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Sydney Opera House Trust

Bennelong Drain Diversion Project

Environmental Assessment

January 2010

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

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Submission of Environmental Assessment

Prepared under Part 3A of the Environmental Planning and Assessment Act 1979

Environmental assessment prepared by:	
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Address	GHD Pty Ltd 10 Bond Street Sydney NSW 2000
In respect of:	
Project to which Part 3A applies	
Applicant name	Sydney Opera House Trust
Applicant address	Sydney Opera House, GPO Box 4274, Sydney NSW 2001
Land to be developed	As described within the environmental assessment
Proposed development	Construction and operation of a diversion to the Bennelong Drain
Environmental assessment	An environmental assessment is attached
Certificate	I certify that I have prepared the contents of this document and to the best of my knowledge: ◗ It is in accordance with the requirements of Part 3A; ◗ It contains all available information that is relevant to the environmental assessment of the development to which it relates; and ◗ The information contained in the document is neither false nor misleading.
Signature	
Name	Peter Carson
Date	8 February 2010

Glossary

Acoustic	Pertaining to the sense of organs of hearing, or to the science of sound
Box culvert	A culvert of rectangular cross section, usually made of precast concrete
Burra Charter	The document that outlines the main principles and practices that guide the conservation of significant places in Australia. It was prepared by Australia ICOMOS (International Council of Monuments and Sites), and is the widely accepted standard for heritage conservation practice in Australia.
Culvert	An enclosed channel used for the passage of surface water
Curtilage	The area of land (including land covered by water) surrounding an item or area of heritage significance, which is essential for retaining and interpreting its heritage significance
Director-general's requirements	Requirements for an environmental assessment issues by the Director-General of the NSW Department of Planning in accordance with the *Environmental Planning and Assessment Act 1979*
Emission	The release of material into the surroundings (for example, noise, water)
Environmental management plan	A document setting out the management, control and monitoring measures to be implemented during construction and/or operation of a project, to avoid or minimise potential environmental impacts
Heritage significance	Historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value
L_{A10}	The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.
L_{Aeq}	The A-weighted equivalent noise level (basically the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.
L_{A90}	The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.
Oviform	Egg shaped
Project	The construction and operation of the proposed Bennelong drain diversion.
Proponent	Sydney Opera House Trust
Sediment	Fine particles of solid matter
Sewer	A pipe or drain used for conveying waste water and sewage
Statement of Significance	A statement that clearly and concisely sets out the significant heritage values of a place, based on the criteria set out in the Burra Charter
State heritage significance	Significance to the State in relation to the historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value of the item

List of abbreviations

ARI	Average Recurrence Interval
CBD	Central Business District
CadnaA	Computer Aided Noise Abatement
CSIRO	Commonwealth Scientific and Industrial Research Organisation
dB(A)	Decibels (A-weighted)
DCP	Development Control Plan
DECCW	Department of Environment, Climate Change and Water
DEWHA	Department of Water, Heritage and the Arts
DP	Deposited Plan
EP&A Act	Environmental Planning and Assessment Act 1979 (NSW)
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)
GHD	GHD Pty Ltd
Hz	Hertz
DI&I NSW	Department of Industry and Investment NSW (formerly Department of Primary Industries)
kg	Kilogram
kW	Kilo watt
LEP	Local Environmental Plan
LGA	Local Government Area
m	Metre
mm	Millimetre
m/s	Metres per second

Executive summary

Overview of the project

The Sydney Opera House Trust proposes to divert a section of the Bennelong Drain from its existing route to a new route discharging at Farm Cove (referred to as 'the project' for the purposes of this environmental assessment).

The Bennelong Drain is a stormwater drain owned by Sydney Water. The Bennelong Drain collects stormwater from a catchment that encompasses the northern part of the Sydney CBD, approximately from Bathurst Street in the south to Sydney Harbour in the north. The Bennelong Drain currently travels from the CBD through the Royal Botanic Gardens and underneath the Sydney Opera House forecourt before discharging into Sydney Harbour.

The project involves construction of a new section of drain from the point where the Bennelong Drain enters the Sydney Opera House site, adjacent to the air intake structure for the Sydney Opera House car park. The new section of drain would run in an easterly direction close to the Tarpeian Wall, around the southern side of the exhaust air shaft for the Sydney Opera House car park, extending to the proposed discharge point at Farm Cove.

The new section of drain would take the form of a concrete box culvert. It would be located underground and would discharge to a new outlet constructed within the seawall at Farm Cove, immediately above the sea bed between the Royal Botanic Gardens Queen Elizabeth II gate and the Man O' War Jetty.

The majority of the drain would be approximately 2.4 m wide by 1.8 m high (internal dimensions). The approximate length of the new section of drain would be 106 m. An 8m section of the original Bennelong Drain would be removed to allow the construction of the junction between Bennelong Drain and the new section. The remaining existing oviform drain will be left in situ and would be unaffected by this project.

The site for the project is located on Bennelong Point at the northern end of the Sydney CBD. The site is located within the forecourt of Sydney Opera House, and occupies Lot 5 of DP 775888 which is under the care and control of the Sydney Opera House Trust, and Lot 6 of DP 775888 which is owned by the Royal Botanic Gardens and Domain Trust.

The project will also encroach on the easement for support of the Sydney Opera House Car Park and on Lot 101 of DP828892 in the sub-surface stratum owned by the Car Park. The Sydney Opera House Car Park is a separate entity owned by the State Property Authority and leased by the Trust Company of Australia.

Scope of the environmental assessment

Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) applies to the project. Schedule 3 of *State Environmental Planning Policy 2005 (Major Development)* lists State significant sites and identifies the types of development on those sites that would require

approval under Part 3A. Sydney Opera House is listed as a state significant site, and the project meets the definitions included in Schedule 3.

This environmental assessment has been prepared in accordance with the requirements of Part 3A of the EP&A Act. It has been prepared to support an application to the Minister for Planning for approval of the project. The environmental assessment assesses the key issues associated with the project as specified by the Director General's requirements received on 24 July 2009.

The environmental assessment provides:

- Information on the site and the project;
- An assessment of the potential key environmental impacts of the project; and
- Commitments made by Sydney Opera House Trust, as the proponent, in terms of measures to minimise and manage potential environmental impacts.

Need for the project

The principal drivers for the project relate to future strategic building plan directions and operational flexibility. The diversion of the drain is in line with strategic building plans and would result in greater operational flexibility for future projects that are planned for Sydney Opera House. Although these future projects are yet to be fully defined, they may include:

- The provision of a new loading area and associated access. This would separate heavy vehicle deliveries from busy pedestrian areas and would increase public safety. It would also avoid the need for heavy vehicles to use the western and northern boardwalks; and
- New corridors and lifts to provide better access between different parts of Sydney Opera House.

Future projects such as these are likely to substantially improve the functionality of Sydney Opera House, but would not be able to proceed if the Bennelong Drain remains in its current position. As such, these projects would be contingent upon realignment of the Bennelong Drain.

Environmental assessment

Key assessment requirements

Specialist studies were commissioned to assess potential impacts associated with heritage and archaeology; hydrology and infrastructure; water quality and aquatic habitat; geotechnical conditions, and construction noise and vibration. The specialist reports form appendices to the environmental assessment, with a summary of the findings included within the main environmental assessment report. A short summary of the findings of the specialist studies is provided below.

Heritage and archaeology

Heritage listings and the existing archaeological environment

Sydney Opera House is listed on the following heritage lists:

- UNESCO World Heritage List;

- National Heritage List;
- Register of the National Estate;
- The NSW State Heritage Register; and
- Sydney Local Environmental Plan 2005.

The Bennelong Drain is listed on Sydney Water's Section 170 register.

The site does not contain any known Aboriginal sites.

The site has potential to contain archaeological evidence associated with the modification of Bennelong Point's shoreline, Fort Macquarie, nineteenth and twentieth-century wharf and harbour facilities and the twentieth-century tram operations.

The section of seawall immediately to the south of the Man O' War Jetty may have been rebuilt during the 1960s-1970s; however, without further evidence it has been assumed that this section of the seawall was built in the 1860s and represents one of the earlier surviving sections of the seawall surrounding Bennelong Point.

Potential impacts

The project does not involve any works to Sydney Opera House, and the heritage significance of Sydney Opera House would not be impacted by the project.

Excavation for the project would have the potential for relatively minor archaeological impacts, limited to potential evidence of the early shoreline and landform, and any incidental (unrecorded) remains in the area of the site that would be affected by construction. Potential impacts would be managed by implementating the recommended archaeological management plan

The project would require removal of some fabric of the eastern seawall to allow construction of a new outlet. Construction of the new outlet through the existing outer sandstone seawall has the potential to result in minor impacts to potentially significant historical fabric. Impacts relate mainly to potential visual impacts.

The Bennelong Drain has been identified as an item of high historical and technical significance at a local level. due to its degree of intactness relative to similar infrastructure that was constructed during the same period. However, the section of the drain within the Sydney Opera House site was substantially modified in association with the construction of Sydney Opera House. The project therefore represents another phase in the drain's evolution. The heritage assessment did not identify any potentially significant impacts to the existing drain as a result of the project.

Consistency with the management plan

The 'Management Plan for the Sydney Opera House' was prepared in preparation for the proposed nomination of Sydney Opera House to the World Heritage List. The terms of the Management Plan are given legal effect by the *Environmental Planning and Assessment Regulation 2000.*

The Management Plan identifies that 'development on the Sydney Opera House site assessed under Part 3A of the Environmental Planning and Assessment Act 1979 will also require approval under Part 4 of the Heritage Act 1977.'

In accordance with the Management Plan, a statement of heritage impacts must be prepared as part of the project approval process. The heritage impact assessment/archaeological management plan (Appendix B) was prepared to address the heritage impacts of the project in relation to the requirements of the Management Plan and the 2003 Conservation Plan. It concluded that the project does not include any activities that would have a significant adverse impact on the National and World Heritage values of Sydney Opera House, and that the recommended mitigation measures are consistent with the objectives of the Management Plan.

Hydrology and infrastructure

Key features

The existing Bennelong Drain currently discharges into Sydney Harbour. The proposed diversion would create a new drain outlet located in Farm Cove south of the Man O' War Jetty and steps. The proposed drain has a slightly larger flow capacity than the existing drain and would service the same catchment as the existing drain.

Potential impacts

As the proposed and existing drains having the same catchment and virtually the same flow rates no adverse upstream impacts relative to operation of the existing drain are expected for the full range of storm events.

There is potential for the proposed drain to generate scour and sedimentation impacts in the vicinity of the outlet. Overall, it is considered that sediment deposition may occur at the proposed outlet over the long term. This would depend on the sediment yield within the catchment and mitigation measures adopted.

There is potential for the proposed diversion to generate different impacts on the study area once climate change is taken into account. Under storm conditions (when taking into account climate change) some backwater is expected upstream along the drainage system, which would result in a reduction in the drainage capacity. As the existing drain would operate in a similar way, no adverse impacts are expected to occur, relative to the existing conditions.

Construction impacts of the project are considered to be minimal and manageable with the implementation of mitigation measures.

Aquatic ecology and water quality

Key features

The project would result in the Bennelong Drain discharging into Farm Cove to the south of the existing outlet. A number of threatened species have been recorded or have the potential to occur in the study area.

The study area contains various habitats, both within intertidal and subtidal regions around the proposed outlet.

Potential impacts

The project has the potential to impact upon aquatic ecology by discharging sediment from the drain. Water quality impacts on aquatic ecology as a result of increased sediment in the water are considered to be minor and mitigation measures are likely to reduce this impact. Sediment entering the cove could also potentially smother aquatic species, though no threatened species

are considered to be under threat of sedimentation, with only common species possibly being impacted.

The main potential for habitat loss would be as a result of the removal of the small section of seawall to construct the outlet. This section is occupied by intertidal habitat which is prevalent within the outer harbour. As such this impact is considered negligible.

Many of the threatened species identified are either unlikely to occur within the study area or are threatened by processes that are not related to the project.

Other species are expected to be present within Farm Cove. However, the potential for wider habitat impacts as a result of the project is expected to be minimal as the project site is relatively contained, is located within a highly modified environment and involves replacing a nearby structure of similar design and function.

Visual impacts

Key features

The key features of the project with respect to potential visual impacts are as follows:

- The drain would be located underground;
- The only visible elements of the drain would be the access hatch and the outlet;
- The access hatch would be located at the western end of the site above the proposed junction pit at the base of the Tarpeian Wall; and
- The outlet would be approximately 2.4 m wide by 1.8 m high (internal dimensions), located to the south of the Man O' War Jetty, and visible above mean sea level.

Potential impacts

Construction of the project has the potential to generate visual impacts during the construction period. However, the visibility of the construction works would be limited by the erection of hoardings according to the standard procedures for construction projects at Sydney Opera House.

As the project would be located below ground under the forecourt, there would be minimal ongoing visual impacts. The access hatch would be located within the landscaped garden located at the base of the Tarpeian Wall and would not be visible from the forecourt.

The majority of the outlet opening would be visible above the mean sea level, which would be most visible when viewed straight on (such as from a vessel on Farm Cove), but in most cases such views would be incidental. The outlet would also be visible when looking south from the Man O' War Jetty, but this view does not include Sydney Opera House itself and does not represent a significant view corridor. While the outlet would be visible from distant locations along the Farm Cove seawall, it would generally not be visible from the Royal Botanic Gardens as a result of the curve of the seawall in the vicinity of the outlet.

To match the existing fabric of the seawall, the drain would be lined with sandstone to about 1-1.5m from the outlet. This would reduce the potential for visual impacts.

The heritage assessment concluded that the project would not result in any significant visual impacts that would affect the setting of, or views to and from, Sydney Opera House, and would not include the introduction of any elements that would obstruct or obscure existing views to and from Sydney Opera House.

Construction noise and vibration

An attended background noise survey was undertaken to quantify the ambient noise environment in the vicinity of the site and potentially affected receivers. The noise emissions from construction were assessed at sensitive receivers. A quantitative assessment was undertaken with consideration to the Department of Environment, Climate Change and Water's (DECCW) Construction Noise Guideline.

The noise levels at the Bennelong Apartments and Government House are predicted to comply with the noise criteria; therefore the project should not adversely impact any residences.

There are no specific external noise criteria for Sydney Opera House but rather an internal noise level requirement that should be achieved. The predicted noise level at Sydney Opera House's nearest façade is 57 dB(A), which is similar to the background noise levels measured. Since the predicted noise levels are similar to the background noise levels, there is unlikely to be any significant increase in noise levels inside Sydney Opera House as a result of the construction of the project.

The construction noise levels at the Sydney Opera House forecourt and the northern end of the Royal Botanic Gardens are predicted to exceed the guideline noise criteria of 60 dB(A) $L_{Aeq(15min)}$. The exceedance is not considered significant as the background noise levels in the area are already high, and only a small area of the Sydney Opera House forecourt and Royal Botanic Gardens exceed the criteria. In addition, the impacts would be temporary and limited to the construction period. However, since construction noise is expected to exceed the noise criteria, mitigation measures have been recommended to reduce potential noise impacts.

Geotechnical conditions

Boreholes and construction of the Sydney Opera House Car Park have indicated that approximately 1-3 metres of fill is located along the alignment of the drain. This fill is underlain by Hawkesbury Sandstone. The fill is generally less than two metres deep along most of the new alignment, with it only becoming deeper closer to the sea wall.

Approximately 1,000 – 3,000m^3 of spoil would be generated, comprising fill and Hawkesbury Sandstone. It is considered unlikely that the fill would be contaminated, and the underlying Hawkesbury Sandstone would be classified as virgin excavated natural material. All spoil would be managed in accordance with the DECC Waste Classification Guideline.

Waste management

The following wastes would be generated during construction:

- Spoil;
- Brick / concrete / sandstone materials;
- Sediment at the bottom of the existing drain; and
- General waste from site personnel – such as packaging, scraps and paper.

If practicable, spoil would be reused onsite as backfill. Any surplus spoil that cannot be reused would be transported off-site to recycling facilities or to approved landfill sites. The material would be tested in accordance with the 'Waste Classification Guidelines' (DECC, 2008). Any transfers of waste would take place in accordance with legislated docket tracking systems that ensure waste reaches the appropriate destination. Only licensed contractors and drivers would be used.

As part of the construction environmental management plan, a waste management sub-plan would be prepared. The sub-plan would be framed using the waste management hierarchy principles outlined above. The sub-plan would be prepared prior to construction commencing and be consistent with the *Waste Avoidance and Resource Recovery Act 2001* and the 'Waste Classification Guidelines'.

Consideration of other environmental issues

The environmental assessment addresses what are considered to be the key potential environmental impacts associated with the project. In addition to the key potential impacts, there are a range of other issues that have been considered to order to develop an environmental management framework for the construction and operation of the project.

These issues include:

- Traffic and access;
- Air quality;
- Land uses; and
- Infrastructure.

The focus for these issues within the environmental assessment is on the management of potential construction issues, and recommendations for the construction environmental management plan.

Draft statement of commitments

The environmental assessment provides the proponent's commitments for environmental mitigation, management and monitoring. The draft statement of commitments identifies mitigation measures that are recommended to be implemented. The draft statement of commitments would be finalised following public exhibition of the environmental assessment. The draft statement may be modified following input received as a result of public exhibition.

Where to from here

The proponent is seeking project approval from the Minister for Planning under Part 3A of the EP&A Act for the construction and operation of a diversion to the Bennelong Drain within the Sydney Opera House site.

Subsequent steps in the process are as follows:

- Exhibition of the environmental assessment for a minimum of 30 days and invitation for the community and stakeholders to make submissions;
- Following exhibition, the proponent would prepare a submissions report and, if required, a preferred project report and final statement of commitments; and
- The Director-General of the Department of Planning provides an assessment report to the Minister for Planning, who then determines the project and, if approved, sets conditions for further assessment and/or further approvals required.

Chapter 1 Introduction

1.1 Overview

Sydney Opera House Trust proposes to divert a section of the Bennelong Drain from its existing route to a new route discharging at Farm Cove (referred to as 'the project' for the purposes of this environmental assessment).

GHD Pty Ltd (GHD) was commissioned by the Sydney Opera House Trust to prepare an environmental assessment for the project. The environmental assessment has been prepared in accordance with Part 3A of the *Environmental Planning and Assessment Act 1979* (the EP&A Act) to address the requirements of the Director-General of the Department of Planning (the Director-General's requirements) received on 24 July 2009 (Appendix A).

1.2 Location of the project

The site for the project (referred to as 'the site' for the purposes of this environmental assessment) is located on Bennelong Point at the northern end of the Sydney Central Business District (CBD). The site is located within the forecourt of Sydney Opera House, and occupies Lot 5 of DP 775888 which is under the care and control of the Sydney Opera House Trust, and Lot 6 of DP 775888 which is part of the Royal Botanic Gardens. It is within the City of Sydney local government area (LGA).

The project will also encroach on the easement for support of the Sydney Opera House Car Park and on Lot 101 of DP828892 in the sub-surface stratum owned by the Car Park. The Sydney Opera House Car Park is a separate entity owned by the State Property Authority and leased by the Trust Company of Australia.

Chapter 2 provides a description of the site and surrounds, which are shown in Figure 2-1.

1.3 Key features of the project

The project involves the diversion of a section of the existing Bennelong drain (also known as the Bennelong stormwater channel), which is about 100m long and services part of the Sydney CBD. The project involves the section of drain that currently runs through the Sydney Opera House site and drains into Sydney Harbour.

The project consists of three main components of work:

- Construction of a junction pit at the point where the new section of drain meets the existing Bennelong drain;
- Construction of a new section of drain from the junction pit to an outlet in Farm Cove; and
- Construction of a new outlet for the drain within the sea wall at Farm Cove adjacent to the Man O' War steps and jetty.

More information on the project is provided in chapter 5.

1.4 The proponent

The proponent for the project is the Sydney Opera House Trust. The Sydney Opera House Trust maintains and operates Sydney Opera House on behalf of the NSW Government under the *Sydney Opera House Trust Act 1961* and is responsible for:

- The administration, conservation, care, control, management and maintenance of the building and site;
- The management and administration of Sydney Opera House as an arts centre and meeting place;
- The promotion of artistic taste and achievement in any branch of the musical, operatic, dramatic, terpsichorean, visual or auditory arts; and
- Research into, development, encouragement and facilitation of new and improved forms of entertainment and methods of presentations.

1.5 Guide to the approval requirements and environmental assessment

1.5.1 Summary of approval requirements

Part 3A of the EP&A Act applies to the project. Schedule 3 of *State Environmental Planning Policy 2005 (Major Development)* lists State significant sites and identifies the types of development on those sites that would require approval under Part 3A. Clause 1 of schedule 3 relates to development at Sydney Opera House. Under this clause all development (other than exempt development) on land identified on map 1 in Schedule 3 is defined as a Part 3A project. The project meets the definitions included in Schedule 3 and is therefore a project to which Part 3A applies.

The Minister for Planning is the approval authority for the project and an environmental assessment (this document) is required to support the application for project approval in accordance with the requirements of the EP&A Act.

Further information on the assessment requirements for the project is provided in 3.5.1.

1.5.2 Purpose and scope of the environmental assessment

The environmental assessment supports an application for project approval from the Minister for Planning under Part 3A of the EP&A Act. It has been prepared in accordance with the EP&A Act and addresses the Director-General's requirements for the project. The environmental assessment provides:

- Information on the site and the project;
- An assessment of the potential key environmental impacts of the project identified by the Director-General's requirements; and
- The proponent's commitments in terms of measures to minimise and manage potential environmental impacts.

The environmental assessment is structured as follows:

- Chapter 1 – provides an introduction to the environmental assessment;
- Chapter 2 – a description of the location and existing environmental features of the site and surrounds;
- Chapter 3 – information on the assessment requirements under relevant legislation and environmental planning instruments;
- Chapter 4 – a summary of the consultation that occurred during the project development and assessment process, and consultation that is planned to occur during project implementation;
- Chapter 5 – a description of the project, its purpose and the options considered;
- Chapters 6 - 8 – based on the project described in Chapter 5, these chapters include an environmental risk analysis identifying key potential environmental issues (chapter 6); describe the results of the assessment of key environmental issues as identified by the Director-General's requirements (Chapter 7) and consider how other environmental issues would be managed (Chapter 8).
- Chapters 9 and 10 – for the project described in chapter 5, and considering the results of the assessment summarised in chapters 6-8, these chapters provide a statement of commitments made by the proponent in relation to mitigation, management and monitoring of potential environmental impacts (Chapter 9). The project justification and conclusion to the environmental assessment is provided in Chapter 10.

Appendices – specialist reports

The following specialist technical/background reports were prepared as part of the environmental assessment process:

- Heritage and archaeology (Godden Mackay Logan Pty Ltd);
- Quantity surveyors certificate (Rider Levett Bucknall).
- Drainage and hydrology (GHD);
- Aquatic ecology (GHD);
- Construction noise assessment (GHD);
- Geotechnical conditions (Pells Consulting); and
- Structural engineers report (Arup).

Chapter 2 Location and setting

2.1 Site description and location

The site is located within the forecourt of Sydney Opera House, at the northern end of the Sydney CBD, on Bennelong Point. Bennelong Point is located between Sydney Cove and Farm Cove, both of which form part of Sydney Harbour.

The forecourt is situated to the south of Sydney Opera House, between the Monumental Steps and the Tarpeian Wall.

The proposed outlet (which forms part of the project) would be located within the seawall at Farm Cove. The outlet would be immediately above the sea bed between the Royal Botanic Gardens Queen Elizabeth II gate and the Man O' War Jetty.

The site location is shown in Figure 2-1 and property boundaries are shown in Figure 2-2.

The property description of the land on which Sydney Opera House is located includes:

- Lot 5 in Deposited Plan 775888 at Bennelong Point, Parish of St James, County of Cumberland, city of Sydney; and
- Lot 4 in Deposited Plan 787933 at East Circular Quay, Parish of St James, County of Cumberland, city of Sydney.

The project mainly occupies Lot 5 of DP 775888 which is Crown land under the care, control and management of Sydney Opera House Trust. A small part of the project near the outlet is located on Lot 6 of DP 775888 which is owned by the Royal Botanic Gardens and Domain Trust. The street address of Sydney Opera House is 2 Circular Quay and Macquarie Street, Sydney.

The proposal will encroach on the easement for support of the Sydney Opera House Car Park and on Lot 101 of DP828892 in the sub-surface stratum owned by the Car Park. The landowner (State Property Authority) and the lessee (Trust Company of Australia) have been consulted and their agreement to this project has been obtained.

2.2 Surrounding land uses

Sydney Opera House occupies Bennelong Point, which extends into Port Jackson. Sydney Opera House and the forecourt area is bounded by Sydney Cove to the west, Farm Cove to the east, the main body of water of Sydney Harbour to the north, and the Royal Botanic Gardens to the south.

Sydney Opera House is raised above the forecourt area and the Monumental Steps provide a grand entrance and access to the two main halls (Concert Hall and Opera Theatre). The forecourt area consists mainly of cobblestones, although some of the area is a sealed bitumen roadway that forms a turning bay for the internal Sydney Opera House access road.

The site for the project is used mainly as a public forecourt for Sydney Opera House. Most of the site is exclusively for the use by pedestrians and the forecourt is also a community gathering

place for special events. The site also contains a turning circle and roadway that forms part of the site's internal road network.

Land uses surrounding the site are as shown in Figure 2-1 and include:

- Sydney Opera House immediately to the north;
- Royal Botanic Gardens immediately to the south and southeast;
- Government House, approximately 150 metres further to the south;
- Bennelong Apartments, and the shops and restaurants along East Circular Quay/Macquarie Street, approximately 200 metres to the southwest;
- Royal Botanic Gardens access gates - the Tarpeian Way stairs and gate immediately to the south, the Sydney Opera House gate to the southeast, and the Queen Elizabeth II gate to the east; and
- Man O' War steps, public jetty and Farm Cove to the east.

The sole vehicular access to the Sydney Opera House site is via the northern end of Macquarie Street. The internal access road runs north through the western side of the site before heading east under the Monumental Steps to the stage door. A security booth located at the Macquarie Street access point controls access to the internal road. Immediately west of the Macquarie Street access point is the East Circular Quay walkway, which provides pedestrian access from East Circular Quay.

The Tarpeian Way gate and the area of the Royal Botanic Gardens to the south of the site (the Tarpeian Precinct) are raised above Bennelong Point. The Tarpeian Wall is a sandstone cliff that separates the Royal Botanic Gardens and the Sydney Opera House site. A stairway at the Tarpeian Wall to the Tarpeian Way gate provides access between the Royal Botanic Gardens and the Sydney Opera House site. The Queen Elizabeth II gate is the more frequently used gate, providing access between the Royal Botanic Gardens and the Sydney Opera House site via the walkway around Farm Cove. The Queen Elizabeth II gate, and a small area on the Sydney Opera House site, is the property of the Royal Botanic Gardens.

The Sydney Opera House car park, which is a separate commercial entity, is located underground to the south of the site and is beneath the Royal Botanic Gardens. Access to the car park is via Macquarie Street. An air intake structure for the car park is located within a roundabout at the southern end of the Sydney Opera House site, adjacent to the Tarpeian Wall. An exhaust air shaft for the car park is located within a roundabout in the southeastern corner of the site, close to the Queen Elizabeth II gate.

Legend

Study Area

Upstream Drain Alignment

Proposed Drain Realignment

0 10 20 40 60

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

N

GHD

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Sydney Opera House Trust
Bennelong Drain Diversion Project
Environmental Assessment

Location of Key Site Features and Surrounds

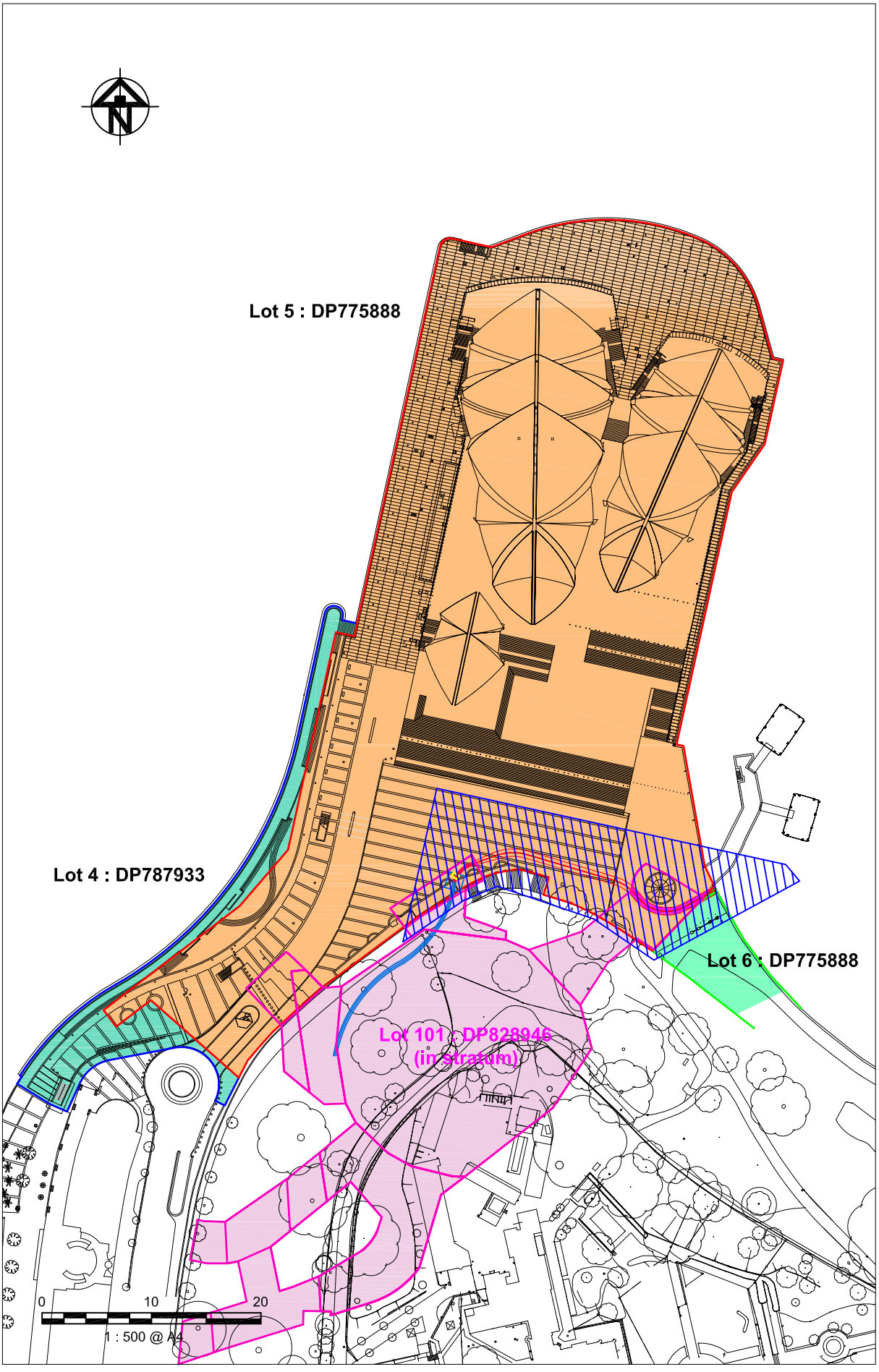
Job Number	21-18445
Revision	B
Date	Jan 2010

Figure 2.1

G:\21\18445\CADD\GIS\Map_Documents\EnvironmentalAssessment\2118445_EA_FIG2_1_Location.mxd

10 Bond Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data source: Aerial Imagery from Google Earth Pro 2009; Locality Map Data, Navigate and Navteq, 2008.



Study Area : Property Boundaries (including Car Park easements only)

2.3 The existing environment

A summary of the main characteristics of the existing environment is provided below. Further information is provided in chapter 7.

2.3.1 Heritage and archaeology

Aboriginal heritage

The site does not contain any known Aboriginal sites.

The site has been subject to land modification and extensive use for pedestrian and vehicle traffic, including historical use by trams. These uses would have impacted on the survival of any evidence of Aboriginal uses or occupation of the area. Therefore the site is considered to have low potential to contain Aboriginal sites.

The site also contains some areas of reclaimed land. These areas would have no potential for in-situ Aboriginal heritage items.

Historic cultural heritage

The following listed heritage items are located in the vicinity of the project:

- Sydney Opera House, which is listed on the following heritage lists:
  - UNESCO World Heritage List;
  - National Heritage List;
  - Register of the National Estate;
  - New South Wales Heritage List;
  - Sydney Local Environmental Plan 2005; and
- Bennelong stormwater channel, which is listed on Sydney Water's Section 170 Register.

Section 7.1.2 provides further information on the existing heritage environment of the site, including an assessment of the potential for historical archaeological deposits to occur on site.

2.3.2 Hydrology and drainage

The Bennelong drain catchment has an area of approximately 72 hectares. It is bounded by Clarence Street to the west, Bathurst Street to the south, Macquarie Street to the east, and Sydney Harbour to the north.

The Bennelong drain forms part of Sydney's CBD stormwater drainage system. The existing drainage system consists of a series of drains aligned in a north-south direction within the Sydney CBD. Stormwater runoff generally flows in a northerly direction through these stormwater drains, until it reaches Alfred Street at Circular Quay. At Alfred Street, the drainage system branches into three outlets. Bennelong drain is the largest of these three drains.

Further information on the existing drain is provided in section 7.2.2.

2.3.3 Aquatic ecology and water quality

Sydney Harbour provides habitat for a wide range of terrestrial and aquatic flora and fauna species. The marine impact assessment identified that eight fish and 14 listed marine mammals have the potential to occur within Farm Cove. Water quality in the harbour is typical of an urbanised catchment, and runoff following large rain events may contain sediments, nutrients, hydrocarbons, heavy metals, and pathogens (DEC, 2006).

Field investigations within Farm Cove indicate that Sydney Rock Oysters, limpets, Murex Shell and an unidentified species of Chilton are present within the intertidal zone on the sandstone seawall in the vicinity of where the proposed outlet is to be located. Seagrasses are present in varying densities in the subtidal area around the proposed outlet.

Green Algae and Common Kelp are also dominant species in the vicinity of the seawall.

Further information on the existing aquatic ecology environment is provided in section 7.3.

2.3.4 Noise and vibration

The site is zoned Parks and Community Places under the Sydney Local Environmental Plan 2005 and is therefore considered a sensitive receiver area with consideration to noise and vibration.

Sensitive receivers in the area consist of:

- The Royal Botanic Gardens;
- NSW Government House;
- Sydney Opera House; and
- Developments to the south-west at East Circular Quay and Macquarie Street, which consist of commercial and residential developments.

Attended noise monitoring and site observations indicate that the ambient noise environment is typical of an urban environment, and consists of the following noise sources:

- Road traffic noise form the Sydney Harbour Bridge, Cahill Expressway and Macquarie Street;
- Harbour vessel traffic noise;
- Aircraft noise;
- Noise from fauna, in particular seagulls;
- Tourist related noise;
- Loading dock noise; and
- Existing construction noise.

'Urban hum', which is defined as the aggregated sound of many unidentifiable noise sources, was present at each monitoring location and is typical of the site.

Section 7.5 provides further information on the existing noise environment at the site.

2.3.5 Visual environment

The site is located within a highly visible location at the forecourt of Sydney Opera House. This area is viewed by visitors to Sydney Opera House and surrounds, and pedestrians walking through the forecourt area. It is also visible from nearby locations within the Royal Botanic Gardens.

Other views to the site are available from the commercial and residential development located at East Circular Quay.

Views from Farm Cove and Sydney Cove to the site are available from the east and west, although views would generally only be available from larger vessels on the harbour due to the slightly elevated nature of the forecourt when compared with the waterways.

Distant views of the site could potentially be obtained from the western side of Circular Quay and from the Sydney Harbour Bridge.

Views of the outlet point would be available mainly from the Man O' War steps and jetty.

Section 7.4 provides further information on the existing visual environment at the site.

2.3.6 Climate and air quality

The nearest Bureau of Meteorology monitoring station is located at Observatory Hill, which is approximately one kilometre to the west of the site. The climate in the region is characterised by mild conditions, with annual average daily air temperatures ranging between 21.7°C (maximum) and 13.8°C (minimum).

Rainfall within the area is described as moderate, with the Observatory Hill station receiving on average 1,213.8 millimetres per annum.

The relative humidity is described as medium, with the mean 9 am and 3 pm relatively humidity being 69 percent and 57 percent respectively, with very little variation between seasons.

Air quality at the site is typical of an inner city environment where emissions from large numbers of vehicles (including water based) contribute to local air quality. Due to the location of the site on Sydney Harbour, coastal winds have the potential to help disperse air pollution.

2.3.7 Water quality

Water quality within Sydney Harbour is impacted by runoff from urban areas, particularly following large rain events. Runoff from urban areas generally contains sediments, nutrients, hydrocarbons, heavy metals, pathogens, and other toxic, and occasionally persistent, chemicals (DEC, 2006). This contamination originates from roads, sewer overflows, spills, industrial activities, building sites and other sources.

2.3.8 Topography and soils

Topography and the physical form of Bennelong Point

The physical development of Bennelong Point over the nineteenth and twentieth centuries has affected the ground levels of the site. The site is relatively flat due to the past development on the site.

Soils

The site is located on between approximately 1-3 metres of fill. The fill is generally less than 2 metres deep along most of the new alignment, with it only becoming deeper closer to the sea wall. Based on excavations undertaken for the construction of the car park ventilation shaft, it is understood that the fill is mostly comprised of crushed sandstone and sandstone fragments.

Contamination

There is no indication available that the fill material to be excavated is contaminated and therefore it is assumed that no contamination would be encountered. The underlying sandstone bedrock to be excavated is classified as Virgin Excavated Natural Material (VENM).

Acid sulphate soils

The bed of adjacent areas of Farm Cove has a high probability of acid sulphate soils. These areas would not be disturbed by the project.

Section 7.5.2 provides further information on the existing environment at the site for topography and soils.

2.3.9 Traffic and access

Vehicular access to the Sydney Opera House site is via the northern end of Macquarie Street, located at the southwestern corner of the site. Access to Sydney Opera House from the end of Macquarie Street is via a private internal road, which is controlled by a security booth. The internal access road travels north through the western side of the Sydney Opera House site, turning east to the stage door located underneath the Monumental Steps. The road then travels south along the eastern edge of the Sydney Opera House site where a turning circle is provided to allow vehicles to exit the site via the internal road.

Pedestrian access to the Sydney Opera House site is mainly via the eastern promenade of Circular Quay, located to the southwest of the site. The main access from/to the Royal Botanic Gardens is located at the southeastern corner of the site (the Queen Elizabeth II gate). There is also an access via steps from the Tarpeian Way and via the Opera House gate. Pedestrian movement within the forecourt is not restricted to formal pathways.

Chapter 3 Statutory framework

3.1 Overview

The Sydney Opera House Trust is seeking project approval from the Department of Planning under Part 3A of the EP&A Act. This chapter outlines the relevant legislative requirements that apply to the project, with a focus on the planning approval requirements. It defines the environmental assessment process and:

- Confirms the application of Part 3A of the EP&A Act and notes any specific requirements that apply to the project;
- Summarises the permissibility of the project;
- Considers other approvals that may apply to the project;
- Considers relevant environmental planning instruments, including state environmental planning policies (SEPP), regional environmental plans, and other plans and strategies that apply to the project and/or the site; and
- Summarises the environmental assessment and approval process.

3.2 Application of Part 3A of the Environmental Planning and Assessment Act 1979

Part 3A of the EP&A Act establishes an assessment and approval regime for development that is declared to be a Part 3A project by either a state environmental planning policy (SEPP) or Ministerial Order (section 75B). According to section 75D(1) of the EP&A Act, the Minister for Planning is the approval authority for Part 3A projects.

Major projects to which Part 3A applies are identified in *State Environmental Planning Policy (Major Development) 2005* (the Major Development SEPP), as well as in declarations made by the Minister for Planning. Clause 6 of the Major Development SEPP identifies Part 3A projects as follows:

6 Identification of Part 3A projects

(1) Development that, in the opinion of the Minister, is development of a kind:

(a) that is described in Schedule 1 or 2, or

(b) that is described in Schedule 3 as a project to which Part 3A of the Act applies, or

(c) to the extent that it is not otherwise described in Schedules 1–3, that is described in Schedule 5,

is declared to be a project to which Part 3A of the Act applies.

Schedule 3 lists State significant sites and identifies the types of development to which Part 3A applies. Clause 1 of schedule 3 relates to development at Sydney Opera House. Under this clause all development (other than exempt development) on land identified on map 1 in schedule 3 is defined as a Part 3A project. The project is located within the land marked on map

1 and is not exempt development. It is therefore considered to be a major project which requires the approval of the Minister for Planning under Part 3A of the EP&A Act.

3.3 Permissibility of the project

The *Sydney Local Environmental Plan 2005* (the LEP) applies to the site. The site is zoned Parks and Community Places under the LEP.

Clause 45(2) of the LEP specifies development that can be carried out with consent. This includes:

> *'(i) underground public utility undertakings, located under the surface of a road or public thoroughfare, or adjacent to or bordering a road or public thoroughfare, but only if the undertakings are not inconsistent with any plan of management'*

Public utility undertakings are defined by the LEP as follows:

> *'public utility undertaking means any undertaking carried on by, or under the authority of, any Government department or agency, or pursuant to any Commonwealth or State Act, for the purpose of:*
>
> *(a) railway, light railway, road, water or air transport, or wharf or river undertakings, or*
>
> *(b) the provision of sewerage or drainage services, or*
>
> *(c) the supply of water, hydraulic power, electricity or gas, or*
>
> *(d) telecommunications facilities.'*

The project is considered to be a public utility undertaking in accordance with the LEP definition, as the works are to be undertaken under the authority of Sydney Water which is a Government department or agency. The project would also be located under the surface of a public thoroughfare, and is therefore considered to be permissible with development consent.

Notwithstanding the above, *State Environmental Planning Policy (Infrastructure) 2007* (known as the Infrastructure SEPP) is considered to apply to the project (see section 3.3.1).

In summary, the project is considered to be permissible (without consent) as a result of the application of the Infrastructure SEPP, however as the project is defined as a Part 3A project by the Major Development SEPP, the assessment and approval processes defined by Part 3A of the EP&A Act apply to the project.

3.3.1 Application of State Environmental Planning Policy (Infrastructure) 2007

The Infrastructure SEPP consolidates and updates 20 previous State planning instruments which included infrastructure provisions. It also includes specific planning provisions and development controls for 25 types of infrastructure works or facilities.

Stormwater management systems are defined by clause 110 of the SEPP:

(a) works for the collection, detention, distribution or discharge of stormwater (such as channels, aqueducts, pipes, drainage works, embankments, detention basins and pumping stations), and

(b) stormwater quality control devices (such as waste entrapment facilities, artificial wetlands, sediment ponds and riparian management), and

(c) stormwater reuse schemes.

The project is considered to meet this definition (clause 110(a)). Consent requirements for stormwater management systems are defined by clause 111:

'111 Development permitted without consent

(1) Development for the purpose of stormwater management systems may be carried out by or on behalf of a public authority without consent on any land.

(2) A reference in this clause to development for the purpose of stormwater management systems includes a reference to development for any of the following purposes if the development is in connection with a stormwater management system:

(a) construction works,

(b) routine maintenance works, including maintenance dredging to remove sediment build-up in a stormwater canal or at exit points into natural waterways that affects the efficiency of the stormwater management system,

(c) environmental management works.'

The project is considered to be 'development for the purpose of stormwater management systems' (under clause 111(1) and as a result, would be permissible without consent as the works are to be carried out on behalf of a public authority (Sydney Water).

3.4 Other relevant legislative requirements, plans and strategies

3.4.1 NSW legislation

Environmental Planning and Assessment Act 1979

Section 75U(1) of the EP&A Act specifies certain authorisations which are not required for an 'approved project' under Part 3A, namely:

'(a) the concurrence under Part 3 of the Coastal Protection Act 1979 of the Minister administering that Part of the Act,

(b) a permit under section 201, 205 or 219 of the Fisheries Management Act 1994,

(c) an approval under Part 4, or an excavation permit under section 139, of the Heritage Act 1977,

(d) a permit under section 87 or a consent under section 90 of the National Parks and Wildlife Act 1974,

(e) an authorisation referred to in section 12 of the Native Vegetation Act 2003 (or under any Act to be repealed by that Act) to clear native vegetation,

(f) a permit under Part 3A of the Rivers and Foreshores Improvement Act 1948,

(g) a bush fire safety authority under section 100B of the Rural Fires Act 1997,

(h) a water use approval under section 89, a water management work approval under section 90 or an activity approval under section 91 of the Water Management Act 2000.'

Section 75A defines 'approved project' as 'a project to the extent that it is approved by the Minister under this Part, but does not include a project for which only approval for a concept plan has been given'. Consequently, these approvals would not be required if the Minister grants project approval to carry out the project under Part 3A. Clause 75U(1)(c) of the Act does not apply to this project, as approval under the *Heritage Act 1977* is required under the Management Plan for the Sydney Opera House as outlined in section 3.4.2.

As indicated in Section 7.3, there is the potential for the project to impact on seagrass beds in Sydney harbour. As the project is subject to approval under Part 3A, a permit from the Department of Industry and Investment under Section 205 of the *Fisheries Management Act 1994* is not required due to application of Section 75U(1)(b) of the EP&A Act.

Under section 75V(1) of the EP&A Act, the following authorisations cannot be refused if necessary for the carrying out of an 'approved project' and are to be substantially consistent with an approval to carry out the project given under Part 3A:

- An environment protection licence under Chapter 3 of the *Protection of the Environment Operations Act 1997*; and
- A consent under s138 of the *Roads Act 1993*.

Environmental Planning and Assessment Regulation 2000

Section 288 ('special provision relating to Sydney Opera House') of the *Environmental Planning and Assessment Regulation 2000* (the Regulation) provides for the following:

(2) To the extent that any development that is to be carried out at the Sydney Opera House is a project to which Part 3A of the Act applies, the Director-General's report under section 75I of the Act in relation to the project must include:

(a) the provisions of the Management Plan for the Sydney Opera House that are relevant to the carrying out of the development, and

(b) advice as to the extent to which the project is consistent with the objectives of that Management Plan.

Note. Section 75J (2) of the Act requires the Minister to consider the Director-General's report (and the reports, advice and recommendations contained in it) when deciding whether or not to approve the carrying out of a project.

(3) In this clause:

Management Plan for the Sydney Opera House means the management plan that relates to Sydney Opera House that has been approved by the Minister

administering the Sydney Opera House Trust Act 1961 and published in the Gazette.

Sydney Opera House means the land identified on Map 1 to Schedule 3 to State Environmental Planning Policy (Major Projects) 2005.

Information on the Management Plan for the Sydney Opera House, and its relevance to the project, is provided in section 3.4.2. An assessment of the consistency of the project with the Management Plan is provided in Appendix B.

Protection of the Environment Operations Act 1997

Clause 43 of the *Protection of Environment and Operations Act 1997* (POEO Act) specifies that environment protection licences may be issued for the following purposes:

(a) to authorise the carrying out of scheduled development work at any premises, as required under section 47,

(b) to authorise the carrying out of scheduled activities at any premises, as required under section 48,

(c) to authorise the carrying out of scheduled activities not related to premises, as required under section 49,

(d) to control the carrying out of non-scheduled activities for the purpose of regulating water pollution resulting from any such activity, as referred to in section 122.

The project does not fall under the any of the categories for which a licence is required.

Heritage Act 1977

The *Heritage Act 1977* would usually only apply to the proposed development of a State significant site if the Minister were to determine that it were subject to the provisions of Part 4 of the EP&A Act. However, as noted in section 3.4.2, the Management Plan for the Sydney Opera House states that 'development on the Sydney Opera House site assessed under Part 3A of the EP&A Act will also require approval under Part 4 of the *Heritage Act 1977*'. The relevant provisions of the Heritage Act include these related to the State Heritage Register and s.170 Register that are discussed below.

State Heritage Register

Sydney Opera House is listed on the NSW State Heritage Register. The State Heritage Register, established under the *Heritage Act 1977*, is a list of identified heritage items of particular importance to the people of NSW. It includes items and places determined to be of State heritage significance. The Heritage Act governs the development of sites registered on the State Heritage Register, specifying compliance with a variety of requirements prior to development under sections 56– 65A of the Act.

Section 57 of the Heritage Act states:

When an Interim Heritage Order or listing on the State Heritage Register applies to a place, building, work, relic, moveable object, precinct, or land, a person must not do any of the following things except in pursuance of an approval …

(a) move, damage or destroy the relic or moveable object,

(b) excavate any land for the purpose of exposing or removing the relic,

(c) carry out any development in relation to the land on which the building, work or relic is situated …

As the project would involve development in relation the land on which a building, work or relic listed on the State Heritage Register, approval is required under Section 57(c) of the *Heritage Act 1977*.

The relics provisions of the Heritage Act (sections 138—146) do not specifically apply to sites that are listed on the State Heritage Register, although the site may contain 'relics' as defined by the Heritage Act.

Section 170 Register

Bennelong Drain (Bennelong SWC No. 29) is listed on Sydney Water's Section 170 Register as an item of high historical and technical significance.

Section 170 of the Heritage Act requires government instrumentalities to maintain a heritage and conservation register of heritage items in their ownership or control, and requires minimum standards of maintenance and repair to all items listed on this register. Notice must be given to the Heritage Council of New South Wales prior to removal of any item from the agency's Section 170 Register, transfer of ownership of any listed items or demolition of any items.

Sydney Water Act 1994

Under the *Sydney Water Act 1994*, Sydney Water has an operating licence which enables it to undertake the provision of water, wastewater, recycled water and some stormwater services in the Sydney, Illawarra and Blue Mountains region. This licence is effective from 1 July 2005 to 30 June 2010.

The project is located within the City of Sydney local government area which is listed under the area of operations for the operating licence, therefore this licence covers the operation of the Bennelong Drain.

This operating licence defines the performance standards under which their systems must operate.

Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) aims to conserve, develop and share the fishery resources of NSW for the benefit of present and future generations. Under Section 205(2), a person must not harm marine vegetation such as seagrass in a protected area, except under the authority of a permit issued by the Minister under Part 7 of the FM Act. As indicated in Section 3.4.1, a permit is not required under Section 205 of the FM Act because the project requires approval under Part 3A of the EP&A Act and Section 75U(1)(b) applies.

3.4.2 Management Plan for the Sydney Opera House

The 'Management Plan for the Sydney Opera House' was prepared by the Sydney Opera House Trust and the NSW Government in August 2005, in preparation for the proposed nomination of Sydney Opera House to the World Heritage List. The terms of the Management

Plan are given legal effect by the *Environmental Planning and Assessment Regulation 2000* (as noted in section 3.4.1).

The Management Plan is also referred to in the 2005 bilateral agreement between the Australian Government and the State of New South Wales, made pursuant to section 45 of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (refer section 3.4.3 below). The plan provides a framework for protection of the National and World Heritage values of Sydney Opera House and has been endorsed by the Heritage Branch, Department of Planning (formerly the NSW Heritage Office). The plan states that approval of actions in relation to Sydney Opera House may only be made in accordance with the Management Plan.

The Management Plan identifies that any proposed development on the Sydney Opera House site would require statutory approvals under both the EP&A Act and the NSW *Heritage Act 1977*. The Management Plan identifies that Part 3A of the EP&A Act applies, and states that 'development on the Sydney Opera House site assessed under Part 3A of the EP&A Act will also require approval under Part 4 of the *Heritage Act 1977*.'

The Management Plan states that applications for approval under Part 4 of the *Heritage Act 1977* must be adequately documented. Sydney Opera House Trust, in accordance with the *Heritage Regulations 1999* and the Heritage Council Guidelines, must provide documentation including all drawings and documents necessary to describe the proposal, a Statement of Heritage Impact (Appendix B), and any other supporting documentation. The Statement of Heritage Impact (refer to Appendix B) analyses the project in terms of the impact on the heritage significance of the site, and against the policies outlined in the conservation management plan. The Statement concludes that the project will not compromise the heritage significance of Sydney Opera House. In accordance with this Management Plan, the Statement considers the way in which the National and World Heritage values (if any) are likely to be affected and concludes that these heritage values would not be affected. The Heritage Impact Assessment and Archaeological Management Plan (refer section 7.1 and Appendix B) has been prepared to satisfy the requirements of the Management Plan for Sydney Opera House.

3.4.3 Commonwealth legislation

Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act prescribes the Commonwealth's role in environmental assessment, biodiversity conservation and the management of protected areas and species, populations and communities, and heritage items. The EPBC Act applies to all land, waters, seabed and airspace in, under or above Australia.

Approval under the EPBC Act is required for:

- An action which has, will have or is likely to have a significant impact on 'matters of national environmental significance';
- An action by the Commonwealth or a Commonwealth agency which has, will have or is likely to have a significant impact on the environment;
- An action on Commonwealth land which has, will have or is likely to have a significant impact on the environment; or

- An action, which has, will have, or is likely to have, a significant impact on the environment on Commonwealth land, no matter where it is to be carried out.

Where the proponent considers that an action will have or is likely to have a significant impact on matters of national environmental significance, or on Commonwealth land, a referral is made to the Commonwealth Department of Environment, Water, Heritage and the Arts (DEWHA). The proponent may also, but is not required to, make a referral where they consider that the action will not have or is not likely to have a significant impact.

If it is determined through the referral process by DEWHA that a project is likely to have a significant impact on a matter of national environmental significance, or on Commonwealth land, then the project is a controlled action and approval from the Commonwealth Minister for the Environment, Heritage and the Arts would be required.

Matters of National Environmental Significance

Matters of national environmental significance are considered below:

- World Heritage properties - The project is located within the forecourt of Sydney Opera House, which is a World Heritage Property. The entire Sydney Opera House site falls within the listing. Farm Cove falls within the associated 'buffer zone'. An assessment of the potential for impacts on the world heritage values of Sydney Opera House is provided in section 7.1. The assessment concluded the project would have no significant adverse impacts on the World Heritage values of Sydney Opera House.
- National Heritage places. The project is located within the forecourt of Sydney Opera House, which is listed on the National Heritage list under the EPBC Act. An assessment of the potential for impacts on the national heritage values of Sydney Opera House is provided in section 7.1. The assessment concluded the project would have no significant adverse impacts on the national heritage values of Sydney Opera House.
- Wetlands of international importance. No wetlands of international importance would be affected by the project.
- Listed threatened species and ecological communities - The aquatic ecology assessment (section 7.3.3) found that the project would be unlikely to have a significant impact on any threatened species listed under the EPBC Act or their habitat, provided the mitigation measures identified are implemented.
- Migratory species protected under international agreements - The aquatic ecology assessment (section 7.3.3) indicates that the project is not expected to have an impact on listed migratory species.
- Commonwealth marine areas - No Commonwealth marine areas would be affected by the project.
- Nuclear actions (including uranium mines) - The project would not involve nuclear action as defined under the EPBC Act.

Other provisions

The Sydney Opera House site is subject to the provisions of the EPBC Act, as a result of the World Heritage and National Heritage listings of the site. Part 3, Division 1 of the EPBC Act

identifies requirements relating to matters of national environmental significance (Subdivision A—World Heritage and Subdivision AA—National Heritage).

Under section 137 of the EPBC Act, approval of activities related to a World Heritage property must be consistent with:

(a) Australia's obligations under the World Heritage Convention; or

(b) The Australian World Heritage Principles; or

(c) A plan that has been prepared for the management of a declared World Heritage property.

Under section 137A of the EPBC Act, approval of activities related to a National Heritage place must be consistent with:

(a) the National Heritage management principles; or

(b) an agreement to which the Commonwealth is party in relation to a National Heritage place; or

(c) a plan that has been prepared for the management of a National Heritage place.

Sydney Opera House is subject to the 2005 bilateral agreement between the Australian Government and the State of New South Wales, made pursuant to section 45 of the EPBC Act. Under the terms of the agreement (Clause 8.1), an action taken at Sydney Opera House does not require the approval of the Commonwealth Minister for the Environment, Heritage and the Arts where:

the taking of the action has been approved by the State of New South Wales or an agency of New South Wales in accordance with the Management Plan for the Sydney Opera House …

As such, the project would not require approval under the EPBC Act if the relevant approvals are obtained under the EP&A Act and *Heritage Act 1977* as required by the Management Plan for the Sydney Opera House.

3.4.4 Environmental planning instruments

Relevant clauses of the Sydney Local Environmental Plan 2005

Part 6 of the LEP includes provisions related to heritage. The relevant provisions of this part are discussed below.

Clause 74 of the LEP addresses development within the vicinity of a heritage item. The clause states that the consent authority must take into account the impact of the proposed development on the heritage significance of any item in the vicinity of the development. The heritage assessment undertaken as part of the environmental assessment (refer section 7.1), concluded that the project would not impact on the significance of Sydney Opera House.

Clause 75 of the LEP addresses development on potential archaeological sites. This clause states that an archaeological assessment should be undertaken. This assessment has been undertaken by Godden Mackay Logan Pty Ltd (Appendix B). A summary of the findings of the assessment is provided in section 7.1.

Regional Environmental Plans

Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005

The *Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005* provides a planning framework for Sydney Harbour.

Within the Sydney Harbour Catchment, particular provisions of the REP apply to:

- The Foreshores and Waterways Area;
- Various strategic foreshore sites (as shown on the Strategic Foreshore Sites Map of the REP);
- Various heritage items (as shown on the Heritage Map of the REP); and
- Various wetlands protection areas (as shown on the Wetlands Protection Area Map of the REP).

The site is located within the Foreshores and Waterways Area. Part of the shoreline of Farm Cove is zoned W2 Environmental Protection. The project is located to the north of the W2 zoning on the western side of Farm Cove.

The site is not identified as a strategic foreshore site. The site is located in close proximity to one heritage item shown on the Heritage Map of the REP. This heritage item is the Man O' War steps located on the western shoreline of Farm Cove just to the north of the site.

Part of the western shoreline of Farm Cove is shown as a Wetlands Protection Area on the REP map. This area includes the sea wall in the vicinity of the Man O' War Steps and jetty.

Aims

Clause 2 sets out the specific aims of the REP. The project is considered to be consistent with the relevant aims of the Harbour Catchment REP.

Planning principles

Clause 14 sets out the planning principles for land within the Foreshores and Waterways Area. The project complies with the applicable planning principles. The natural assets and environmental qualities would be unaffected by the development since the majority of the site is reclaimed land. Public access along this area of the foreshore would not be completely restricted during the construction of the project; public access would not be restricted during operation.

Clause 15 sets out the planning principles for heritage conservation of items listed under the Harbour Catchment REP. The project would meet the principles set out in Clause 15, as no heritage item listed under the REP would be directly impacted upon by the project.

Zoning and permissibility

The project is located in the vicinity of Farm Cove which is zoned W2 Environmental Protection under the Harbour Catchment REP. However, as the project is not located within this zoning the development controls do not apply.

Matters for consideration

Division 2, Clause 21 applies to biodiversity, ecology and environment protection. An assessment of potential environmental impacts is provided in Chapter 7 and Chapter 8.

Clause 22 refers to public access to, and use of, foreshores and waterways. The project would not impact on public access to or along the foreshore area for any extended period of time during construction. No impacts to access to or along the foreshore would occur during operation.

Clause 23 refers to the maintenance of a working harbour. The project would not impact on Sydney Harbour as a working harbour.

Clause 24 refers to the interrelationship of waterway and foreshore uses. This project is compatible with development along the waterways and would not adversely affect the waterway.

Clause 25 Foreshore and waterways scenic quality and Clause 26 Maintenance, protection and enhancement of views do not apply, as the project would not be higher than ground level.

Heritage provisions

Part 5 of the REP sets out the provisions for heritage items. The project would not impact directly on any heritage items marked on the map located in the REP. The nearest item is the Man O' War steps, which are located adjacent to the site within Farm Cove. Clause 59 of the REP states that the consent authority must take into account the impacts of works located adjacent to a heritage item.

Wetland protection

Part 6 of the REP sets out the objectives and consent requirements of for the protection of wetlands. Part of the project is located within the wetlands protection area. The project is considered to be consistent with the matters for consideration listed under Part 6 as it would have a neutral effect on the quality of water entering the waterway. Potential impacts on aquatic environments have been assessed and management measures developed to ensure impacts are mitigated.

3.4.5 Other plans and strategies

Sydney Harbour Foreshores Area Development Control Plan 2006 (DCP 2006)

Bennelong Point is located within the Sydney Harbour Foreshore Area under the Sydney Harbour Foreshore Area Development Control Plan 2006.

Section 4.17 of the DCP relates to sea walls located along the foreshore area. This section states that where a sea wall is being upgraded, a similar material is to be used. Consistent with this, the project involves use of materials similar to the existing materials in the construction of the outlet.

Sustainable Sydney 2030

Sustainable Sydney 2030 is a vision for the future development of the City of Sydney LGA. Sustainable Sydney 2030 has a vision of the City of Sydney being a green, global and connected city. An outline of this vision is located below:

- 'Green' with a minimal environmental impact, green with trees, parks, gardens and linked open spaces, green by example and green by reputation.
- 'Global' in economic orientation, global in links and knowledge exchange, global and open-minded in outlook and attitude.
- 'Connected' physically by walking, cycling and high quality public transport, connected 'virtually' by world–class telecommunications, connected to communities through a sense of belonging and social well being, and connected to other spheres of government and to those with an interest in the City.

Due to the relatively small scale and the minimal change to the environment as a result of the project, it is considered to be consistent with Sustainable Sydney 2030.

3.5 The application process

The Part 3A application and assessment process for the project is summarised below.

3.5.1 Assessment requirements

Director-General's Requirements

Under clause 75F of the EP&A Act, the Director-General is required to prepare and issue the proponent with requirements for undertaking the environmental assessment. These identify key issues to be addressed and the level of assessment required.

The Director-General's requirements for the project were issued on 24 July 2009. A copy of the requirements is included in Appendix A. The matters raised by the Director-General for consideration are outlined in Table 3.1 together with the section of this report that addresses the matter.

Table 3.1 Director-General's requirements

Issue category	Requirement	Document reference
General requirements	Executive summary	Executive Summary
	Details of the proposal:	
	◗ Any development options	Section 5.3
	◗ Justification of the proposal	Section 10.1
	◗ Outline implementation of the project	Section 5.1
	◗ Details of the maintenance and management procedures	Section 5.5
	Site analysis and existing environment	Section 2.3
	Consideration of any relevant statutory provisions	Chapter 3
	Compliance with the BCA and relevant Australian Standards	Section 5.1

Issue category	Requirement	Document reference
	Details of environmental protection measures and draft Statement of Commitments	Chapter 9
	Assessment of the key issues	Chapter 7
	Quantity Surveyors Certificate of Cost	Section 5.4.5 and Appendix D
	Environmental Assessment certification	Front of document
	Conclusion justifying the project	Section 10.2
	Plans and documents	Appendix C
Key assessment requirements	Statutory and other requirements	Chapter 3
	Heritage and archaeological	Section 7.1
	Hydrological Analysis and Infrastructure	Section 7.2
	Water quality and aquatic habitat	Sections 7.2 and 7.3
	Geotechnical	Section 2.3.8 and 7.6
	Demolition and excavation	Sections 7.5, 7.6, and 7.7
	Structural engineers report	Appendix I
	Safe Work Method Statement	Section 5.4.6
Consultation requirements	Consultation with nominated agencies, stakeholders and the community	Chapter 4

Exhibition

If the environmental assessment is considered to meet the requirements, the Department would place it on public exhibition for at least 30 days. During the exhibition period, submissions would be invited from relevant agencies and members of the public.

The Department would provide the Sydney Opera House Trust with a copy of the submissions or a summary of the issues raised. The Trust would be asked to respond to the issues and may modify the project and the draft Statement of Commitments to minimise impacts on the environment if required.

If the project or Statement of Commitments were modified in response to issues raised, a Preferred Project Report would be prepared to describe the scope of the revised project. The Director-General would make this report public.

Assessment and determination

Following the exhibition period, the Department would, on behalf of the Minister, review the environmental assessment, any preferred project report, and submissions received. Once the Department has completed its assessment, a draft assessment report would be prepared for the Director-General, which may include recommended conditions of approval.

The recommended conditions would refer to the Statement of Commitments and may modify them and/or add additional provisions.

The assessment report would then be submitted to the Minister for determination. The Minister may refuse the project, or approve it with any conditions considered appropriate.

The Minister's determination and the Director-General's report would be published on the Department of Planning's web site immediately following determination.

Chapter 4 Consultation

4.1 Statutory consultation

In July 2009, the Department of Planning distributed the preliminary environmental assessment and requested that agencies identify key issues and assessment requirements for the project.

The Director General's requirements did not specify which government authorities were required to be consulted with during the environmental assessment. Consultation with the following government agencies was deemed to be appropriate for the project:

- Sydney Water;
- Department of Industry and Investment NSW (DI&I NSW);
- Department of Environment, Climate Change and Water (DECCW);
- Commonwealth Department of Environment, Water, Heritage and the Arts (DEWHA);
- Department of Planning – Heritage Branch;
- Sydney Harbour Foreshore Authority; and
- City of Sydney.

A summary of the issues and requirements identified is provided in Table 4.1.

Table 4.1 Agency issues and information requirements

Stakeholder	Issue raised	Where addressed in environmental assessment
Sydney Water	Sydney water advised that there is a sediment trap near the Sydney Opera House Car Park. This trap does not collect a great deal of sediment.	Section 7.2
	Drainage capacity – the design of the drain actually results in a greater capacity when compared to the existing drain	Section 7.2
	Climate change – GHD notified Sydney Water that climate change scenarios were not accommodated in the design as the upstream component of the system would not be altered. Sydney Water advised that this approach is appropriate as the amplification of the upstream system to accommodate climate change scenarios is extremely limited.	Section 7.2
DI&I NSW	Direct and indirect impacts during construction of the stormwater outlet on aquatic habitats in Farm Cove	Section 7.3.3
	Potential increased sediment load, freshwater influence, pollutants and altered hydrology from stormwater outlet discharges on aquatic habitats in Farm Cove	Section 7.3.3
	Map and description of aquatic communities	Section 7.3 and Figure 7-2

Stakeholder	Issue raised	Where addressed in environmental assessment
	Location, nature, extent and type of habitat removal or modification	Section 7.3.3
DECCW	Detailed description of the proposal detailing the works and drain route	Section 5.1
	Details of the environmental protection measures	Chapter 9
	Likely direct and indirect impacts during construction of the proposal on aquatic ecology.	Section 7.3
	Likely impacts of stormwater discharges from the new discharge location on sediment deposition rates and scour of Farm Cove. This includes the impact of the above on aquatic ecology.	Sections 7.2 and 7.3
	Likely impacts on Aboriginal cultural heritage values	Section 7.1
	Predicted noise and vibration impacts during construction of the project	Section 7.5
	Measures to be adopted for the assessment, treatment, storage and disposal of material, particularly contaminated material, excavated during the project.	Section 7.6
	Details of community consultation to be undertaken for the proposal, including any consultation with relevant Aboriginal communities	Chapter 4
	Operation details and procedures of the completed drain	Section 5.5
DEWHA	Direct impacts on Sydney Opera House forecourt should be assessed against, and comply with the conservation policies in the Sydney Opera House conservation management plan (2003).	Section 7.1
	A Heritage Assessment and/or Statement of Heritage Impact is required	Appendix B
	Consideration should be given to whether the project complies with the requirements of the Bilateral Agreement under Section 45 of the EPBC Act; and ◗ How the blocking of the drain is to be carried out, the sensitivities on the existing Sydney Opera House fabric, and how the forecourt paving impacted by the proposal will be removed, conserved and reinstated; ◗ The impact of the proposal on the seawall; ◗ The significance of the ovoid channel and its future conservation; and ◗ The impact of future operational efficiency projects likely to have an effect on the open and uncluttered character of the forecourt, or other significant Sydney Opera House fabric.	Appendix B

Stakeholder	Issue raised	Where addressed in environmental assessment
Department of Planning – Heritage Branch	An archaeological assessment should be prepared in addition to a heritage impact assessment.	Appendix B

4.2 Stakeholder consultation

Between 2005 and 2009, Sydney Opera House Trust consulted with a range of stakeholders that would be potentially affected by the proposal, including:

- Royal Botanic Gardens and Domain Trust;
- EnergyAustralia;
- Telstra;
- Alinta;
- Department of Commerce - State Property Authority;
- Heritage Council of NSW;
- Optus; and
- Sydney Harbour Foreshore Authority.

These organisations indicated in-principle approval of the project, however a number of issues were identified that would need to be resolved during detailed design. These primarily relate to the need to ensure that any services or utilities that may be affected are temporarily relocated and/ or reinstated following completion of construction. Ongoing consultation will occur to ensure that relocation and restoration meets the requirements of the relevant stakeholder.

A small portion of the works would occur on land that is controlled by the Royal Botanic Gardens and Domain Trust. As the landowner, the Royal Botanic Gardens and Domain Trust have provided written consent for the project (refer to Appendix J). Details of consultation with the Royal Botanic Gardens and Domain Trust are outlined in Section 4.2.1 of this report.

The proposal will also encroach on the easement for support of the Sydney Opera House Car Park and on Lot 101 of DP828892 in the sub-surface stratum owned by the Car Park. The landowner (State Property Authority) and the lessee (Trust Company of Australia) have been consulted and their consent as landowners to this project have been obtained (refer to Appendix J). Details of consultation with Car Park are outlined in Section 4.2.2. of this report.

As indicated in Section 7.1, Godden Mackay Logan consulted with the Metropolitan Local Aboriginal Land Council (MLALC) during preparation of the Heritage Impact Assessment. The MLALC did not raise any issues with the proposal.

4.2.1 Consultation with the Royal Botanic Gardens and Domain Trust

A portion of the project would be located on land owned by the Royal Botanic Gardens and Domain Trust (RBGDT). Further to initial consultation in 2005, RBGDT was provided with the

opportunity to provide comment on the draft environmental assessment. Comments were received from the RBGDT on 6th October 2009.

The RBGDT stated that the environmental assessment provided limited commentary on potential heritage impacts on the Royal Botanic Gardens. At the request of the Sydney Opera House Trust, the Heritage Impact Assessment and Archaeology Management Plan was revised to confirm that there would be no significant adverse impacts on the Royal Botanic Gardens, including the sea wall and the QEII Gate.

The RBGDT advised that any proposed acquisition of RBGDT land, be it through easement or freehold title, would not be supported by RBGDT. Sydney Opera House Trust has no intention of acquiring this land as part of this project and Sydney Water advised that it would not require an easement for the project and that the provisions of the Sydney Water Act 1994 are sufficient to maintain the asset.

The RBGDT noted their intention to investigate the potential to harvest the storm water from the Bennelong Drain and requested support from Sydney Opera House Trust to progress this option. Sydney Opera House Trust supports in principle water harvesting initiatives, provided a technically and financially feasible programme could be prepared that would not result in any cost or loss of revenue to the Sydney Opera House Trust. It is also noted that given that the drain is a Sydney Water asset, any proposal would be subject to Sydney Water approval. Any infrastructure proposed to support future water harvesting projects would be required to comply with the Sydney Opera House Conservation Management Plan and the accredited Plan of Management for Sydney Opera House land.

The RBGDT desired confirmation that safe access to the Royal Botanic Gardens via the Sydney Opera House forecourt would be maintained at all times. They also wished to confirm that the RBGDT would not incur any cost or loss of revenue associated with the project. As stated in Section 8.2.2 of this report, public access to the Royal Botanic Gardens will be maintained at all times during construction. This will be achieved by undertaking the project in stages.

The RBGDT requested timely information in regards to the staging, location of safety hoarding, site compound and alike prior to the commencing of construction. The Sydney Opera House Trust is committed to providing updates on the planning and delivery of the project at the frequency and level of detail as desired by the RBGDT.

As the landowner of a small portion of land affected by the project, the Royal Botanic Gardens and Domain Trust has provided written consent for the project (refer to Appendix J).

4.2.2 Consultation with the State Property Authority and Trust Company of Australia regarding the carpark

The proposal will encroach on the easement for support of the Sydney Opera House of Car Park and on Lot 101 DP828892 in the sub-surface stratum owned by the Car Park.

The Sydney Opera House Car Park is separate entity owned by the State Property Authority and leased by the Trust Company of Australia. The landowner (State Property Authority) and the lessee (Trust Company of Australia) have been consulted and their consent as landowners to this project have been obtained (refer to Appendix J).

A Deed and consent agreement between Sydney Opera House and the Carpark has been developed. Under the Deed and consent agreement between Sydney Opera House and the Carpark, Sydney Opera House has agreed to undertake all engineering investigations and engineering structural work required prior to and during the project to obtain an Engineering Certificate to confirm that the project will not have any material adverse affect on the Easement for Support and the structural integrity of the Car Park and its associated ventilation shafts.

4.3 Community consultation

Sydney Opera House Trust has distributed information on the project to commercial and residential occupants in the vicinity of the site, including those along east Circular Quay. The information provided an overview of the need for the project and the likely environmental issues during construction and operation. It advised that the environmental assessment would be publicly exhibited and that the community would have an opportunity to comment on the proposal at this time.

Chapter 5 The project

5.1 Description of the project

The project involves the construction of a new section of drain from the point where the Bennelong Drain enters the Sydney Opera House site, adjacent to the air intake structure for the Sydney Opera House car park. The Sydney Opera House Car Park is a separate entity owned by the State Property Authority and leased by the Trust Company of Australia.

The new section of drain would run in an easterly direction close to the Tarpeian Wall, around the southern side of the exhaust air shaft for the Sydney Opera House car park, extending to the proposed discharge point at Farm Cove.

Design consultants to the Sydney Opera House Trust advised that no Building Code of Australia provisions apply to the design of the project. The project was designed using 'Australian Rainfall and run off' (issued by Institute of Engineers) as a guide. Sydney Water requirements were also factored into the design.

5.1.1 New section of drain

The new section of drain would be a box culvert measuring approximately 1.5 m wide by 1.5 m high (internal dimensions) or 1.8 m wide by 1.9 m high (external dimensions) at the junction point, increasing to approximately 2.4 m wide by 1.8 m high (internal dimensions) or 2.7 m wide by 2.2 m high (external dimensions) along the majority of the diversion route. The drain would be constructed using prefabricated sections of concrete box culvert. A 4.4 m deep pit would be constructed at the junction between the existing drain and the new section of drain. The junction pit would include a cover to enable access for maintenance. The access cover would be located within a narrow strip of feature garden located at the southern extreme of the Sydney Opera House site against the base of the Tarpeian Wall. The new section of drain would be approximately 106 m long.

An area of approximately 8 m by 8 m would need to be excavated around the proposed new junction to construct and install the required infrastructure. Excavation would also be required along the route of the proposed diversion. The width and depth of the excavation would vary and would generally be between 2 m - 3.2m wide to enable the drain to be installed. The construction compound around the drain would be approximately 10m wide depending on the final construction method developed by the contractor.

An 8m long section of the original Bennelong Drain would be removed to allow construction construction of the junction between the Bennelong Drain and the new section. The remaining existing oviform drain would be unaffected.

The existing section of drain would be blocked off at the diversion point and at the obsolete outlet.

5.1.2 Outlet

The discharge point for the new section of box culvert drain would be located within the seawall at Farm Cove, immediately above the sea bed between the Royal Botanic Gardens Queen Elizabeth II gate and the Man O' War Jetty. The discharge point would involve a new outlet through the seawall approximately 2.4 m wide by 1.8 m high (internal dimensions), 2.7 m wide by 2.2 m high (external dimensions).

The majority of the outlet would be visible above the mean sea level, which in this location would be approximately 0.38 m above the bottom of the culvert. The mean high water level would be 0.93 m above the bottom, which means that just under half of the outlet would be visible at high tide.

The drain would be lined with sandstone to match the existing fabric of the seawall to approximately 1-1.5 m from the outlet.

Details of the project are shown in Figure 5-1. Plans are provided in Appendix C.

5.2 Need for the project

Sydney Opera House Trust proposes to divert the Bennelong Drain from its current route to a new route under the Sydney Opera House forecourt. At its current location, the drain discharges to Sydney Harbour. The proposed new discharge point would be to Farm Cove. The principal drivers for the project are discussed below and relate to future strategic building plan directions and operational flexibility.

Alignment with the Strategic Building Plan and Operational flexibility

The diversion of the drain is in line with the strategic building plan and would result in greater operational flexibility for future projects that are planned for Sydney Opera House. Although these future projects are yet to be fully defined, they may include:

- The provision of a new loading area and associated access. This would separate heavy vehicle deliveries from busy pedestrian areas and would increase public safety. It would also avoid the need for heavy vehicles to use the western and northern boardwalks; and
- New corridors and lifts to provide better access between different parts of Sydney Opera House.

Future projects such as these are likely to substantially improve the functionality of Sydney Opera House, but would not be able to proceed if the Bennelong Drain remains in its current position. As such, these projects would be contingent upon realignment of the Bennelong Drain.

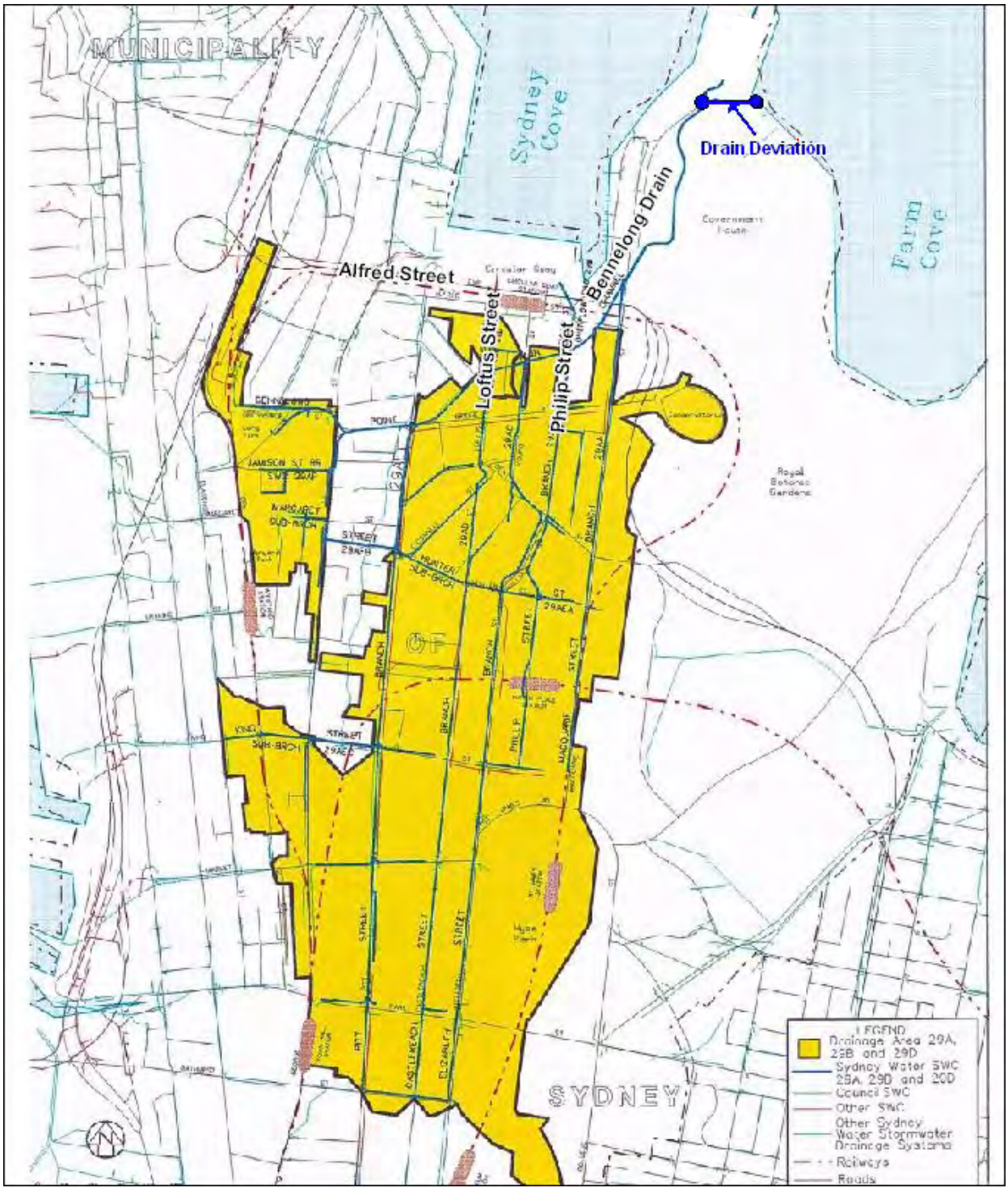


Figure 5-1 Location of the existing Bennelong Drain and proposed realignment

5.3 Options considered

The following section outlines options that were considered during development of the project, including:

- The do nothing option;
- Alignments;
- Design capacities;
- A flap valve at the outlet; and
- The need for a sediment trap.

5.3.1 Do nothing option

The do nothing option would involve leaving the existing alignment. This option is not considered appropriate as the existing alignment presents a site constraint that reduces the flexibility to accommodate future projects or developments at the site. This option does not align with the Strategic Building Plan directions for Sydney Opera House.

5.3.2 Alignment

Alignment to the west

Consideration was given to realigning the Bennelong Drain to enter Sydney Cove to the west of Sydney Opera House. This option was rejected due to potential conflicts with existing infrastructure such as Sydney Harbour Tunnel, carpark entrance and facilities including kitchens, air conditioning plant and sea water intake and boardwalk areas on the lower concourse. It may also conflict with future developments that may be undertaken in this area, such as the potential construction of a truck ramp to provide access to a new loading dock.

Alignment to the east (preferred option)

The preferred option is to realign the drain to the east so that it discharges into Farm Cove. A detailed description of this option is located in section 5.1.

Realigning the drain to the east was considered the preferred option as it avoids the potential conflicts with existing infrastructure such as Sydney Harbour Tunnel, and facilities such as the lower western concourse. It also minimises conflicts with possible future projects that may occur within the Sydney Opera House precinct.

A route that winds south around the car park air vent was chosen. This was due to a number of reasons including that the route north of the air vent has a greater impact on existing in ground services. It was also observed that the area south of the air vent provides a more open marine area for the stormwater discharge compared to the area north of the air vent which is situated in a sheltered area between the wall and the Man O'War steps.

5.3.3 Design capacity

The existing Bennelong Drain has capacity to accommodate a 10 year ARI storm event, and consideration was given to increasing this design capacity to accommodate larger events. Discussions with Sydney Water indicated that it is not considered appropriate to substantially increase the design capacity because the project involves retrofitting a section of drain at the downstream end of an existing system, and the project does not involve increasing the capacity of the remainder of the existing system.

It was considered that a substantially higher design capacity would only be justified if the existing upstream system was likely to be upgraded. Sydney Water advised it is highly unlikely the existing upstream system would be upgraded.

Based on this, the project has been designed to have hydraulic capacity to accommodate a storm event of approximately 15 year ARI which would be marginally greater than the existing drain. Sydney Water confirmed that this design capacity is appropriate.

5.3.4 Sediment trap

Consideration was given to provision of a sediment trap within the project. Discussions with Sydney Water indicated that a sediment trap is located within the Sydney Opera House Car Park, immediately upstream of the project, and that very little sediment has needed to be removed from this facility.

Based on the above, Sydney Water agreed that if a sediment trap is required, the forecourt of the Sydney Opera House is unlikely to be the optimal location. As a result, a sediment trap has not been included in the project. However, as discussed in Section 7.2, sedimentation rates will be monitored and the need for any additional sediment controls will be reviewed once the drain is operational. If it is found that increased sediment control is required, it is likely that an upgrade of the existing sediment trap will be the preferred mitigation measure.

5.3.5 Provision of a flap valve at outlet

Outlet with flap valve

The original design undertaken by Warren Smith and Partners in 2005, proposed the inclusion of a flap valve at the outlet point in Farm Cove. A preliminary review of this design was undertaken which indicated that the flap valve may result in some adverse hydrological impacts upstream along the drainage system. Therefore the inclusion of a flap was not considered to be a viable option.

Outlet without flap valve

On the basis of hydrological studies, the design of the project will be an open discharge at the outlet, without a flap. This option would operate in a similar manner to the existing drain outlet which has no flap valve. This design has been agreed with Sydney Water.

5.4 Construction

The following construction method and associated details are indicative and will be refined by the contractor engaged to undertake the project. This method has been developed to provide a basis for assessment of the environmental impacts of the project.

5.4.1 Indicative construction method

The new section of drain would be constructed using a cut and fill construction method with a 2 m to 3.2 m (dependant on size of drain at any one point) wide trench to be excavated to allow installation of precast concrete sections of box culvert. The trench to be excavated would vary from approximately 3.8 m deep at the western end of the project to approximately 2.7 m deep at the eastern end. The project would be constructed in a staged manner to minimise disturbance to the use of the Sydney Opera House forecourt area, and minimise impact on access to the Royal Botanic Gardens. Construction would be timed in order to minimise impacts on any proposed events on the forecourt.

The first stage would involve construction of section of the section of drain between the foot of the Tarpeian Steps and the eastern edge of the Sydney Opera House car park exhaust air shaft. The second stage would be a small section of the drain between the eastern edge of the exhaust air shaft and the seawall at Farm Cove, and the construction of the outlet within the seawall. The final stage would involve the construction of the junction pit and a section of the drain from the junction pit to the foot of the Tarpeian Steps. The construction of the junction pit would include the excavation of an 8m by 8m area.

The staging would ensure that access to and from the Royal Botanic Gardens is maintained throughout the construction period. The construction of the project would take approximately six to nine months and the proposed construction hours would be during daylight hours, Monday to Saturday.

Cobblestones within the Sydney Opera House forecourt would be removed during trenching for the construction of the new section of drain. These cobblestones would be replaced following completion of construction.

The existing drain would continue to function until construction of the new section is complete. The existing drain that is to be decommissioned would be blocked off at both ends to prevent access to the drain.

Methodologies employed for the construction of the eastern section of the drain will be selected to minimise construction vibration and to avoid any impact on surrounding structures including the sea wall and QEII gates.

5.4.2 Construction duration and timing

Construction of the project would take approximately six to nine months and the proposed construction hours would be during standard daytime construction hours, Monday to Saturday. These hours are:

- Monday – Friday – 7am – 6pm;
- Saturday 8am – 1pm; and

- No work on Sunday or public holidays.

5.4.3 Workforce

The size of the workforce would be dependent on the specific construction method employed by the contractor and is unable to be defined at this stage. An indicative peak construction workforce is estimated to be approximately 10 persons.

5.4.4 Indicative construction equipment

A definitive list of the proposed construction equipment is not currently available as this would be dependent on the specific method used by the contractor. The following is indicative of the equipment that may possibly be used during construction:

- 18 tonne 90 kW wheeled excavator;
- Rotary saw (if required);
- Rock saw (if required);
- Rock hammers (if required);
- Mobile crane;
- 5 tonne dump trucks for spoil removal;
- Semi-trailers for delivery of material (including prefabricated sections of concrete box culvert);
- Hand-held circular saw for cutting paving slabs; and
- Site vehicles.

5.4.5 Cost

The estimated Capital Investment Value for the project would be $3,244,000 plus an allowance for consultants fees of approximately $325,000. The overall project cost is estimated at $3,569,000.

A copy of the Quantity Surveyor's Certificate of Cost is located in Appendix D.

5.4.6 Safe work method statement

The Director-General's requirements state that a safe work method statement must be provided explaining the delivery and installation of the project whilst ensuring the surrounding heritage fabric. An indicative description of the methods to construct the project are provided in Sections 5.4.1 to 5.4.4, and measures to protect the heritage significance of the broader Sydney Opera House site are detailed in Section 7.1.4.

As stated in Section 5.4, the construction method is indicative and will need to be refined by the selected contractor. Once the construction method is finalised, the contractor would also develop a detailed safe work method statement to ensure construction of the project maintains the integrity of the surrounding heritage fabric.

5.5 Operation

5.5.1 Operation activities

Following construction of the new section of drain, the Bennelong Drain would continue to provide drainage to the northern CBD catchment, with stormwater discharging to Farm Cove.

The drain would form part of Sydney Water's stormwater drainage system. As with the existing drain, it would be operated and maintained by Sydney Water and this would include periodic monitoring the performance of the sediment trap in the Sydney Opera House Car Park, immediately upstream of the project.

5.5.2 Operating hours

The realigned drain would operate as normal with the project simply altering the discharge point of the drain.

5.5.3 Employment

Other than during detailed design, planning and construction, the project would not result in an increase in employment, as the new alignment would operate as per the existing drain. As per the existing operation of the drain, Sydney Water may be required to undertake occasional or emergency maintenance on an as needs basis.

Chapter 6 General environmental risk analysis

6.1 General environmental risk analysis

The Director-General's environmental assessment requirements for the project establish the requirements for preparation of the environmental assessment under Part 3A of the EP&A Act. The Director-General's requirements nominate the following as key issues for the assessment:

- Heritage and archaeology;
- Hydrology and drainage;
- Aquatic ecology and water quality;
- Geotechnical conditions, including the impacts associated with demolition and excavation;
- Construction noise;
- Soils and contamination; and
- Spoil and waste management.

Based on the outcome of the environment risk assessment summarised in Table 6.1, potential visual impacts were also considered to be a key issue.

Other issues that have been considered in order to develop an appropriate environmental management framework for the construction and operation of the project include:

- Traffic and access;
- Air quality;
- Land uses; and
- Infrastructure.

Discussion of key issues is provided in Chapter 7, and discussion of other issues is provided in Chapter 8 of this environmental assessment.

Table 6.1 provides a general environmental risk analysis relating to the project

Table 6.1 General environmental risk analysis of key issues

Issue	Potential impacts	Comments
Heritage and archaeology	Sydney Opera House is subject to a number of heritage listings at the international, national, state and local level. These include: ◗ UNESCO World Heritage List; ◗ National Heritage List; ◗ Register of the National Estate; ◗ NSW State Heritage Register; and ◗ The Sydney Local Environmental Plan 2005. Bennelong Drain is listed on Sydney Water's Section 170 register. Over the years the site has been used for a wide range of uses and there is potential for archeological remains on site which could be disturbed by the project. The 2005 Management Plan for the Sydney Opera House requires assessment of potential heritage and archaeological impacts for works to Sydney Opera House and/or within the site.	The Director-General's Requirements identify this as a key issue. This issue is addressed in section 7.1.
Hydrology and drainage	The Bennelong Drain has a catchment of approximately 72 hectares, and predominantly services the northern CBD. There is the potential that the proposed realignment of the drain could generate hydrological impacts related to the functioning of the CBD's stormwater drainage system, with the key potential issue being upstream flooding. Other issues requiring consideration include sediment deposition and scour at the outlet and climate change impacts.	The Director-General's Requirements identify this as a key issue. This issue is addressed in section 7.2.
Aquatic ecology and water quality	Due to the proposed realignment discharging at a new location in Farm Cove, there is potential for impacts on aquatic ecology. Potential impacts may include direct impacts as a result of construction of the outlet and indirect impacts as a result of changes in water quality if construction activities are inadequately controlled. The impact of stormwater on aquatic ecology during operation also requires consideration. It is necessary to determine whether any threatened species are present or potentially present in the vicinity of the outlet, and the potential for impacts on these species during construction and operation.	The Director-General's Requirements identify this as a key issue. This issue is addressed in section 7.3.
Visual impacts	During construction, potential visual impacts would be associated with the construction works located within the forecourt. During operation, the main potential impacts relate to the presence of the new outlet in the seawall south of the Man O' War steps. The visibility of the outlet location needs to be considered, and the significance of the visual impacts should be considered.	The Director-General's Requirements do not identify this as a key issue. It was considered that due to the prominent location of the site that visual impacts are a key issue. This issue is addressed in section 7.4.
Construction noise	Operation of the project would not generate noise impacts. The main potential for impacts relate to the	The Director-General's Requirements identify this as a

Issue	Potential impacts	Comments
	generation of noise during the construction phase. During construction, there is the potential for noise impacts to be generated by construction equipment, as well as by traffic movements, in particular heavy vehicles required for material delivery and spoil removal.	key issue. This issue is addressed in section 7.5.
Geotechnical conditions	Soil impacts would be associated with the storage of soils on site and removal of soils not required for backfill. There is also potential for land to be contaminated due to past uses of the site and for the fill used to form Bennelong Point to contain contaminated land.	The Director-General's Requirements identify this as a key issue. This issue is addressed in section 7.6.
Waste management	Waste issues may be associated with the removal of materials associated with excavation and other materials generated during construction of the new infrastructure.	The Director-General's Requirements identify this as a key issue. This issue is addressed in section 7.6.
Traffic and access	During construction of the project, vehicles would be required to access the pedestrian area that is located in the forecourt of Sydney Opera House. Vehicles that would be required to access the site would be associated with the delivery of materials or equipment, removal of excess spoil, and access for private vehicles. If inadequately managed, the project would have the potential to impact on pedestrian access to and from the Royal Botanic Gardens. Operation of the project would only involve minor traffic impacts associated with the infrequent maintenance required for the drain.	This issue would focus on the management of potential construction issues, maintaining public safety and recommendations for the construction environmental management plan. This issue is addressed in section 8.2.
Air quality	If inadequately controlled, construction of the project would have the potential to result in air quality impacts associated with dust generation, vehicle movements and vehicle emissions. The project would not result in any air quality impacts during operation.	This issue would focus on the management of potential construction issues and recommendations for the construction environmental management plan. This issue is addressed in section 8.3.
Land uses	As the project would be located underground, it would not impact on the use of the forecourt area or surrounding area during operation. Construction of the project has the potential to temporarily disrupt use of the forecourt in the immediate vicinity of the construction site. There would be no impacts to surrounding land uses.	This issue would focus on the management of potential construction issues and recommendations for the construction environmental management plan. This issue is addressed in section 8.4.
Infrastructure	The Sydney Opera House forecourt contains a variety of underground services. The presence of these services would need to be considered and managed by the construction contractor so as not to result in any service disruptions.	Not considered to be a key issue for the project. This issue is addressed in section 8.5.