12 months post-construction.	During design (before construction commences).
Draft SOC	Control potential dispersion of noxious aquatic weeds and existing contaminated sediments due to construction should Botany Bay pipeline be selected.	21. Work practices will be developed to control the potential dispersion of *Caulerpa taxifolia* located along the pipeline route as feasible for implementation during construction.	During design (before construction commences).
Amended SOC	Control potential dispersion of noxious aquatic weeds and existing contaminated sediments due to construction should Botany Bay pipeline be selected.	23. Work practices will be developed to control the potential dispersion of *Caulerpa taxifolia* located along the pipeline route as feasible for implementation during construction, **including practices to avoid transporting** *Caulerpa taxifolia* **to unaffected areas during seagrass restoration activities.**	During design (before construction commences).

Table 12.1 Amended Statement of Commitments Part A: Key Issues (cont'd)

Desired Outcome		Action	Timing
Water Quality and Aquatic Ecology (Delivery Infrastructure) (cont'd)			
Draft SOC	Control potential dispersion of noxious aquatic weeds and existing contaminated sediments due to construction should Botany Bay pipeline be selected.	22. Work practices will be developed to manage existing sediment-bound contaminants and acid sulphate soils located along the pipeline route for implementation during construction. This will include where possible, emplacement of pipeline within the existing depression to avoid the need for dredging in potentially affected areas.	During design (before construction commences).
Amended SOC	Control potential dispersion of noxious aquatic weeds and existing contaminated sediments due to construction should Botany Bay pipeline be selected.	24. Work practices will be developed to manage sediment-bound contaminants and acid sulphate soils located along the pipeline route **(as detected by geotechnical testing)** for implementation during construction. This **may** include where possible, emplacement of pipeline within the existing depression **to minimise the extent of** dredging in potentially affected areas, **the adoption of least impact construction dredging and the use of controls such as silt curtains.**	During design (before construction commences).
Draft SOC	Marine mammals in Botany Bay protected during construction should Botany Bay pipeline be selected.	23. Management practices will be developed for marine mammals, particularly southern right whales, humpback whales and dolphins, for implementation should they be present during emplacement of the pipeline across Botany Bay. This will involve, where practicable, stopping or scaling down works when marine mammals are approaching the area of construction.	During design (before construction commences).
Amended SOC	Marine mammals in Botany Bay protected during construction should Botany Bay pipeline be selected.	25. **A Construction Noise Management Plan will be prepared** for marine mammals, particularly southern right whales, humpback whales and dolphins, for implementation should they be present during emplacement of the pipeline across Botany Bay. This will involve, where practicable, (a) Stopping or scaling down **at risk activities** when marine mammals are approaching the area of construction.	During design (before construction commences).

Table 12.1 Amended Statement of Commitments Part A: Key Issues (cont'd)

Desired Outcome		Action	Timing
Terrestrial Ecology (Delivery Infrastructure)			
Draft SOC	No significant impact on threatened species and endangered ecological communities during construction from infrastructure routes and temporary construction sites.	24. Infrastructure routes and temporary construction sites will be located and management practices will be developed to minimise impacts, where practicable, on threatened species and endangered ecological communities for implementation during construction, including: (a) Developing onsite management practices to reduce impacts associated with trenching and drilling of shafts; (b) Further surveys once final option is chosen to confirm optimal routes and site locations to limit impacts on biodiversity in accordance with EPBC Act and Draft Part 3A *Guidelines for Threatened Species Assessment* (DEC & DPI July 2005); (c) Developing work practices to reduce damage to vegetation and fauna during construction (such as limiting disturbance, fencing, worker education); (d) Restoring vegetation of temporarily disturbed areas post-construction, with the aim to restore to at least pre-existing condition; and (e) If works are undertaken in native vegetation communities, restoration will use plant species from that community	During design (before construction commences).
Amended SOC	No significant impact on threatened species and endangered ecological communities during construction from infrastructure routes and temporary construction sites.	26. Infrastructure routes and temporary construction sites will be located to **avoid impacts on threatened species, endangered ecological communities and remnant vegetation, where practicable. Where avoiding impacts is not practicable,** management practices will be developed to minimise impacts on threatened species, endangered ecological communities **and remnant vegetation** for implementation during construction. **Measures to avoid and/or minimise impacts include:** (a) Developing onsite management practices to reduce impacts associated with trenching and drilling of shafts; (b) Further **flora and fauna** assessments **to assist in selection of the final route(s) and** once final option is chosen to confirm optimal routes and site locations to limit impacts on biodiversity in accordance with EPBC Act and Draft Part 3A Guidelines for Threatened Species Assessment (DEC & DPI July 2005); (c) Developing work practices to reduce damage to vegetation and fauna during construction (such as limiting disturbance, fencing, worker education; **(d) Developing work practices to minimise impacts on mangroves and/or saltmarsh or compensatory measures arranged in accordance with DPI policy;** (e) Restoring vegetation of temporarily disturbed areas post-construction, with the aim to restore to at least pre-existing condition; **(f) Developing strategies to rehabilitate areas following completion of construction work, should activities impact on areas that have been, previously rehabilitated; and** (g) If works are undertaken in native vegetation communities, restoration will use plant species from that community.	During design (before construction commences).

Table 12.1 Amended Statement of Commitments Part A: Key Issues (cont'd)

Desired Outcome		Action	Timing
Spoil and Traffic Management (Delivery Infrastructure, Seawater Intake and Outlet)			
Draft SOC	Beneficial reuse of spoil from construction maximised. Contaminated soils, if encountered, managed in accordance with DEC guidelines.	25. A strategy to beneficially reuse all suitable spoil will be developed for implementation during construction to effectively reduce the volumes of spoil disposed of to landfill and to manage contaminated soils in accordance with guidelines. This will include: (a) Maximising the reuse of suitable material generated from construction in preference to importing fill; (b) Identifying possible sites for beneficial spoil reuse or disposal and securing arrangements; (c) Field investigations to confirm presence of soil contamination and to classify spoil for disposal in accordance with DEC Guidelines; (d) Confirming presence of potential acid sulphate soils and developing management and disposal options for acid sulphate soils consistent with the *Acid Sulphate Soil Manual* (Acid Sulphate Soil Management Advisory Committee, 1998); (e) Adoption of appropriate health, safety and environmental protocols during any disturbance of potentially contaminated soils; (f) Measures to avoid disturbing any known contaminated soils from construction work sites and pipeline routes; and (g) Auditing to ensure spoil reuse location has all required environmental and planning approvals.	During design (before construction commences).
Amended SOC	Beneficial reuse of spoil from construction maximised. Contaminated soils, if encountered, managed in accordance with DEC guidelines.	27. **A Construction Spoil Management Plan will be prepared** to beneficially reuse all suitable spoil will be developed for implementation during construction to effectively reduce the volumes of spoil disposed of to landfill and to manage contaminated soils in accordance with guidelines. This will include: (a) Maximising the reuse of suitable material generated from construction, **particularly waste classified as Virgin Excavated Natural Material (VENM),** in preference to importing fill; (b) Identifying possible sites for beneficial spoil reuse, **recycling or storage (particularly VENM)** or disposal and securing arrangements; (c) Field investigations to confirm presence of soil contamination and to classify spoil for disposal in accordance with ***Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Waste (EPA, 1995);*** (d) Confirming presence of potential acid sulphate soils and developing management and disposal options for acid sulphate soils consistent with the *Acid Sulphate Soil Manual* (Acid Sulphate Soil Management Advisory Committee, 1998); (e) Adoption of appropriate health, safety and environmental protocols during any disturbance of potentially contaminated soils; (f) Measures to avoid disturbing any known contaminated soils from construction work sites and pipeline routes; (g) Auditing to ensure spoil reuse location has all required environmental and planning approvals; and **(h) Submission of the Plan to the Department of Planning.**	During design (before construction commences).

Table 12.1 Amended Statement of Commitments Part A: Key Issues (cont'd)

Desired Outcome		Action	Timing
Spoil and Traffic Management (Delivery Infrastructure, Seawater Intake and Outlet) (cont'd)			
Draft SOC	Minimise traffic impacts from spoil transportation during construction.	26. Traffic management measures will be developed to minimise, as far as practicable, traffic impacts transporting spoil from excavation sites to reuse or disposal sites for implementation during construction, including: (a) Provision of adequate spoil stockpiling capacity where practicable to limit truck impacts; (b) Favouring spoil reuse near the excavation site where possible; (c) Development of measures to reduce traffic impacts from spoil disposal on the operation of the existing road network including: i. Informing the local community and road users on changed conditions prior to spoil transportation; ii. Scheduling of disruptive spoil transportation where feasible and needed, outside peak commuting hours, peak weekend times and school start and finish times where relevant; iii. Arrangements to reduce impacts on road network developed in consultation with road authorities; and iv. Traffic control in accordance with RTA *Traffic Control at Work Sites* and AS 1742.3 1996, *Traffic Control Devices for Works on Roads*. (d) Consulting with local communities potentially impacted by preferred tunnel/pipeline routes and the location of associated tunnel shafts to mitigate local issues of access, amenity, safety and traffic management.	During design (before construction commences).
Amended SOC	Minimise traffic impacts from spoil transportation during construction.	28. **A Construction Spoil Traffic Management Plan will be prepared** to minimise, as far as practicable, traffic impacts transporting spoil from excavation sites to reuse or disposal sites for implementation during construction, including: (a) Provision of adequate spoil stockpiling capacity where practicable to limit truck impacts; (b) Favouring spoil reuse near the excavation site where possible; (c) Development of measures to reduce traffic impacts from spoil disposal on the operation of the existing road network **and sensitive receptors including schools, parks and residential areas** including: i. Informing the local community and road users on changed conditions prior to spoil transportation; ii. Scheduling of disruptive spoil transportation where feasible and needed, outside peak commuting hours, peak weekend times and school start and finish times where relevant; iii. Arrangements to reduce impacts on road network developed in consultation with road authorities; iv. Traffic control in accordance with RTA *Traffic Control at Work Sites* and AS 1742.3 1996, *Traffic Control Devices for Works on Roads*; v. **Arrangements to ensure road safety is not compromised.** (d) Consulting with local communities potentially impacted by preferred tunnel/pipeline routes and the location of associated tunnel shafts to mitigate local issues of access, amenity, safety and traffic management.	During design (before construction commences).

Table 12.2 Amended Statement of Commitments Part B: Other Issues (cont'd)

Desired Outcome		Action	Timing
Construction Hours			
Draft SOC	Construction hours of work notified and managed where practicable to minimise disturbance to local amenity.	27. Construction will be restricted to between the hours of 7am to 6pm (Monday to Friday) and 7am to 1pm (Saturdays) and at no time on Sundays and public holidays except: (a) Where works are not a disturbance to nearby residences; or (b) For tunnelling and other underground activities; or (c) For the delivery of materials required outside these hours by authorities for safety reasons; or (d) Where it is required in an emergency to avoid the loss of lives, property and/or to prevent environmental harm; or (e) Where agreement has been reached with local residents in order to reduce the duration of construction activities and / or manage other traffic, amenity or disturbance issues; or (f) As otherwise necessary and in accordance with relevant authority requirements.	During construction.
Amended SOC	Construction hours of work notified and managed to minimise disturbance to local amenity.	29. Construction will be restricted to between the hours of 7am to 6pm (Monday to Friday) and 7am to 1pm (Saturdays) and at no time on Sundays and public holidays except: (a) Where works are not a disturbance to nearby residences; or (b) **For tunnelling and other underground activities, marine works, works on the desalination plant site at Kurnell (if >125 ML/day); or** (c) For the delivery of materials outside these hours **as required** by authorities for safety reasons; or (d) Where it is required in an emergency to avoid the loss of lives, property and/or to prevent environmental harm; or (e) Where agreement has been reached with local residents in order to reduce the duration of construction activities and / or manage other traffic, amenity or disturbance issues; or (f) As otherwise necessary and in accordance with relevant authority requirements.	During construction.
Draft SOC		28. Prior advice will be given to the community regarding any works outside of standard construction hours	During construction.
Amended SOC		30. Prior advice will be given to the community regarding any works outside of standard construction hours.	During construction.

Table 12.2 Amended Statement of Commitments Part B: Other Issues (cont'd)

Desired Outcome		Action	Timing
Noise and Vibration			
Draft SOC	Construction noise disturbance of local residents and schools minimised.	28. Construction work sites will be located and work practices will be developed for implementation during construction, to limit noise disturbance as far as practicable, including: (a) Applying a construction noise objective in line with the *Environmental Noise Control Manual* (DEC, 1994), as far as practicable, i.e. for activities at work sites operating for a period greater than 26 weeks (as measured by the $L_{A10\ (15\ minute)}$ descriptor) that the background L_{A90} noise level is not exceeded by more than 5dB(A) at any residence or other noise sensitive receiver. If noise from a construction activity is substantially tonal or impulsive in nature (as described in Chapter 4 of the NSW *Industrial Noise Policy*), 5dB(A) will be added to the measured construction noise level when comparing the measured noise with the construction noise objective; (b) Identifying reasonable and feasible noise mitigation measures, where the noise objectives cannot be achieved, including selection of less noisy construction method, noise controls on equipment, noise mitigation barriers, timing and notification of construction activities and/or options identified in line with 28(f); and (c) Developing a construction noise monitoring program to verify noise levels from key work sites.	During design (before construction commences).
Amended SOC	Construction noise disturbance of local residents and schools minimised.	**31. A Construction Noise Management Plan will be prepared to limit noise disturbance as far as practicable, including:** **(a) Undertaking an assessment of construction and traffic noise at the plant site and delivery infrastructure worksites and calculating project specific noise goals as follows;** Applying a construction noise objective in line with the *Environmental Noise Control Manual* (**EPA**, 1994) **or any construction noise guidelines developed by DEC to replace that manual**, as far as practicable, i.e. for activities at work sites operating for a period greater than 26 weeks (as measured by the $L_{A10\ (15\ minute)}$ descriptor) that the background L_{A90} noise level is not exceeded by more than 5dB(A) at any residence or other noise sensitive receiver. If noise from a construction activity is substantially tonal or impulsive in nature (as described in Chapter 4 of the NSW Industrial Noise Policy), 5dB(A) will be added to the measured construction noise level when comparing the measured noise with the construction noise objective; (b) Identifying reasonable and feasible noise mitigation measures, where the noise objectives cannot be achieved **and addressing noisy activities such as sheet piling for implementation during construction. This will** include selection of less noisy construction method, noise controls on equipment, noise mitigation barriers **such as noise shielding at construction compounds,** timing and notification of construction activities and/or options identified; **(c) Consulting with local communities where construction activities occur, including pipelaying along roadways, to mitigate local issues of noise, access, working hours, safety and disruption to traffic movements;** **(d) Measures to manage blasting activities on land generally in accordance with the guideline *"Technical Basis for Guidelines to Reduce Annoyance due to Blasting Overpressure and Ground Vibration"* (ANZECC, 1990) and Chapter 154 of the *Environmental Noise Control Manual* (EPA, 1994); and** (e) Developing a construction noise monitoring program to verify noise levels from key work sites.	During design (before construction commences).

Table 12.2 Amended Statement of Commitments Part B: Other Issues (cont'd)

Desired Outcome		Action	Timing
Noise and Vibration (cont'd)			
Draft SOC	Vibration impacts during construction on property and amenity of local residents and schools minimised.	30. Work practices will be developed to minimise vibration impacts as far as practicable for implementation during construction including: (a) Measures to limit vibration impacts on property and amenity of local residents and schools associated with construction activities in accordance with relevant Standards as far as practicable; and (b) Measures to manage blasting activities on land generally in accordance with the guideline "*Technical Basis for Guidelines to Reduce Annoyance due to Blasting Overpressure and Ground Vibration*" (ANZECC). Note there will be no blasting offshore.	During design (before construction commences).
Amended SOC	Vibration impacts during construction on property and amenity of local residents and schools minimised.	32. Work practices will be developed to minimise vibration impacts as far as practicable for implementation during construction including: (a) Measures to limit vibration impacts on property and amenity of local residents and schools associated with construction activities in accordance with relevant Standards as far as practicable; and (b) Measures to manage blasting activities on land generally in accordance with the guideline "*Technical Basis for Guidelines to Reduce Annoyance due to Blasting Overpressure and Ground Vibration*" (ANZECC, **1990) and Chapter 154 of the *Environmental Noise Control Manual* (EPA, 1994).** Note there will be no blasting offshore.	During design (before construction commences).
Draft SOC	Operational noise impacts from the desalination plant managed in accordance with guidelines.	31. An assessment of operational noise impact of the desalination plant design will be undertaken and intrusiveness and amenity criteria established generally in accordance with the NSW *Industrial Noise Policy* (EPA, 1999). Design mitigation measures will be identified as needed to reduce operational noise levels including controls on equipment and noise mitigation barriers.	During design (before operation commences).
Amended SOC	Operational noise impacts from the desalination plant managed in accordance with guidelines.	33. An assessment of operational noise impact of the desalination plant design will be undertaken and intrusiveness and amenity criteria established in accordance with the NSW *Industrial Noise Policy* **(EPA,** 1999). **An Operational Noise Management Plan will be prepared and include:** **(a) Amenity criteria for affected residential areas, Botany Bay National Park and recreation reserves;** **(b) Development of sleep disturbance criteria;** **(c) Scheduling of heavy vehicle movements associated with the operation of the desalination plant during the daytime (7am to 6pm) where possible; and** (d) Identification of design mitigation measures as needed to reduce operational noise levels including controls on equipment and noise mitigation barriers.	During design (before operation commences).

Table 12.2 Amended Statement of Commitments Part B: Other Issues (cont'd)

Desired Outcome		Action	Timing
Traffic and Access			
Draft SOC	Impact of construction activities on surrounding road network minimised	32. Work practices will be developed to minimise construction traffic impacts on the surrounding road network and disruptions from works within road reserves, such as pipeline trenching, as far as practicable, in consultation with road authorities for implementation during construction, including: (a) Informing the local community and road users on changed conditions prior to commencement; (b) Scheduling disruptive works outside peak commuting hours (including school start and finish times where relevant) and peak weekend times; (c) Arrangements for parking (onsite where practicable) and safe access to work areas from the adjacent road network; (d) Methods to reduce temporary lane closures, reduce delays and provide alternative access; (e) Controlling traffic in accordance with RTA *Traffic Control at Work Site* and AS 1742.3 1996, *Traffic Control Devices for Works on Roads*; and (f) Consulting with local communities where construction activities occur, including pipelaying along roadways, to mitigate local issues of access, working hours, safety and disruption to traffic movements.	During design (before construction commences).
Amended SOC	Impact of construction activities on surrounding road network minimised	34. **A Construction Traffic Management Plan will be prepared in consultation road authorities,** to minimise construction traffic impacts on the surrounding road network and disruptions from works within road reserves, such as pipeline trenching, as far as practicable, **and ensure road safety is not compromised,** including: (a) Informing the local community and road users on changed conditions prior to commencement; (b) Scheduling disruptive works outside peak commuting hours (including school start and finish times where relevant) and peak weekend times; (c) Arrangements for parking (onsite where practicable) and safe access to work areas from the adjacent road network; (d) Methods to reduce temporary lane closures, reduce delays and provide alternative access **including temporary traffic arrangements;** **(e) Restrictions on routes and times travelled by heavy vehicles;** (f) Controlling traffic in accordance with RTA *Traffic Control at Work Site* and AS 1742.3 1996, *Traffic Control Devices for Works on Roads*; (g) Consulting with local communities where construction activities occur, including pipelaying along roadways, to mitigate local issues of **noise**, access, working hours, safety and disruption to traffic movements; and **(h) Maintaining access along Captain Cook Drive and liaising with emergency services to ensure emergency response plans are not compromised.**	During design (before construction commences).

Table 12.2 Amended Statement of Commitments Part B: Other Issues (cont'd)

Desired Outcome		Action	Timing
Traffic and Access (cont'd)			
Draft SOC	Disruption to property access, parklands, bus services, pedestrians and cyclists during construction minimised.	33. Arrangements will be developed to ensure public safety and to minimise disruption to property access, parking, access to recreational areas, bus services, pedestrians and cyclists at all times where feasible for implementation during construction. This will include: (a) Measures to maintain access, bus service routes and frequencies, footpaths and bicycle facilities at all times where feasible; (b) Arrangements for notification and consultation if temporary changes are required; and (c) Measures to separate construction work areas such as through temporary fencing to maintain safety.	During design (before construction commences).
Amended SOC	Disruption to property access, parklands, bus services, pedestrians and cyclists during construction minimised.	35. Arrangements will be developed to ensure public safety and to minimise disruption to property access, parking, access to recreational areas, bus services, pedestrians and cyclists at all times where feasible for implementation during construction. This will include: (a) Measures to maintain access, bus service routes and frequencies, footpaths and bicycle facilities **(including routes at Kurnell and the Cooks River)** at all times where feasible; **(b) Arrangements to maintain access to properties or other arrangements where this is not practicable;** **(c) Measures to assess the condition of affected parklands and repair damage caused by construction;** (d) Arrangements for notification and consultation if temporary changes are required; and (e) Measures to separate construction work areas such as through temporary fencing to maintain safety.	During design (before construction commences).
Dust			
Draft SOC	Dust generation during construction minimised.	34. Construction activities will be undertaken in a manner that limits dust emissions from the site including: (a) Managing stockpiles to suppress dust emissions; (b) Collecting dust from tunnels and from enclosed spaces; and (c) Measures to wash vehicles and cover loads where there is the potential to generate dust, as practicable.	During construction.
Amended SOC	Dust generation during construction minimised.	36. **A Construction Dust Management Plan will be prepared,** to limit dust emissions **from the work sites including**: (a) Managing stockpiles to suppress dust emissions; (b) Collecting dust from tunnels and from enclosed spaces; and (c) Measures to wash vehicles and cover loads where there is the potential to generate dust, as practicable.	During construction.
Air Quality			
Draft SOC	No significant odour emissions produced during operation from marine debris.	35. The desalination plant will be designed and constructed to minimise intake of marine debris as far as practicable and meet POEO Act provisions for no offensive odour emitted from the premises during operation	During design (before operation commences).
Amended SOC	No significant odour emissions produced during operation from marine debris.	37. The desalination plant will be designed and constructed to minimise intake of marine debris as far as practicable and meet POEO Act provisions for no offensive odour emitted from the premises during operation. **A complaints register will be used to identify odour issues should they occur.**	During design (before operation commences).

Table 12.2 Amended Statement of Commitments Part B: Other Issues (cont'd)

Desired Outcome		Action	Timing
Erosion Control/Sedimentation			
Draft SOC	Control soil erosion and sedimentation during construction and operation to protect nearby waterways.	36. Work practices to control erosion and sedimentation will be identified for all work sites for implementation during construction and operation including: (a) Measures to manage surface water and stormwater from disturbed areas in accordance with Managing Urban Stormwater: Soils and Construction (Landcom, 2004); (b) Identifying the need for a licence under the POEO Act for any activities associated with stormwater discharge; and (c) Measures to manage spoil, grout and drill fluid during tunnelling.	During design (before construction/ operation commences).
Amended SOC	Control soil erosion and sedimentation during construction and operation to protect nearby waterways.	38. **A Construction Erosion and Sedimentation Control Plan will be prepared for the work sites** for implementation during construction and operation including: (a) Measures to manage surface water and stormwater from disturbed areas in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004) **including**: **i. Avoiding sediment runoff into sensitive waterways (including Quibray Bay and Cooks River);** **ii. Minimising the area of bare surfaces during construction; and** **iii. Preventing the spread of soil by construction vehicles on public roads.** (b) Identifying the need for a licence under the POEO Act for any activities associated with stormwater discharge; and (c) Measures to manage spoil, grout and drill fluid during tunnelling.	During design (before construction/ operation commences).
Hydrology and Flooding			
Draft SOC	Stormwater and flood risk managed on the desalination site.	37. Stormwater management measures on the desalination plant site will be designed and constructed to effectively provide onsite detention and drainage generally in line with relevant guidelines.	During design (before construction commences).
Amended SOC	Stormwater and flood risk managed **on all project sites.**	39. Stormwater management measures on **all project sites** will be designed and constructed to effectively provide onsite detention and drainage generally in line with relevant guidelines. **Relevant local authorities will be consulted regarding flood risk and mitigation measures.**	During design (before construction commences).
Draft SOC	Release of water used for commissioning managed to minimise the impact on waterways.	38. Work practices will be developed to manage the release of potable water for implementation during commissioning of construction works, generally in accordance with Sydney Water Water Discharge Protocols to reduce water quality impacts and hydrological impacts on receiving waters.	During design (prior to commissioning).
Amended SOC	Release of water used for commissioning managed to minimise the impact on waterways.	40. Work practices will be developed to manage the release of potable water for implementation during commissioning of construction works, generally in accordance with Sydney Water Water Discharge Protocols to reduce water quality impacts and hydrological impacts on receiving waters.	During design (prior to commissioning).

Table 12.2 Amended Statement of Commitments Part B: Other Issues (cont'd)

Desired Outcome		Action	Timing
Contaminated Soils			
Draft SOC	Contaminated soils and acid sulphate soil risks managed during construction in accordance with guidelines.	39. Management measures will be developed to identify and manage contaminated soils for implementation during construction including: (a) Field investigations to confirm presence of soil contamination and to classify spoil for disposal in accordance with DEC Guidelines; and (b) Confirming presence of potential acid sulphate soils and developing management and disposal options for acid sulphate soils consistent with the *Acid Sulphate Soil Manual* (Acid Sulphate Soil Management Advisory Committee, 1998).	During design (before construction commences).
Amended SOC	Contaminated soils and acid sulphate soil risks managed during construction in accordance with guidelines.	41. **A Contaminated Soil and Acid Sulphate Soil Management Plan will be prepared** to identify and manage contaminated soils **(including in Botany Bay)** for implementation during construction including: (a) Field investigations to confirm presence of soil contamination and measures to avoid and mitigate impacts on sites; **(b) Monitoring of water quality immediately adjacent to the dredging area;** (c) Methods to classify spoil for disposal in accordance with ***Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Waste*** **(EPA, 1999);** **(d) Procedures to properly assess and manage any previously unidentified areas of contaminated soils encountered; and** (e) Confirming presence of potential acid sulphate soils and developing management and disposal options for acid sulphate soils consistent with the *Acid Sulphate Soil Manual* (Acid Sulphate Soil Management Advisory Committee, 1998).	During design (before construction commences).
Groundwater			
Draft SOC	Minimise potential changes to the hydrological regime from construction activities.	40. Tunnelling and drilling activities will be designed and work practices will be developed to protect locally perched water bodies from draining or migration of contaminants for implementation during construction, such as through grouting of areas of high permeability.	During design (before construction commences).
Amended SOC	Minimise potential changes to the hydrological regime from construction activities.	42. **Intake and outlet** tunnelling and any **project** drilling activities will be designed and work practices will be developed to protect **groundwater and sensitive groundwater dependent ecosystems** from draining or migration of contaminants for implementation during construction. This will include: **(a) Undertaking a survey of groundwater levels at intake/outlet tunnel shafts and any drilling works sites;** **(b) Selection of final tunnel alignments to minimise interfaces with dykes; and** **(c) Measures to limit and monitor the rate of groundwater inflow into shafts and tunnels during construction such as probe drilling, use of grouting to seal fractures in rock, use of concrete diaphragm wall to seal shafts in sand or other suitable measures.**	During design (before construction commences).
Draft SOC		41. Controls on dewatering activities, including containment and treatment prior to discharge, will be identified in line with provisions in the POEO Act, for implementation during construction to protect quality of nearby water bodies.	During design (before construction commences).
Amended SOC		43. Controls on dewatering activities, including containment and treatment prior to discharge, will be identified in line with provisions in the POEO Act, for implementation during construction to protect quality of nearby water bodies.	During design (before construction commences).

Table 12.2 Amended Statement of Commitments Part B: Other Issues (cont'd)

Desired Outcome		Action	Timing
Groundwater (cont'd)			
Draft SOC	No significant alteration of groundwater regime associated with tunnel operations.	42. Tunnels will be designed and operational maintenance procedures developed to ensure no significant alteration of existing groundwater regime and groundwater use during operation.	During design (before operation commences).
Amended SOC	No significant alteration of groundwater regime associated with tunnel operations.	44. Tunnels will be designed and operational maintenance procedures developed to ensure no significant alteration of existing groundwater regime and groundwater use during operation.	During design (before operation commences).
Heritage			
Draft SOC	National heritage values of the Botany Bay National Park protected.	43. The visual impact of the desalination project will be designed not to adversely impact on the identified Kurnell Peninsula National Heritage values and the natural conservation values of the Botany Bay National Park, including: (a) Avoiding leaving any visibly intrusive structures in place at the surface of the intake and outlet site aside from possible buoys; and (b) Avoiding any significant visible permanent structure associated with the trenched pipeline crossing Botany Bay at Silver Beach.	During design (before construction commences).
Amended SOC	National heritage values of the Botany Bay National Park protected.	45. The visual impact of the desalination project will be designed not to adversely impact on the identified Kurnell Peninsula National Heritage values and the natural conservation values of the Botany Bay National Park, including: (a) Avoiding leaving any visibly intrusive structures in place at the surface of the intake and outlet site aside from possible buoys; and (b) Avoiding any significant visible permanent structure associated with the trenched pipeline crossing Botany Bay at Silver Beach.	During design (before construction commences).

Table 12.2 Amended Statement of Commitments Part B: Other Issues (cont'd)

Desired Outcome		Action	Timing
Heritage (cont'd)			
Draft SOC	Indigenous and non-indigenous cultural heritage values protected along infrastructure routes and at temporary construction sites.	44. Infrastructure routes and temporary construction sites will be located and management practices will be developed to minimise impacts, where practicable, on indigenous and non-indigenous cultural heritage values for implementation during construction, including: (a) Further assessments once final option is chosen to confirm optimal routes and site locations to limit impacts on indigenous and non-indigenous heritage values; (b) Developing work practices to reduce risk of damage to indigenous and non-indigenous heritage items or archaeology (such as limiting disturbance, fencing, worker education); (c) Further consultation with the local indigenous community will be undertaken once final option is chosen to confirm optimal routes and site locations. This will include consultation with the Local Aboriginal Land Council and other indigenous organisations.	During design (before construction commences).
Amended SOC	Indigenous and non-indigenous cultural heritage values protected along infrastructure routes and at temporary construction sites.	46. Infrastructure routes and temporary construction sites will be located and management practices will be developed to minimise impacts, where practicable, on indigenous and non-indigenous cultural heritage values for implementation during construction, including: (a) **Undertaking an Aboriginal Cultural Heritage Impact Assessment generally in accordance with DEC *Part 3A Guidelines* (current Draft July 2005) and non-indigenous Heritage Assessment generally in accordance *NSW Heritage Office Guidelines* to assist in selection of the final routes)** and once the final option is chosen confirm optimal routes and site locations to limit impacts on indigenous and non-indigenous heritage values; **(b) Reviewing remote magnetic survey work for the presence of any shipwreck debris in the path of the works in Botany Bay and off shore from Kurnell;** (c) Developing work practices to reduce risk of damage to indigenous and non-indigenous heritage items or archaeology (such as limiting disturbance, fencing, and **worker induction);** (d) Further consultation with the local indigenous community will be undertaken once final option is chosen to confirm optimal routes and site locations. This will include consultation with the Local Aboriginal Land Council and other indigenous organisations; and **(e) Further consultation with Municipal Councils will be undertaken once final option is chosen to identify local heritage items and heritage features.**	During design (before construction commences).
Draft SOC	Indigenous and non-indigenous cultural heritage values protected along infrastructure routes and at temporary construction sites.	45. If previously unidentified Aboriginal objects are discovered during construction of delivery infrastructure, all work likely to affect the object(s) will cease and the DEC informed. An investigation will be undertaken by a suitably qualified archaeologist to identify measures to be implemented to reduce impact on the objects discovered, prior to recommencing works.	During construction.
Amended SOC	Indigenous and non-indigenous cultural heritage values protected along infrastructure routes and at temporary construction sites.	47. If previously unidentified Aboriginal objects are discovered during construction of delivery infrastructure, all work likely to affect the object(s) will cease **immediately** and the DEC and **relevant Local Aboriginal Land Councils** informed. An investigation will be undertaken by a suitably qualified archaeologist to identify measures to be implemented to reduce impact on the objects discovered, prior to recommencing works.	During construction.

Table 12.2 Amended Statement of Commitments Part B: Other Issues (cont'd)

Desired Outcome		Action	Timing
Heritage (cont'd)			
Draft SOC	Indigenous and non-indigenous cultural heritage values protected along infrastructure routes and at temporary construction sites.	46. If unexpected historical relic(s) are discovered during construction, all work likely to affect the relic(s) will cease and the NSW Heritage Office notified. An investigation will be undertaken by a suitably qualified archaeologist to identify measures to be implemented to reduce impact on the relics discovered, prior to recommencing works.	During construction.
Amended SOC	Indigenous and non-indigenous cultural heritage values protected along infrastructure routes and at temporary construction sites.	48. If unexpected historical relic(s) are discovered during construction, all work likely to affect the relic(s) will cease and the NSW Heritage Office notified. An investigation will be undertaken by a suitably qualified archaeologist to identify measures to be implemented to reduce impact on the relics discovered, prior to recommencing works.	During construction.
Draft SOC	Heritage values of the Pressure/City Tunnels maintained.	47. Connection into the Pressure or City Tunnels will be designed to be consistent with heritage values of maintaining the existing use of these tunnels. The NSW Heritage Office will be informed of the works and discussions held as to possible mitigation measures for implementation during construction.	During design (before construction commences).
Amended SOC	Heritage values of the Pressure/City Tunnels maintained.	49. Connection into the Pressure or City Tunnels will be designed to be consistent with heritage values of maintaining the existing use of these tunnels. The NSW Heritage Office will be informed of the works and discussions held as to possible mitigation measures for implementation during construction.	During design (before construction commences).
Visual			
Draft SOC	Construction work sites rehabilitated.	48. A program will be developed to minimise construction time and to progressively rehabilitate areas disturbed temporarily by construction as far as practicable to pre-work condition to mitigate visual impact.	During design (before construction commences).
Amended SOC	Construction work sites rehabilitated.	50. A program will be developed to minimise construction time and to progressively rehabilitate areas disturbed temporarily by construction as far as practicable to pre-work condition to mitigate visual impact.	During design (before construction commences).
Draft SOC	Visual impact of the desalination plant minimised and landscaping maintained during operation.	49. Designs of the desalination plant will be developed that are consistent with the visual landscape from local and regional vantage points including the use of colour, landscaping and retaining the conservation area to allow screening.	During design (before construction commences).
Amended SOC	Visual impact of the desalination plant minimised and landscaping maintained during operation.	51. Designs of the desalination plant will be developed that are consistent with the visual landscape from local and regional vantage points (including from the air) including the use of colour, landscaping and retaining the conservation area to allow screening.	During design (before construction commences).

Table 12.2 Amended Statement of Commitments Part B: Other Issues (cont'd)

Desired Outcome		Action	Timing
Chemical Use			
Draft SOC	Chemicals used and stored during construction within guidelines.	50. Work practices to reduce hazards from chemical use will be developed for implementation during construction including: (a) Measures for the handling, storage and disposal of hazardous substances in accordance with the relevant legislation, standards and guidelines, eg. *Occupational Health and Safety Regulation 2001 and Code of Practice for Dangerous Goods* (WorkCover, 2005); and (b) Development of procedures for incident management including spill control and clean-up measures.	During design (before construction commences).
Amended SOC	Chemicals used and stored during construction in compliance with legislation.	52. Work practices to reduce hazards from chemical use will be developed for implementation during construction including: (a) Measures for the handling, storage and disposal of hazardous substances in accordance with the relevant legislation, standards and guidelines, eg. *Occupational Health and Safety Regulation 2001 and Code of Practice for Dangerous Goods* (WorkCover, 2005); and (b) Development of procedures for incident management including spill control and clean-up measures.	During design (before construction commences).
Draft SOC	Chemicals used and stored during operation within guidelines.	51. Further screening of hazards associated with the desalination plant designs will be undertaken and a preliminary hazard analysis undertaken if needed, generally following relevant guidelines such as *Guidelines for Hazard Analysis, Hazardous Industries Planning Advisory Paper No. 6* (NSW Department of Urban Affairs and Planning, 1992). 52. Measures to manage chemical use and storage risks will be developed for implementation during design and operation including: (a) Study of hazard and operability of the desalination plant once detailed designs are determined, generally following relevant guidelines such as *Hazard and Operability Studies, Hazardous Industries Planning Advisory Paper No. 8* (NSW Department of Urban Affairs and Planning, 1995); (b) Measures for the handling, storage and disposal of hazardous substances in accordance with the relevant legislation, standards and guidelines, eg. *Occupational Health and Safety Regulation 2001 and Code of Practice for Dangerous Goods* (WorkCover, 2005); and (c) Procedures for incident management including spill control and clean-up measures.	During design (before construction commences). During design (before operation commences).
Amended SOC	Chemicals used and stored during operation **in compliance with legislation.**	53. Further screening of hazards associated with the desalination plant designs will be undertaken and a Preliminary Hazard Analysis undertaken **in accordance with guidelines** such as *Guidelines for Hazard Analysis, Hazardous Industries Planning Advisory Paper No. 6* (NSW Department of Urban Affairs and Planning, 1992). 54. Measures to manage chemical use and storage risks will be developed for implementation during design and operation including: **(a) Identification of the type, volume and concentration of chemicals that will be used and stored including chemicals used to preserve membranes during shutdowns;** (b) Study of hazard and operability of the desalination plant once detailed designs are determined, generally following relevant guidelines such as *Hazard and Operability Studies, Hazardous Industries Planning Advisory Paper No. 8* (NSW Department of Urban Affairs and Planning, 1995); (c) Measures for the handling, storage and disposal of hazardous substances in accordance with the relevant legislation, standards and guidelines, eg. *Occupational Health and Safety Regulation 2001 and Code of Practice for Dangerous Goods* (WorkCover, 2005); and (d) Procedures for incident management including spill control and clean-up measures	During design (before construction commences). During design (before operation commences).

Table 12.2 Amended Statement of Commitments Part B: Other Issues (cont'd)

Desired Outcome		Action	Timing
Bushfire Hazard			
Draft SOC	Bushfire hazards during construction and operation managed in accordance with guidelines.	53. Measures to reduce the bushfire hazard risks to people and property in relation to the desalination plant and delivery infrastructure will be developed generally in line with NSW Rural Fire Service and Planning NSW (2001) *Planning for Bushfire Protection*, for implementation during construction and operation.	During design (before construction/ operation commences).
Amended SOC	Bushfire hazards during construction and operation managed in accordance with guidelines.	55. Measures to reduce the bushfire hazard risks to people and property in relation to the desalination plant and delivery infrastructure will be developed generally in line with NSW Rural Fire Service and Planning NSW (2001) *Planning for Bushfire Protection*, for implementation during construction and operation. **Fencing and utilities within the project sites will be located with due consideration given to minimising the impact of bushfire buffer requirements on remnant native vegetation.**	During design (before construction/ operation commences).
Waste			
Draft SOC	Construction wastes minimised, reuse and recycling maximised.	54. Measures to reduce, reuse and recycle construction wastes will be developed with consideration of the Resource NSW (2003) *Waste Avoidance and Resource Recovery Strategy*, for implementation during construction.	During design (before construction commences).
Amended SOC	Construction wastes minimised, reuse and recycling maximised.	56. Measures to reduce, reuse and recycle construction wastes will be developed with consideration of the Resource NSW (2003) *Waste Avoidance and Resource Recovery Strategy*, for implementation during construction.	During design (before construction commences).
Draft SOC	Waste disposal during construction and operation managed in accordance with guidelines.	55. Waste management procedures will be developed to dispose of any construction or operational waste material unable to be reused or recycled in accordance with relevant legislation and guidelines, eg. DEC (1999) *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes*, for implementation during construction and operation.	During design (before construction/ operation commences).
Amended SOC	Waste disposal during construction and operation managed in accordance with guidelines.	57. **A Waste Management Plan will be prepared to ensure the proper classification and management of** all construction or operational waste material unable to be reused or recycled in accordance with relevant legislation and *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes* (**EPA**, 1999), for implementation during construction and operation. **Disposal requirements will involve appropriate treatment on-site and/or as applicable the use of a licensed waste transporter and disposal at a facility licensed to accept the waste type.**	During design (before construction/ operation commences).
Water Use			
Draft SOC	Efficient use of water during construction.	56. Work practices to optimise efficient use of potable water will be adopted where practicable for implementation during construction (including commissioning) to promote water conservation.	During design (before construction commences).
Amended SOC	Efficient use of water during construction.	58. Work practices to optimise efficient use of potable water will be adopted where practicable for implementation during construction (including commissioning) to promote water conservation.	During design (before construction commences).
Draft SOC	Efficient use of water during operations.	57. Investigations of methods to optimise water conservation will be developed for implementation during operation of the desalination plant and infrastructure.	During design (before operation commences).
Amended SOC	Efficient use of water during operations.	59. Investigations of methods to optimise water conservation will be developed for implementation during operation of the desalination plant and infrastructure.	During design (before operation commences).

Table 12.2 Amended Statement of Commitments Part B: Other Issues (cont'd)

Desired Outcome		Action	Timing
Navigation and Fishing			
Draft SOC	Disruption to boating, fishing and aquaculture activities during construction minimised.	58. Measures to limit disruption to boating, fishing and aquaculture activities offshore from Kurnell and in Botany Bay will be developed in consultation with waterways authorities for implementation during construction of intakes and outfalls, and in relation to jetty installation, dredging works or pipeline laying in Botany Bay. This will include protocols for notification.	During design (before construction commences).
Amended SOC	Disruption to boating, fishing and aquaculture activities during construction minimised.	60. Measures to limit disruption to boating, fishing and aquaculture activities offshore from Kurnell and**/or** in Botany Bay will be developed in consultation with waterways authorities for implementation during construction of intakes and outfalls, and in relation to jetty installation, dredging works or pipeline laying in Botany Bay. This will include protocols for notification.	During design (before construction commences).
Draft SOC	Navigation risks associated with maritime structures managed	59. Maritime structures (including seawater intakes, outlets, pipelines) will be designed to minimise impacts on navigation where practicable. This will include consideration of *Engineering Standards and Guidelines for Maritime Structures* (NSW Maritime, 2005), notification procedures and consideration of potential designation of no anchoring zones.	During design (before operation commences).
Amended SOC	Navigation risks, **impacts on fishing and recreational use** associated with maritime structures managed.	61. Maritime structures (including seawater intakes, outlets, pipelines) will be designed to minimise impacts on navigation, **fishing activities and recreational use** where practicable. This will include consideration of *Engineering Standards and Guidelines for Maritime Structures* (NSW Maritime, 2005), **design of Botany Bay pipeline to withstand anchors,** notification procedures, **navigation signs and confirmation of whether** a no anchoring zone(s) **is needed in consultation with NSW Maritime and Sydney Ports Corporation**.	During design (before operation commences).
Property			
Draft SOC	Minimise potential construction related damage to structures, properties and infrastructure.	60. Design measures and management procedures will be developed to prevent or suitably mitigate, damage to existing properties, structures and infrastructure (such as from vibration, blasting, excavation-induced settlement or from water table draw-down) for implementation during construction. This will include a process for conducting property inspections, subject to landowner agreement, on all structures at risk of impact during construction and rectification measures, for implementation during construction.	During design (before construction commences).
Amended SOC	**Prevent or suitably mitigate** potential construction related damage to structures, properties and infrastructure.	62. Design measures and management procedures will be developed for implementation during construction to prevent or suitably mitigate, damage to properties, structures and infrastructure (such as from vibration, blasting, excavation-induced settlement or from water table draw-down). This will include a process for conducting property inspections, subject to landowner agreement, **and dilapidation surveys, if required**, on all structures at risk of impact during construction **and formulation of measures to rectify property damage caused by construction at no cost to the owner.**	During design (before construction commences).

Table 12.2 Amended Statement of Commitments Part B: Other Issues (cont'd)

Desired Outcome		Action	Timing
Utilities and Services			
Draft SOC	Disruption to services during construction minimised and customers notified.	61. Measures will be developed for implementation during construction so that disruptions to services and utilities due to construction activities are minimised and advised to customers.	Before construction commences.
Amended SOC	Disruption to services during construction minimised and customers notified.	63. Measures will be developed for implementation during construction so that disruptions to services and utilities due to construction activities are minimised and advised to customers.	Before construction commences.
Draft SOC	Assist in lessening peak electricity loads at times of high demand	62. Designs will enable operation of the desalination plant as an interruptible energy supply to assist in lessening peak electricity loads at times of maximum demand as far as practicable.	During design (before operation commences).
Amended SOC	Assist in lessening peak electricity loads at times of high demand.	64. Designs will enable operation of the desalination plant as an interruptible energy supply, **if required** to assist in lessening peak electricity loads at times of maximum demand. **Back-up supply will be provided to power essential equipment at the plant, such as an on-site generator or back-up battery supply.**	During design (before operation commences).

Table 12.3 Amended Statement of Commitments Part C: Overarching Issues

Desired Outcome		Action	Timing
Environmental Management Systems			
Draft SOC	Management systems in place for protection of the environment.	63. The construction and operation will be undertaken in accordance with an Environmental Management System(s) (EMS) to the standard of ISO 14001 or equivalent. 64. The EMS will provide an overarching system to achieve the environmental management objectives for the project and address all commitments in this statement, the Minister's Conditions of Approval and any environmental due diligence requirements identified by the proponent or contractor. The EMS(s) will be developed specifically for the project by the successful tenderer. The EMS will be integrated with environmental management activities of the proponent and all contractors.	EMS prepared during design (construction elements of EMS before construction commences, operation elements of EMS before operation commences).
Amended SOC	Management systems in place for protection of the environment.	65. The construction and operation will be undertaken in accordance with an Environmental Management System(s) (EMS) to the standard of ISO 14001 or equivalent. 66. The EMS will provide an overarching system to achieve the environmental management objectives for the project and address all commitments in this statement, the Minister's Conditions of Approval and any environmental due diligence requirements identified by the proponent or contractor. The EMS(s) will be developed specifically for the project by the successful tenderer. The EMS will be integrated with environmental management activities of the proponent and all contractors.	EMS prepared during design (construction elements of EMS before construction commences, operation elements of EMS before operation commences).

Table 12.3 Amended Statement of Commitments Part C: Overarching Issues (cont'd)

Desired Outcome		Action	Timing
Communications Processes			
Draft SOC	The community and stakeholders have a high level of awareness of all processes and activities associated with the project; Provision of accurate and accessible information; and A high level of responsiveness to issues and concerns raised by the community.	65. Communications processes will be developed and implemented throughout delivery of the project. This will include: (a) Opportunities to input to mitigation measures for construction or operations; (b) Methods to inform the community of the progress and performance of the project and issues of interest to the community; (c) Notification of construction activities to potentially affected local residents and businesses; (d) Processes to receive and manage complaints in accordance with Sydney Water customer contract; (e) Consultation with affected property owners including property inspections, where appropriate; (f) Induction and training of construction personnel in communications requirements; and (g) Protocols to notify stakeholders of relevant activities and any incidents should they occur.	Before construction commences and reviewed at regular intervals.
Amended SOC	The community and stakeholders have a high level of awareness of all processes and activities associated with the project; Provision of accurate and accessible information; and A high level of responsiveness to issues and concerns raised by the community.	**67. When it is determined that a desalination plant needs to be constructed and details of the final distribution routes are known, impacted communities will be provided detailed information on the nature and timing of the proposed works including:** **(a) Sydney Water will work with local Councils, stakeholder groups and the community to identify local issues and concerns prior to the commencement of construction to ensure that appropriate measures are put in place to mitigate local impacts;** **(b) Measures will address issues such as access, local amenity, safety and traffic management; and** **(c) Local communities will be consulted should site restoration works be required following construction.** 68. Communications processes will be developed and implemented **at appropriate times with impacted communities** throughout delivery of the project. These will include: (a) Opportunities to input to mitigation measures for construction or operations; (b) Methods to inform the community of the progress and performance of the project and issues of interest to the community; (c) Notification of construction activities to potentially affected local residents and businesses; (d) Processes to receive and manage complaints in accordance with Sydney Water's customer contract; (e) Consultation with affected property owners including property inspections, where appropriate; (f) Induction and training of construction personnel in communications requirements; and (g) Protocols to notify stakeholders of relevant activities and any incidents should they occur.	During design (before operation commences).

Table 12.3 Amended Statement of Commitments Part C: Overarching Issues (cont'd)

Desired Outcome		Action	Timing
Further Approval of Tunnelling Options			
Draft SOC	Details of tunnels under urban areas investigated in consultation with affected communities and subject to further Minister's approval.	66. A detailed Tunnelling Impacts Investigation Report on the construction of delivery infrastructure tunnels under urban areas will be developed in consultation with affected communities, for implementation during construction. This will include: (a) Adequate level of assessment to demonstrate that: i. Any geotechnical risks can be effectively managed; ii. Spoil can be managed to minimise traffic disruption; and iii. Noise, local access and public safety issues can be effectively managed; (b) Details of appropriate management and monitoring measures; and (c) Identification of how the communities' interests will be addressed.	During design (before commencement of construction of tunnelling works under urban areas).
Amended SOC	Details of tunnels under urban areas investigated in consultation with affected communities and subject to further Minister's approval.	69. A detailed Tunnelling Impacts Investigation Report on the construction of delivery infrastructure tunnels under urban areas will be developed in consultation with affected communities, for implementation during construction. This will include: (a) Adequate level of assessment to demonstrate that: i. Any geotechnical risks can be effectively managed; ii. Spoil can be managed to minimise traffic disruption; and iii. Noise, local access and public safety issues can be effectively managed; (b) Details of appropriate management and monitoring measures; and (c) Identification of how the communities' interests will be addressed.	During design (before commencement of construction of tunnelling works under urban areas).
Draft SOC		67. No substantial construction of tunnels through urban areas will be undertaken without the prior approval of the Minister for Planning.	During design (before commencement of construction of tunnelling works under urban areas).
Amended SOC		70. No substantial construction of tunnels through urban areas will be undertaken without the prior **Project Approval of** the Minister for Planning. **Note: Commitments 69 & 70 apply only to tunnels under urban areas comprising houses and other buildings but does not include trenchless pipelaying technology such as micro-tunnelling or drilling under roads, railways or creeks in order to minimise environmental impact or social disruption.**	During design (before commencement of construction of tunnelling works under urban areas).
Desalinated Water Distribution Infrastructure Assessment			
New SOC	**The community and stakeholders have a high level of awareness of the basis of final distribution routes(s) selection.**	**71. For Project Approval, a Desalinated Water Distribution Infrastructure Assessment will be prepared to ensure that the community has a high level of awareness as to the final distribution routes selected and will include:** **(a) Assessment of various distribution route options;** **(b) Analysis of options identifying constraints;** **(c) Preferred distribution route(s); and** **(d) Mitigation measures.**	**During design (before construction commences).**

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Appendix A
The Concept Plan for the Desalination project as exhibited

The following text is reproduced from Chapter 2 of the Environmental Assessment. This is the project description that submissions are based upon. After the Environmental Assessment was exhibited the project was been modified as outlined in Section 1.4. Footnotes are provided where project circumstances have changed in the time elapsed since exhibition.

1. Overview

Drinking water produced by desalination is not a new concept. It has been implemented for many decades and is the principal source of drinking water in some countries. It is also used to produce fresh water on ships. The desalination processes available today can readily achieve health and aesthetic (salt content, taste and odour) water quality standards superior to the criteria set down in the Australian Drinking Water Guidelines as published by the National Health and Medical Research Council (NHMRC). In the case of Sydney, a desalination plant will achieve water quality that meets the NSW Health requirements and the Australian Drinking Water Guidelines and as set out in Sydney Water's operating licence.

The Concept Plan involves treating and delivering up to 500 ML/day of drinking water into the existing water distribution network.

It is proposed to have the capacity to build the desalination plant in stages ranging from 125 to 500 ML/day as the need arises. This can be achieved by constructing the intake and outlet structures close offshore in the Tasman Sea and infrastructure across Botany Bay for the ultimate capacity of 500 ML/day. Once across Botany Bay the distribution will be sized to the built capacity of the desalination plant.

Options include:

- 125 ML/day plant with local distribution from Kyeemagh;
- Plant initially built at 125 ML/day and then expanded up to 500 ML/day; or
- 500 ML/day plant initially constructed with distribution to City/Pressure Tunnels.

In each of these options it is also possible to deliver up to 50 ML/day locally from the desalination plant by connecting to the water distribution system at Caringbah, which delivers water to the Sutherland area. Pipes would be laid along roadways and easements.

The major elements are:

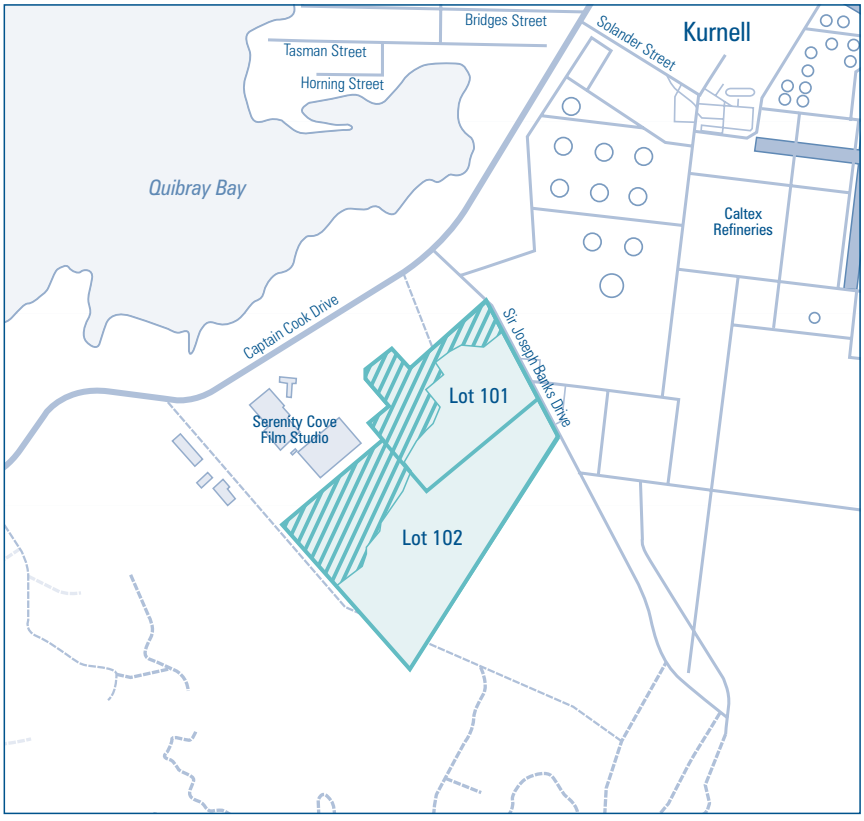
- A reverse osmosis desalination plant on industrial land at Kurnell sized in approximately 125 ML/day modules. The desalination site is composed of two parcels of land as follows:

- Lot 2 in DP 1077972 owned by Valad Property Group and referred to as Lot 101 in the Environmental Assessment;
- Lot 1 in DP 1088703 being part of Lot 102 in DP 1027438 owned by Serenity Cove Business Park and referred to as Lot 102 in the Environmental Assessment (refer to Figure 1.1);
- Acquisition by Sydney Water of these lots is proceeding[5];

[5] Land now acquired.

- Intake and outlet structures sized to full plant capacity of 500 ML/day and located close offshore in the Tasman Sea. These will be linked to the desalination plant by tunnels;
- Infrastructure to deliver water to the existing distribution network, allowing any of the following:
  - 50 ML/day delivered locally to Caringbah;
  - 125 ML/day delivered to Kyeemagh and then to the existing distribution network; and
  - Up to 500 ML/day delivered to the major water distribution system consisting of the City and Pressure Tunnels via a pipeline or tunnel across Botany Bay.

Figure 1.1 The desalination plant site at Kurnell



To date, two water distribution methods (that is, distribution route and method of construction) are under consideration to connect the desalination plant to the water network. A pipeline and/or tunnel could be used to distribute the water. Figures 1.2 and 1.3 show examples of routes that have been investigated. Other distribution methods will be considered.

Alternative distribution methods may arise during the detailed design process. Decisions on the route and method of construction will be made during detailed design.

The precise details of the site layout, distribution routes and other infrastructure will not be available until further investigation and design are undertaken as part of the detailed design in the project procurement strategy. This will be subject to the applicable environmental approval process, under Part 3A of the EP&A Act (refer 1.5.3).

For a 125 ML/day plant, pipes or horizontal directional drilling could be used to distribute water locally from Kyeemagh. Two possible routes are shown in Figure 1.2. For a plant delivering more than 125 ML/day, a tunnel will be required to deliver the additional water to the city's major distribution network. Figure 1.3 shows possible tunnel routes. Only one route would be required.

Figure 1.2 Indicative potential water distribution systems for a 125 ML/day desalination plant at Kurnell

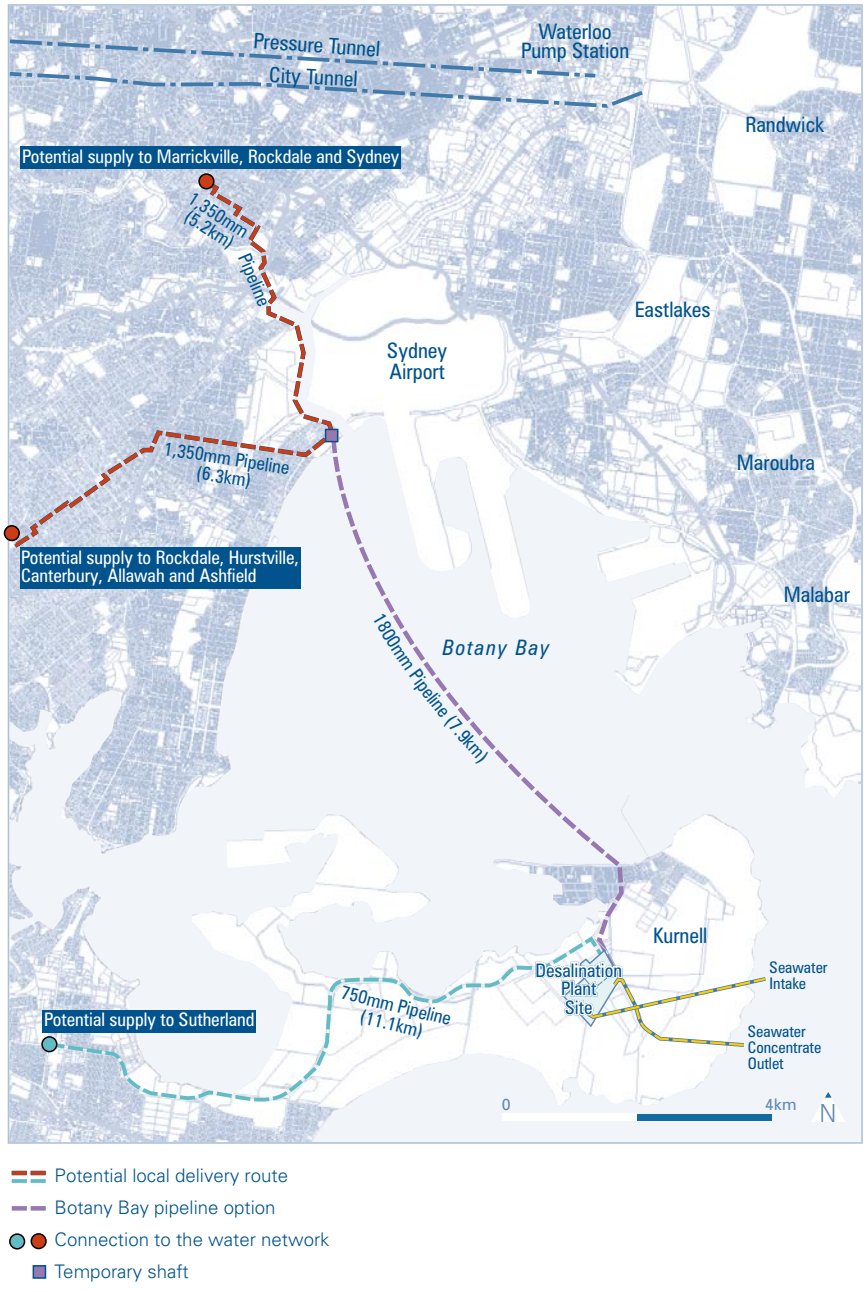
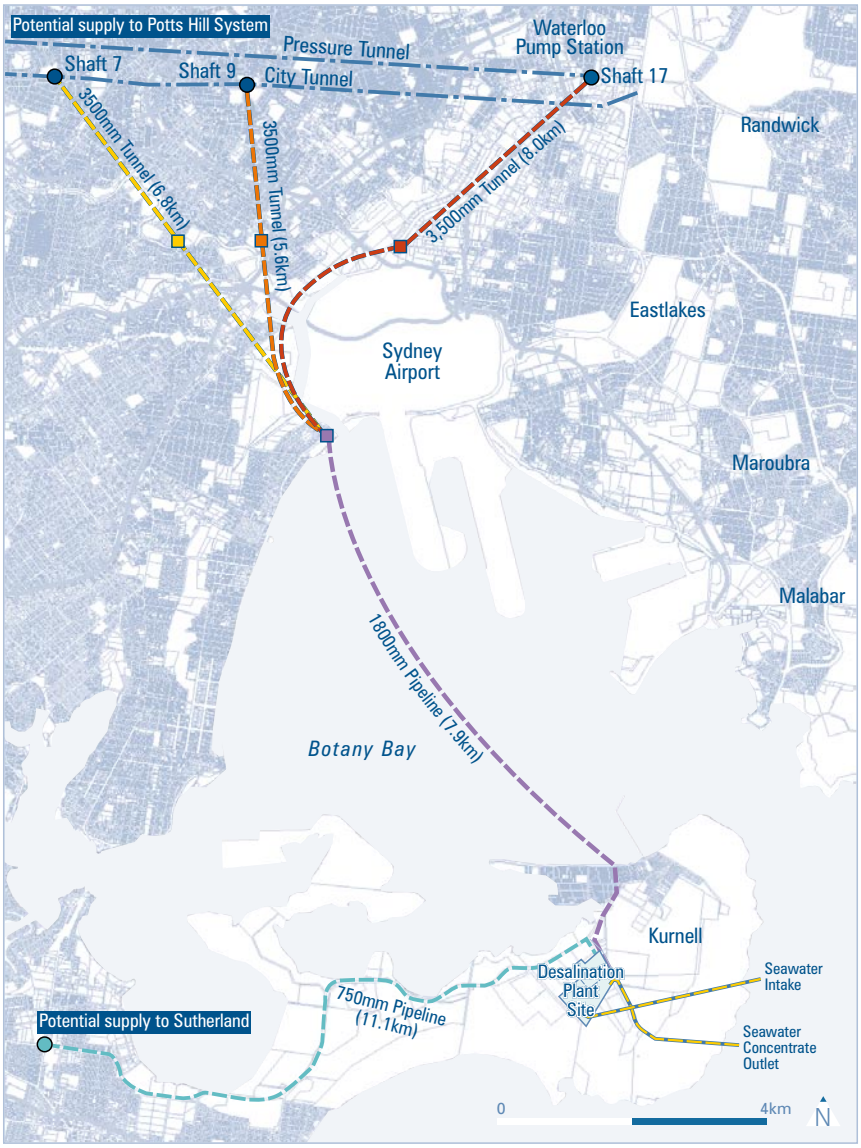


Figure 1.3 Indicative potential water distribution systems for a 125 ML/day desalination plant at Kurnell then expanded to 500 ML/day



2. Staging of the plant

If severe drought were to be sustained, the desalination plant could be needed in late 2008. To achieve this, construction would need to start in late 2006[6].

As the project is a response to drought, it is quite possible that the plant will be built in stages of 125 ML/day modules. This could be achieved by constructing intakes and outlets for 500 ML/day and treatment units for a lesser amount with delivery infrastructure also staged. The initial size of the plant will be determined during the procurement phase with due consideration to dam storage levels. The treatment units will be designed in modules to allow staging up to 500 ML/day.

Factors that will influence decisions to increase capacity will depend on inflows into the water storages and rate of depletion of those storages.

3. Localities

The study area for the environmental assessment is focused on the area of impact of the proposed project and includes sites that could potentially be affected by the construction or operational phases:

- The plant location site at Kurnell;
- The intake and outlet locations;
- The Botany Bay impact zone for a pipeline, tunnel, or microtunnel and the locations where tunnel shafts may occur; and
- The area covering the distribution routes.

Potentially affected Local Government Areas (LGAs) include Sutherland, Botany, City of Sydney, Rockdale, Marrickville, Canterbury, Kogarah and Ashfield. However, this will not be known until the final size of the plant and delivery routes are determined.

4. Project phases

Feasibility and pre-construction activities

Before construction commences, additional routine feasibility studies need to continue. These are likely to include geotechnical, groundwater, soil and sediment studies along with other surveys and minor tasks required to assess routes, sites and other infrastructure needs.

Tasks associated with pre-design and construction are likely to include consideration and optimisation of the concept design.

Construction

Construction will take approximately 26 months. Tunnelling and plant development will occur simultaneously. For the purposes of this document it should be noted that a variety of construction methods could be used, including:

- Site preparation;
- Temporary construction compound areas;
- Temporary wharves and barges;
- Tunnelling;
- Dredging and pipe laying across Botany Bay;
- Trenching, directional drilling, boring, or other means for installing pipelines;
- Blasting may occur for shaft construction on inland sites (no blasting will occur in the ocean); and
- Heavy lift for plant items.

[6] Storage levels have since increased altering this project timeline.

Construction will include pipeline or tunnelling areas, trenching, dredging, directional drilling, wharves/barges, clearing plant site, construction of tanks and buildings and associated infrastructure including connection to the electricity grid. The exact impact zones are not defined at this stage, as these will be determined at completion of detailed design in line with the approval conditions set by the Minister.

There are various options for constructing pipelines and the method to be selected depends on circumstances encountered and the outcomes of the detailed design stage.

Temporary compounds

Temporary compounds are required during construction for administration offices, parking for personnel, open areas to laydown and store materials, plant and equipment, and covered areas for the storage of perishable materials. For safety, fencing will be installed around construction areas such as pipe trenches, shafts, and adits (an entrance to a tunnel). All temporary structures will be removed at the completion of construction.

Workforce

The workforce involved in the project will be up to approximately 1,000 construction and commissioning staff and up to 20 permanent operational staff. It is likely that the workforce will include local contractors as well as international experts, particularly during the commissioning phase.

Spoil management

If the project proceeded to the ultimate 500 ML/day, there is likely to be between 735,000 and 1.1 million tonnes of spoil excavated from tunnels and the delivery infrastructure. This is less than other recent projects in Sydney that include the Northside Storage Tunnel that produced 1.8 million tonnes of spoil and the Chatswood Epping Rail Link that produced 1.7 million tonnes.

Spoil will range from clean sandstone to sediments, so disposal methods will vary accordingly. Most of the spoil will be clean material that can be beneficially reused. Some of the spoil may need to be sent to landfill. Little contaminated material is expected.

Commissioning

Before the plant is brought on line there will be a commissioning period where all plant systems are tested thoroughly and water quality targets are confirmed. During this period the plant's output will not be sent into the delivery system. This water will be discharged through the outlets with the seawater concentrate. Similarly, as the delivery systems are finalised, tunnels and pipelines will be tested. This water will be discharged to either sewer or to the stormwater system.

Operation

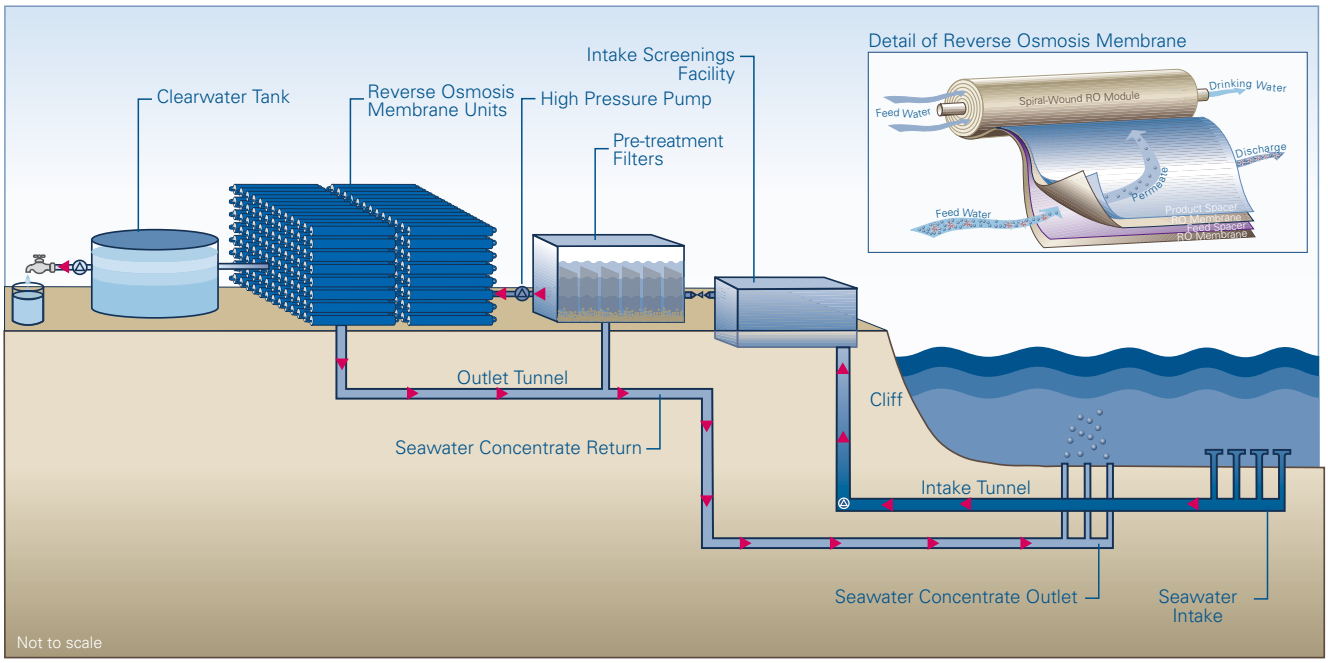
The desalination plant will provide up to 500 ML/day of drinking water into the existing drinking water network. As with all supplementary sources of drought supply, should the level of Sydney's water supply dams increase significantly, production may be reduced, suspended and recommenced as required.

The desalination plant will operate as follows as shown in Figure 1.4:

- Seawater will be extracted from the ocean and pumped to the desalination plant. The intakes will be designed to minimise impacts to aquatic ecology;
- The seawater will pass through pre-treatment processes to remove suspended solids and other solid matter. This will be achieved through coagulation and sedimentation followed by filtration, or by using microfiltration or ultrafiltration membranes upstream of the reverse osmosis membranes;

- The seawater will then be passed through Reverse Osmosis membranes. The process uses a semi-permeable membrane to separate salts from seawater. The membrane retains the salts, viruses, micro-organisms and other impurities, while desalinated water diffuses through the membrane;
- The desalinated water will be potabilised, fluoridated and disinfected to maintain chlorine residual to meet Australian Drinking Water Guidelines (published by the National Health and Medical Research Council) and NSW Health requirements, in accordance with normal Sydney Water practice. Desalinated water will then be delivered to a clear water tank before distribution to the network via a system of tunnels and/or pipelines; and
- Backwash water from the pre-treatment filters and the water that does not pass through the reverse osmosis process will be discharged to the ocean via an outlet designed to maximise dilution and dispersion of the discharge.

Figure 1.4 Schematic of the reverse osmosis process



Appendix B Issues Database Summary

Issue	Number of times issue raised	Submission ID number
1. General issues		
General issues relating to the proposal	2	P224 P275
Does not support the desalination project	571	P1 P100 P101 P102 P103 P104 P105 P106 P107 P108 P109 P11 P110 P111 P112 P113 P114 P115 P116 P117 P119 P121 P122 P123 P124 P125 P126 P127 P128 P129 P13 P130 P131 P132 P133 P134 P135 P136 P137 P138 P14 P140 P143 P144 P149 P15 P150 P153 P154 P155 P156 P157 P158 P159 P160 P161 P164 P165 P166 P167 P170 P171 P172 P174 P175 P177 P178 P179 P18 P180 P181 P182 P183 P184 P185 P187 P188 P189 P191 P193 P194 P195 P197 P198 P2 P20 P200 P201 P202 P203 P204 P205 P208 P21 P210 P211 P212 P213 P214 P216 P218 P219 P22 P220 P222 P223 P225 P226 P227 P228 P229 P23 P230 P231 P233 P234 P235 P236 P237 P238 P239 P240 P241 P242 P243 P244 P245 P246 P247 P248 P249 P25 P250 P251 P252 P253 P254 P255 P256 P257 P258 P259 P26 P260 P261 P262 P264 P265 P266 P267 P268 P269 P270 P271 P272 P273 P274 P275 P277 P278 P279 P28 P280 P281 P282 P283 P284 P285 P286 P287 P288 P289 P29 P290 P291 P292 P294 P295 P296 P297 P298 P299 P3 P300 P301 P302 P303 P304 P305 P306 P308 P309 P310 P311 P312 P313 P314 P315 P316 P317 P318 P319 P320 P321 P322 P323 P325 P326 P327 P329 P330 P331 P332 P333 P334 P335 P336 P337 P338 P339 P34 P341 P342 P343 P344 P345 P346 P348 P349 P35 P350 P351 P352 P353 P354 P355 P356 P357 P358 P359 P36 P360 P361 P362 P363 P364 P365 P366 P367 P368 P369 P37 P370 P371 P372 P373 P374 P375 P376 P378 P38 P380 P381 P382 P383 P384 P385 P386 P387 P388 P39 P390 P391 P392 P394 P395 P396 P397 P398 P399 P40 P400 P401 P402 P403 P404 P407 P408 P409 P41 P410 P412 P413 P414 P415 P416 P417 P418 P419 P42 P420 P421 P422 P423 P424 P425 P426 P427 P428 P429 P43 P431 P432 P433 P434 P435 P436 P437 P439 P44 P440 P441 P442 P443 P445 P446 P447 P448 P449 P45 P450 P451 P452 P453 P454 P455 P456 P457 P458 P459 P46 P460 P461 P462 P465 P466 P467 P468 P47 P472 P473 P474 P477 P478 P48 P480 P482 P483 P484 P485 P488 P489 P49 P490 P491 P492 P493 P494 P496 P497 P50 P500 P501 P502 P503 P504 P506 P507 P509 P51 P510 P511 P512 P514 P515 P517 P519 P52 P520 P522 P523 P524 P525 P526 P527 P529 P53 P531 P532 P534 P536 P538 P54 P540 P541 P543 P544 P545 P547 P548 P549 P55 P550 P551 P552 P553 P554 P555 P556 P557 P558 P559 P56 P561 P563 P564 P565 P567 P57 P570 P573 P575 P576 P579 P58 P580 P581 P582 P583 P587 P589 P59 P590 P591 P593 P594 P595 P596 P597 P6 P60 P600 P602 P603 P604 P605 P608 P609 P61 P610 P612 P613 P614 P615 P62 P63 P64 P65 P66 P67 P68 P69 P7 P70 P71 P72 P73 P74 P75 P76 P77 P78 P79 P8 P80 P81 P82 P83 P84 P85 P86 P87 P88 P9 P91 P92 P93 P94 P95 P96 P97 P98 P99 PP379 PP464 PP518 SW10 SW100 SW101 SW103 SW104 SW106 SW107 SW108 SW109 SW110 SW112 SW113 SW123 SW126 SW127 SW128 SW129 SW130 SW136 SW139 SW14 SW140 SW142 SW145 SW147 SW1672 SW17 SW18 SW19 SW2 SW20 SW2034 SW21 SW22 SW24 SW27 SW28 SW29 SW3 SW31 SW39 SW41 SW42 SW43 SW45 SW47 SW5 SW51 SW53 SW56 SW58 SW62 SW68 SW69 SW70 SW71 SW73 SW77 SW80 SW83 SW84 SW9 SW92 SW98 SW99
Support for the desalination project	27	P142 P162 P17 P186 P196 P32 P448 P530 P560 P562 P568 P569 P572 P89 SW115 SW116 SW118 SW119 SW122 SW124 SW143 SW144 SW23 SW33 SW34 SW567 SW81
Concern about the desalination proposal	1	P338
Concern over Sydney Water in general	4	P208 P348 P401 P525

Issue	Number of times issue raised	Submission ID number
Concern over the NSW State Government in general	29	P1 P11 P14 P150 P154 P155 P210 P223 P224 P237 P258 P259 P295 P324 P329 P330 P376 P384 P409 P411 P499 P516 P555 P6 P63 SW100 SW107 SW22 SW92
Request for further information	4	P141 P487 P586 SW77
Request for consortia details	4	P209 P347 P393 P533
Concern that the proposal is an expedient political move forced upon NSW	110	P100 P101 P102 P103 P104 P105 P106 P111 P112 P113 P114 P115 P116 P125 P127 P128 P129 P130 P131 P132 P133 P166 P178 P179 P180 P181 P182 P183 P184 P185 P198 P200 P201 P202 P205 P281 P29 P318 P327 P34 P35 P36 P39 P40 P41 P411 P419 P42 P43 P44 P45 P46 P462 P47 P473 P48 P484 P49 P497 P50 P500 P509 P51 P52 P53 P54 P55 P56 P57 P58 P59 P60 P61 P612 P613 P614 P615 P64 P65 P66 P67 P68 P72 P73 P74 P75 P76 P77 P78 P79 P80 P81 P82 P83 P84 P86 P87 P88 P91 P92 P93 P94 P95 P97 P98 P99 SW18 SW54 SW80 SW86
Assets such as water should be controlled by government	1	P25
Sydney Water has previously indicated that desalination should not be pursued	18	P156 P158 P205 P242 P318 P329 P362 P448 P499 P500 P555 P561 P587 P604 SW100 SW129 SW18 SW86
Does the Federal Government support reliance on Desalination?	1	P136
2. The assessment process		
The decision making process	6	P188 P221 P224 P25 P251 P318
General concern about the assessment process	1	P477
Decision has already been made/concern that the proposal will go ahead regardless	28	P150 P154 P155 P176 P18 P19 P221 P259 P27 P318 P327 P340 P374 P406 P505 P506 P511 P537 P553 P554 P555 P575 P6 P600 P604 SW100 SW42 SW80
Concern that the decision making process does not include all relevant stakeholders	3	P188 P251 P487
The Part 3A process is flawed	22	P135 P191 P220 P221 P259 P275 P277 P322 P327 P329 P409 P442 P445 P473 P480 P500 P548 P553 P554 P591 SW123 SW90
Scope of the Environmental Assessment	8	P29 P358 P38 P477 P487 P505 P515 P599
Inadequate detail provided in the Environmental Assessment	324	P110 P154 P155 P165 P189 P191 P194 P211 P212 P216 P221 P226 P227 P228 P230 P233 P234 P235 P236 P237 P239 P243 P244 P245 P246 P247 P248 P250 P251 P252 P253 P254 P255 P256 P257 P258 P260 P261 P262 P264 P265 P266 P267 P268 P269 P270 P271 P272 P273 P274 P275 P278 P279 P280 P282 P283 P284 P285 P286 P287 P288 P289 P290 P291 P292 P296 P298 P299 P300 P301 P302 P303 P304 P305 P306 P308 P309 P310 P311 P312 P313 P314 P315 P316 P320 P321 P322 P323 P325 P326 P329 P331 P332 P333 P334 P335 P336 P337 P339 P340 P341 P342 P343 P344 P345 P346 P349 P350 P351 P353 P354 P355 P356 P357 P358 P359 P360 P361 P363 P364 P365 P366 P367 P368 P369 P371 P372 P373 P375 P376 P379 P38 P380 P381 P382 P383 P387 P388 P390 P391 P392 P394 P395 P396 P397 P398 P400 P402 P403 P404 P408 P409 P410 P411 P412 P413 P414 P415 P416 P418 P420 P421 P422 P424 P425 P426 P427 P428 P431 P432 P433 P434 P435 P436 P437 P438 P439 P440 P441 P442 P444 P445 P449 P450 P452 P453 P455 P456 P458 P459 P460 P461 P462 P464 P465 P466 P467 P468 P468 P472 P472 P479 P480 P481 P482 P483 P484 P487 P489 P490 P491 P492 P494 P497 P502 P503 P505 P506 P507 P508 P512 P514 P517 P518 P520 P523 P524 P525 P526 P527 P529 P532 P534 P537 P538 P539 P540 P541 P543 P544 P545 P547 P548 P549 P550 P551 P552 P556 P557 P558 P561 P563 P567 P570 P575 P576 P577 P580 P581 P582 P584 P589 P590 P591 P593 P594 P595 P596 P597 P600 P602 P603 P606 P610 SW114 SW123 SW139 SW141 SW42 SW49 SW51 SW56 SW82 SW90 SW98

Issue	Number of times issue raised	Submission ID number
Environmental Assessment does not assess or compare the alternatives	43	P110 P156 P220 P242 P248 P29 P411 P438 P442 P445 P472 P479 P481 P482 P484 P487 P497 P498 P500 P506 P507 P512 P518 P523 P537 P538 P548 P551 P575 P576 P577 P589 P590 P591 P593 P594 P600 P604 SW120 SW123 SW51 SW86 SW90
Environmental Assessment assesses 'easy' impacts and ignores 'key' impacts	2	P29 P445
Environmental Assessment does not compare the social, economic and environmental costs or advantages and disadvantages	22	P110 P188 P221 P29 P327 P327 P431 P442 P445 P472 P500 P537 P538 P548 P563 P575 P590 P591 P594 SW120 SW51 SW80 SW90
Environmental Assessment is designed to support the project/provide smokescreen	1	P29
'Do nothing' option needs to be considered	9	P118 P188 P242 P385 P487 P500 SW111 SW138 SW96
Impact not supported by an independent authority/third review	4	P117 P327 P487 SW18
The Director General's requirements are deficient	3	P110 P548 P577
Environmental Assessment should be based on a 'project' not a 'concept'	229	P165 P191 P194 P211 P212 P216 P221 P226 P227 P228 P230 P233 P234 P235 P236 P239 P243 P244 P245 P246 P247 P248 P250 P251 P252 P253 P254 P255 P256 P258 P260 P261 P262 P264 P265 P266 P267 P268 P269 P270 P272 P274 P278 P279 P280 P282 P283 P284 P285 P286 P287 P288 P289 P290 P291 P292 P296 P298 P299 P300 P301 P302 P303 P304 P306 P308 P309 P310 P311 P312 P313 P314 P315 P316 P317 P320 P321 P322 P323 P329 P331 P332 P333 P334 P335 P336 P337 P339 P340 P341 P342 P343 P344 P345 P346 P349 P350 P353 P354 P355 P356 P357 P359 P361 P363 P364 P365 P366 P367 P368 P369 P371 P372 P373 P375 P376 P379 P380 P381 P382 P387 P388 P390 P391 P392 P394 P395 P396 P397 P398 P400 P402 P403 P404 P408 P409 P410 P411 P412 P413 P414 P415 P416 P418 P421 P422 P424 P425 P426 P427 P428 P431 P432 P433 P434 P435 P436 P439 P440 P441 P445 P449 P450 P453 P455 P456 P458 P459 P460 P461 P464 P465 P466 P467 P468 P468 P473 P484 P489 P490 P491 P492 P494 P497 P502 P503 P512 P514 P515 P517 P524 P526 P527 P529 P534 P537 P538 P540 P541 P543 P544 P545 P547 P549 P550 P556 P557 P558 P567 P570 P576 P577 P580 P581 P582 P589 P590 P591 P593 P595 P596 P597 P600 P601 P602 P603 P610 SW139 SW90
Environmental Assessment not clear on how impacts would be mitigated because the Statement of Commitments lacks sufficient detail	234	P165 P191 P194 P211 P212 P216 P221 P226 P227 P228 P230 P235 P236 P239 P243 P244 P245 P246 P247 P248 P250 P251 P252 P253 P254 P255 P256 P258 P260 P261 P262 P264 P265 P266 P267 P268 P269 P270 P272 P274 P278 P279 P280 P282 P283 P284 P285 P286 P287 P288 P289 P290 P291 P292 P296 P298 P299 P300 P301 P302 P303 P304 P306 P308 P309 P310 P311 P312 P313 P314 P315 P316 P320 P321 P322 P323 P329 P331 P332 P333 P334 P335 P336 P337 P339 P340 P341 P342 P343 P344 P345 P346 P349 P350 P353 P354 P355 P356 P357 P358 P359 P361 P363 P364 P365 P366 P367 P368 P369 P371 P372 P373 P375 P376 P379 P380 P381 P382 P387 P388 P390 P391 P392 P394 P395 P396 P397 P398 P400 P402 P403 P404 P408 P409 P410 P411 P412 P413 P414 P415 P416 P418 P421 P422 P424 P425 P426 P427 P428 P431 P432 P433 P434 P435 P436 P438 P439 P440 P441 P442 P449 P450 P453 P455 P456 P458 P459 P460 P461 P464 P465 P466 P467 P468 P468 P479 P484 P487 P489 P490 P491 P492 P494 P496 P497 P502 P503 P505 P508 P512 P514 P515 P517 P518 P522 P523 P524 P526 P527 P529 P534 P537 P538 P540 P543 P544 P545 P547 P548 P549 P550 P556 P557 P558 P567 P570 P576 P577 P580 P581 P582 P589 P590 P593 P595 P596 P600 P602 P603 P605 P610 SW100 SW139 SW90
Insufficient detail provided on 'standard measures' to manage 'other issues'	13	P442 P444 P445 P456 P487 P518 P522 P523 P548 P561 P577 SW123 SW53
Have not complied with Director General's requirements	8	P431 P487 P518 P522 P561 P577 P590 P600

Issue	Number of times issue raised	Submission ID number
'Assessment of significance' not 8-Part Test	1	P577
Alternatives to the inlet and outlet locations not addressed or justified	3	P616 P577 P590
What level of public scrutiny will the further approvals to tunneling be subject to	3	P327 P508 P577
Why not referred to Federal Minister responsible for the EPBC Act	7	P211 P212 P227 P228 P233 P234 P590
The decision to site the desalination plant at Kurnell is flawed	39	P120 P124 P137 P14 P144 P145 P15 P164 P170 P176 P189 P189 P2 P20 P20 P214 P219 P221 P3 P327 P329 P330 P442 P445 P452 P497 P516 P522 P523 P561 P577 P584 P591 P597 P600 P606 P608 SW19 SW23 SW23
Other sites not adequately considered	4	SW26 SW37 SW42
Expert opinion suggests that desalination should not be the preferred option	128	P100 P101 P102 P103 P104 P105 P106 P108 P111 P112 P113 P114 P115 P116 P121 P125 P127 P128 P129 P130 P131 P132 P133 P137 P143 P158 P159 P160 P178 P179 P180 P181 P182 P183 P184 P185 P188 P197 P198 P200 P201 P202 P223 P225 P231P236 P237 P271 P28 P281 P329 P338 P34 P35 P352 P36 P384 P39 P40 P401 P41 P42 P43 P44 P448 P45 P46 P462 P47 P48 P49 P499 P50 P500 P509 P51 P52 P53 P54 P548 P55 P56 P561 P57 P58 P59 P60 P61 P612 P613 P614 P615 P64 P65 P66 P67 P68 P71 P72 P73 P74 P75 P76 P77 P78 P79 P80 P81 P82 P83 P84 P86 P87 P88 P91 P92 P93 P94 P95 P97 P98 P99 SW100 SW127 SW129 SW18 SW60 SW74
No justification for plants smaller than 500 ML/day	5	P442 P452 P577 P600 P604
3. Need for the desalination plant		
Questions the need for a desalination plant	337	P100 P101 P102 P103 P104 P105 P106 P111 P112 P113 P114 P115 P116 P125 P127 P128 P129 P130 P131 P132 P133 P15 P153 P178 P179 P18 P180 P181 P182 P183 P184 P185 P191 P194 P198 P200 P201 P202 P208 P216 P219 P224 P226 P230 P233 P234 P235 P236 P239 P241 P243 P244 P245 P246 P247 P250 P251 P252 P253 P254 P255 P256 P258 P260 P261 P262 P264 P265 P266 P267 P268 P269 P270 P272 P274 P278 P279 P280 P282 P283 P284 P285 P286 P287 P288 P289 P290 P291 P292 P296 P298 P299 P300 P301 P302 P303 P304 P305 P306 P308 P309 P310 P311 P312 P313 P314 P315 P316 P318 P320 P321 P322 P323 P331 P332 P333 P334 P335 P336 P337 P338 P339 P34 P340 P341 P342 P343 P345 P346 P349 P35 P350 P351 P352 P353 P354 P355 P356 P357 P358 P359 P36 P360 P361 P363 P365 P366 P367 P368 P369 P371 P372 P373 P375 P376 P379 P380 P381 P382 P384 P387 P388 P39 P390 P391 P394 P395 P396 P397 P398 P40 P400 P402 P403 P404 P407 P408 P41 P410 P411 P412 P413 P414 P416 P418 P42 P420 P421 P422 P424 P425 P426 P427 P428 P429 P43 P432 P433 P434 P435 P436 P439 P44 P440 P442 P443 P446 P449 P45 P450 P452 P453 P455 P458 P459 P46 P460 P461 P464 P465 P466 P467 P468 P468 P47 P474 P48 P489 P49 P490 P491 P492 P494 P497 P499 P50 P500 P502 P503 P507 P509 P51 P512 P514 P515 P517 P518 P519 P52 P520 P524 P525 P526 P527 P529 P53 P534 P537 P54 P540 P541 P543 P544 P545 P547 P549 P55 P550 P555 P556 P557 P558 P56 P567 P57 P570 P58 P580 P581 P582 P583 P586 P59 P593 P595 P596 P6 P60 P602 P603 P61 P610 P612 P613 P614 P615 P64 P65 P66 P67 P68 P72 P73 P74 P75 P76 P77 P78 P79 P80 P81 P82 P83 P84 P86 P87 P88 P91 P92 P93 P94 P95 P97 P98 P99 SW100 SW106 SW107 SW15 SW26 SW37 SW38 SW43 SW54 SW80 SW85
Need for the desalination plant has been exaggerated by the NSW State Government/Environmental Assessment	2	P108 P33
Desalination is a short term solution	58	P121 P123 P135 P144 P147 P15 P150 P153 P160 P18 P197 P215 P236 P242 P251 P258 P279 P294 P305 P319 P358 P37 P385 P386 P407 P419 P438 P446 P448 P457 P473 P479 P483 P484 P488 P497 P500 P506 P521 P525 P573 P605 P611 P63 SW103 SW111 SW126 SW138 SW141 SW142 SW147 SW15 SW54 SW61 SW74 SW77 SW80 SW85

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Alternative processes for increasing water supply preferred	113	P109 P110 P117 P118 P123 P135 P149 P150 P153 P156 P157 P158 P160 P167 P172 P175 P188 P189 P191 P205 P208 P210 P214 P215 P219 P222 P224 P225 P226 P229 P241 P242 P248 P257 P273 P277 P278 P281 P295 P297 P317 P318 P322 P330 P344 P351 P360 P364 P37 P374 P383 P384 P397 P399 P405 P406 P409 P411 P415 P419 P420 P431 P437 P438 P441 P442 P443 P446 P456 P462 P464 P471 P472 P474 P478 P479 P480 P483 P484 P487 P488 P499 P501 P507 P510 P515 P518 P520 P527 P538 P550 P551 P553 P554 P555 P564 P583 P69 P70 SW101 SW104 SW139 SW22 SW35 SW46 SW64 SW71 SW73 SW76 SW77 SW80 SW97
Water recycling has not been fully explored	500	P100 P101 P102 P103 P104 P105 P106 P108 P110 P111 P112 P113 P114 P115 P116 P118 P123 P124 P125 P127 P128 P129 P130 P131 P132 P133 P135 P14 P147 P149 P150 P154 P155 P157 P160 P161 P163 P165 P166 P167 P170 P171 P174 P176 P178 P179 P180 P181 P182 P183 P184 P185 P188 P19 P191 P193 P194 P195 P197 P198 P200 P201 P202 P203 P204 P207 P208 P210 P214 P215 P216 P218 P219 P22 P220 P221 P222 P223 P225 P226 P23 P230 P233 P234 P235 P236 P239 P241 P242 P243 P244 P245 P246 P247 P248 P25 P250 P251 P252 P253 P254 P255 P256 P258 P259 P260 P261 P262 P264 P265 P266 P267 P268 P269 P270 P271 P272 P273 P274 P275 P277 P278 P279 P28 P280 P282 P283 P284 P285 P286 P287 P288 P289 P29 P290 P291 P292 P294 P296 P297 P298 P299 P300 P301 P302 P303 P304 P306 P308 P309 P310 P311 P312 P313 P314 P315 P316 P317 P318 P319 P320 P321 P322 P323 P329 P330 P331 P332 P333 P334 P335 P336 P337 P339 P34 P340 P341 P342 P343 P344 P345 P346 P349 P35 P350 P351 P353 P354 P355 P356 P357 P358 P359 P36 P360 P361 P363 P364 P365 P366 P367 P368 P369 P370 P371 P372 P373 P374 P375 P376 P378 P380 P381 P382 P383 P384 P385 P386 P387 P388 P39 P390 P391 P392 P394 P395 P396 P397 P398 P40 P400 P401 P402 P403 P404 P406 P407 P408 P409 P41 P410 P411 P412 P413 P414 P415 P416 P417 P418 P419 P42 P420 P421 P422 P423 P424 P425 P426 P427 P428 P429 P43 P430 P431 P432 P433 P434 P435 P436 P437 P438 P439 P44 P440 P441 P442 P445 P448 P449 P45 P450 P452 P453 455 P456 P458 P459 P46 P460 P461 P465 P466 P467 P468 P468 P469 P47 P472 P473 P477 P479 P48 P480 P483 P485 P487 P489 P49 P490 P491 P492 P494 P495 P496 P497 P499 P50 P500 P502 P503 P504 P507 P509 P51 P510 P511 P512 P513 P514 P515 P516 P517 P519 P52 P521 P522 P524 P525 P526 P527 P529 P53 P530 P531 P534 P535 P536 P54 P540 P541 P543 P544 P545 P547 P549 P55 P550 P551 P553 P554 P555 P556 P557 P558 P559 P56 P561 P563 P567 P568 P569 P57 P570 P573 P576 P58 P580 P581 P582 P583 P584 P585 P587 P589 P59 P590 P593 P594 P595 P596 P597 P60 P600 P602 P603 P605 P606 P609 P61 P610 P611 P612 P613 P614 P615 P63 P64 P65 P66 P67 P68 P69 P70 P71 P72 P73 P74 P75 P76 P77 P78 P79 P80 P81 P82 P83 P84 P85 P86 P87 P88 P91 P92 P93 P94 P95 P96 P97 P98 P99 PP379 PP464 PP518 SW100 SW101 SW103 SW104 SW105 SW107 SW108 SW111 SW112 SW113 SW121 SW125 SW126 SW128 SW130 SW132 SW133 SW136 SW138 SW139 SW140 SW142 SW145 SW1672 SW2034 SW21 SW22 SW24 SW26 SW31 SW38 SW43 SW45 SW47 SW51 SW52 SW53 SW54 SW56 SW60 SW70 SW72 SW74 SW75 SW78 SW79 SW80 SW82 SW83 SW86 SW87 SW89 SW90 SW94 SW95 SW97

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Support for education/ demand management	413	P100 P101 P102 P103 P104 P105 P106 P108 P111 P112 P113 P114 P115 P116 P118 P123 P125 P127 P128 P129 P130 P131 P132 P133 P135 P14 P144 P160 P163 P165 P166 P167 P170 P178 P179 P180 P181 P182 P183 P184 P185 P188 P191 P193 P194 P198 P200 P201 P202 P203 P204 P208 P215 P216 P218 P219 P22 P220 P221 P226 P23 P230 P233 P234 P235 P236 P239 P243 P244 P245 P246 P247 P248 P250 P251 P252 P253 P254 P255 P256 P258 P259 P260 P261 P262 P264 P265 P266 P267 P268 P269 P270 P271 P272 P274 P277 P278 P279 P280 P282 P283 P284 P285 P286 P287 P288 P289 P290 P291 P292 P296 P297 P298 P299 P300 P301 P302 P303 P304 P305 P306 P308 P309 P310 P311 P312 P313 P314 P315 P316 P317 P319 P320 P321 P322 P323 P327 P329 P331 P332 P333 P334 P335 P336 P337 P339 P34 P340 P341 P342 P343 P344 P345 P346 P349 P35 P350 P351 P353 P354 P355 P356 P357 P358 P359 P36 P360 P361 P363 P364 P365 P366 P367 P368 P369 P371 P372 P373 P374 P375 P376 P379 P380 P381 P382 P383 P384 P387 P388 P39 P390 P391 P394 P395 P396 P397 P398 P399 P40 P400 P402 P403 P404 P406 P407 P408 P409 P41 P410 P411 P412 P413 P414 P415 P416 P417 P418 P419 P42 P420 P421 P422 P424 P425 P426 P427 P428 P429 P43 P431 P432 P433 P434 P435 P436 P437 P438 P439 P44 P440 P441 P442 P446 P448 P449 P45 P450 P453 P455 P456 P458 P459 P46 P460 P461 P464 P465 P466 P467 P468 P468 P469 P47 P471 P472 P473 P474 P477 P478 P479 P48 P480 P483 P484 P489 P49 P490 P491 P492 P493 P494 P497 P50 P500 P502 P503 P504 P507 P509 P51 P510 P511 P512 P514 P515 P517 P518 P519 P52 P524 P526 P527 P529 P53 P530 P534 P536 P54 P540 P541 P543 P544 P545 P547 P549 P55 P550 P551 P556 P557 P558 P56 P561 P563 P564 P565 P567 P568 P569 P57 P570 P573 P58 P580 P581 P582 P583 P586 P589 P59 P590 P593 P594 P595 P596 P60 P600 P602 P603 P609 P61 P610 P612 P613 P614 P615 P64 P65 P66 P67 P68 P70 P71 P72 P73 P74 P75 P76 P77 P78 P79 P80 P81 P82 P83 P84 P86 P87 P88 P91 P92 P93 P94 P95 P97 P98 P99 SW100 SW103 SW104 SW106 SW109 SW11 SW113 SW126 SW127 SW133 SW136 SW139 SW142 SW1672 SW35 SW43 SW54 SW55 SW56 SW61 SW62 SW80 SW85 SW90 SW95
Support for new dam	10	P144 P174 P214 P23 P237 P555 SW132 SW133 SW25 SW26
Support for water tanks	282	P118 P14 P147 P153 P154 P155 P161 P165 P170 P19 P191 P193 P194 P203 P204 P208 P21 P210 P215 P216 P220 P222 P226 P230 P235 P236 P237 P239 P241 P243 P244 P245 P246 P247 P248 P250 P251 P252 P253 P254 P255 P256 P257 P258 P260 P261 P262 P264 P265 P266 P267 P268 P269 P270 P271 P272 P274 P277 P278 P279 P280 P282 P283 P284 P285 P286 P287 P288 P289 P290 P291 P292 P296 P298 P299 P300 P301 P302 P303 P304 P306 P308 P309 P310 P311 P312 P313 P314 P315 P316 P317 P319 P320 P321 P322 P323 P331 P332 P333 P334 P335 P336 P337 P339 P340 P341 P342 P343 P344 P345 P346 P349 P350 P351 P353 P354 P355 P356 P357 P359 P360 P361 P363 P364 P365 P366 P367 P368 P369 P371 P372 P373 P375 P376 P377 P378 P379 P380 P381 P382 P383 P387 P388 P390 P391 P394 P395 P396 P397 P398 P399 P400 P401 P402 P403 P404 P406 P408 P409 P410 P411 P412 P413 P414 P415 P416 P418 P419 P420 P421 P422 P424 P425 P426 P427 P428 P429 P431 P432 P433 P434 P435 P436 P437 P439 P440 P441 P443 P446 P449 P450 P453 P455 P458 P459 P460 P461 P464 P465 P466 P467 P468 P468 P471 P478 P480 P483 P484 P489 P490 P491 P492 P494 P497 P500 P502 P503 P507 P510 P511 P512 P514 P515 P517 P524 P526 P527 P529 P534 P536 P540 P541 P543 P544 P545 P547 P549 P550 P556 P557 P558 P565 P567 P570 P573 P576 P580 P581 P582 P583 P589 P591 P593 P595 P596 P602 P603 P610 P611 P9 SW101 SW104 SW105 SW106 SW11 SW139 SW22 SW28 SW36 SW43 SW51 SW52 SW56 SW58 SW71 SW84 SW85 SW86 SW88 SW90 SW99

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Support for stormwater harvesting	419	P100 P101 P102 P103 P104 P105 P106 P110 P111 P112 P113 P114 P115 P116 P118 P123 P124 P125 P127 P128 P129 P130 P131 P132 P133 P135 P14 P147 P149 P150 P153 P154 P155 P157 P161 P165 P170 P171 P178 P179 P180 P181 P182 P183 P184 P185 P19 P191 P194 P197 P198 P200 P201 P202 P208 P210 P211 P212 P216 P220 P222 P223 P226 P227 P228 P23 P230 P235 P236 P239 P242 P243 P244 P245 P246 P247 P248 P250 P251 P252 P253 P254 P255 P256 P258 P259 P26 P260 P261 P262 P264 P265 P266 P267 P268 P269 P270 P271 P272 P273 P274 P277 P278 P279 P28 P280 P282 P283 P284 P285 P286 P287 P288 P289 P29 P290 P291 P292 P295 P296 P297 P298 P299 P300 P301 P302 P303 P304 P306 P308 P309 P310 P311 P312 P313 P314 P315 P316 P317 P319 P320 P321 P322 P323 P324 P327 P329 P331 P332 P333 P334 P335 P336 P337 P339 P34 P340 P341 P342 P343 P344 P345 P346 P349 P35 P350 P351 P353 P354 P355 P356 P357 P358 P359 P36 P360 P361 P363 P364 P365 P366 P367 P368 P369 P371 P372 P373 P375 P376 P378 P379 P380 P381 P382 P383 P385 P387 P388 P39 P390 P391 P394 P395 P396 P397 P398 P399 P40 P400 P402 P403 P404 P405 P406 P407 P408 P409 P41 P410 P411 P412 P413 P414 P415 P416 P418 P419 P42 P420 P421 P422 P424 P425 P426 P427 P428 P429 P43 P431 P432 P433 P434 P435 P436 P437 P439 P44 P440 P441 P442 P447 P448 P449 P45 P450 P453 P454 P455 P456 P458 P459 P46 P460 P461 P464 P465 P466 P467 P468 P468 P47 P471 P473 P478 P48 P480 P483 P484 P489 P49 P490 P491 P492 P494 P497 P499 P50 P500 P501 P502 P503 P506 P507 P509 P51 P510 P511 P512 514 P516 P517 P518 P52 P524 526 P527 P529 P53 P531 P534 P54 P540 P541 P543 P544 P545 P547 P549 P55 P550 P551 P555 P556 P557 P558 P56 P567 P57 P570 P575 P576 P58 P580 P581 P582 P583 P586 P589 P59 P590 P591 P593 P594 P595 P596 P597 P6 P60 P602 P603 P609 P61 P610 P611 P612 P613 P614 P615 P64 P65 P66 P67 P68 P69 P70 P72 P73 P74 P75 P76 P77 P78 P79 P80 P81 P82 P83 P84 P85 P86 P87 P88 P91 P92 P93 P94 P95 P96 P97 P98 P99 SW101 SW104 SW107 SW111 SW125 SW127 SW131 SW138 SW139 SW20 SW26 SW27 SW36 SW39 SW51 SW53 SW55 SW58 SW60 SW66 SW68 SW71 SW74 SW78 SW85 SW86 SW95 SW98
Support for water pricing	237	P165 P194 P208 P216 P218 P22 P226 P230 P235 P236 P237 P239 P242 P243 P244 P245 P246 P247 P248 P250 P251 P252 P253 P254 P255 P256 P257 P258 P260 P261 P262 P264 P265 P266 P267 P268 P269 P270 P271 P272 P274 P277 P278 P279 P280 P282 P283 P284 P285 P286 P287 P288 P289 P290 P291 P292 P296 P297 P298 P299 P300 P301 P302 P303 P304 P306 P308 P309 P310 P311 P312 P313 P314 P315 P316 P317 P320 P321 P323 P331 P332 P333 P334 P335 P336 P337 P339 P341 P342 P343 P344 P345 P346 P349 P350 P351 P353 P354 P355 P356 P357 P359 P360 P361 P363 P364 P365 P366 P367 P368 P369 P371 P372 P373 P375 P376 P379 P380 P381 P382 P383 P387 P388 P390 P391 P394 P395 P396 P397 P398 P400 P402 P403 P404 P406 P408 P409 P410 P411 P412 P413 P414 P415 P416 P418 P419 P420 P421 P422 P424 P425 P426 P427 P428 P431 P432 P433 P434 P435 P436 P437 P439 P440 P449 P450 P453 P455 P456 P458 P459 P460 P461 P464 P465 P466 P467 P468 P468 P471 P473 P478 P483 P484 P489 P490 P491 P492 P494 P497 P500 P502 P503 P504 P507 P510 P511 P512 P514 P517 P519 P524 P526 P527 P529 P534 P540 P541 P543 P544 P545 P547 P549 550 P551 P556 P557 P558 P567 P570 P576 P580 P581 P582 P589 P595 P596 P600 P602 P603 P610 SW11 SW126 SW139 SW14 SW68 SW80 SW85
Other alternative suggestions	112	P100 P101 P102 P103 P104 P105 P106 P111 P112 P113 P114 P115 P116 P120 P125 P127 P128 P129 P130 P131 P132 P133 P178 P179 P180 P181 P182 P183 P184 P185 P193 P198 P200 P201 P202 P203 P204 P208 P210 P219 P223 P34 P35 P36 P377 P39 P4 P40 P407 P41 P42 P43 P44 P443 P447 P45 P46 P47 P48 P49 P50 P500 P509 P51 P52 P53 P54 P541 P55 P56 P561 P57 P58 P59 P60 P61 P612 P613 P614 P615 P64 P65 P66 P67 P68 P72 P73 P74 P75 P76 P77 P78 P79 P80 P81 P82 P83 P84 P86 P87 P88 P91 P92 P93 P94 P95 P97 P98 P99 SW120 SW14 SW41
General comment on other ideas tried first	57	P14 P15 P18 P248 P273 P297 P317 P322 P330 P340 P344 P351 P360 P364 P383 P397 P406 P409 P411 P415 P420 P431 P437 P438 P441 P442 P447 P456 P469 P471 P473 P477 P478 P479 P483 P484 P496 P497 P500 P511 P515 P527 P550 P551 P576 P587 P591 P593 P594 P609 P9 SW122 SW131 SW139 SW140 SW36 SW73

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Repair existing infrastructure (leaking pipes)	243	P124 P13 P134 P144 P154 P155 P165 P191 P194 P216 P220 P226 P23 P230 P233 P234 P235 P236 P239 P241 P243 P244 P245 P246 P247 P248 P25 P250 P251 P252 P253 P254 P255 P256 P258 P259 P260 P261 P262 P264 P265 P266 P267 P268 P269 P27 P270 P272 P274 P277 P278 P279 P280 P282 P283 P284 P285 P286 P287 P288 P289 P290 P291 292 P296 P297 P298 P299 P300 P301 P302 P303 P304 P306 P308 P309 P310 P311 P312 313 P314 P315 P316 P317 P320 P321 P322 P323 P331 P332 P333 P334 P335 P336 P337 339 P340 P341 P342 P343 P344 P345 P346 P348 P349 P350 P351 P353 P354 P355 P356 P357 P359 P360 P361 P363 P364 P365 P366 P367 P368 P369 P371 P372 P373 P375 P376 379 P380 P381 P382 P383 P387 P388 P390 P391 P394 P395 P396 P397 P398 P400 P402 403 P404 P406 P408 P409 P410 P411 P412 P413 P414 P415 P416 P418 P420 P421 P422 424 P425 P426 P427 P428 P431 P432 P433 P434 P435 P436 P437 P439 P440 P441 P449 450 P452 P453 P455 P456 P458 P459 P460 P461 P464 P465 P466 P467 P468 P468 P471 473 P478 P483 P484 P489 P490 P491 P492 P494 P497 P500 P502 P503 P507 P510 P512P514 P517 P524 P526 P529 P540 P543 P544 P545 P547 P549 P550 P551 P556 P557 P558 567 P570 P576 P580 P581 P582 P589 P593 P594 P595 P596 P602 P603 P610 SW112 SW113 SW139 SW19 SW26 SW35
Bore water for households	1	P597
Support for dual water supplies	21	P124 P18 P208 P214 P219 P23 P233 P234 P257 P259 P273 P28 P295 P358 P374 P448 P504 P510 P519 SW126 SW138
Desalination will discourage people from conserving water	126	P100 P101 P102 P103 P104 P105 P106 P111 P112 P113 P114 P115 P116 P125 P127 128 P129 P130 P131 P132 P133 P147 P178 P179 P180 P181 P182 P183 P184 P185 P198 200 P201 P202 P213 P218 P220 P275 P295 P327 P329 P33 P34 P35 P358 P36 P374 P384 39 P40 P41 P42 P43 P438 P44 P441 P45 P456 P46 P47 P472 P477 P479 P48 P480 P484 488 P49 P50 P509 P51 P510 P52 P53 P534 P536 P54 P548 P55 P550 P56 P57 P573 P58 P59 P591 P60 P605 P61 P612 P613 P614 P615 P64 P65 P66 P67 P68 P72 P73 P74 P75 P76 P77 P78 P79 P80 P81 P82 P83 P84 P86 P87 P88 91 P92 P93 P94 P95 P97 P98 P99 SW55 SW56 SW69 SW73
The option has arisen due to years of inefficiency and inaction	9	P25 P305 P327 P409 P484 P498 P500 P525 P555
Desalination is suited to countries with limited rainfall that cannot satisfy potable needs. Not the case in Australia	13	P108 P14 P147 P219 P224 P241 P26 P318 P324 P384 P499 P504 P96
Perception that desalination is proposed at the expense of recycling, stormwater harvesting and other alternatives	258	P121 P134 P135 P156 P158 P160 P165 P170 P171 P194 P208 P21 P216 P218 P219 P22 P220 221 P223 P226 P230 P233 P234 P235 P236 P239 P243 P244 P245 P246 P247 P248 P250 P251 P252 P253 P254 P255 P256 P258 P259 P260 P261 P262 P264 P265 P266 P267 P268 P269 P270 P272 P273 P274 P278 P279 P28 280 P282 P283 P284 P285 P286 P287 P288 P289 P290 P291 P292 P296 P298 P299 P300 P301 P302 P303 P304 P306 P308 P309 P310 P311 P312 P313 P314 P315 P316 P320 P321 P323 P327 P329 P330 P331 P332 P333 P334 P335 P336 P337 P339 P341 P342 P343 P344 P345 346 P349 P350 P353 P354 P355 P356 P357 P358 P359 P361 P363 P365 P366 P367 P368 369 P371 P372 P373 P375 P376 P379 P380 P381 P382 P384 386 P387 P388 P390 P391 P394 P395 P396 P398 P400 P402 P403 P404 P408 P410 P412 P413 P414 P416 P418 P421 P422 P424 P425 P426 P427 P428 P432 P433 P434 P435 P436 P438 P439 P440 P449 P450 P453 P455 P458 P459 P460 P461 P464 P465 P466 P467 P468 P469 P473 P474 P477 P479 P489 P490 P491 P492 P494 P497 P502 P503 P504 P506 P511 P512 P514 P516 P517 P524 P525 P526 P527 P529 P535 P537 P540 P543 P544 P545 P547 P549 P551 P556 P557 P558 P564 P567 P568 P569 P570 P576 P579 P580 P581 P582 P589 P590 P593 P594 P595 P596 P600 P602 P603 P605 P610 P63 SW106 SW107 SW126 SW141 SW142 SW147SW21 SW31 SW46 SW50 SW53 SW54 SW63 SW69 SW76 SW80 SW94
Why can't we pipe water from Ord River and Fitzroy River etc in Western Australia?	1	P28

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Desalinated water should supplement recycling, stormwater harvesting and other alternatives	2	P32 SW125
If there is no water in the catchment, then you cannot recycle it	2	P17 P32
Other cities in the world drink recycled water	31	P118 P124 P159 P166 P171 P173 P221 P222 P294 P384 P420 P448 P464 P477 P500 P510 P511 P559 P585 P85 SW101 SW125 SW126 SW140 SW141 SW145 SW2034 SW24 SW52 SW80 SW94
Desalination would supply only a small component of Sydney's water needs	3	P123 P521 P525
Water tanks were banned in the past	1	P119
Community should be educated on drinking recycled water. Recent surveys show community will drink recycled water	23	P118 P136 P173 P218 P221 P223 P242 P318 P385 P469 P473 P486 P500 P558 SW101 SW111 SW121 SW130 SW138 SW61 SW72 SW80 SW94
Produce different types of water for different purposes	14	P108 P208 P242 P358 P385 P423 P504 P510 P531 P555 P558 P573 SW138
Sydney's population growth, as part of government policy, has created this water shortage	8	P153 P154 P155 P173 P176 P221 P550 SW58
Why was AGL plan rejected and why wasn't the community told about it	8	P171 P207 P431 P445 P500 P553 P554 SW128
People already drink treated sewage i.e. catchments of Warragamba	5	P124 P166 P500 P521 SW142
Desalination is needed to ensure sufficient safe water supply	2	P162 P572
Need a desalination plant, Sydney had always had a water problem/continual problem of saving water	1	P196
Concern about Shoalhaven transfers	2	P108 P162
4. Financial costs		
Unspecified concern about the cost of the project	223	P100 P101 P102 P103 P104 P105 P106 P109 P111 P112 P113 P114 P115 P116 P120 P121 P124 P125 P127 P128 P129 P130 P131 P132 P133 P137 P15 P150 P154 P155 P 160 P161 P166 P170 P171 P172 P178 P179 P180 P181 P182 P183 P184 P185 P188 P193 P195 P197 P198 P2 P200 P201 P202 P203 P204 P205 P208 P210 P214 P219 P221 P223 P224 P225 P229 P231 P236 P25 P27 P275 P277 P28 P3 P305 P319 P324 P329 P34 P35 P358 P36 P37 P38 P384 P385 P386 P39 P399 P40 P401 P405 P407 P41 P419 P42 P423 P43 P430 P438 P44 P441 P443 P448 P45 P454 P458 P46 P462 P47 P473 P479 P48 P480 P484 P485 P488 P49 P493 P497 P498 P499 P50 P500 P504 P509 P51 P511 P515 P518 P519 P52 P523 P53 P534 P54 P548 P55 P551 P559 P56 P561 P563 P565 P57 P573 P575 P579 P58 P583 P59 P594 P60 P605 P61 P611 P612 P613 P614 P615 P63 P64 P65 P66 P67 P68 P69 P70 P72 P73 P74 P75 P76 P77 P78 P79 P80 P81 P82 P83 P84 P85 P86 P87 P88 P91 P92 P93 P94 P95 P97 P98 P99 SW10 SW105 SW107 SW128 SW129 SW133 SW141 SW145 SW147 SW15 SW18 SW19 SW29 SW3 SW39 SW41 SW46 SW55 SW58 SW60 SW61 SW64SW74 SW75 SW76 SW78 SW79 SW83 SW89 SW97 SW99

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Concern about the cost of the consultation process	1	P277
Concern about the impacts on property values	3	P1 P126 P7
Concern about the cost of construction	111	P100 P101 P102 P103 P104 P105 P106 P111 P112 P113 P114 P115 P116 P117 P125 P127 P128 P129 P130 P131 P132 P133 P143 P170 P178 P179 P180 P181 P182 P183 P184 P185 P191 P198 P200 P201 P202 P219 P237 P242 P34 P35 P36 P385 P39 P40 P41 P42 P43 P44 P445 P45 P46 P47 P473 P48 P49 P50 P509 P51 P52 P53 P537 P54 P55 P56 P57 P577 P58 P59 P594 P6 P60 P61 P612 P613 P614 P615 P64 P65 P66 P67 P68 P72 P73 P74 P75 P76 P77 P78 P79 P80 P81 P82 P83 P84 P86 P87 P88 P91 P92 P93 P94 P95 P97 P98 P99 SW111 SW123 SW138 SW52
Concern about the operational costs of the project	128	P100 P101 P102 P103 P104 P105 P106 P111 P112 P113 P114 P115 P116 P125 P127 P128 P129 P130 P131 P132 P133 P143 P153 P178 P179 P180 P181 P182 P183 P184 P185 P191 P198 P200 P201 P202 P219 P237 P241 P242 P294 P327 P34 P35 P36 P377 P385 P39 P40 P405 P41 P419 P42 P429 P43 P431 P438 P44 P443 P445 P448 P45 P452 P46 P47 P479 P48 P49 P496 P50 P505 P509 P51 P52 P527 P53 P537 P54 55 P551 P56 P561 P57 P58 P59 P591 P594 P60 P61 P611 P612 P613 P614 P615 P64 P65 P66 P67 P68 P72 P73 P74 P75 P76 P77 P78 P79 P80 P81 P82 P83 P84 P86 P87 P88 P91 P92 P93 P94 P95 P97 P98 P99 SW111 SW123 SW138 SW52 SW67
Concern about the cost to customers	29	P108 P119 P124 P153 P160 P166 P170 P191 P208 P237 P242 P327 P385 P442 P487 P504 P505 P521 P522 P525 P561 P577 P600 SW100 SW111 SW138 SW38 SW67 SW97
Greater subsidies for rainwater tanks/water efficient appliances	37	P118 P138 P154 P155 P161 P193 P203 P204 P21 P210 P215 P220 P222 P237 P241 P259 P319 P441 P500 P507 P510 P511 P561 P611 P63 SW101 SW109 SW14 SW140 SW36 SW5 SW54 SW58 SW68 SW86 SW95 SW99
Cost relative to alternatives such as recycling and stormwater harvesting	406	P100 P101 P102 P103 P104 P105 P106 P108 P110 P111 P112 P113 P114 P115 P116 P117 P118 P119 P121 P124 P125 P127 P128 P129 P130 P131 P132 P133 P135 P136 P150 P154 P155 P158 P165 P166 P175 P178 P179 P180 P181 P182 P183 P184 P185 P187 P188 P189 P191 P193 P194 P198 P200 P201 P202 P203 P204 P208 P216 P225 P226 P23 P230 P231 P233 P234 P235 P236 P237 P239 P241 P243 P244 P245 P246 P247 P248 P25 P250 P251 P252 P253 P254 P255 P256 P258 P260 P261 P262 P264 P265 P266 P267 P268 P269 P270 P271 P272 P274 P275 P277 P278 P279 P280 P282 P283 P284 P285 P286 P287 P288 P289 P290 P291 P292 P294 P296 P297 P298 P299 P300 P301 P302 P303 P304 P306 P308 P309 P310 P311 P312 P313 P314 P315 P316 P317 P318 P319 P320 P321 P322 P323 P324 P327P329 P33 P331 P332 P333 P334 P335 P336 P337 P339 P34 P340 P341 P342 P343 P344 P345 P346 P349 P35 P350 P351 P353 P354 P355 P356 P357 P358 P359 P36 P360 P361 P363 P364 P365 P366 P367 P368 P369 P371 P372 P373 P374 P375 P376 P379 P380 P381 P382 P383 P386 P387 P388 P39 P390 P391 P394 P395 P396 P397 P398 P399 P40 P400 P402 P403 P404 P406 P408 P409 P41 P410 P411 P412 P413 P414 P416 P418 P419 P42 P421 P422 P424 P425 P426 P427 P428 P43 P432 P433 P434 P435 P436 P437 P438 P439 P44 P440 P445 P449 P45 P450 P452 P453 P454 P455 P456 P458 P459 P46 P460 P461 P464 P465 P466 P467 P468 P469 P47 P472 P473 P478 P479 P48 P480 P483 P484 P485 P487 P488 P489 P49 P490 P491 P492 P494 P497 P499 P50 P502 P503 P504 P507 P509 P51 P510 P512 P514 P515 P517 P518 P52 P521 P522 P524 P525 P526 P527 P529 P53 P531 P54 P540 P543 P544 P545 P547 P548 P549 P55 P550 P551 P556 P557 P558 P56 P561 P565 P567 P57 P570 P577 P579 P58 P580 P581 P582 P59 P590 P594 595 P596 P60 P600 P602 P603 P604 P61 P610 P612 P613 P614 P615 P64 P65 P66 P67 P68 P69 P72 P73 P74 P75 P76 P77 P78 P79 P80 P81 P82 P83 P84 P86 P87 P88 P91 P92 P93 P94 P95 P97 P98 P99 SW109 SW113 SW133 SW13 9 SW15 SW17 SW18 SW19 SW2 SW29 SW31 SW36 SW41 SW46 SW50 SW52 SW55 SW56 SW66 SW67 SW68 SW79 SW82 SW86 SW87 SW90 SW95 SW99
Concern about operational costs if penalties are paid when the plant is not operating	2	P23 SW128
Industry/commerce should pay more for water	3	P122 P430 P506
Given the expense, it will serve too few of the NSW population	3	P119 P442 P527

Issue	Number of times issue raised	Submission ID number
Should only proceed if it is the most economical solution	2	P118 P555
Water should be priced appropriately	7	P118 P456 P504 P511 P541SW80 SW85
Is Macquarie Bank involved?	4	P143 P225 P242 P327
Concern about cost of feasibility studies	1	P327
5. The consultation process		
Scope and effectiveness of the consultation process	206	P124 P137 P160 P165 P166 P194 P216 P226 P230 P235 P236 P239 P243 P244 P245 P246 P247 P248 P250 P251 P252 P253 P254 P255 P256 P258 P260 P261 P262 P264 P265 P266 P267 P268 P269 P270 P272 P274 P277 P278 P279 P280 P282 P283 P284 P285 P286 P287 P288 P289 P290 P291 P292 P296 P298 P299 P300 P301 P302 P303 P304 P306 P308 P309 P310 P311 P312 P313 P314 P315 P316 P320 P321 P322 P323 P331 P332 P333 P334 P335 P336 P337 P339 P341 P342 P343 P345 P346 P349 P350 P353 P354 P355 P356 P357 P359 P361 P363 P365 P366 P367 P368 P369 P371 P372 P373 P375 P376 P379 P380 P381 P382 P387 P388 P390 P391 P394 P395 P396 P398 P400 P402 P403 P404 P408 P410 P412 P413 P414 P416 P418 P421 P422 P424 P425 P426 P427 P428 P432 P433 P434 P435 P436 P439 P440 P449 P450 453 P455 P458 P459 P460 P461 P464 P465 P466 P467 P468 P469 P483 P487 P489 P490 P491 P492 P494 P502 P503 P512 P514 P515 P517 P518 P524 P526 P529 P540 P543 P544 P545 P547 P549 P556 P557 P558 P567 P568 P569 P570 P575 P576 P577 P580 P581 P582 P589 P590 P593 P594 P595 P596 P597 P600 P602 P603 P610
Consultation process is inadequate	175	P100 P101 P102 P103 P104 P105 P106 P111 P112 P113 P114 P115 P116 P125 P127 P128 P129 P130 P131 P132 P133 P14 P176 P178 P179 P180 P181 P182 P183 P184 P185 P187 P19 P191 P198 P200 P201 P202 P207 P220 P222 P229 P242 P248 P25 P257 P259 P277 P317 P318 P324 P327 P329 P34 P340 P344 P35 P36 P364 P385 P386 P39 P392 P40 P406 P409 P41 P411 P415 P417 P42 P420 P43 P431 P437 P44 P441 P442 P446 P45 P452 P456 P46 P462 P47 P473 P48 P481 P482 P483 P484 P485 P487 P49 P496 P499 P50 P505 P509 P51 P510 P512 P515 P518 P52 P520 P527 P53 P537 P538 P54 P548 P55 P550 P551 P552 P553 P554 P56 P563 P564 P57 P58 P59 P60 P61 P612 P613 P614 P615 P64 P65 P66 P67 P68 P72 P73 P74 P75 P76 P77 P78 P79 P80 P81 P82 P83 P84 P86 P87 P88P91 P92 P93 P94 P95 P97 P98 P99 SW101 SW107 SW111 SW123 SW128 SW136 SW138 SW139 SW142 SW148 SW15 SW1672 SW42 SW56 SW95
Concern about the timing of the consultation process	5	P173 P456 P499 P505 P6
Online submission form favours positive response	1	P6
Government doesn't listen to the public/government needs to listen to the public/ or experts	34	P1 P126 P13 P154 P155 P157 P158 P175 P193 P203 P204 P208 P223 P224 P237 P258 P27 P271 P275 P28 P295 P327 P358 P362 P399 P500 P527 P6 P604 P605 SW29 SW39 SW60 SW74
Dissatisfied with the timelines of response to the issues raised in the submission	1	P31
6. The procurement process		
Concerned about the procurement process	7	P187 P210 P225 P249 P364 P486 P500
7. Construction of the plant		
General concern about construction of the plant	1	P505
Visual impact	7	P175 P2 P3 P329 P441 P505 P518
Air quality	2	P480 SW113
Dust	1	P505
Noise and vibration	9	P126 P442 P457 P480 P505 P518 SW113 SW12 SW30

Issue	Number of times issue raised	Submission ID number
Noise at the site	4	P5 P577 P598 P607
Traffic noise	3	P12 P5 P607
Terrestrial ecology	262	P15 P165 P172 P175 P18 P187 P189 P191 P194 P197 P20 P211 P212 P216 P220 226 P227 P228 P230 P235 P236 P239 P243 P244 P245 P246 P247 P248 P250 P251 P252 P253 P254 P255 P256 P258 P260 P261 P262 P264 P265 P266 P267 P268 P269 P270 P271 P272 P274 P275 P277 P278 P279 P280 P282 P283 P284 P285 P286 P287 P288 P289 P290 P291 P292 P296 P297 P298 P299 P300 P301 P302 P303 P304 P306 P308 P309 P310 P311 P312 P313 P314 P315 P316 P317 P320 P321 P322 P323 P324 P327 P328 P329 P331 P332 P333 P334 P335 P336 P337 P339 P340 P341 P342 P343 P345 P346 P349 P350 P351 P353 P354 P355 P356 P357 P359 P360 P361 P363 P364 P365 P366 P367 P368 P369 P371 P372 P373 P375 P376 P379 P38 P380 P381 P382 P383 P387 P388 P390 P391 P394 P395 P396 P397 P398 P400 P402 P403 P404 P406 P408 P409 P410 P411 P412 P413 P414 P415 P416 P417 P418 P420 P421 P422 P424 P425 P426 P427 P428 P432 P433 P434 P435 P436 P437 P438 P439 P440 P441 P442 P445 P449 P450 P452 P453 P455 P456 P457 P458 P459 P460 P461 P464 P465 P466 P467 P468 P469 P479 P480 P484 P485 489 P490 P491 P492 P494 P497 P502 P503 P507 P512 P514 P515 P517 P518 P522 P523 P524 P525 P526 P527 P529 P534 P538 P540 P543 P544 P545 P547 P548 P549 P550 P552 P556 P557 P558 P567 P570 P573 P576 P577 P580 P581 P582 P584 P590 P593 P595 P596 P597 P602 P603 P605 P606 P607 P610 SW100 SW139 SW42 SW90 SW98
Bushfire hazard	1	P498
Geology and soil	1	P328
Site contamination	2	P328 P598
Spoil management	11	P15 P18 P189 P20 P329 P442 P522 P523 P561 P584 P606
Heritage	6	P1 P175 P2 P221 P3 P329
Indigenous heritage	17	P15 P173 P189 P197 P20 P329 P442 P452 P505 P522 P523 P561 P577 P584 P606 P607 P607 SW42
European heritage	5	P329 P452 P505 P561 P577
Hydrology	14	P211 P212 P227 P228 P233 P234 P328 P441 P442 P518 P548 P561 P577 P607
Groundwater	17	P187 P211 P212 P227 P228 P442 P522 P523 P548 P552 P561 P577 P590 P597 P600 P607 SW98
Traffic and access	8	P176 P442 P505 P584 P606 SW113 SW12 SW30
Increase in traffic volumes	4	P2 P3 P5 P505
Socio-economic impacts - disruption	4	P176 P442 P445 P498
Kurnell is a terrorism target	2	P144 P498
8. Construction of the intakes/outlets		
Air quality	1	SW113
Noise and vibration	4	P442 P457 P505 SW113
Terrestrial ecology	45	P189 P191 P197 P221 P248 P271 P277 P297 P329 P340 P351 P360 P364 P383 P397 P406 P409 P411 P415 P417 P420 P437 P438 P441 P452 P456 P457 P479 P480 P484 P485 P497 P507 P512 P515 P522 P523 P525 P527 P534 P538 P550 SW139 SW42 SW90
General concern	1	P561
Spoil management	8	P15 P18 P189 P20 P329 P442 P522 P561
Indigenous heritage	3	P197 P329 SW42
European heritage	1	P329
Hydrology	4	P442 P457 P522 P523
Traffic and access	2	P442 SW113
Aquatic ecology - why are the intakes/outlets on rocky reefs, not sand beds	35	P233 P234 P248 P275 P317 P326 P340 P351 P360 P364 P383 P397 P406 P409 P411 P415 P417 P496 P507 P512 P515 P518 P522 P525 P527 P532 P534 P538 P550 P561 P577 P605 SW139 SW56 SW90

Issue	Number of times issue raised	Submission ID number
9. Construction of the delivery infrastructure		
Visual impact	1	P616
Air quality	4	P508 P548 P591 SW113
Dust	1	P508
Noise and vibration	6	P442 P457 P508 P577 P591 SW113
Noise at the site	3	P5 P598 P607
Traffic noise	4	P5 P508 P598 P607
Terrestrial ecology	245	P165 P172 P189 P191 P194 P197 P216 P220 P221 P226 P230 P235 P236 P239 P243 P244 P245 P246 P247 P248 P250 P251 P252 P253 P254 P255 P256 P258 P260 P261 P262 P264 P265 P266 P267 P268 P269 P270 P271 P272 P274 P275 P277 P278 P279 P280 P282 P283 P284 P285 P286 P287 P288 P289 P290 P291 P292 P296 P297 P298 P299 P300 P301 P302 P303 P304 P306 P308 P309 P310 P311 P312 P313 P314 P315 P316 P317 P320 P321 P322 P323 P329 P331 P332 P333 P334 P335 P336 P337 P339 P340 P341 P342 P343 P345 P346 P349 P350 P351 P353 P354 P355 P356 P357 P359 P360 P361 P363 P364 P365 P366 P367 P368 P369 P371 P372 P373 P375 P376 P379 P38 P380 P381 P382 P383 P387 P388 P390 P391 P394 P395 P396 P397 P398 P400 P402 P403 P404 P406 P408 P409 P410 P411 P412 P413 P414 P415 P416 P417 P418 P420 P421 P422 P424 P425 P426 P427 P428 P432 P433 P434 P435 P436 P437 P438 P439 P440 P441 P449 P450 P453 P455 P456 P457 P458 P459 P460 P461 P464 P465 P466 P467 P468 P468 P479 P480 P484 P485 P489 P490 P491 P492 P494 P497 P502 P503 P505 P507 P512 P514 P515 P517 P522 P523 P524 P525 P526 P527 P529 P534 P538 P540 P543 P544 P545 P547 P548 P549 P550 P556 P557 P558 P567 P570 P573 P576 P577 P580 P581 P582 P588 P590 P591 P593 P595 P596 P602 P603 P605 P607 P607 P610 SW131 SW139 SW42 SW90
General concern	9	P18 P20 P326 P330 P498 P542 P559 P561 SW131
Geology and soil	2	P326 P616
Erosion control	4	P326 P588 P591 P607
Site contamination	9	P325 P326 P452 P472 P473 P480 P548 P588 P591
Spoil management	13	P15 P18 P189 P20 P329 P442 P508 P522 P523 P561 P577 P591 P616
General concern about spoil impacts	1	P38
Indigenous heritage	7	P189 P197 P20 P577 P591 P607 SW42
European heritage	1	P591
Hydrology	6	P221 P442 P472 P522 P523 P577
Flooding	2	P588 P591
Water quality	4	P190 P480 P548 P591
Traffic and access	8	P442 P472 P508 P577 P591 P598 P600 SW113
Flooding	1	P591
Aquatic ecology	64	P164 P18 P189 P190 P191 P20 P214 P220 P221 P248 P271 P275 P297 P317 P322 P325 P326 P329 P340 P351 P360 P364 P383 P397 P406 P409 P411 P415 P417 P431 P437 P441 P456 P457 P472 P473 P477 P480 P484 P497 P498 P499 P505 P506 P507 P512 P515 P522 P523 P525 P527 P534 P538 P548 P550 P561 P573 P577 P585 P591 P605 P616 SW131 SW145
Seagrass beds	21	P15 P214 P221 P259 P325 P326 P329 P452 P472 P473 P480 P496 P498 P505 P522 P523 P548 P577 P591 P607 P616
Not concerned as not in my backyard	1	P38
Impact on private property (damage)	1	P508
Impact on oyster farming	2	P190 P577
Impact on Wilkins Public School	2	P508 P601

Issue	Number of times issue raised	Submission ID number
10. Operation of the plant		
Energy and greenhouse gas emission	9	P197 P20 P21 P22 P222 P249 P273 P522 P523
Energy use	221	P10 P100 P101 P102 P103 P104 P105 P106 P108 P111 P112 P113 P114 P115 P116 P123 P124 P125 P127 P128 P129 P130 P131 P132 P133 P14 P143 P149 P15 P153 P156 P158 P160 P164 P166 P167 P170 P172 P173 P174 P176 P178 P179 P18 P180 P181 P182 P183 P184 P185 P19 P193 P196 P198 P200 P201 P202 P203 P204 P208 P213 P214 P215 P221 P223 P224 P229 P237 P25 P275 P281 P305 P318 P327 P329 P33 P330 P34 P340 P341 P35 P358 P36 P37 P370 P38 P39 P399 P40 P405 P406 P407 P41 P419 P42 P429 P43 P430 P438 P44 P441 P445 P447 P448 P45 P46 P469 P47 P472 P479 P48 P480 P487 P488 P49 P495 P498 P499 P50 P500 P501 P505 P506 P509 P51 P510 P512 P513 P515 P518 P519 P52 P521 P53 P530 P534 P54 P541 P548 P55 P551 P56 P563 P565 P568 P569 P57 P573 P579 P58 P581 P587 P59 P590 P591 P594 P60 P605 P609 P61 P612 P613 P614 P615 P64 P65 P66 P67 P68 P72 P73 P74 P75 P76 P77 P78 P79 P80 P81 P82 P83 P84 P86 P87 P88 P91 P92 P93 P94 P95 P97 P98 P99 SW10 SW101 SW109 SW128 SW136 SW15 SW20 SW24 SW27 SW31 SW35 SW43 SW44 SW46 SW51 SW52 SW56 SW61 SW62 SW63 SW64 SW68 SW72 SW77 SW85 SW88 SW95 SW97
Capacity of the electricity network	16	P137 P148 P19 P193 P203 P204 P231 P327 P445 P448 P473 P499 P504 P527 P530 SW108
Greenhouse gas emissions	450	P100 P101 P102 P103 P104 P105 P106 P108 P111 P112 P113 P114 P115 P116 P124 P125 P127 P128 P129 P130 P131 P132 P133 P135 P137 P138 P14 P146 P149 P158 P160 P164 P165 P167 P170 P172 P173 P176 P178 P179 P180 P181 P182 P183 P184 P185 187 P191 P193 P194 P197 P198 P200 P201 P202 P203 P204 P208 P21 P211 P212 P213 P214 P215 P216 P217 P220 P221 P222 P226 P227 P228 P229 P230 P233 P234 P235 P236 P237 P239 P242 P243 P244 P245 P246 P247 P248 P250 P251 P252 P253 P254 P255 P256 P258 P259 P26 P260 P261 P262 P264 P265 P266 P267 P268 P269 P270 P271 P272 P273 P274 P275 P277 P278 P279 P280 P282 P283 P284 P285 P286 P287 P288 P289 P290 P291 P292 P296 P297 P298 P299 P300 P301 P302 P303 P304 P306 P308 P309 P310 P311 P312 P313 P314 P315 P316 P317 P318 P320 P321 P322 P323 P328 P329 P33 P330 P331 P332 P333 P334 P335 P336 P337 P339 P34 P340 P341 P342 P343 P344 P345 P346 P349 P35 P350 P351 P353 P354 P355 P356 P357 P358 P359 P36 P360 P361 P363 P365 P366 P367 P368 P369 P370 P371 P372 P373 P374 P375 P376 P379 P38 P380 P381 P382 P383 P384 P385 P387 P388 P39 P390 P391 P394 P395 P396 P397 P398 P399 P40 P400 P402 P403 P404 P405 P406 P408 P409 P41 P410 P411 P412 P413 P414 P415 P416 P418 P42 P420 P421 P422 P424 P425 P426 P427 P428 P429 P43 P431 P432 P433 P434 P435 P436 P437 P438 P439 P44 P440 P441 P443 P446 P447 P448 P449 P45 P450 P452 P453 P455 P456 P458 P459 P46 P460 P461 P462 P464 P465 P466 P467 P468 P468 P469 P47 P472 P473 P474 P477 P478 P479 P48 P480 P484 P485 P486 P487 P488 P489 P49 P490 P491 P492 P494 P497 P498 P499 P50 P500 P502 P503 P504 P505 P507 P509 P51 P510 P512 P514 P515 P516 P517 P518 P52 P521 P524 P526 P527 P529 P53 P534 P536 P538 P54 P540 P541 P543 P544 P545 P547 P548 P549 P55 P550 P551 P552 P553 P554 P556 P557 P558 P56 P561 P563 P567 P568 P569 P57 P570 P573 P576 P58 P580 P581 P582 P587 P59 P590 P591 P593 P594 P595 P596 P60 P602 P603 P605 P608 P609 P61 P610 P612 P613 P614 P615 P64 P65 P66 P67 P68 P69 P71 P72 P73 P74 P75 P76 P77 P78 P79 P80 P81 P82 P83 P84 P85 P86 P87 P88 P91 P92 P93 P94 P95 P97 P98 P99 SW100 SW101 SW106 SW111 SW113 SW122 SW127 SW128 SW138 SW139 SW15 SW20 SW27 SW31 SW42 SW44 SW47 SW51 SW54 SW56 SW62 SW64 SW69 SW71 SW73 SW74 SW77 SW83 SW88 SW90 SW95 SW97 SW98
Concern about long term greenhouse impacts that are not assessed in the Environmental Assessment	4	P172 P277 P38 P442
Energy use can only add to global warming that will reduce rainfall	46	P124 P158 P167 P176 P208 P213 P214 P221 P229 P242 P248 P257 P27 P33 P330 P385 P399 P415 P419 P429 P438 P445 P446 P448 P452 P479 P512 P541 P568 P569 P573 P598 P609 P69 SW111 SW113 SW123 SW138 SW17 SW27 SW31 SW45 SW74 SW86 SW97

Issue	Number of times issue raised	Submission ID number
Greenhouse Gas offset are not sufficient/or there is insufficient capacity i.e. green power/or how greenhouse gasses are offset	45	P148 P15 P150 P211 P212 P213 P221 P227 P228 P242 P275 P429 P431 P442 P445 P456 P472 P473 P480 P487 P496 P497 P500 P505 P515 P518 P522 P523 P538 P548 P551 P561 P577 P581 P590 P591 P594 P600 P607 P609 SW111 SW123 SW44 SW90 SW98
Energy use relative to other options	15	P123 P166 P318 P358 P385 P405 P407 P429 P487 P518 P530 P551 SW123 SW138 SW39
Should be promoting reduction in energy use as per 80% reductions by 2020	9	P108 P123 P156 P166 P215 P221 P275 P487 P609
Should only proceed if it is the most energy efficient solution	1	P118
General degradation of Kurnell	12	P13 P214 P329 P438 P445 P457 P479 P498 P499 P516 P518 P561
Concern about water quality produce by the plant	7	P145 P149 P175 P325 P538 P598 P62
Visual impact of the plant- artists impression	4	P24 P325 P370 P505
Benefit of only producing 500 ML has not been presented/Why not more	3	P117 P142 P616
Desalination more hygienic that recycled sewage	3	P154 P155 P168
Alternative energy source i.e. nuclear, solar etc	9	P154 P155 P344 P548 P555 P565 P604SW32 SW40
Hazards and risks, such as the need to evaluate Kurnell if an incident at Caltex	6	P140 P457 P487 P498 P598 SW112
Chemical use and storage on site	4	P318 P457 P498 P577
Contaminated stormwater runoff to Quibray Bay	2	P487 P577
Air quality impact	4	P241 P457 P499 P577
Reverse osmosis not adequately described	12	P237 P327 P358 P385 P442 P448 P484 P498 P510 P577 P600 P607
Vegetation Corridor	5	P518 P328 P598 P600 SW42
Noise	3	P548 SW12 SW30

Issue	Number of times issue raised	Submission ID number
11. Operation of the outlets		
General concern abut the operation of the intakes	1	P616
Quality of seawater intake – health	4	P329 P452 P577 SW125
Proximity to sewage outfalls	5	P108 P505 P616 P8 P9
Impact on aquatic ecology	268	P144 P15 P150 P157 P165 P167 P174 P191 P194 P215 P216 P220 P226 P230 P233 P234 P235 P236 P239 P243 P244 P245 P246 P247 P248 P250 P251 P252 P253 P254 P255 P256 P258 P259 P260 P261 P262 P264 P265 P266 P267 P268 P269 P270 P271 P272 P273 P274 P275 P277 P278 P279 P280 P282 P283 P284 P285 P286 P287 P288 P289 P290 P291 P292 P296 P297 P298 P299 P300 P301 P302 P303 P304 P305 P306 P308 P309 P310 P311 P312 P313 P314 P315 P316 P320 P321 P322 P323 P325 P326 P331 P332 P333 P334 P335 P336 P337 P339 P340 P341 P342 P343 P345 P346 P349 P350 P351 P353 P354 P355 P356 P357 P359 P360 P361 P363 P364 P365 P366 P367 P368 P369 P370 P371 P372 P373 P375 P376 P379 P38 P380 P381 P382 P383 P387 P388 P390 P391 P394 P395 P396 P397 P398 P400 P402 P403 P404 P406 P408 P409 P410 P411 P412 P413 P414 P415 P416 P417 P418 P421 P422 P424 P425 P426 P427 P428 P431 P432 P433 P434 P435 P436 P437 P438 P439 P440 P441 P445 P449 P450 P453 P455 P456 P458 P459 P460 P461 P464 P465 P466 P467 P468 P468 P473 P477 P479 P484 P485 P487 P489 P490 P491 P492 P494 P496 P497 P502 P503 P505 P506 P507 P510 P512 P514 P515 P517 P522 P523 P524 P525 P526 P527 P529 P534 P538 P540 P541 P543 P544 P545 P547 P549 P550 P551 P556 P557 P558 P567 P568 P569 P570 P573 P576 P577 P580 P581 P582 P590 P593 P595 P596 P602 P603 P605 P607 P610 P616 P63 P69 P71 SW139 SW16 SW41 SW56 SW67 SW90 SW97
12. Operation of the intakes		
General concern abut the operation of the outlets	1	P616
Seawater quality – recreation	11	P193 P203 P204 P325 P326 P328 P445 P457 P499 P8 SW100
Effect on fishing	1	P616
Seawater quality	23	P144 P15 P150 P157 P191 P211 P212 P227 P228 P242 P248 P271 P273 P297 P340 P457 P487 P518 P568 P569 P573 P583 P605
Effect on whales/aquatic ecology	288	P14 P160 P165 P167 P174 P18 P191 P193 P194 P203 P204 P211 P212 P214 P215 P216 P220 P226 P227 P228 P230 P235 P236 P239 P243 P244 P245 P246 P247 P248 P250 P251 P252 P253 P254 P255 P256 P258 P259 P260 P261 P262 P264 P265 P266 P267 P268 P269 P270 P271 P272 P273 P274 P275 P278 P279 P28 P280 P282 P283 P284 P285 P286 P287 P288 P289 P290 P291 P292 P296 P297 P298 P299 P300 P301 P302 P303 P304 P305 P306 P308 P309 P310 P311 P312 P313 P314 P315 P316 P320 P321 P322 P323 P325 P326 P327 P329 P331 P332 P333 P334 P335 P336 P337 P339 P340 P341 P342 P343 P345 P346 P349 P350 P351 P353 P354 P355 P356 P357 P358 P359 P360 P361 P362 P363 P364 P365 P366 P367 P368 P369 P370 P371 P372 P373 P374 P375 P376 P379 P380 P381 P382 P383 P384 P385 P387 P388 P390 P391 P394 P395 P396 P397 P398 P400 P402 P403 P404 P406 P408 P409 P410 P411 P412 P413 P414 P415 P416 P417 P418 P421 P422 P424 P425 P426 P427 P428 P431 P432 P433 P434 P435 P436 P437 P438 P439 P440 P441 P445 P449 P450 P452 P453 P455 P456 P457 P458 P459 P460 P461 P464 P465 P466 P467 P468 P468 P472 P473 P477 P479 P480 P484 P485 P487 P489 P490 P491 P492 P494 P497 P502 P503 P505 P507 P510 P512 P514 P515 P517 P518 P522 P523 P524 P525 P526 P527 P529 P532 P534 P538 P539 P540 P541 P543 P544 P545 P547 P548 P549 P550 P551 P552 P556 P557 P558 P567 P570 P575 P576 P577 P580 P581 P582 P590 P591 P593 P595 P596 P597 P602 P603 P610 P616 P8 P96 SW100 SW111 SW138 SW139 SW49 SW56 SW67 SW9 SW90 SW95 SW97 SW98

Issue	Number of times issue raised	Submission ID number
General impact on water quality	280	P158 P160 P165 P194 P2 P211 P212 P216 P220 P226 P227 P228 P23 P230 P235 P236 P239 P242 P243 P244 P245 P246 P247 P250 P251 P252 P253 P254 P255 P256 P258P260 P261 P262 P264 P265 P266 P267 P268 P269 P270 P272 P274 P277 P278 P279 P280 P282 P283 P284 P285 P286 P287 P288 P289 P290 P291 P292 P296 P298 P299 P3 P300 P301 P302 P303 P304 P306 P308 P309 P310 P311 P312 P313 P314 P315 P316 P320 P321 P322 P323 P325 P326 P327 P328 P329 P331 P332 P333 P334 P335 P336 P337 P339 P340 P341 P342 P343 P345 P346 P349 P350 P351 P353 P354 P355 P356 P357 P358 P359 P360 P361 P362 P363 P365 P366 P367 P368 P369 P370 P371 P372 P373 P374 P375 P376 P379 P380 P381 P382 P383 P384 P385 P387 P388 P390 P391 P394 P395 P396 P398 P400 P402 P403 P404 P406 P408 P410 P411 P412 P413 P414 P415 P416 P418 P421 P422 P424 P425 P426 P427 P428 P431 P432 P433 P434 P435 P436 P437 P439 P440 P441 P442 P445 P448 P449 P450 P452 P453 P455 P456 P458 P459 P460 P461 P462 P464 P465 P466 P467 P468 P468 P472 P485 P487 P489 P490 P491 P492 P494 P497 P499 P502 P503 P505 P506 P507 P510 P512 P513 P514 P515 P517 P518 P521 P522 P523 P524 P525 P526 P527 P529 P530 P538 P539 P540 P541 P543 P544 P545 P547 P548 P549 P550 P551 P552 P553 P554 P556 P557 P558 P561 P567 P570 P575 P576 P577 P580 P581 P582 P590 P591 P593 P594 P595 P596 P597 P598 P600 P602 P603 P607 P610 P611 P616 P96 SW108 SW111 SW121 SW138 SW139 SW47 SW49 SW57 SW67 SW74 SW76 SW90 SW95 SW98
What is the impact within the near fields?	7	P364 P397 P409 P417 P438 P479 P577
Questioned the size (area) of the near field	1	P577
13. Operation of the delivery infrastructure		
Aquatic ecology	28	P248 P277 P329 P340 P351 P360 P364 P383 P397 P406 P409 P411 P415 P417 P431 P437 P441 P506 P522 P523 P527 P534 P548 P550 SW139 SW145 SW56 SW90
Terrestrial ecology	2	P248 P271
14. Choice of the technology		
Possibility of recovering of salt from the seawater concentrate	2	P17 P217
Operational regime for the plant	7	P19 P221 P294 P431 P577 P600 P604
Thermal plant preferable	3	P120 P189 P20
Magnesium or manganese salts should be extracted. Titanium could also be extracted	2	P162 P32
Use of evaporative technology	2	P162 P168
Misconception that the plant can be turned on and off	10	P154 P155 P221 P377 P442 P500 P527 P561 SW100 SW117

Issue	Number of times issue raised	Submission ID number
15. Miscellaneous		
Miscellaneous concerns about the desalination project	3	P444 P518 SW32
Proximity to oil refineries	2	P1 SW1672
General concern about detrimental effects on the environment	241	P100 P101 P102 P103 P104 P105 P106 P109 P111 P112 P113 P114 P115 P116 P121 P123 P125 P127 P128 P129 P130 P131 P132 P133 P157 P160 P161 P163 P171 P175 P176 P178 P179 P180 P181 P182 P183 P184 P185 P188 P195 P198 P200 P201 P202 P207 P208 P211 P212 P213 P214 P222 P227 P228 P231 P233 P234 P236 P240 P241 P248 P257 P258 P259 P27 P273 P274 P275 P281 P317 P329 P335 P34 P340 P35 P358 P36 P370 P374 P38 P384 P386 P39 P40 P401 P406 P407 P41 P415 P417 P42 P423 P426 P429 P43 P437 P438 P44 P441 P447 P448 P45 P451 P454 P457 P46 P462 P47 P471 P472 P474 P479 P48 P480 P483 P484 P487 P488 P49 P497 P498 P50 P500 P504 P505 P506 P509 P51 P510 P511 P515 P518 P519 P52 P521 P523 P525 P527 P53 P530 P531 P534 P536 P537 P54 P548 P55 P550 P56 P564 P57 P579 P58 P583 P59 P590 P591 P599 P60 P600 P605 P608 P61 P612 P613 P614 P615 P64 P65 P66 P67 P68 P70 P72 P73 P74 P75 P76 P77 P78 P79 P80 P81 P82 P83 P84 P85 P86 87 P88 P91 P92 P93 P94 P95 P96 P97 P98 P99 SW100 SW101 SW103 SW104 SW105 SW110 SW113 SW122 SW126 SW127 SW129 SW130 SW131 SW136 SW14 SW140 SW141 SW142 SW15 SW17 SW18 SW2034 SW27 SW31 SW36 SW42 SW43 SW44 SW46 SW56 SW62 SW73 SW74 SW75 SW77 SW78 SW80 SW83 SW88 SW89 SW99
General concern about social and cultural impact	60	P213 P215 P218 P273 P275 P326 P329 P335 P352 P358 P38 P385 P399 P401 P406 P407 P415 P417 P426 P429 P438 P441 P442 P445 P448 P451 P478 P479 P480 P483 P484 P487 P488 P497 P499 P500 P508 P518 P521 P527 P531 P537 P550 P563 SW100 SW111 SW112 SW113 SW127 SW138 SW18 SW25 SW36 SW44 SW46 SW61 SW64 SW75 SW83
General concern about economic impacts	18	P326 P327 P329 P357 P358 P38 P439 P448 P518 P527 P537 P563 SW100 SW14 SW18 SW42 SW80 SW84
Would like to be involved in the project	4	P151 P152 P32 P328
General concern about pilot testing	1	P444

Appendix C
Matters relating to the need for and alternatives to Desalination

A large number of people who made a formal submission on the Environmental Assessment of the Concept Plan for desalination expressed views on alternatives to desalination as a supply option rather than being confined to issues specific to the proposal.

These submissions identified areas of interest and concern that, although outside the scope of the Environmental Assessment process, should be addressed. This appendix summarises the nature of these submissions and provides information pertinent to each topic covered in the submissions.

The issues raised in the submissions can be grouped into the following subjects:

Demand Management – These submissions generally argued that more effort should be put into demand management, including public education and appropriate pricing.

The appropriateness of desalination as a supply option – These submissions either queried the need for a desalination plant or the appropriateness of desalination as a response to Sydney's water supply needs.

Recycling – These submissions supported recycling as the preferred supply option.

Cost of desalination – These submissions opposed desalination because it is more costly than recycling.

A new dam – These submissions supported construction of a new dam.

Rainwater tanks – These submissions preferred local harvesting with rainwater tanks to desalination.

Leakage – These submissions called for more initiatives to reduce leakage.

Borewater – These submissions preferred borewater to desalination.

In the period since these submissions were received the Progress Report on the Metropolitan Water Plan has been released. The Progress Report confirms that Sydney can secure its water supplies without building a desalination plant right now. The Government's independent consultants (Professor Stuart White and David Campbell) have however, advised that the ability to construct and operate a desalination plant is a necessary component of a multifaceted plan to secure Sydney's water supplies.

Sydney Water is continuing to work to ensure that, should storages fall to around 30 per cent, a desalination plant can be built quickly. This work includes the purchase of land and completion of a design blueprint, as well as completion of the planning approval process.

A capital project of the magnitude of the desalination plant would ordinarily require at least four years to deliver. However, should there be a serious water shortage in Sydney, a solution would be required to be implemented quicker than this.

Work to access deeper water in our dams will be complete by August 2006 and will increase supplies by around 8 per cent. Then, if severe drought conditions were to return and dam levels fell rapidly the Government would:

- At around 40 per cent storage levels, proceed to access groundwater; and
- At around 30 per cent storage levels, award the construction contract for a desalination plant.

The work that Sydney Water has undertaken to date, together with the work that will be completed by the end of this year, will put Sydney Water in a position to build a desalination plant in around two years from the time that a contract is awarded, should that become necessary.

Desalination therefore remains as a last resort option among a portfolio of options that the Government has announced to ensure a sustainable water supply for Sydney. The portfolio of options includes:

Recycled water – together with recycling projects already underway new measures will take Sydney's total recycled water volume up to 65 GL by 2011 rising to more than 70 GL by 2015. These new measures include:

- North Western Recycled Water Scheme which takes effluent from three existing sewage treatment plants (Penrith, St Marys and Quakers Hill) to an advanced water treatment plant where it will be treated to replace water from Warragamba Dam for agricultural, domestic and river health purposes;
- Dual reticulation to all 160,000 new homes to be built in new suburbs in Sydney's north west and south west;
- A recycled water scheme at camellia to provide for large scale commercial and industrial water users; and
- Potential schemes at Kurnell, Botany, Parramatta, Wollongong and the Royal Botanic Gardens.

Water saving measures – Sydney Water will consolidate and grow its demand management initiatives that are now saving water at a rate of around 35 GL of water per year. These savings will grow to an estimated 65 GL by 2015. In 2005 the NSW Government introduced the $120 million Water Savings Fund to be used to improve water efficiency, increase the uptake of alternative water sources and stimulate investment in innovative water technologies. Large water-using businesses, Councils and Government agencies are now required to achieve greater water efficiency in line with Water Savings Action Plans the Government required them to prepare. Other new programs include retrofitting an additional 50,000 Department of Housing homes and units; a rebate of $150 for the purchase of water efficient front-loading washing machines; a trial to help 20 government schools improve water efficiency by reducing leaks and the targeting of 60 government sites over the next two years to achieve water savings of 25-30 per cent.

Shoalhaven transfers – In the short term the Sydney Catchment Authority will examine the potential for modest increases in the water available from the Shoalhaven through changed pumping rules and minor modifications to the existing transfer network.

Deep storages – Works are underway to access water at the bottom of the dams by August 2006. This will add about 190,000ML or 8 per cent of total supply to Sydney's available storage.

New groundwater resources – The Sydney Catchment Authority is conducting further studies on potential groundwater sources identified at Leonay in Western Sydney and Kangaloon in the Southern Highlands. Together these two sites may contribute around 30 GL of additional water per year.

Each of these portfolio measures and other options identified in public submissions are addressed in more detail below.

Demand Management

Since 1999, the Demand Management Program has reduced annual demand for water by around 35 GL a year. Sydney's demand management efforts mean the same volume of water is being used today as it was 25 years ago – despite the population of Sydney increasing by almost one million over the same period. By today's average consumption of 250kL per household per annum, the savings achieved are equivalent to the annual water demand of about 138,000 households.

Over $100 million has been invested to date in Sydney Water's Demand Management Program, which is the largest delivered by an Australian utility and one of the largest and most diverse urban demand reduction programs internationally. The program now includes a diverse range of projects targeting all sectors of the market and many different end uses of water.

Through the Sydney Water Retrofit program, around 300,000 homes have been retrofitted with water efficient showerheads, taps and toilets. Sydney Water has also taken an active role in the ongoing development of the National Water Conservation Rating and Labeling Scheme since it began in 1994. The scheme provides water-efficiency assessment and rating for the major water using domestic appliances and fittings including toilets, showers, washing machines, dishwashers, taps, urinals, flush controls and flow regulators.

Sydney Water's Demand Management Program in 2005/2006 includes:

- Residential retrofits;
- Public housing retrofits;
- Residential outdoor programs;
- Rainwater tank rebates for existing residents and schools;
- Every Drop Counts Business Program;
- Leakage reduction and pressure control;
- Recycling projects at BlueScope Steel Port Kembla, Rouse Hill (residential) and North Head Sewage Treatment Plant; and
- Every Drop Counts in Schools program.

In recognition of the need to reduce demand for potable water even further given the current drought, the Government has recently announced an additional five demand management programs:

- Retrofitting with water saving devices an additional 50,000 Department of Housing homes and units, bringing the total number of public housing properties to be retrofitted to 75,000 out of a total of 550,000 properties by 2008;
- A rebate of $150 for one calendar year from March 2006 for the purchase of water efficient front loading washing machines;
- An increase of $10 million to the Water Savings Fund to assist high water using councils and businesses to implement actions identified in their Water Savings Action Plans;
- Sydney Water to assist 64 Government sites (mainly hospitals, correctional facilities and TAFEs) to improve their water efficiency; and
- A trial to help 20 Government schools to improve water efficiency by reducing leaks (via smart metering). This will be expanded to all 920 Government schools if the technology proves to be cost effective.

Together, these programs will save 15.9 ML/day.

Pricing is also an important demand management tool. The Independent Pricing and Regulatory Tribunal is the body that recommends to Government what the potable water prices paid by Sydney Water customers should be. It re-assesses the price, via a price determination, every five years.

The Tribunal's latest price determination recommends prices effective for five years from 1 July 2005. This price determination:

- Introduced a two-tier price structure in Sydney, so that households will be charged a higher price for the water they use above a certain reasonable volume; and
- Reduced the fixed component of household water bills, so that consumers are likely to have a stronger motivation to reduce the variable part of the water bill that is directly related to the volume of water they use.

The Government recognises that a change in the pricing structure for water supplied to Sydney's urban users – both households and businesses – can help reduce the demands on our finite water supplies and therefore accepted the Tribunal's recommendations, after making sure that programs are in place to protect low income and large families and people with special needs.

The appropriateness of desalination as a supply option

The Metropolitan Water Plan 2004 indicated that the Government would assess the appropriateness of desalination as a water supply option for Sydney by undertaking a study to assess the feasibility of a desalination plant to supplement Sydney's water supply if significant droughts occur in the catchment areas. The feasibility study, undertaken in the first half of 2005, demonstrated that a desalination plant is a feasible way to enhance the supply of potable water.

Desalination is widely used in other parts of the world, including Spain, the USA, Singapore, Japan, Israel, United Arab Emirates and Trinidad and Tobago to provide a safe and reliable supply of high quality drinking water.

The independent consultants engaged to review the 2004 Metropolitan Water Plan examined Sydney's long term water supply/demand balance. They determined that rising dam levels, the availability of new groundwater sources, an even greater focus on recycling and other measures mean Sydney has sufficient water supplies to meet its growing needs over the next ten years.

However, especially given climate variability, the consultants advised that the capacity to construct and operate a desalination plant is a necessary component of a multi-faceted plan to secure Sydney's water supplies. This is because it diversifies Sydney's supply source and reduces the reliance on rainfall in the catchments. The independent consultants' analysis demonstrated that when dam levels are at very low levels in severe drought, desalination would stabilise Sydney's water supply.

As a result, the Government has determined that the desalination plant will become part of Sydney's contingency water supply plan. This means that the Government will continue with the program of preparatory works, including environmental assessment, detailed design and pilot testing. It will then award contracts for the construction of the plant if and when dam levels reach around 30 per cent.

It is most important to note that desalination is only one of a number of activities including infrastructure initiatives proposed in the Metropolitan Water Plan which includes:

- Works by the Sydney Catchment Authority to access 40 GL of deep water storage at the bottom of the Avon, Warragamba and potentially the Nepean Dams to be completed by August 2006;
- Increased water available via the Shoalhaven Transfer Scheme through changed pumping rules and minor modifications to the existing transfer network; and
- Investigations into groundwater availability (which have yielded a likely 30 GL of groundwater useable in drought for three years and which would be available for extraction within 6 months of approval).

The combination of these activities is a flexible and appropriate response to meet Sydney's water needs in both the short and long term.

Recycling

In recent years, a significant focus has been placed on recycling as a key feature of successful water saving. Since 1995, the use of recycled water has increased by more than 100 per cent from 6,000 ML/year to 15,000 ML/year.

The increase in recycled water use can be attributed to the increasing use of recycled water at Sydney Water's sewage treatment plants and the commissioning of recycled water schemes at Kiama Golf Club, Dunheved Golf Club, Liverpool Golf Club, Picton agricultural scheme, Gerringong/Gerroa, University of Western Sydney and the Rouse Hill residential scheme. Sydney Water is also implementing recycling projects that could save an additional 15 GL per year through a number of business and residential recycled water projects.

Further recycling opportunities have recently been identified that will mean Sydney is recycling around 65 GL of recycled water by 2011, rising to 70 GL by 2015. The largest of these is the Western Sydney Recycled Water Initiative, which will see 27 GL of water recycled by 2015. The Initiative will be completed by 2009 and involves the replacement of environmental flow releases from Warragamba Dam with recycled water from three Western Sydney sewage treatment plants as well as the provision of recycled water by means of dual reticulation to new land release areas.

While dual water supplies will form an important part of recycling initiatives in new growth areas, it is not feasible to implement large-scale residential dual pipe recycled schemes in existing suburbs. Such a proposal would entail spending billions of dollars to replicate the existing 21,000 kilometre network of water mains to provide recycled water. It would impose significant costs on consumers who would need to lay a new set of pipes on their own properties and cause major disruption as streets are dug up to lay new mains.

The Government's BASIX initiative to improve the water efficiency of new homes by 40 per cent is set to increase the demand for recycled water in new developments by an estimated 30 GL per annum by 2020.

The next 25 years will see recycled water being supplied to all 160,000 homes in the new north-west and south-west land release areas. Recycled water will replace as many environmental flow releases as feasible and more recycled water will be used for agriculture as the supply of appropriately treated wastewater increases.

Moreover, detailed planning by the Government has determined that a range of smaller recycled water projects can be implemented in established areas of Sydney. In early December 2005, the Government issued a Registration of Interest to supply recycled water services to industrial customers at Camellia, near Parramatta. This scheme could save 6 GL of water a year.

The Government is in negotiations with customers for a further five schemes located at Botany, Kurnell, Wollongong, Parramatta and the Royal Botanic Gardens.

The recycled water initiatives in the Metropolitan Water Plan will provide recycled water for non-potable purposes. While it is technically possible to treat wastewater to drinking quality standards and reintroduce it into the existing distribution system, there are significant social, health and risk managements issues to be faced. The NSW Government has made a firm commitment that in Sydney it does not intend to recycle water for potable reuse – that is, the treatment of wastewater for drinking purposes. To introduce recycled water directly into the drinking water supply would not only require health studies to confirm its safety, but also major public education to communicate the outcomes of such studies.

Overseas experience, plus local research on the matter, has shown that the community has reservations about drinking water that contains recycled sewage. While there is some overseas experience of distributing recycled water into drinking water systems, it is not widely practised. In Singapore, for example, where recycled water is used for drinking, recycled water makes up only one per cent of supply. This is expected to increase to about 2.5 per cent by 2011.

Indirect potable reuse occurs informally or in an unplanned way in many places around the world including Europe and North America where substantial populations live along inland river systems (such as the Thames, the Rhine, the San Gabriel, the Santa Ana and the Ohio). In these areas, treated wastewater is discharged to the same waterways from which raw water is subsequently drawn for treatment or the treated wastewater is used to recharge groundwater used for potable supply. Locally this occurs with the water supply of many Australian cities including Adelaide, Brisbane and Sydney (the North Richmond Water Filtration Plan extracts water from the Hawkesbury Nepean River). Although not common, planned indirect potable schemes are operational on a small scale in Singapore, parts of the USA, Holland and Belgium.

Indirect potable reuse takes advantage of natural ecosystems to help purify the recycled water. Large-scale indirect potable reuse would require broad public acceptance and meet the same health regulations before it could be introduced. There are no Australian guidelines for indirect potable reuse of treated effluent. A detailed (quantitative) health risk assessment, consistent with the draft National Guidelines for Water Recycling, would be necessary to determine that a scheme could safely be implemented. In the meantime, public education and customer support could be needed to make potable reuse an acceptable option.

Cost of desalination

Sydney Water has undertaken studies to understand the costs of Indirect Potable Recycling (IPR) compared to desalination. No comparable costs for large scale stormwater harvesting have been developed due to the difficulty in identifying a viable concept for large scale stormwater recycling that identifies a suitable site, treatment requirements and distribution of treated water to users.

Concepts and costs for IPR have been the subject of planning studies and the desalination proposal has advanced to preliminary engineering study.

An IPR project could involve treating sewage to a very high level and transporting the recycled water to Warragama Dam where it would be mixed with fresh water to provide dilution and a significant detention time before delivery to customers. As recycled water would be introduced into the drinking water supply, the use of large-scale IPR for drinking water purposes would require public acceptance and the recycled water itself would have to meet normal community health standards (the cost of achieving broad based public acceptance and establishing health guidelines for IPR has not been factored into the calculations below).

The scale of the activity and where the wastewater for IPR is sourced influences the relative costs of IPR and desalination. An IPR project of 500 ML/day for Sydney would need to source its wastewater from the large coastal sewage treatment plants to obtain sufficient volumes.

The capital costs of a 500 ML/day desalination plant and associated infrastructure are approximately $2.6 billion with that of IPR (where the wastewater is sourced from the coastal sewage treatment plants and transferred to the Warragamba catchment) approaching $4 billion. Even allowing for the uncertainties in planning versus preliminary engineering estimates the capital cost differences are significant. The annual operating costs for 500 ML/day desalination and IPR are estimated to be broadly similar at $165 million and $175 million respectively.

The costs of desalination and IPR for a 100 ML/day plant are more comparable. Capital costs are estimated to be $650 million and $800 million respectively and annual operating costs $27 million and $30 million respectively. In this instance the effluent for IPR would be sourced from a number of inland STPs where the effluent is of a much higher quality (but the available effluent volumes relatively small) compared with the major coastal STPs. The current proposal to expand the recycling of effluent from the inland STPs uses virtually all of the available treated effluent for a range of non-potable recycling opportunities rather than IPR.

However it is noted that a 100 ML/day IPR facility could not be scaled up to 500 ML/day should severe drought conditions continue, limiting the value of this option as a drought contingency measure.

A new dam

Drought is a natural part of life in Australia. Sydney, like the rest of south-east Australia, is currently in the grip of a severe drought – our worst since the 1930s.

Thanks to the efforts of the community to save water, our dams are at more than 40 per cent capacity as at February 2006. Since mandatory restrictions were introduced in October 2003, water use has reduced by 13 per cent against the 10-year average. The review of the Metropolitan Water Plan (2004) by independent consultants showed that Sydney has enough water to meet its growing demands over the next ten years, so it needs to concentrate now on measures that are readily available in the event of extreme drought.

A new dam is not a feasible drought contingency given the very long construction time and lack of rain to fill it. Further, another dam would be very costly from a financial and environmental perspective. The proposed Welcome Reef Dam has a preliminary estimated cost of over $2 billion. It would take nearly 10 years to build and fill under average conditions, and up to 30 years if current drought conditions continue. A new dam would not make the most of the existing infrastructure and so it is far more effective to implement the suite of measures outlined in the Metropolitan Water Plan.

Large scale stormwater harvesting

Capturing rain that falls on Sydney appears a logical first step in meeting Sydney's water needs. However, the wide variation of rainfall levels across Sydney at different times of year and in different weather conditions, affects the viability and effectiveness of a large-scale stormwater-harvesting scheme as a drought measure.

Stormwater run-off in Sydney is estimated to be 500 GL per year based on average rainfall. To capture this volume of water, which is equivalent to the size of Sydney Harbour, large storage facilities would need to be constructed throughout Sydney, the Illawarra and the Blue Mountains.

Storage opportunities are limited in established areas, although over the past year a number of potential local recycled water schemes have been identified, including stormwater schemes. Negotiations are proceeding with key customers to build these schemes.

Stormwater collected via drains in urban catchments is often polluted with metals, oils, nutrients, litter and sediments from roads, commercial and public areas. It would need to be highly treated before being reused in homes and businesses. Given the difficulties with large scale capture and treatment of stormwater, more localised solutions, that are closer to the end user, are more appropriate.

Rainwater tanks

Rainwater tanks are a viable component of a sustainable water strategy for Sydney though not a solution in their own right. There are about 1,000,000 single dwellings in Sydney, consuming, on average, about 290 kilolitres per year. This is just less than half the total Sydney consumption per year. If each of these dwellings installed a 5 kilolitre rainwater tank, they could save about 50- 60 kilolitres per year (a maximum of 20 per cent), assuming that the tank is used for outdoor water use and for toilet flushing. This means that if all single dwellings had rainwater tanks, we would save 50 gigalitres per year, or just over 8 per cent of Sydney's total water consumption.

As a 5 kilolitre rainwater tank costs approximately $5000 to install, including plumbing adjustments, the cost of this solution would be $5 billion for a solution which delivers just under 140 ML/day of saving. Rainwater tanks would save more water, up to 80GL per year, if they were connected to more uses (e.g. laundry, hot water). This would increase the cost of installation at each dwelling to around $10,000, due to increased plumbing.

Sydney Water's Rainwater Tank Rebate Program is designed to encourage Sydney's existing residential and business customers to install rainwater tanks. The program offers a customer rebate ranging from $150 for a 2 KL capacity tank to $500 for tanks with a capacity equal to or greater than 7 KL.

Customers qualify for an additional $150 rebate if they have a licensed plumber connect the tank for indoor use to supply washing machines and/or toilets. Under the rainwater tank rebate scheme, which was launched in June 2002, more than 20,000 rebates have been paid, totalling over $6.5 million. The scheme has now been extended until July 2008. In addition, Sydney Water's Rainwater Tanks in Schools Programme is available to all primary and secondary schools, private and public, connected to the Sydney Water system.

Leakage

Water main bursts and water leaking from pipes, both publicly and privately owned, has raised public awareness of the level of water loss from pipe leakage and the role leak detection and repair can play in ensuring a sustainable water supply. Sydney Water runs a major campaign to reduce water loss from leaking pipes called the Active Leak Reduction Program.

The Active Leak Reduction Program has already reduced Sydney Water's leakage losses by nearly 25 per cent in the last couple of years – which is currently saving around 46 ML of water every day. Over the next four years Sydney Water is investing $300 million to reduce leakage by a further 25 per cent, including $86 million this financial year.

This program aims to detect and repair hidden leaks along Sydney Water's 21,000 kilometres of water pipelines and the vast network of water main to meter pipes owned by customers. This work reduces the amount of water lost to underground leaks. Hidden leaks are detected by using sophisticated listening devices that pick up the noise that water makes as it leaks from a pipe. This activity is best carried out at night, when it is quiet and there is not as much noise in the pipes from customers using water. To date nearly the entire 21,000 kilometre network of pipes has been checked.

In 2004/05, Sydney Water inspected nearly 8,000 kilometres of pipeline and repaired hidden leaks as they were found. To date this activity has resulted in savings of 46 ML of water per day – around 46 Olympic sized swimming pools per day. Sydney Water plans to inspect the equivalent of 18,000 kilometres of water mains over the next four years – targeting those areas that will produce the biggest leakage reductions.

There are also specific leak reduction programs in place on Sydney Water's major aboveground pipelines including Woronora, Warringah and Prospect.

Sydney Water's leak reduction initiatives and its relatively low total losses allow it to meet best practice standards used throughout the world.

Borewater

In the 2004 Metropolitan Water Plan, the Government committed to a thorough investigation of the potential for groundwater sources to play a more significant role in securing Sydney's drinking water supply during periods of severe drought.

Until now, groundwater sources in Sydney's hydrological catchments have not been studied extensively or systematically.

Over the past year the Sydney Catchment Authority has carried out a major study examining potential groundwater reserves in a number of sites around the catchment. The study involved drilling to depths of more than 200 metres through the Hawkesbury sandstone at seven key sites.

The Sydney Catchment Authority study, to be completed in mid 2006, has already identified one major groundwater reserve in the Upper Nepean and there are encouraging early results from a further trial near Leonay in Western Sydney. The Upper Nepean deep groundwater source is located near Kangaloon in the Southern Highlands. Findings to date suggest a high quality water source capable of providing up to 15 GL per year for up to three years during drought, with a range of five to seven years for the resource to recharge.

A potential bore field in this site would cover 50 to 100 square kilometres and would:

- Be within Sydney Catchment Authority owned lands;
- Produce water of extremely high quality;
- Have bore locations and connecting pipelines that are close to flowing streams that can be used to deliver water to either Avon Dam or Nepean Dam;
- Represent the first significant development of deep groundwater in the catchment (most existing groundwater extraction comes from shallow aquifers); and
- Would take about two years to fully construct (with bores coming on line progressively from six months into the construction phase) at a cost of $40-50 million, providing around 50 bores with five discharge points.

While drilling is less advanced at Leonay in Western Sydney, early signs suggest that something in the order of 15 GL per year could be achieved. Together, these two sites may well contribute around 30 GL of additional water a year for a period of three years during a prolonged drought. This will provide a major addition to Sydney's water supply should dam storage levels fall below 40 per cent.

Bore water is already used in some areas of Sydney for non-potable uses. The most common source of bore water is the Botany Aquifer extending south east from Centennial Park and including parts of Kogarah and Sutherland Shire local government areas. The water is suitable for garden watering and industrial use and is extracted from relatively shallow boreholes into sandy soil layers. Bores for residential use cost around $1,500 to install.

Bore water of suitable quality is also available from deep aquifers in rock generally in outer areas of Sydney. These bores have much higher installation costs of approximately $15,000 to $20,000.