WaterDeliveryAlliance
SYDNEY'S DESALINATION PROJECT

Sydney WATER

Desalinated Water Delivery System: application for modification of Project Approval for the Urban Sydney Sector: Sydney North

for

Water Delivery Alliance
Sydney's Desalination Project

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GLOSSARY of TERMS

dB	Decibels
CEMP	Construction Environmental Management Plan
CSRP	Community and Stakeholder Relations Plan
CNVMP	Construction Noise and Vibration Management Plan
DCP	Development Control Plan
DECC	NSW Department of Environment and Climate Change
DoP	NSW Department of Planning
EMS	Environmental Management System
ENCM	Environmental Noise Control Manual
EP&A Act	*Environmental Planning and Assessment Act 1979*
EA	Environmental Assessment
LGA	Local Government Area
PPR	Preferred Project Report
PPV	Peak Particle Velocity
RTA	NSW Roads and Traffic Authority
WDA	Water Delivery Alliance

Executive Summary

The Water Delivery Alliance (WDA) has been established to design, construct and commission the pump station and desalinated water delivery system linking the desalination plant on the Kurnell Peninsula with the existing distribution network at Shaft 11C, Erskineville.

Sydney Water has received Concept Approval for the desalination project and Project Approval for the desalinated water delivery system. These Approvals were granted following consideration of a number of supporting documents, including the Major Project Application, Environmental Assessments (EA) and Preferred Project Reports (PPR). These documents envisaged the need to optimise the design based on additional engineering and environmental information that was to become available during detailed design. Since receipt of the Project Approval, WDA has undertaken a range of engineering and environmental investigations to inform the detailed design. WDA propose to optimise the approved project as described in the PPR and this involves refining the route along a portion of the Urban Sydney Sector of the route between Campbell Road, Alexandria and Shaft 11C, Erskineville.

This application for modification has been prepared to seek modification of Condition 2.1 of the Project Approval under Section 75W(2) of the NSW *Environmental Planning and Assessment Act 1979*. Condition 2.1 specifies a route and corresponding construction method for certain residential streets within the Urban Sydney Sector. This document also assesses the environmental impacts of the proposed refinements to the route, compared with the two PPR routes approved, and concludes that overall, the proposed refinements will provide a reduction in environmental and social impacts, compared with the PPR routes approved for construction.

1 Introduction

1.1 Background

The Water Delivery Alliance (WDA) has been established to design, construct and commission the pump station and desalinated water delivery system linking the desalination plant on the Kurnell Peninsula with the existing distribution network at Shaft 11C, Erskineville.

An Environmental Assessment (EA) was prepared by Sydney Water in November 2005 for the construction and operation of the Sydney Desalination Project, consisting of the desalination plant, intakes and outlets, and water delivery system. In November 2006, Sydney Water received Concept Approval for the desalination project as a whole and Project Approval for all its components with the exception of the water delivery pipeline, as the system required further investigations and assessment.

An EA was prepared by Sydney Water in April 2007 for the construction and operation of the desalinated water delivery system from the desalination plant at Kurnell to Sydney's water distribution infrastructure system at Shaft 11C, Erskineville. The EA responded to the requirements of the Director-General of the Department of Planning (DoP).

Subsequent to the EA for the delivery system, a Preferred Project Report (PPR) was prepared to respond to issues raised in submissions made to the DoP during exhibition of the EA. This response drew on the EA, new information gained since exhibition of the EA, and changes in response to public inputs. The PPR also detailed refinements to the route and changes to the construction method made since completion of the EA and described the project for which approval was sought. The Minister for Planning granted Project Approval for the delivery system, subject to conditions, on 22 October 2007.

The Concept and Project Approvals were granted following consideration of the EA and PPR, and supporting documents. These documents envisaged the need to optimise the design based on additional engineering and environmental information that was to become available during detailed design.

Detailed design has been progressing and, where finalised, construction has commenced along parts of the route.

1.2 Purpose of this application for modification

Since receipt of the Project Approval, WDA has undertaken a range of engineering and environmental investigations to inform the detailed design. WDA propose to optimise the approved project as described in the PPR and this involves refining the route along a portion of the Urban Sydney Sector of the route, between Campbell Road, Alexandria and Shaft 11C, Erskineville.

Section 75W of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) relates to the modification of approved projects under Part 3A of the Act. Section 75W(2) allows a proponent to request that the Minister for Planning modify a project's approval. However, section 75W(2) also states that *approval for a modification is not required if the project as modified will be consistent with the existing approval.*

This application for modification has been prepared to:

- seek modification of Condition 2.1 of the Project Approval which specifies a route and corresponding construction method for certain residential streets within the Urban Sydney Sector.

- assess the environmental impacts of the proposed refinements to the route within the Urban Sydney Sector of the route, between Campbell Road and Shaft 11C, compared with the two PPR routes approved.

Section 75W(4) allows the Minister to modify an approval (with or without conditions) or disapprove of the modification.

1.3 Approach to this application for modification

As discussed above, this application for modification has been prepared to amend Condition 2.1 of the Project Approval and assess the environmental impacts of the proposed refinements to the route. The application for modification:

- Describes the proposed refinements to the route (refer Section 2);
- Assesses whether the refinements are permitted under the existing conditions of approval by considering:
    - whether the proposed works (including the refinements) are generally in accordance with the documents listed in condition 1.1 of the Concept Approval "Terms of the Concept Approval" (refer Section 3); and
    - whether the proposed works (including the refinements) are generally in accordance with the documents listed in condition 1.1 of the Project Approval "Terms of the Project Approval" (refer Section 3);
- Assesses whether the refinements will make a material difference to anyone or the environment (refer Section 3).
- Assesses the potential environmental impacts of the refinements relative to those of the approved project (refer Section 4);
- Outlines issues relating to the refinements that were raised during consultation with affected stakeholders after receipt of the Project Approval, and during finalisation of the proposed refinements (refer Section 5); and
- Identifies the next tasks following approval of the modification (Section 6).

A condition was not considered to be relevant if it required actions or the preparation of documents to manage environmental issues, unless the issues were directly related to a stipulated route that is now the subject of a proposed refinement.

Consideration is given to whether the proposed refinements are anticipated to result in any material changes to the impacts on the social or natural environment utilising the same approach used to assess refinements to the project for the PPR. It also addresses the environmental aspects assessed in the EA. This approach involves using evaluation criteria that were established for the EA for the Desalinated Water Delivery System.

2 Project descriptions and rationale for refinement

2.1 Description of the approved project – Water Distribution System

Chapter 10 of the PPR defined the project for which Sydney Water sought approval and states that:

Sydney Water seeks Project Approval for construction, commissioning, operation and maintenance of a desalinated water delivery system linking the desalination plant on the Kurnell Peninsula with the existing distribution network.

Project Approval is sought for construction and operation of all components of the project, including those elements described in Chapter 5 of the Environmental Assessment of the Desalinated Water Delivery System, as amended by the refinements and changes outlined in Chapter 2 of this Preferred Project Report. In summary the indicative route is described in Table 10.1 and Figures 10-1, 10-2 and 10-3.

The delivery system will:

- *Be built to deliver an annual daily average of 500 ML of desalinated water per day;*
- *Link the desalination plant at Kurnell with Sydney's major water distribution system;*
- *Be generally located on the alignment indicated in Figure 10-1, Figure 10-2 and Figure 10-3;*
- *Be generally constructed using a combination of trenchless and trenched construction methods as indicated in Figure 10-1, Figure 10-2 and Figure 10-3;*
- *Require a range of construction related activities and facilities such as temporary laydown areas, temporary jetties, quays or work platforms, barges, site compounds, spoil stockpiles, connection to utility services and infrastructure, environmental controls etc;*
- *Include ancillary features to ensure safe operation and maintenance, including, but not limited to, air and scour valves, scour drain lines, isolation valves, pressure release valves, access chambers, cross connection pipework to the existing network, booster pump stations, surge protection equipment, and chlorine injection facilities;*
- *Require feasibility and pre-construction investigations, likely to include geotechnical, groundwater, soil, water and sediment studies along with other surveys and minor tasks or other activities likely to have minimal environmental impact; and*
- *Operate on a continuous (24 hours per day, 7 days per week) basis.*

The proposed refinements are considered to be generally consistent with this overall project description.

2.2 Description of the approved project – Urban Sydney Sector

The Project Approval defines the Urban Sydney Sector as "*the dry land component of the project between Kyeemagh and Erskineville (approximately 8.3 kilometres)*". Figure 10.3 of the PPR relates to the urban Sydney sector and is described in Table 10.1 of the PPR. From Sydney Park to Shaft 11C, the PPR sought approval for two routes, only one of which was to be constructed, with the selection to be made during detailed design. Table 2.1 presents the two routes assessed in the PPR. **Figure 2.1** displays the two routes described in the PPR.

Table 2.1: Routes assessed in the PPR.

Option identified in EA and PPR: "Euston Road PPR route"	Option identified in PPR: "Sydney Park PPR route"
• Trenchless construction under Euston Road.	• Trenched construction along the eastern boundary of Sydney Park.
• Trenchless construction under Harley Street and Ashmore Street to the intersection of Bridge Street and Ashmore Street.	• Trenchless construction along Mitchell Road and Ashmore Street to the intersection of Bridge Street and Ashmore Street.
• Trenched construction between the intersection of Bridge Street and Ashmore Street, and Shaft 11C.	• Trenched construction between the intersection of Bridge Street and Ashmore Street, and Shaft 11C.

2.3 Description of the refinements to the route – Urban Sydney Sector

WDA propose to refine the route within a portion of the Urban Sydney Sector of the desalinated water delivery system. Figure 2.2 displays the proposed refinements addressed in this application for modification. As indicated, the proposed refinements are restricted to the section between Campbell Road, Alexandria and Shaft 11C, Erskineville. The proposed refinements are outlined below relative to the project described in the PPR (subsequently referred to as the 'PPR routes').

The proposed refinements generally involve:

- Trenchless construction under land identified for future widening of Euston Road, from the south east corner of Sydney Park to the intersection of Sydney Park Road and Euston Road.
- Trenchless construction under Euston Lane, Maddox Street and through the Ashmore and Mitchell Industrial Estates.
- Trenched or trenchless construction (for approximately 100m) from the final launch/receival pit in the Ashmore Industrial Estate to the connection point at Shaft 11C.
- Construction of launch and recevial pits at intervals along the route.

As indicated in Figure 2.2, the refined route generally follows the alignment along the "Euston Road PPR route" between Campbell Road and Sydney Park Road. Within this section, the refined route has been determined based on consultation with Council, businesses within Euston Road, and the RTA.

While the modification proposes to refine the route between Campbell Road and Shaft 11C, the construction methodology would remain substantially the same, comprising trenchless construction, with a short section of either trenchless construction or trenching to connect the pipeline to the existing distribution system. This is considered to be generally consistent with the construction methodology proposed in the PPR.

It should also be noted that consistency assessments have been prepared for other sections of the project where refinements to the route or changes to the construction method have been proposed. Those consistency assessments concluded that the proposed refinements/changes were generally in accordance with the Concept and Project Approvals. The refinements/changes assessed for the other sections of the route in the Urban Sydney Sector have also been included in Figure 2.2.

2.4 Rationale/justification for refinements to the route

A range of engineering and environmental investigations and stakeholder consultation have been undertaken following completion of the PPR to inform the detailed design. The availability of additional information has enabled the design in the Urban Sydney Sector between Campbell Road and Shaft 11C to be optimised by refining the two PPR routes, to minimise overall environmental and social impacts, including:

- less traffic disruption, including affecting fewer residential streets
- less receivers experiencing noise impacts
- avoids potential safety risks and disruptions to Erskineville Primary school
- avoids former landfill areas within Sydney Park
- reduces impacts to existing businesses
- consistent with Council's Development Control Plan (DCP) for the Ashmore Precinct
- less geotechnical implications as the refined route is through residual soil or shale rather than former areas of landfill
- shorter route which minimises service disruptions.

Section 5 provides additional detail and an environmental assessment of the proposed refinements.

While the main reason for the proposed refinements is to reduce overall environmental and social impacts, the same approach used to evaluate the refinements presented in the PPR was adopted to assess the proposed refinements, and ensure a consistent approach was applied to the evaluation of refinements during project development. As required by Section 5.2 of the EA, refinements to the route were made to:

- *Avoid ground conditions or services that present significant construction difficulties;*
- *Reduce construction timeframe; or*
- *Reduce environmental or social impacts on residents and businesses.*

The evaluation of the refinements to the route against these criteria is presented below.

Avoid ground conditions or services

The proposed refinements will reduce the number of points the pipeline crosses existing services such as water, gas, sewer, electricity, and communications. Under the proposed refinements, the intersection of Maddox Street and Euston Lane is the only location where services will be crossed, potentially requiring the relocation of a 132kV cable and the diversion of a sewer reticulation line. An investigation of services for the EA (GHD, 2007), identified that there are a number of services within Euston Road that have the potential to influence the location of the pipeline, including:

- Gas service located in south bound carriage;
- Electrical substation located at 160 Euston Road and associated electrical cables;
- Stormwater channel crosses under the road;
- Sewer service in south bound carriage and a sewer main at the corner of Euston Road and Campbell Road; and
- Telstra services.

The proposed location of the pipeline within the road verge, rather than the carriageway as per the PPR, reduces the number of services impacted. This reduces the number of temporary service relocations required and the duration customers may be affected by service interruptions. It also reduces construction complexity, cost, and potential safety and traffic management issues.

Similarly, Sydney Park is built on an old brick pit that was subsequently used as a landfill. As such, significant geotechnical and contamination investigations would have been required for this route. By avoiding the Sydney Park PPR route, construction complexity, cost, and potential contamination and disposal issues are also reduced or avoided.

In addition, the refined route would be located within land owned by the RTA and dedicated for future road widening. The RTA have advised that microtunneling at the depths proposed within the refined alignment is preferential to the routes described in the PPR, as the refinements and depth have less potential to affect future road projects.

Reduce construction timeframe

While not likely to reduce the construction timeframe, the refined route within this section will be constructed within the overall timeframe for the project.

Reduce environmental or social impacts

The proposed refinements would reduce the overall environmental or social impacts by avoiding construction in Sydney Park Road, Euston Road, Mitchell Road, Harley Road, Ashmore Street and Bridge Street. However, the proposed refinements will affect new receivers within Euston Lane and Maddox Street. It has been estimated that the proposed refinement will potentially affect approximately 130 residents, compared with 285 and 360 residents potentially affected by the Euston Road and Sydney Park PPR routes.

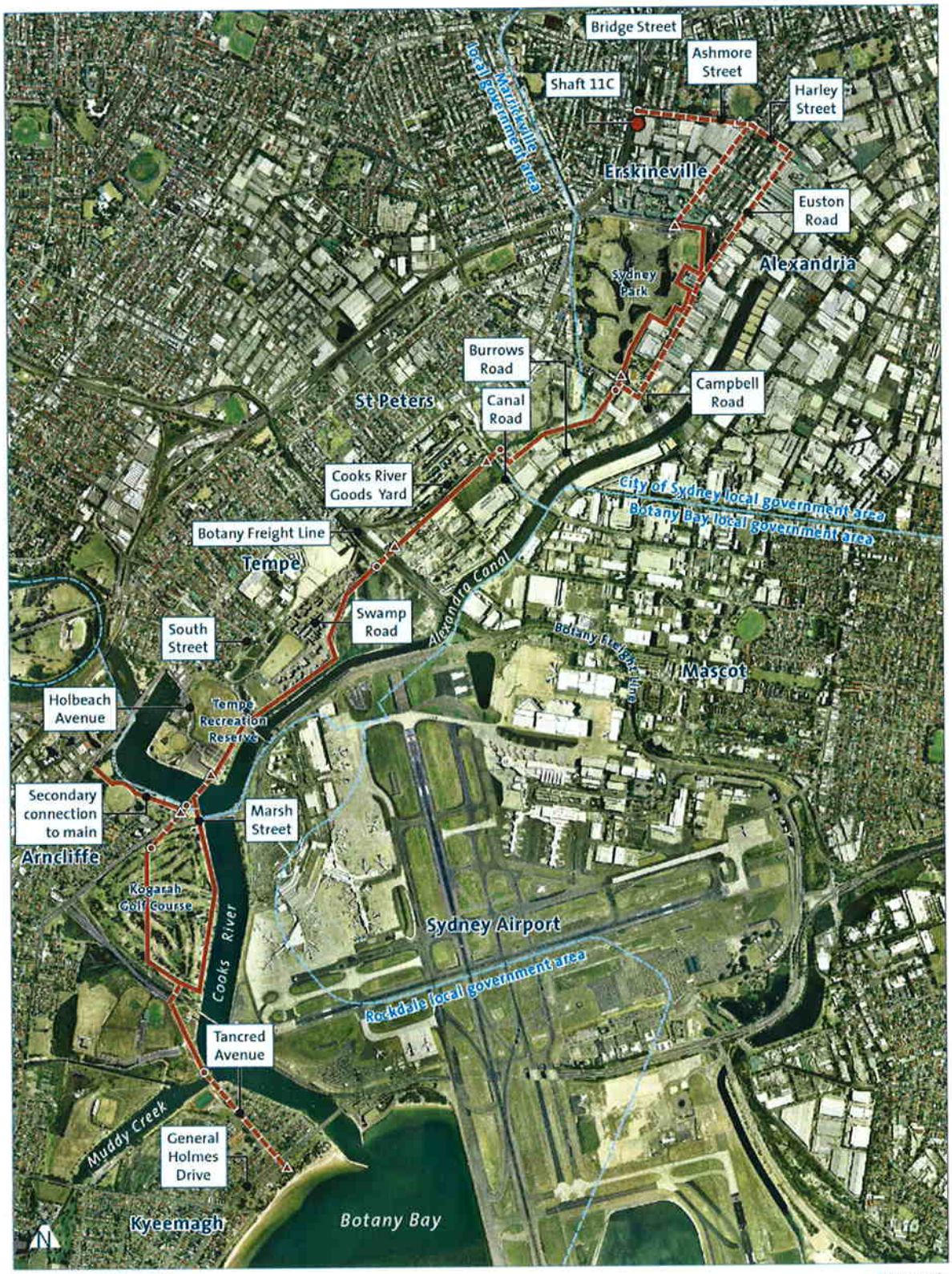

Figure 2.1: Project as described in the PPR

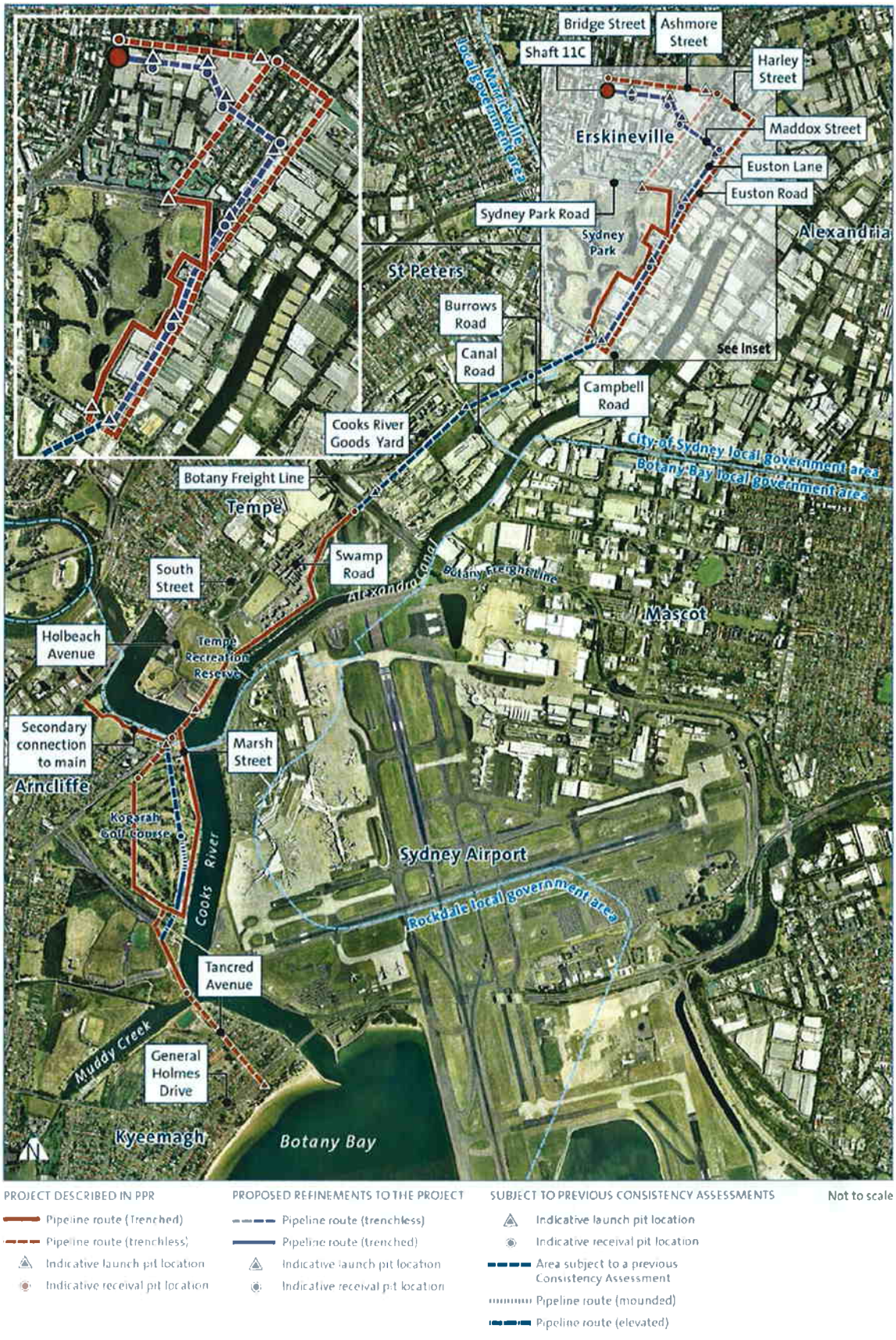

Figure 2.2: Proposed refinements to the route

3 Consistency Assessment

A consistency assessment was commenced for the proposed refinements to determine if the refined route was generally in accordance with the planning approvals and associated documentation. It was found that the proposed refinements were not consistent with one of the conditions of the Project Approval. At this point, preparation of the consistency assessment ceased, and this application for modification prepared. The results are summarised below.

3.1 Consistency with the Concept Approval

The proposed refinements are considered to be consistent with the Concept Approval. Refer to Appendix A for further details.

3.2 Consistency with the Project Approval

The Project Approval includes a number of conditions with which the project must comply. These conditions relate to requirements such as environmental monitoring and auditing etc, or to other parts of the project, for example Botany Bay impacts and coordination. Appendix A includes details of consistency of the proposed refinements with the Project Approval. A copy of the Project Approval is included as Appendix B.

Condition 1.1 - Terms of the Project Approval requires the project to be carried out in accordance with various documents including the conditions of project approval. Of these conditions, Condition 2.1 is the only one that directly relates to this application for modification.

3.2.1 Condition 2.1

Condition 2.1 of the Project Approval stipulates routes for the delivery system and the application of construction methods. Condition 2.1 requires that trenchless construction be undertaken at various locations along the route and states that:

"*without limiting or restricting the selection of a construction method for other parts of the project, the Proponent shall ensure that the project parts identified in Table 1 are only constructed using a trenchless technology*"

Table 1: Trenchless Technology Project Segments

Sector	*Description*	*Location*
Urban Sydney Sector	*Under residential streets and watercourses*	*From Cook Park along Tancred Avenue and under Muddy Creek to Riverine Park (Figure 10-3 of the document referred to under condition 1.1b))*
	Under watercourses	*Under Cooks River (near Marsh Street) to Tempe Recreational Reserve (Figure 10-3 of the document referred to under condition 1.1b))*

	Under major rail infrastructure	*Under Botany Freight Line (Figure 10-3 of the document referred to under condition 1.1b))*
	Under major road infrastructure	*Under Canal Road (Figure 10-3 of the document referred to under condition 1.1b))*
	Under residential streets	*From Sydney Park, near Mitchell Road, along Mitchell Road and Ashmore Street to the Junction of Ashmore and Bridge Streets (Figure 10-3 of the document referred to under condition 1.1b))*

Within the Urban Sydney Sector covered by this assessment, Table 1 of the Project Approval requires that trenchless construction be undertaken under residential streets from Sydney Park, along Mitchell Road and Ashmore Street to the Junction of Ashmore and Bridge Streets, and refers to Figure 10.3 of the PPR. While trenchless construction is proposed from Sydney Park, the refined route passes under different streets, namely, Euston Lane and Maddox Street, then into the Ashmore and Mitchell Industrial Estates.

As Condition 2.1 specifies the residential streets in which trenchless construction must be undertaken, the WDA considers the proposed route is inconsistent with Condition 2.1 and has prepared this application for modification to obtain approval for the refined route (**Figure 2.2**).

Condition 2.1 should be modified to amend the streets identified in Table 1 of the Project Approval for trenchless construction under residential streets of the Urban Sydney Sector, as follows:

Existing approval text (Condition 2.1)	Proposed amendment to text
From Sydney Park, near Mitchell Road, along Mitchell Road and Ashmore Street to the Junction of Ashmore and Bridge Streets (Figure 10-3 of the document referred to under condition 1.1b))	*From Sydney Park (near the intersection of Euston Road), along Euston Lane to Maddox Street and through Ashmore and Mitchell Industrial Estates (Figure 2.2 of Desalinated Water Delivery System: application for modification of Project Approval for the Urban Sydney Sector: Sydney North, dated May 2008 and prepared by the Water Delivery Alliance)*

3.3 Are any new conditions required?

Section 4 assesses the potential environmental impacts associated with the proposed refinements and identifies the Minister's Conditions of Approval and Statements of Commitment that will be implemented to manage impacts. As the impacts can be managed by implementing the existing Minister's Conditions of Approval and Statements of Commitment, it is considered that new conditions are not required.

3.4 Assessing consistency with the approved project

When assessing consistency, it is generally accepted that the key tests must be drawn from the objectives of the project, description of the approved activity, and the described impacts of the project. The project objectives, description, and assessment of potential impacts are contained in a number of documents including:

- Major Project Application;
- EA of the Concept Plan for Sydney's Desalination Project;
- PPR for Sydney's Desalination Project;
- EA for the Desalinated Water Delivery System; and
- PPR for the Desalinated Water Delivery System.

3.4.1 Objectives

The proposed refinements are generally consistent with the objectives of the project (refer to Appendix A).

3.4.2 Project Description

The project descriptions in the documents listed above stated that during the course of detailed design, the alignment of the route may need to be refined. As such, the project description provides a degree of flexibility to enable optimisation during detailed design.

3.4.3 Impacts

Section 4 assesses the potential impacts of the proposed refinements. When comparing whether the proposed and approved impacts are consistent, the following issues need to be addressed:

- Are there any significant impacts?
- Are the proposed impacts similar in scale to the approved impacts?
- Will someone be affected by an impact who was not previously impacted?
- Are there any new impacts and who/what will be affected?

These issues are discussed below.

Are there any significant impacts?

The proposed refinements apply to a small proportion of the overall project, affect similar land uses to those previously affected, and will not result in any significant environmental impacts. The proposed refinements will reduce the overall environmental impacts relative to both PPR routes. Potential impacts will be managed by implementing the Minister's Conditions of Approval and Statement of Commitments (refer to Section 4).

Are the proposed impacts similar in scale to the approved impacts?

The proposed refinements apply to a small proportion of the overall project, affect similar land uses, and will result in impacts that are similar in scale to the approved impacts. Changes in the scale of impact are associated with reductions in potential impacts on land use, noise and vibration, spoil and groundwater management, and traffic.

As described in Section 5, the refinements to the route will reduce the overall environmental impacts. Potential impacts will be managed by implementing the Ministers Conditions of Approval and relevant Statement of Commitments (refer to Section 5).

Will someone be affected by an impact who was not previously impacted?

As discussed in Section 4, while the proposed refinements reduce the overall environmental impacts and the number of receivers (people/businesses) affected, the refinements require new streets to be accessed, impacting new receivers. WDA has consulted with the affected landowners (refer to Section 5) to identify potential issues which primarily relate to impacts associated with noise and vibration, traffic, and access to premises during construction. These impacts will be managed by implementing the Minister's Conditions of Approval and Statement of Commitments.

Are there any new impacts and who/what will be affected?

The proposed refinements to the route will impact two new streets (Euston Lane and Maddox Street) and the Ashmore/Mitchell Industrial Estate, using approved construction methods (trenchless and trenching). The impacts are similar to those identified in the PPR, however they will potentially impact new receivers within these streets. Potential impacts will be managed by implementing the Minister's Conditions of Approval and Statement of Commitments.

Based on the above considerations of consistency with objectives, project description and impacts, the proposed refinements are considered to be consistent with the approved project.

4 Environmental assessment

4.1 Gap Analysis / Summary of Change in Impact

This section compares the potential impacts from the proposed refinements to the route with those identified for the PPR routes. The comparison uses the potential environmental impacts assessed in the EA and PPR. Table 4.1 summarises the relative change in environmental impacts associated with the proposed refinements to the route. Additional detail is provided in Sections 4.2 to 4.4.

Table 4.1: Change in environmental impact due to the proposed refinements

Aspect	Relative change in environmental impact	Additional management measures required
Land use	Reduced impact on land use due to fewer streets affected, and reduced distance of the refined route. Refined route considers future land use within the Ashmore and Mitchell Industrial Estates and is consistent with Council's DCP for these estates.	N/A
Traffic and access	Similar type of impact, however reduced impact overall. Refined route reduces distance and number of streets affected, including reduced potential for construction impacts to Euston Road. Two new streets affected; Maddox Street and Euston Lane, which include a road closure.	N/A
Noise and vibration	Similar type of impact, however reduced impact overall due to significantly fewer receivers affected. New receivers affected at intersection of Maddox Street and Euston Lane, however with appropriate management measures, impacts comparable to PPR and EA impacts.	N/A
Flora and fauna	Refined route will have a similar impact compared to the Euston Road route described in the PPR, and a significantly reduced impact compared to the route through Sydney Park. Minimal tree removal proposed, as per the Euston Road PPR route.	N/A
Heritage	Indigenous - Similar impacts to those presented in the PPR – no known items of indigenous heritage significance will be impacted by the proposed refinement.	N/A
	Non-indigenous - Similar impacts to those presented in the PPR – there will be no direct impact to heritage items.	
Spoil management	Reduced impact relative to both PPR routes due to shorter length, subsequently reducing the volume of groundwater and spoil, including potentially contaminated spoil and potential acid sulphate soil, requiring management.	N/A

4.2 Land use

4.2.1 Summary of Approved Project

This section of the route is located in the suburbs of Alexandria and Erskineville, within the City of Sydney LGA. Land uses along this section are mainly residential, with some industrial, commercial and recreation uses. The PPR routes approved for construction had the potential to affect the following land uses:

- Residential – including terrace housing, apartments and public housing units within Harley Street, Ashmore Street, Mitchell Road, Euston Road and Bridge Street.

- Commercial – variety of businesses, primarily located in Euston and Mitchell Roads.
- Education – including Erskineville Primary School and the Lady Gowrie Child Care centre
- Industrial – Mitchell Road Estate and an electrical substation
- Recreation – Sydney Park, Erskineville Park, Erskineville Bowling Club, Erskineville Oval.

4.2.2 Assessment of Modified Project

The proposed refinements reduce the length of the pipeline, compared to the PPR routes, as well as directly affecting fewer streets. Figure 4.1 shows the land use within the area. The proposed refinements would change the potential impacts on land use as follows:

- Avoidance of impacts on the residential, commercial, educational, industrial and recreational land uses in Harley Street, Mitchell Road, Sydney Park Road, Ashmore Street, and Bridge Street.
- Impact residential, mixed and industrial land uses within Euston Lane, Maddox Street and the Ashmore and Mitchell Industrial Estates.

Changes to land use would only be for the duration of construction and no permanent land use changes are proposed. No private property will be resumed and no homes will be demolished.

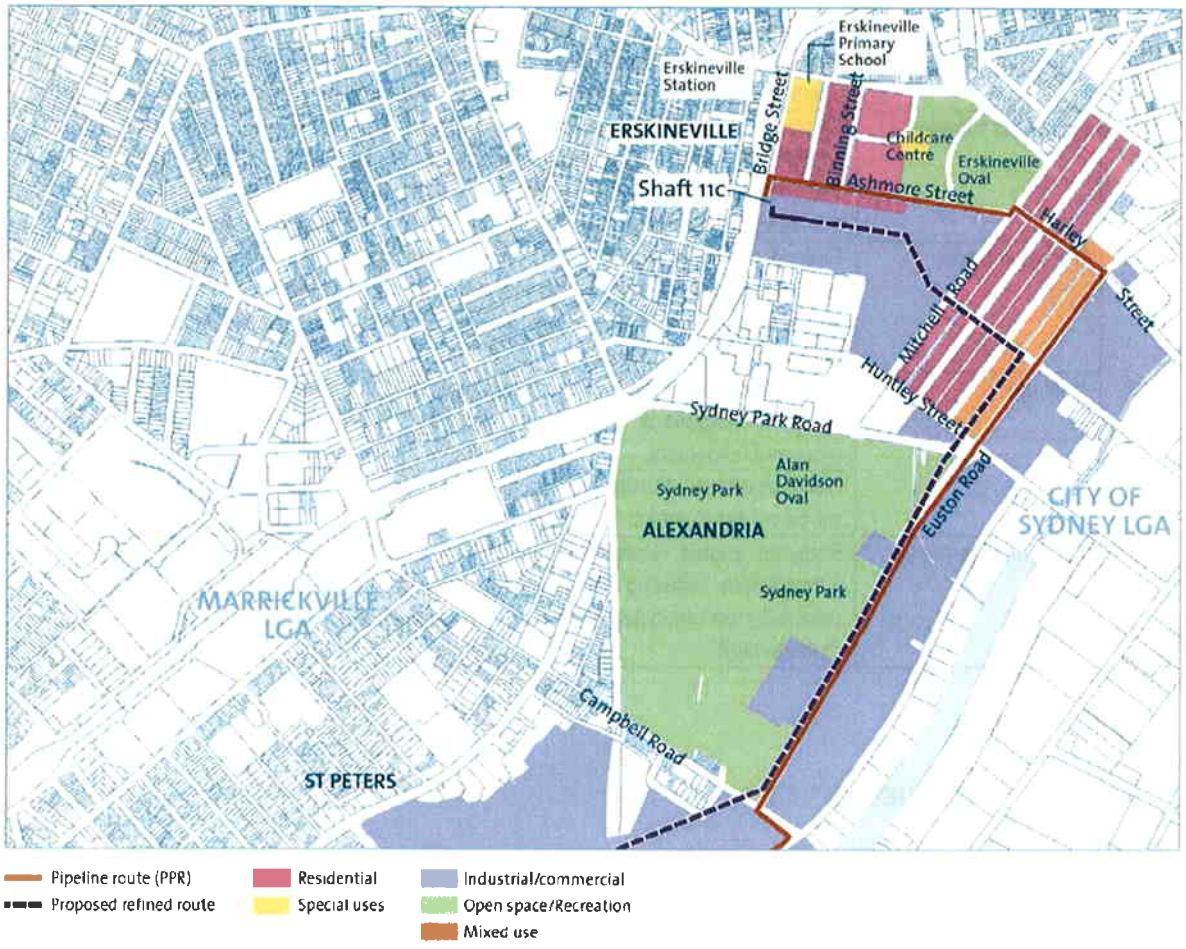

Figure 4.1: Land use – Campbell Road to Shaft 11C

Avoidance of impacts

The refined route avoids potential impacts to land use within Harley Street, Mitchell Road, Sydney Park Road, Ashmore and Bridge Streets, by avoiding these streets entirely.

The refined route involves a reduction in land use impacts on Sydney Park, namely:

- trenchless construction adjacent to Sydney Park rather than trenching through Sydney Park
- the carpark near the intersection with Mitchell Road will no longer be used as a construction compound.

As per the Euston Road PPR route, the refined route is located within RTA land, and land that has been identified for future road widening. The alignment has been determined in consultation with the RTA, who have indicated that the proposed refinements are preferential to the PPR routes. The refined route reduces the distance of the Euston Road PPR route by over 24%.

Impact to new streets/areas

The proposed refinements have the potential to impact land uses within Euston Lane, Maddox Street and the Ashmore/Mitchell Industrial Estates, as the refined route would be located under these areas.

Land use in Maddox Street is mainly residential, with some commercial uses including restaurant/cafes, offices and garage/manufacturing. Land use within Euston Lane is residential, however the properties do not front to Euston Lane. Within these streets, the route would be trenchless and pass under the road reserve, minimising impacts to land use. In addition, the properties on the eastern side of Euston Lane may have a reduced impact compared to the Euston Road PPR route as these residences no longer front onto the construction route (ie Euston Road).

Land use within the Ashmore/Mitchell Industrial Estates is industrial. The refined route within these Estates has been selected to minimise future land use issues and is consistent with the DCP for the Ashmore Precinct (Figure 4.2). While the refined route will require construction under existing industrial buildings, the route has been aligned to follow what will be future public land (eg road reserves and open space). Where the pipeline passes under existing buildings, the building footing details have been obtained, and, given the depth of the pipeline (approximately 10m below ground level) it is unlikely the footings would be impacted.

The refined route requires launch and receival pits with the potential to impact land use during construction:

- At the intersection of Maddox Street and Euston Lane are three residential apartments, and a commercial tyre facility
- Within the Ashmore/Mitchell Industrial Estates.

These land uses would not have been impacted by the routes proposed in the PPR. The launch/receival pits proposed for Sydney Park (along Euston Road) are generally consistent with the PPR routes.

4.2.3 Management Measures / Conclusion

Overall, the proposed refinements reduce the distance of the route by 500 to 600m compared with the PPR routes, or by approximately 20 to 25% of these routes. This also reduces both the number of streets and number of receivers affected.

WDA is consulting with affected stakeholders and developing formal agreements for the use of sites during the construction and operation phases (eg Ashmore and Mitchell Industrial Estates). Prior to the commencement of construction, WDA will establish Access Agreements with affected landholders that will address issues such as:

- Timing and duration of works;
- Safety;
- Security;
- Traffic management;
- Incident management; and
- Contact protocols.

However, if WDA and affected landholders are unable to reach agreement on land access, WDA will undertake the works using powers granted under the *Sydney Water Act 1994*. Sydney Water will negotiate easements for the pipeline if required, and this will take into consideration the impacts of the pipeline on future land use. Any property acquisition required will be undertaken in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*.

Consultation with affected landholders will continue as part of discussions with Sydney Water regarding operational arrangements for the pipeline.

Potential impacts on land use will be managed by implementing Statements of Commitment 13, 33, 34, 37 and 38. No new Statements of Commitment are considered necessary for the proposed refinements.

Figure 4.2: Proposed refined route relative to future land use as per DCP for Ashmore Precinct

4.3 Traffic

4.3.1 Summary of the Approved Project

The EA and PPR identified potential impacts relating to traffic and access, including those related to additional vehicles on the surrounding traffic network associated with construction works. General traffic impacts would be caused by increases in heavy vehicle movements due to the transportation of material (including spoil transport), deliveries of pipes, plant and machinery to/from the proposed work site on the surrounding road network, as well as light vehicles associated with staff movements.

The PPR routes had the potential to impact a wide road network associated with construction under the following streets: Euston Road, Sydney Park Road, Mitchell Road, Harley Street, Ashmore and Bridge Streets. Impacts within and surrounding these streets included (among others):

- additional vehicles on the surrounding road network (as above)
- numerous partial road closures
- closure of the northern end of Bridge Street
- loss of on street parking
- relocation of bus stops and the diversion of on-road cycle routes.

4.3.2 Assessment of Modified Project

The proposed refinements would have similar impacts on traffic and access in terms of number and type of vehicles for deliveries, etc compared to the PPR routes. However locating the pipeline along the edge of Sydney Park is predicted to have fewer traffic impacts due to the construction of the pipeline within the park, rather than within the road.

Overall, the proposed refinements would change the potential impacts on traffic as follows:

- No longer affects Harley Street, Mitchell Road, Sydney Park Road, Ashmore and Bridge Streets, by avoiding these streets entirely.
- Reduces overall impacts on Euston Road by:
    - Reducing the total length of construction under Euston Road by approximately 25%
    - Improving the alignment of the pipeline and location of the launch/receival pits.
- Reduces overall distance of route by 500 – 600m compared with the Euston Road and Sydney Park PPR routes.
- Impacts on new streets/areas; Maddox Street, Euston Lane and within the Ashmore/Mitchell Industrial Estates.

The roads located in the immediate vicinity of the refined route are included in Figure 4.3.

Avoidance of Impacts

The proposed refinements to the route would reduce the overall impact compared to both PPR routes, as fewer streets would be affected, and less road distance affected. This avoids impacts such as partial and complete road closures, loss of on-street parking in each of the streets, relocation of bus stops and cycleways, etc. Similarly, the reduced length of the pipeline and relatively straighter alignment, compared to the PPR routes, reduces the number of launch/receival pits required, reducing the amount of construction traffic within the Alexandria and Erskineville area.

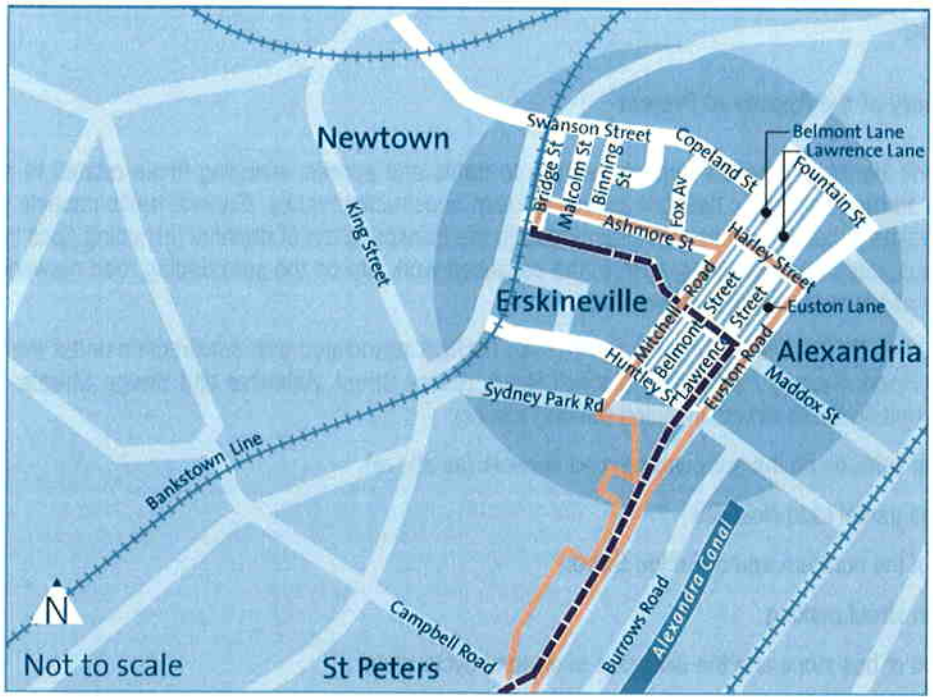

Figure 4.3: Roads in the immediate vicinity of the refined route

Reduced impacts on Euston Road

The refined route passes under Euston Road between Campbell Street and Sydney Park Road. The Euston Road PPR route passed beyond this area, through to Huntley Street (refer Figure 4.3). Impacts on Euston Road include:

- partial road closures in the immediate vicinity of the launch and receival pits. Half of the road will be available and two way traffic movement maintained.
- Loss of approximately 10 to 12 on-street parking spaces in the immediate vicinity of the construction zone.

These impacts are the same as the PPR, however the extent is less due to the shorter distance of road tunnelled under, and the alignment through the road verge rather than the carriageway. In addition, the PPR management measures will be applied. The proposed refinements have been undertaken in consultation with the RTA.

Impacts on new streets

The refined route passes under the following new roads and road reserves:

- Euston Lane (between Huntley and Maddox Streets)
- Maddox Street (from Euston Lane through to the Ashmore/Mitchell Industrial Estate)
- Ashmore/Mitchell Industrial Estate (future roads as per the DCP).

Impacts on these areas are generally limited to the areas of the launch and receival pits. Launch pits are approximately 6m x 6m, while receival pits are approximately 12m x 6m. All pits will be within construction compounds. The launch pit requires a larger construction compound relative to the receival pit as it is open for a longer period of time and pipe deliveries and spoil management activities occur at this location.

The exact locations and nature of the shafts will be determined during detailed design, however they will be sited to minimise traffic impacts, where possible, for example on the road verge along Euston Road. The entry and exit routes for the work sites will be finalised during detailed design and included in the Construction Traffic Management Plan (MCoA 5.2c and SOC 12). Access through and to the Euston Road (Sydney Park) and the Ashmore and Mitchell Industrial Estates work-sites will be via defined access-ways. The timing of the proposed works along this section of the route is proposed from July 2008 to July 2009.

Euston Lane

Euston Lane is a local access serving residences backing onto the lane. It has very low traffic volumes consisting of local residential traffic only with no appreciable through traffic. Due to its narrow width (approximately 3.5 to 4.0m), heavy vehicles would rarely use the access lane and if so, would be destined for an adjacent property. There is no on-street parking available along Euston Lane, although accesses to off-street parking are evident.

Maddox Street

Maddox Street is a local road serving mainly residential, and some commercial land uses, with two travel lanes and kerbside parking on both sides. It connects Mitchell Road at a roundabout intersection to the west with Euston Road (and beyond) at a signal-controlled intersection to the east. The speed limit is 50 km/h and it has a 3-tonne weight restriction (west of Euston Road). Daily traffic volumes along Maddox Street are relatively low in comparison with the adjacent road network and are typical of a local road.

Ashmore/Mitchell Industrial Estate

The Ashmore and Mitchell Industrial Estates are primarily large scale, light industrial businesses with some commercial, retail and residential uses. One business within the Mitchell Estate requires access for B-Doubles to maintain normal operation. Figure 4.4 shows businesses located between Campbell Road and Shaft 11C that require access for B-Doubles and semi trailers to maintain normal operation.

The potential traffic impacts associated with the proposed refinements on Euston Lane, Maddox Street and the Ashmore/Mitchell Industrial estates are identified in Table 4.2. Euston Road was one of the roads affected in the PPR, and the reduced impact was addressed above.

Table 4.2: Potential traffic impacts on Euston Lane, Maddox Street and the Ashmore/Mitchell Industrial Estates

Location	Traffic Movement	Access	Parking	Heavy Vehicles
Euston Lane	Temporary impacts on travel routes for residents due to closure of Maddox Street	Access to Euston Lane will be maintained via Harley Street (north) and Huntley Street (south) during the Maddox Street road closure. Pedestrian access around the temporary work zone will be maintained.	No parking would be affected	N/A
Maddox Street	Road closed - between Euston Lane and Lawrence Street. Temporary impacts on travel routes	Access will be arranged for residents through the temporary work zone Access will be maintained to the tyre exchange business via the existing access on Euston Road	Loss of approximately 10-12 on-street parking spaces in vicinity of construction zone.	Heavy vehicles would leave the work sites off Euston or Mitchell Roads, prior to accessing the arterial road network. Some access would be restricted.

Location	Traffic Movement	Access	Parking	Heavy Vehicles
Ashmore/ Mitchell Industrial Estates	Potential delays to traffic flow within the Estate	Existing access maintained or suitable alternative temporary access provided to industrial and commercial businesses, including business using B-doubles (Figure 4.4) within the Estates.	Temporary loss of some off-street parking spaces.	N/A – no heavy vehicle marshalling areas proposed due to low number of daily movements

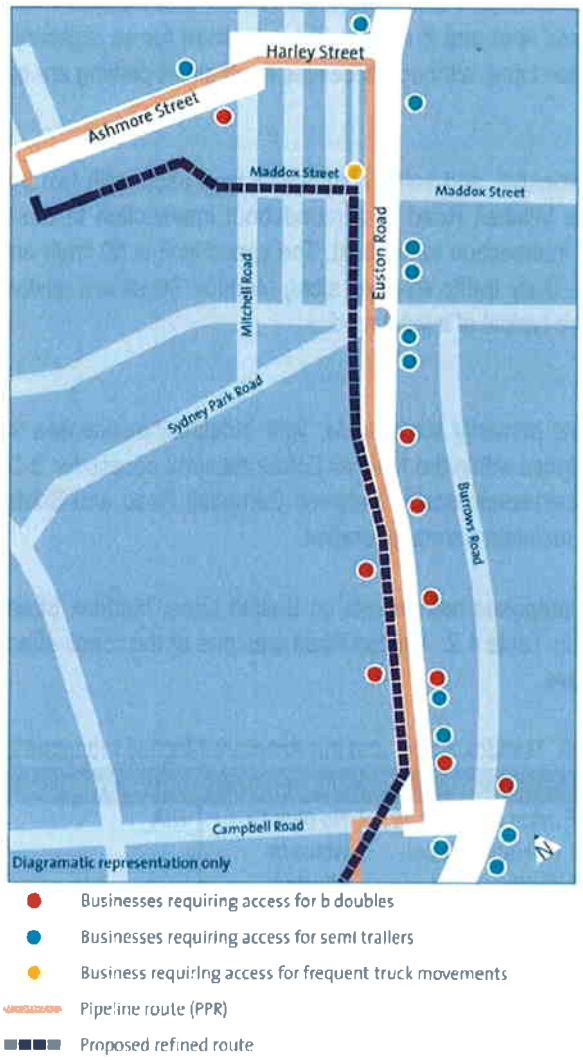

Figure 4.4: Businesses between Campbell Road and Shaft 11C that require access for large vehicles

Trenchless construction along the refined route would operate 24 hours per day, seven days per week, to reduce the construction timeframe and avoid traffic disruptions and other impacts on residents and businesses along the refined route (Euston Road, Euston Lane, Maddox Street and Ashmore /Mitchell Industrial Estates) that would occur if construction is limited to general construction hours only (Monday to Friday 7am-6pm and Saturday 8am-1pm).

Launch and receival pits will be located to minimise impacts on property access, as well as ensuring that swept paths for heavy vehicles can be accommodated. Traffic controls will be implemented during road closures including suitable vehicle detours and signage (warning, details of road closures, and detour signage to guide vehicles around the road closure and continue to their destinations), and when required for large/heavy vehicles. These will be detailed in the Construction Traffic Management Plan prepared for the area.

4.3.3 Management Measures / Conclusion

The proposed refinements will result in similar types of impacts on traffic to those presented in the PPR as the same types of vehicle movements will be required to deliver plant and machinery. The impacts will result in short term traffic delays, and existing traffic and access arrangements will be reinstated following completion of construction. The refined route will not result in any long term impacts on traffic or access. Overall, the refinement will reduce impacts on the traffic network compared to those associated with the PPR routes.

Potential impacts on the surrounding road network will be minimised by implementing Statement of Commitment 12, which requires preparation of a Construction Traffic Management Plan. Statement of Commitment 13 will also be implemented which requires that arrangements be developed to ensure public safety and minimise disruption to property access, parking, access to recreational areas, bus services, pedestrians and cyclists at all times where feasible during construction. Potential impacts will also be managed by undertaking the project in accordance with conditions 2.10, 2.11, 2.12, and 5.2c of the Project Approval. No additional Statements of Commitment are considered necessary for the proposed refinements.

4.4 Noise and Vibration

4.4.1 Summary of the Approved Project

Noise

The EA and PPR included noise modelling results, and an assessment of potential noise impacts. Table 4.3 provides a summary of the key findings from the EA and PPR for this section of the route.

Table 4.3 Summary of EA and PPR noise assessment findings

Location	Activity	Nearest receiver (m)	Construction noise goals[1] ($L_{A10(15\text{-}min)}$)	Expected exceedances – no mitigation	Expected exceedances – with mitigation[2]
Alexandria	Trenching	5	Day – 63-78	21 – 37	3 – 19
Erskineville	Trenching	4	Day – 63	23 – 39	5 – 21
Euston Road	Launch and receival pit – EA		Day – 68	6 – 20	0 – 2
Harley Street and Mitchell Road	Launch and receival pit – EA	6	Day – 68	5 – 20	0 – 2
Ashmore Street and Mitchell Road	Launch and receival pit – EA	20	Day – 68	13 – 28	13 – 28
Ashmore Street/ Mitchell Road	Retrieval and launch pit	35	Day – 53	13-27	0 – 9
Ashmore Street/ Bridge Street	Receival pit	6	Day – 53	28-44	10 – 26
Sydney Park	Trenching	70	Day – 53	13-21	0 – 6

Notes

1 The construction noise goals were based on day time criteria plus 10 dB, ie based on a construction period of between 4 and 26 weeks.

2 An indicative reduction of 18dB was used, based on an assumed reduction for standard mitigation measures such as barriers or enclosures.

In addition to the noise levels identified in Table 4.3 above, night time exceedances were identified, associated with tunnel boring and pipeline installation. At the nearest residence to the Ashmore Street/Mitchell Road retrieval and launch pit (35m), activities were expected to exceed criteria by 2 and 3 dB, with mitigation.

Vibration

The PPR indicated that there was the potential for construction activities to exceed the annoyance criteria associated with both tunnelling and trenching construction activities as follows:

- sheetpiling within 20m of residences
- rockbreaking (heavy) within 20m of residences
- vibratory rollers within 20m of residences
- microtunnelling within 10m of residences

In addition, some regenerated noise impacts were likely to be experienced by residents (approximately 50 dB(A)), for an average of 3 days, when microtunneling works are within 20m of the dwelling foundations.

4.4.2 Assessment of the Modified Project

Noise

Overall, the proposed refinements to the route would have a reduced potential for noise impacts, due to the significantly reduced number of receivers affected in Euston Road, Harley, Ashmore and Bridge Streets. New receivers at the intersection of Maddox Street and Euston Lane would be affected, however the type of impacts predicted are the same as per the PPR and EA, as are the proposed mitigation measures.

Noise modelling has been undertaken for the proposed refinements to the route. The potential for construction activities to cause noise that would impact on residential amenity surrounding the proposed launch and receival pits along the refined route has been assessed.

The approach to this assessment has focussed on the sites of the proposed launch and receival pits, and their nearest residences, including:

- establishment of construction noise goals / criteria for each of the sites
- calculation of likely noise levels and an assessment of the expected exceedances with and without mitigation
- comparison of the potential noise impacts associated with the proposed refinements with those identified in the PPR and EA.

More conservative criteria compared to the PPR has been used to ensure that potential impacts demonstrate the worst case scenario.

This section of the route has been divided into four geographical areas to present and compare the information. Table 4.4 provides details of the sites of the proposed launch and receival pits. Figure 4.5 shows the location of the launch and receival pits.

Table 4.4 Location of launch and receival pits

Area	Location	Key	Pit type
Area 1	Euston Road, between Campbell Road and Sydney Park Road	1LP1	Launch pit
		1L/RP1	Launch or receival pit
		1L&RP1	Launch and receival pit
Area 2	Intersection of Maddox Street and Euston Lane	2L&RP1	Launch and receival pit
Area 3	Ashmore/Mitchell Industrial Estate	3L/RP1	Launch or receival pit
		3L/RP2	Launch or receival pit
		3L/RP3	Launch or receival pit
Area 4	Ashmore/Mitchell Industrial Estate	-	Trenching

It should be noted that receivers near Areas 1, 3 and 4 were to be potentially affected by the PPR routes, with generally the same type and level of impacts. Receivers in Area 2 (Maddox Street/ Euston Lane) are new receivers not previously identified.

Overall, the refined route has the potential to impact substantially less receivers compared with both PPR routes.

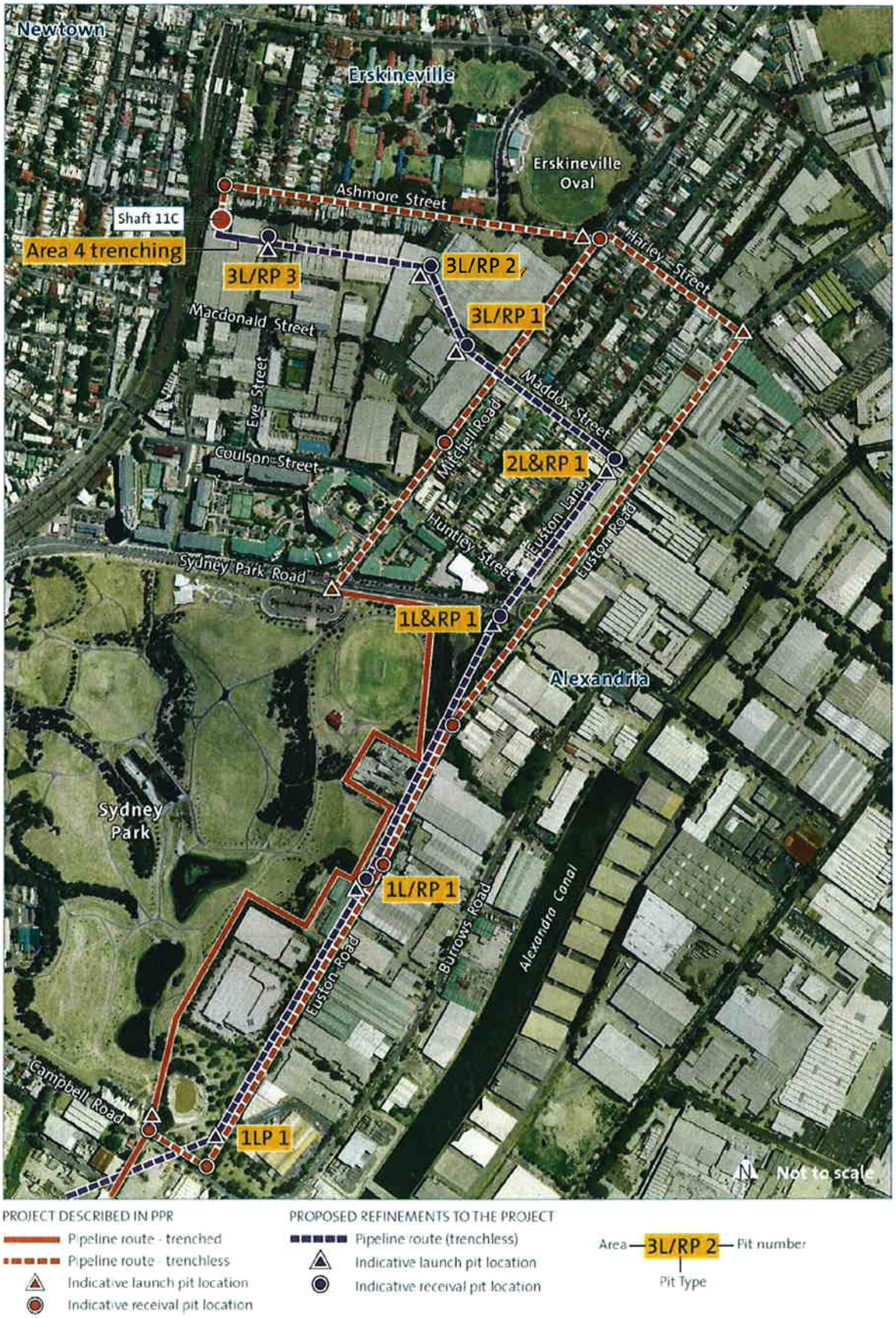

Figure 4.5: Location of launch and receival pits along the proposed refined route

Approach to calculating noise assessment

As identified above, a conservative approach to calculating the criteria used in this assessment has been applied, for the following calculations/assumptions:

- construction timing
- construction noise criteria
- background noise levels
- indicative reduction for standard mitigation measures
- construction activities.

Construction Timing

Time restrictions are the primary form of criteria used to minimise impacts from construction on the community. This is because construction is not permanent in nature and inevitably results in excessively high noise levels that are not readily controlled. The emphasis is therefore placed on adopting all reasonable and feasible mitigation.

As per the PPR and Construction Noise and Vibration Management Plan (CNVMP), the Department of Environment and Climate Change's (DECC) guidelines for construction noise will be adopted. In the first instances, these guidelines specify time limits for construction activities where construction noise is audible at residential premises, as outlined below:

- Monday to Friday, 7:00 am to 6:00 pm;
- Saturday, 8:00 am to 1:00 pm, otherwise 7:00 am to 1:00 pm if inaudible at residential premises; and
- No construction on Sundays or public holidays.

A second means of assessing the potential for noise impacts at residences is described below in the form of noise levels. The DECC rarely use noise level limits on construction sites, but require levels to be used to guide the likelihood of impacts. The approach is dependent upon the cumulative duration of noise exposure at a site and the existing representative background noise level at residences prior to any works.

Construction noise criteria

The duration of construction works are expected to vary along the route depending on the construction method, length of the delivery section being constructed and other factors (e.g. geotechnical conditions). For this assessment, derivation of noise level based criteria conservatively assumes construction duration of greater than 6 months for all pits. This results in the application of the strictest noise level criteria of background plus 5dB (refer Table 4.5 below). For example, while the Maddox Street / Euston Lane pit works will span a cumulative period of approximately 9 months, it is likely that construction will only result in less than 6 months of actual noise exposure. Where total duration of all activities combined is less than 26 weeks, criteria should be increased to background plus 10dB (between 4 and 26 weeks) or background plus 20dB (less than 4 weeks).

Table 4.5 DECC-Recommended Noise Goals for Construction Works

Period of Noise Exposure	$L_{A10(15min)}$ Construction Noise Goal
Cumulative noise exposure period not exceeding 4 weeks	$L_{A90(15min)}$ plus 20 dBA
Cumulative noise exposure period of between 4 and 26 weeks	$L_{A90(15min)}$ plus 10 dBA
Cumulative noise exposure period longer than 26 weeks	$L_{A90(15min)}$ plus 5 dBA

Construction noise goals for each site were calculated using the cumulative noise exposure period of longer than 26 weeks, in all cases, except Area 4. Area 4 used the cumulative noise exposure for between 4 and 26 weeks as this section is particularly short and works will occur over a period of two or three months. Night time noise criteria in all cases are based on background plus 5dB.

Background noise levels

The assessment adopted a conservative background noise level for newly exposed residential areas where specific data is not available. However, this will be revised once data is collected at these, or representative locations, as per the CNVMP. For example, representative background noise levels for the Maddox Street/Euston Lane pit is based on the lowest available data in the area, which was collected at Bridge Street. Where representative background noise data is not yet available for newly affected residences, the quietest data available is adopted from monitoring undertaken at residences in the locality. This provides a "most affected residence" approach to the assessment.

Indicative reduction for standard mitigation measures

A conservative reduction of 12 dB has been applied for standard mitigation measures, compared to 18 dB used for the PPR assessment. This is considered to be a more readily achievable performance by say a solid noise wall, and likely to be conservative.

Construction activities

There is some scope to refine the construction method during detailed design. This would provide the basis for the assessment of noise impacts that forms part of the CNVMP, however the 'loudest' construction method has been used for this assessment.

Results of Assessment

Results of the noise assessment undertaken for each area are presented in Tables 4.6 to 4.12 below. Figure 4.5 shows the proposed location of each of the pits within this section of the route. For each of the assessments, the following detail has been applied:

- Daytime criteria is based on background plus 5dB (except Area 4). Where total duration of all activities combined is less than 26 weeks, criteria above should be increased by 5dB or background plus 10dB
- Night time criteria is based on background plus 5dB
- Pit excavation – plant equipment includes truck, generator, excavator and with/without rock-hammer
- Sheet piling – plant equipment includes truck, 50t crane, sheet piling rig
- Tunnel boring – plant equipment includes TBM, crane, separation plant and ventilation fans
- Pipe installation – plant equipment includes crane, truck and generator.
- Retrieving boring machine – equipment includes truck and crane.

Area 1 - Euston Road Launch and receival pits

Table 4.6 details the construction noise levels at Area 1 - Launch pit 1 (1LP1). The most affected residential receiver is located approximately 80m from construction works, on Campbell Road.

Table 4.6: Construction noise levels at Area 1 – Launch pit 1 (1LP1)

Location / Activity	Duration of works (weeks)	Noise at residence (No Mitigation) dB(A)	Period	Criteria dB(A)[1,2]	Exceedance dB(A)	Exceedance with Mitigation dB(A)
1LP1: Area 1 – Launch pit 1, Euston Road. Most affected residence ~ 80m Campbell Street						
Sheet-piling	2	65	Day	57	8	0
Pit excavation	6	74	Day	57	17	5
Tunnel boring	8 – 9	63	Day	57	6	0
			Night	53	10	0
Install pipeline	6 – 6.5	62	Day	57	5	0
			Night	53	9	0

Table 4.6 shows that with appropriate mitigation, there would be an exceedance of day time noise levels by 5 dB(A). This is less than the noise levels identified for this area in the PPR, and significantly lower than the trenching levels proposed for this area in the EA. In addition, conservative criteria have been used, based on construction occurring for up to 9 months.

Overall, the proposed refinements near this site would have a reduced noise impact compared to the EA and PPR.

Table 4.7 details the construction noise levels at Area 1 – Launch/receival pit 1 (1L/P1). The most affected residential receiver is located approximately 400m from the construction works, on Sydney Park Road.

Table 4.7: Construction noise levels at Area 1 – Launch/receival pit 1 (1L/RP1)

Location / Activity	Duration of works (weeks)	Noise at residence (No Mitigation) dB(A)	Period	Criteria dB(A)[1,2]	Exceedance dB(A)	Exceedance with Mitigation dB(A)
1L/RP1: Area 1 – Launch/receival pit, Euston Road. Most affected residence ~ 400m Sydney Park Road						
Sheet-piling	2	51	Day	67	0	0
Pit excavation	6	60	Day	67	0	0
Tunnel boring	9	49	Day	67	0	0
			Night	45	4	0
Install pipeline	9	48	Day	67	0	0
			Night	45	3	0
Retrieving boring machine	2	43	Day	67	0	0

Table 4.7 shows that with mitigation, there would be no exceedances of the criteria associated with construction works.

Table 4.8 details the construction noise levels at Area 1 – Launch and receival pit 1 (1L&RP1). The most affected residential receiver is located approximately 80m from the construction works, in Huntley Street.

Table 4.8: Construction noise levels at Area 1 – Launch and receival pit 1 (1L&RP1)

Location / Activity	Duration of works (weeks)		Noise at residence (No Mitigation) dB(A)	Period	Criteria dB(A)[1,2]	Exceedance dB(A)	Exceedance with Mitigation dB(A)
1L&RP1: Area 1 – Launch and receival pit 1, Euston Road. Most affected residence ~ 80m Huntley Street							
Sheet piling	2		65	Day	63	2	0
Pit excavation	6		74	Day	63	11	0
Tunnel boring	9	8	63	Day	63	0	0
				Night	45	18	6
Install pipeline	6.5	6	62	Day	63	0	0
				Night	45	17	5
Retrieving boring machine	2		59	Day	63	0	0

Table 4.8 shows that with appropriate mitigation, there would be no day time exceedances, however exceedance of night time noise criteria by 5 and 6 dB(A). This is higher than the results presented in the PPR for this area, based on a more conservative night time criteria used (45dB(A) vs 50dB(A)), and the more conservative indicative reduction for mitigation measures (12 vs 18 dB).

As such, and considering the above conservatism, the proposed refinements near this site are predicted to have a similar noise impact compared to the PPR.

Area 2 – Maddox Street/Euston Lane launch and receival pit

Table 4.9 shows the construction noise levels for the launch and receival pit within Area 2 (2L&RP1). Figure 4.5 shows that for Area 2, the nearest receivers to the proposed launch and receival pit at the intersection of Euston Lane and Maddox Street are 3 residential apartments and a tyre exchange business. The closest of these apartments is located approximately 10m from the proposed construction works.

Table 4.9: Construction noise levels at Area 2 – Maddox Street/Euston Lane intersection (2L&RP1)

Location / Activity	Duration of works (weeks)	Noise at residence (No Mitigation) dB(A)	Period	Criteria dB(A)[1,2]	Exceedance dB(A)	Exceedance with Mitigation dB(A)
2L&RP1: Area 2 – Launch and receival pit, Maddox Street/Euston Lane. Nearest residence ~ 10m						
Sheet-piling	2	83	Day	48	35	23 - 35
Pit excavation	6	85	Day	48	37	25 - 37
Pit excavation - with rock-hammer	6	93	Day	48	45	33 - 45

Location / Activity	Duration of works (weeks)	Noise at residence (No Mitigation) dB(A)	Period	Criteria dB(A)[1,2]	Exceedance dB(A)	Exceedance with Mitigation dB(A)
Retrieving boring machine	2	77	Day	48	29	17 - 29
Tunnel boring	8	81	Day	48	33	3 (Fully enclosed)
			Night	45	36	6 (Fully enclosed)
Install pipeline	6	80	Day	48	32	2 (Fully enclosed)
			Night	45	35	5 (Fully enclosed)

Table 4.9 shows that the launch and receival pit at Maddox Street/Euston Lane will result in exceedances of both the day and night time criteria, with mitigation. The day time exceedances would be short term and temporary, and are likely to be less than the figures presented, based on the use of background levels for the quietest street, and a construction period of over 26 weeks. These works would be undertaken during the DECC day time hours identified above to minimise impacts to residents. The range in figures (eg 25 to 37dB(A) for pit excavation) has also assumed that there can be no mitigation at the higher apartments.

Prior to the relatively longer term tunnelling and pipe installation works commencing, a complete enclosure will be constructed to fully enclose the pit site and all noise producing sources from that stage onwards. This will ensure significant noise level reductions to all residences (including those at height) as demonstrated in Table 4.9.

Similarly, once 24 hour construction commences the night time exceedances of 5 to 6 dB with mitigation are within the range of exceedances identified in the PPR, and are likely to be even lower.

Given each of the conservative factors applied for this site, the extent of exceedance would be within the levels considered in the EA and PPR for such works.

Area 3 – Ashmore/Mitchell Industrial Estate – 3 Launch / receival pits

Figure 4.5 shows the nearest residential receivers to the pits within Area 3. The tables below relate to the launch and receival pits which will be constructed within the Industrial Estates. While each pit will only be a launch or a receival pit, details for both are included to allow for flexibility during detailed design.

Table 4.10 details the construction noise levels at Launch/receival pit 1 - Area 3 (3L/RP1). The most affected residential receiver is located approximately 140m from the construction works, at the intersection of Mitchell and Belmont Streets.

Table 4.10: Construction noise levels at Area 3 – Launch / Receival pit 1 (3L/RP1)

Location / Activity	Duration of works (weeks)	Noise at residence (No Mitigation) dB(A)	Period	Criteria dB(A)[1,2]	Exceedance dB(A)	Exceedance with Mitigation dB(A)
3L/RP1: Area 3 – Receival pit 1, Ashmore/Mitchell Industrial Estate. Most affected residence ~ 140m Mitcehll/Belmont Street						
Sheet-piling	2	60	Day	71	0	0
Pit excavation - with rock-hammer	6	69	Day	71	0	0

Location / Activity	Duration of works (weeks)	Noise at residence (No Mitigation) dB(A)	Period	Criteria dB(A)[1,2]	Exceedance dB(A)	Exceedance with Mitigation dB(A)
Pit excavation - no rock-hammer	6	57	Day	71	0	0
Retrieving boring machine	2	54	Day	71	0	0
Tunnel boring	N/A – none likely	58	Day	71	0	0
			Night	45	13	1
Install pipeline	N/A – none likely	57	Day	71	0	0
			Night	45	13	1

Table 4.10 shows that with mitigation, 3L/RP1 is predicted to meet or imperceptibly exceed strict criteria.

Overall, the proposed refinements near this site would have a reduced noise impact compared to the EA and PPR.

Table 4.11 details the construction noise levels for launch/receival pits 2 and 3 - Area 3 (3L/RP2, 3L/RP3). The most affected residential receivers are located approximately 47m and 45m from the construction works, both in Ashmore Street.

Table 4.11: Construction noise levels at Area 3 – Launch/ Receival pits 2 and 3 (3L/RP2, 3L/RP3)

Location / Activity	Duration of works (weeks)		Noise at residence (No Mitigation) dB(A)	Period	Criteria dB(A)[1,2]	Exceedance dB(A)	Exceedance with Mitigation dB(A)
3L/RP2: Area 3 – Launch/receival pit 2, Ashmore/Mitchell Industrial Estate. Most affected residence ~ 47m Ashmore Street							
Sheet-piling	2		70	Day	48	22	10
Pit excavation - with rock-hammer	6		79	Day	48	31	19
Pit excavation - no rock-hammer	6		67	Day	48	19	7
Retrieving boring machine	2		64	Day	48	16	4
Tunnel boring	6	4.5	68	Day	48	20	8
				Night	45	23	11
Install pipeline	3.5	2.5	67	Day	48	19	7
				Night	45	22	10

Location / Activity	Duration of works (weeks)	Noise at residence (No Mitigation) dB(A)	Period	Criteria dB(A)[1,2]	Exceedance dB(A)	Exceedance with Mitigation dB(A)
3L/RP3: Area 3 – Launch/receival pit 3, Ashmore/Mitchell Industrial Estate. Most affected residence ~ 45m Ashmore Street						
Pit excavation - with rock-hammer	6	79	Day	48	31	19
Pit excavation - no rock-hammer	6	67	Day	48	19	7
Sheet-piling	2	70	Day	48	22	10
Retrieving boring machine	2	63	Day	48	15	5
Tunnel boring	N/A – none likely	68	Day	48	20	8
			Night	45	23	11
Install pipeline	N/A – none likely	66	Day	48	18	6
			Night	45	21	9

Table 4.11 shows that the launch/receival pits 2 and 3 within the Ashmore/Mitchell Industrial Estates will result in exceedances of both the day and night time criteria, with mitigation. The day time exceedances would be short term and temporary, and would be undertaken during the DECC day time hours identified above to minimise impacts to residents. They are also likely to be less than the figures presented, based on the use of the quietest background levels and adoption of a construction period of over 26 weeks. Similarly, the night time exceedances of between 9 and 11 dB(A) are likely to be lower, as conservative mitigation has been applied.

Overall, these receivers are predicted to experience similar levels of noise impacts comparable to the PPR routes.

Area 4 – Ashmore/Industrial Estate Trenching

Table 4.12 details the construction noise levels for the trenching from the Ashmore Industrial Estate to Shaft 11C. Trenched construction is proposed for this section as the excavation of launch and receival pits would lead to greater levels of disturbance compared to trenching, however trenchless construction may be required. In such an event, the receival pit would be located within the existing building. The most affected residential receiver is located approximately 10m away, within Ashmore Street.

Table 4.12: Construction noise levels at Area 4 – Trenching

Location / Activity	Duration of works (weeks)	Noise at residence (No Mitigation) dB(A)	Period	Criteria dB(A)1,2	Exceedance dB(A)	Exceedance with Mitigation dB(A)6
Area 4: Trenching - Ashmore Industrial Estate to Shaft 11C . Most affected residence ~ 10 m Ashmore Street						
Sheet piling	2-4	83	Day	53	35	18
Other activities	8-10	79-84	Day	53	36	17

Table 4.12 shows that with appropriate mitigation, there would be an exceedance of day time noise levels by approximately 17 – 18 dB). The day time exceedances would be short term and temporary, and would be undertaken during the DECC day time hours identified above to minimise impacts to residents. This exceedance is within the noise levels identified in the EA (19 – 39 dB, no mitigation). In addition, conservative criteria have been used, based on construction occurring for between 6 and 9 months.

The levels of mitigation noted in Tables 4.6 to 4.12, can be achieved by implementing measures such as the use of best available technology economically available, and fixed or mobile screens, aside from the launch/receival pit at Euston Lane and Maddox Street for which a noise enclosure is proposed. These measures will be included in the Construction Noise and Vibration Management Plan, required by Ministers Condition of Approval 2.5 and Statement of Commitment 11.

Vibration

The potential impact of vibration and regenerated noise from construction activities on the surrounding environment has been examined for the proposed refinements.

Vibration is likely to occur during construction as a result of activities such as excavation, tunnelling and installation of sheet piles. Vibration above certain thresholds can affect the integrity of structures as well as cause annoyance to occupants. Table 4.13 is based on AS2670.2-1990 and shows vibration levels that may disturb building occupants. These are annoyance based criteria and are described as peak particle velocity (PPV).

Table 4.13: Australian standards for vibration levels that may disturb occupants

	Maximum acceptable peak particle velocity (mm/s)	
Type of building occupancy	Continuous or Intermittent Vibration	Transient Vibration (several per day)
Critical working areas such as hospitals theatres, precision labs	0.1	0.1
Residential - night	0.2	0.2
Residential - day	0.3	4
Office	0.6	9

Notes: Source AS2670.2-1990

Table 4.14 (below) shows indicative PPV generated at various distances from the main equipment that is likely to generate vibration during construction. These are conservative estimates based on previous studies and data collected on this project. Ground vibration is very site specific and the actual level of vibration experienced will depend on factors such as soil properties, foundation type, and local geological features. Equally important is the separation distance between the source of vibration and the receiver. For example, the depth of the microtunnelling will be a major factor in received vibration. Generally, the greater the depth of the microtunnel the less vibration impacts experienced by receivers.

Table 4.14: Indicative vibration levels likely to be generated during construction

Equipment	Vibration peak particle velocity (mm/s)				
	5m from the works	10m from the works	14m from the works	17m from the works	20m from the works
Sheet Piling (as measured on this project (Canal Rd))		0.96 – 3.13			
Piling (5000kg hammer; hollow steel pile; Junttan PM25) 300mm drop 400mm drop 900mm drop	 3.5-4.2 5.7-8.0 9.7-10.9	 -	 1.5-2.0 2.4-3.3 -	 2.5-2.9 - -	 -
Hydraulic rock breaker (heavy)	4.5	1.3	-	-	0.4
Hydraulic rock breaker (light)	1	0.3	-	-	0.1
Vibratory roller	-	-	-	-	1.5
Bulldozer	1 - 2	-	-	-	<0.2
Tunneling machine	0.5	0.13	-	-	0.04
Trucks	-	-	-	-	0.01-0.2

Comparing the indicative levels in Table 4.14 with the criteria in Table 4.13 indicates that construction activities are likely to exceed the annoyance criteria in the following circumstances:

- Sheetpiling within 20m of residences
- Rockbreaking (heavy) within 20m of residences
- Vibratory rollers within 20m of residences
- Microtunnelling within 10m of residences.

Construction through residential areas would be undertaken using trenchless methods, meaning that potential impacts associated with sheetpiling, rockbreaking and vibratory rollers would be limited to the area in the vicinity of the launch and receival pits. The distance to residences from the launch/receival pits within this section of the route are approximately:

- 80m, 400m and 80m from the three pits along Euston Road (1LP1, 1RP1, 1LP2)
- 10m for the Euston Lane/Maddox Street pit (2L&RP1)
- 147m, 47m and 45m from the three pits within the Ashmore/Mitchell Industrial Estate (3L/RP1, 3L/RP2, 3L/RP3).

As such, construction of these pits using sheetpiling, rockbreaking and vibratory rollers may exceed the annoyance criteria at the residences within 20m for approximately 2 weeks. The only pit location where this is likely is at the Maddox Street/Euston Lane intersection ie 2L&RP1. It should also be noted that the nearest residence (approximately 10m) to the proposed trenching to Shaft 11C is likely to experience vibration which may exceed the annoyance criteria.