WestConnex M4-M5 Link

Mainline Tunnel

Modification report

Appendix C

Noise and vibration report

Roads and Maritime Services

WestConnex M4-M5 Link

Mainline Tunnel – Modification report

Appendix C Noise and vibration report

September 2018

Prepared for

Roads and Maritime Services

Prepared by

SLR Consulting Australia

Contents

Glossary of terms and abbreviations

Term	Definition
AS	Australian Standard
BS	British Standard
CEMP	Construction Environmental Management Plan
CNVMP	Construction Noise and Vibration Management Sub-Plan
CORTN	Calculation of Road Traffic Noise
CSSI	Critical State Significant Infrastructure
dB	Decibels
dBA	A-weighted decibels
dBL	Linear weighted decibels
DECC	Department of Environment and Climate Change NSW
DECCW	Department of Environment, Climate Change and Water NSW
DGA	Dense Graded Asphalt
DIN	Deutsches Institut für Normung
DP&E	(NSW) Department of Planning and Environment
ECRTN	Environmental Criteria for Road Traffic Noise (replaced by the RNP)
EIS	Environmental Impact Statement
ENMM	Environmental Noise Management Manual
EPA	(NSW) Environment Protection Authority
EPL	Environment Protection Licence
ICNG	Interim Construction Noise Guideline
$L_{A1(1minute)}$	The "typical maximum noise level" for an event, used in the assessment of potential sleep disturbance during night-time periods. Alternatively, assessment may be conducted using the L_{Amax} or maximum noise level
L_{A90}	The "background noise level" in the absence of construction activities. This parameter represents the average minimum noise level during the daytime, evening and night-time periods respectively. The $L_{Aeq(15minute)}$ construction Noise Management Levels (NMLs) are based on the L_{A90} background noise levels.
$L_{Aeq(1hour)}$	The 'energy average noise level' evaluated for a specific one-hour period.
$L_{Aeq(9hour)}$	The 'energy average noise level' evaluated over the night-time period (10.00 pm to 7.00 am).
$L_{Aeq(15hour)}$	The 'energy average noise level' evaluated over the daytime period (7.00 am to 10.00 pm). The L_{Aeq} can be likened to the average of all the noise events occurring in the relevant time period.
$L_{Aeq(15minute)}$	The "energy average noise level" evaluated over a 15-minute period. This parameter is used to assess the potential construction noise impacts
L_{AFmax}	The maximum fast time weighted noise level from road traffic noise occurring at a particular location.
LPI	NSW Land and Property Information
MIC	Maximum Instantaneous Charge
NATA	National Association of Testing Authorities
NCA	Noise Catchment Area
NCG	Noise Criteria Guideline
NMG	Noise Mitigation Guideline
NML	Noise Management Level.
OEH	Office of Environment and Heritage
OGA	Open Graded Asphalt
OOHW	Out of Hours Work
RIC	Relative Increase Criteria as described in the NMG
RBL	Rating Background Level
RMS	Root Mean Square
Roads and Maritime	(NSW) Roads and Maritime Services

Term	Definition
RTA	(NSW) Roads and Traffic Authority (now Roads and Maritime)
SEARs	Secretary's Environmental Assessment Requirements
SLR	SLR Consulting Australia
SPL	Sound Pressure Level
SWL	Sound Power Level
VDV	Vibration Dose Value

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Executive summary

Introduction

SLR Consulting Australia (SLR) has been engaged by NSW Roads and Maritime Services (Roads and Maritime) to assess the potential noise and vibration impacts associated with modifications to Stage 1 of the WestConnex M4-M5 Link project (the project). This report has been prepared to inform the modification report.

Overview of the modification

The proposed modification relates to Stage 1 of the approved project. The following points provide an overview of the proposed modification:

- The Northcote Street civil site (C3a) would become a civil and tunnel site. This would result in 24 hours, seven days a week tunnelling works being carried out from this location within an existing acoustic shed. The Northcote Street site is being used for tunnelling as part of the M4 East project. A construction access tunnel is to be provided from the Northcote Street site that utilises part of the existing access tunnel for the M4 East project. Proposed spoil haulage routes to and from this site are identified in this traffic and transport assessment. Relevant conditions of the project approval would apply to the use of this site for tunnelling and civil works to ensure potential impacts are managed consistently with the project approval
- The Parramatta Road West and Parramatta Road East civil sites (C1b and C3b) would be used as civil sites in accordance with condition of approval C19 and other conditions of the project approval. The sites would be used for site offices, light and heavy vehicle car parking, shuttle bus services, workshop and storage of equipment, materials and construction machinery. Both sites would operate 24 hours a day, 7 days a week in accordance with the conditions of the project approval. No tunnelling, tunnel spoil handling or tunnel spoil stockpiling and haulage would occur at these sites
- A temporary pedestrian walkway would be constructed above Parramatta Road to connect the Parramatta Road East and Parramatta Road West civil sites. The pedestrian walkway would only be available for use by project staff during the construction phase of the project and would not be available for public use. The pedestrian walkway would be demobilised upon completion of the construction phase of the project
- Removal of the Darley Road civil and tunnel site (C4) from the project. No construction activities or permanent operational infrastructure would be provided at this location. The M4-M5 Link Environmental Impact Statement (EIS) provided for construction spoil to be removed from the Darley Road site. This spoil would now be removed from other tunnelling sites
- The relocation of the operational water treatment plant from the Darley Road motorway operations complex (as described in the EIS) to the Campbell Road motorway operations complex at the St Peters interchange.

Relevant guidelines

Construction noise has been assessed in accordance with the *Construction Noise and Vibration Guideline* (CNVG) (Roads and Maritime, 2016) and the *Interim Construction Noise Guideline* (ICNG) (DECC, 2009) which references *Assessing Vibration: A Technical Guideline* (EPA, 2006) for human comfort vibration guidance. Guidance for assessing potential structural damage from vibration is taken from Australian Standard AS 2187: Part 2-2006 *Explosives - Storage and Use – Part 2: Use of Explosives* (Standards Australia, 2006), BS 7385 Part 2-1993 *Evaluation and measurement for vibration in buildings* Part 2 (British Standards Institution (BSI), 1993), and DIN 4150: Part 3-1999 *Structural vibration - Effects of vibration on structures* (Deutsches Institut für Normung (DIN), 1999).

Noise from operation of proposed fixed operational facilities is assessed with guidance from the *NSW Industrial Noise Policy* (INP) (EPA 1999).

Noise and vibration assessment

The assessment of potential changes to noise and vibration impacts followed the same approach as was carried out for the approved project and involved:

- A quantitative assessment of construction noise (including ground borne noise), vibration and road traffic noise impacts associated with the use of the Northcote Street civil and tunnel site and the construction of the G-loop
- Qualitative discussion of the impacts relating to the use of the Parramatta Road East and West civil sites by comparison to that assessed in the EIS.
- A quantitative assessment of construction noise and vibration assessment of the temporary overhead pedestrian overpass which connects the Parramatta Road East and Parramatta Road West sites
- An assessment of the operational noise associated with the proposed water treatment plant to be located at the Campbell Road motorway operations complex (MOC5) at St Peters interchange.

Northcote Street civil and tunnel site

The Northcote Street site at Haberfield is located between Wattle Street and Wolseley Street at Haberfield and was assessed in the EIS as a civil site. The modification proposes the use of this site as a civil and tunnel site incorporating tunnelling activities 24 hours, seven days a week, which is consistent with the current use of the site as part of the M4 East project.

Airborne noise impacts

Minor noise impacts (less than 10 dBA) are predicted during site establishment and decommissioning of the site. Impacts are limited to five receivers who are located in close proximity to the site. These works are proposed to be conducted during standard daytime hours only and would be relatively short in duration.

Tunnelling activities are predicted to result in minor impacts (less than 10 dBA) at surrounding receivers with the exception of one receiver which is predicted to be moderately impacted (greater than 10 dBA) during the night-time period. Airborne noise impacts are generally as a result of spoil trucks entering and exiting the site along with concrete trucks pumping concrete. Predicted noise levels represent a worst-case noise level with all activities working simultaneously within the site. Mitigation of these exceedances could include investigation of localised barriers or enclosures around static noise sources (pumps etc) and limiting the amount that the roller doors are open during the night time period.

Minor noise impacts (less than 10 dBA) are predicted during site establishment and decommissioning of the G-loop. Impacts are limited to six receivers which are located in close proximity to the site. As some of the works may require road occupancy, there will be the requirement for some works to be undertaken outside of standard construction hours, in which case moderate impacts (greater than 10 dBA) are predicted at nearby receivers. Out of hours works (OOHWs) are expected to be limited in duration as the extent of the modification required is minor and as such would be managed via the implementation of the mitigation and management measures outlined in the EIS to be incorporated in the Construction Noise and Vibration Management Sub-Plan.

Construction traffic noise

Two spoil haulage routes for the Northcote Street civil and tunnel site have been assessed against relevant noise criterion. Predicted noise from construction traffic on public roads is below the Roads and Maritime assessment criterion for both spoil haulage routes options. It should be noted that while the predicted increase is below the 2 dB increase threshold, both Ramsay Street and Great North Road currently have relatively low volumes of heavy vehicles during the night time period. The project should consider the potential impact from maximum noise levels that heavy vehicles may have on surrounding receivers along Ramsay Street, Fairlight Street and Great North Road when finalising the routes for construction traffic during the night time period.

Ground-borne noise

Ground-borne noise from tunnelling works associated with the excavation of the access tunnel is predicted to be compliant with the night-time criterion at all sensitive receivers when road headers are being used. During rock-breaker tunnelling works, the worst case ground-borne noise levels are predicted to exceed the 35 dBA $L_{Aeq(15minute)}$ night-time criterion at up to 38 sensitive receivers in NCA01, NCA02 and NCA06. While most tunnelling works would be anticipated to progress at a consistent rate, there may be discreet locations which require a longer duration of tunnelling works due to site conditions.

Parramatta Road West and Parramatta Road East civil sites

The EIS described the Parramatta Road West site as a civil and tunnel site and the Parramatta Road East site as a civil site. The modification proposes that these sites would be used as civil sites in accordance with condition of approval C19 (ie they would be used for parking and other works that do not exceed the 'Noise affected' Noise Management Levels as identified in the ICNG).

A qualitative consistency assessment was undertaken to identify activities associated with the proposed modification that may result in a greater impact or otherwise be considered inconsistent with activities identified in the EIS. The assessment indicated that the proposed use of the Parramatta Road West and Parramatta Road East civil sites is considered to be consistent with the assessment undertaken in the M4-M5 Link EIS and SPIR and would not result in a change to the mitigation proposed for the equivalent activities. The proposed modification would remove tunnelling activities from the site and is therefore expected to result in a reduction in the impact on nearby receivers previously predicted in association with tunnelling related activities. There would be no change to the project footprint as assessed in the EIS and SPIR.

Consistent with recommendations in the EIS and SPIR, a CNVIS will be prepared based on the finalised construction methodology and will include consideration of the indicative revised layout and use of the site, including the location of specific items of plant. The CNVIS will include details of how the noise emissions from the sites will be managed to achieve compliance with the applicable noise management levels as required by condition of approval C19. Where non-compliances are predicted within the CNVIS, the contractor will explore a range of at source noise mitigation options.

A temporary overhead pedestrian walkway for construction workers only connecting the Parramatta Road West and East civil sites is proposed. This walkway would span Parramatta Road and would be in place from around late 2018 to early 2023.

Minor noise impacts (less than 10 dBA) are predicted during the construction of the gantry during standard construction hours. Impacts are limited to 14 receivers which are located in close proximity to the site. As the works involving lifting of the bridge span may require road occupancy, there will be a requirement for these works to be undertaken outside of standard construction hours, in which case moderate impacts (greater than 10 dBA) are predicted at nearby receivers. Out of hours works (OOHWs) are expected to be limited in duration and as such would be managed via the implementation of the mitigation and management measures outlined in the EIS to be incorporated in the Construction Noise and Vibration Management Sub-Plan. The use of the pedestrian walkway by workers during the construction period is expected to result in negligible noise impacts.

Campbell Road motorway operations complex

The operational water treatment plant (WTP) is to be relocated to the Campbell Road motorway operations complex at St Peters interchange. The relocation of the operational WTP would result in the operational footprint of the motorway operations complex at St Peters being increased.

The water treatment plant at the Campbell Road motorway operations complex (MOC5) has been modelled at a sound power level (SWL) of 90 dBA. This is the maximum SWL that results in compliance with the criteria at all residential receivers and is considered to be reasonably representative of similar plant. Other fixed plant at this location has been modelled as per the EIS inputs.

The selected mechanical equipment should be reviewed and assessed for compliance with the established criteria at the detailed design stage of the project when specific plant selection is finalised

and appropriate noise control measures can be determined. Note that the cumulative noise emissions from all fixed facility noise sources should be considered when determining the appropriate mitigation options.

1 Introduction

Approval for the construction and operation of the project was granted on 17 April 2018 by the NSW Minster for Planning (application number SSI 7485).

Construction design and planning has progressed since the assessment contained in the EIS and the M4-M5 Link Submissions and Preferred Infrastructure Report (SPIR) and a review of the concept design for the approved project has occurred. As a result, the proponent has further optimised the construction site arrangements assessed in the EIS and SPIR to reduce community impacts and to decrease the overall number of construction sites required for Stage 1 of the project. The main changes include the removal of the Darley Road civil and tunnel site for the project and changes to some of the construction ancillary facilities as summarised in **Table 1-1**.

Table 1-1 Change to construction ancillary facilities at Haberfield, Ashfield and Leichhardt

EIS and SPIR	Proposed modification
Wattle Street civil and tunnel site (C1a)	No change
Haberfield civil site (C2a/C2b)[1]	No change
Northcote Street civil site (C3a)	Northcote Street civil and tunnel site. Includes tunnelling, spoil handling and spoil haulage from this site
Parramatta Road West civil and tunnel site (C1b)	Parramatta Road West civil site[2] Inclusion of a temporary pedestrian walkway above Parramatta Road to link to the Parramatta Road East civil site.
Parramatta Road East civil site (C3b)	Parramatta Road East civil site[2] Inclusion of a temporary pedestrian walkway above Parramatta Road to link to the Parramatta Road West civil site.
Darley Road civil and tunnel site (C4)	Removal of site

Notes

1. The use and footprint of this site was amended in sections B11.6.8 and C6.1.3 of the SPIR to be as per the arrangement for the Haberfield civil site (C2b).
2. Condition C19 allowed use of the site for parking and other works that do not exceed the 'noise affected' Noise Management Levels as identified in the ICNG.

1.1 Overview of M4-M5 Link project

The EIS describes construction and operation of the M4-M5 Link in two stages:

Stage 1[1], as described in the EIS included:

- Construction of the mainline tunnels between the M4 East Motorway at Haberfield and the New M5 Motorway at St Peters, stub tunnels to the Rozelle interchange (at the Inner West subsurface interchange) and ancillary infrastructure at the Darley Road motorway operations complex (MOC1) and Campbell Road motorway operations complex (MOC5)
- These works are anticipated to commence in 2018 with the mainline tunnel opening to traffic in 2022.

Stage 2[2] as described in the EIS, included:

- Construction of the Rozelle interchange and Iron Cove Link including connection to the stub tunnels at the Inner West subsurface interchange, connection to the surface road network at Lilyfield and Rozelle, and construction of tunnels, ramps and associated infrastructure as part of the Rozelle interchange to provide connections to the proposed future Western Harbour Tunnel and Beaches Link project. Ancillary infrastructure will be provided at Rozelle West motorway operations complex (MOC2), Rozelle East motorway operations complex (MOC3) and Iron Cove Link motorway operations complex (MOC4)
- Stage 2 works are expected to commence in 2019 with these components of the project opening to traffic in 2023.

The M4-M5 Link project is part of the WestConnex program of works that, together with the proposed future Sydney Gateway, would facilitate improved connections between western Sydney, Sydney Airport and Port Botany and south and south-west Sydney, as well as better connectivity between the important economic centres along Sydney's Global Economic Corridor and through local communities.

A more comprehensive overview of the M4-M5 Link project, as well as other aspects of the WestConnex program of works, is provided within the EIS and the SPIR.

[1] M4-M5 Link Stage 1 (the mainline tunnels) is also commonly referred to as Stage 3A of the WestConnex program of works

[2] M4-M5 Link Stage 2 (the Rozelle interchange and Iron Cove Link) is also commonly referred to as Stage 3B of the WestConnex program of works

1.2 Overview of modification

The proposed modification relates to Stage 1 of the approved project. The following points provide an overview of the proposed modification:

- The Northcote Street civil site (C3a) would become a civil and tunnel site. This would result in 24 hours, seven days a week tunnelling works being carried out from this location within an existing acoustic shed. The Northcote Street site is being used for tunnelling as part of the M4 East project. A construction access tunnel is to be provided from the Northcote Street site that utilises part of the existing access tunnel for the M4 East project. Proposed spoil haulage routes to and from this site are identified in this modification report. Relevant conditions of the project approval would apply to the use of this site for tunnelling and civil works to ensure potential impacts are managed consistently with the project approval
- The Parramatta Road West and Parramatta Road East civil sites (C1b and C3b) would be used as civil sites in accordance with condition of approval C19 and other conditions of the project approval. The sites would be used for site offices, light and heavy vehicle car parking, shuttle bus services, workshop and storage of equipment, materials and construction machinery. Both sites would operate 24 hours a day, 7 days a week in accordance with the conditions of the project approval. No tunnelling, tunnel spoil handling or tunnel spoil stockpiling and haulage would occur at these sites
- A temporary pedestrian walkway would be constructed above Parramatta Road to connect the Parramatta Road East and Parramatta Road West civil sites. The pedestrian walkway would only be available for use by project staff during the construction phase of the project and would not be available for public use. The pedestrian walkway would be demobilised upon completion of the construction phase of the project
- Removal of the Darley Road civil and tunnel site (C4) from the project. No construction activities or permanent operational infrastructure would be provided at this location. The EIS provided for construction spoil to be removed from the Darley Road site. This spoil would now be removed from other tunnelling sites
- The relocation of the operational water treatment plant from the Darley Road motorway operations complex (as described in the EIS) to the Campbell Road motorway operations complex at the St Peters interchange.

Key aspects of the proposed modification relevant to the assessment of potential noise and vibration impacts are described in further detail in **Chapter 2.** Chapter 4 (Proposed modification) of the modification report provides a detailed description of the proposed modification.

The proposed modification would require changes to the conditions of the project approval. Proposed changes to the project approval are detailed in Chapter 7 (Conditions of approval) of the modification report.

Site establishment works (in accordance with an approved Site Establishment Management Plan) and/or construction works (in accordance with an approved Construction Environmental Management Plan) are proposed at a number of the project construction sites and will be carried out in accordance with the existing conditions of approval for the project.

1.3 Purpose of this report

The purpose of the noise and vibration assessment is to support the environmental assessment for the project modification by assessing and reporting changes to that assessed for the project approval. Specifically, the assessment will include the following:

- Construction noise (including ground borne noise), vibration and road traffic noise impacts associated with the use of the Northcote Street civil and tunnel site
- Construction noise and vibration assessment of the temporary overhead pedestrian overpass which links the Parramatta Road East and Parramatta Road West civil sites
- Fixed facility operational noise assessment of the proposed water treatment plant to be located at the Campbell Road motorway operations complex (MOC5) at the St Peters interchange.

This report is to be read in conjunction with Appendix J (Technical working paper: Noise and vibration) of the EIS which contains detailed descriptions and explanations of the assessment guidelines and methodologies used.

1.4 Structure of this report

This report has been structured as follows:

- **Chapter 2** presents an overview of the modification to the approved project
- **Chapter 3** presents ambient noise surveys to determine the existing noise environment within the study area
- **Chapter 4** details assessment guidelines and methodology
- **Chapter 5** provides an assessment of predicted noise and vibration impacts during construction and consideration of potential mitigation and management measures associated with the propose modification
- **Chapter 6** provides an assessment of predicted noise impacts due to the operation of the project and consideration of potential mitigation measures.

1.5 Terminology

The technical terminology used in this report is explained in Appendix J (Technical working paper: Noise and vibration) of the M4-M5 Link EIS.

2 Key aspects of the proposed modification relevant to this assessment

2.1 Change of use at the Northcote Street civil and tunnel site

The Northcote Street site is located between Wattle Street and Wolseley Street at Haberfield. The site is currently being used as a tunnelling site for the M4 East project and was approved for use as a civil site during construction of the M4-M5 Link project.

The Northcote Street site is proposed to be used as a civil and tunnel site for the project. Once construction works for the M4 East project are completed at this site, the site would be altered to make it suitable for use by the M4-M5 Link project. Existing construction infrastructure that is currently being used for the M4 East project would, where required, be retained and used for the project. This includes hoarding, offices, access gates, noise walls, the acoustic shed structure and part of the construction access tunnel.

2.1.1 Site layout

The proposed indicative site layout is provided in **Figure 2-1**. Key elements that would be consistent with the existing layout for the M4 East project include the vehicle entry and exit locations, the acoustic shed and the entry to the temporary access tunnel. Infrastructure not required for construction of the M4-M5 Link project would be removed from the site. The final layout for this site would be confirmed during detailed design and detailed in the approved Site Establishment Management Plan (SEMP) and/ or approved Construction Environmental Management Plan (CEMP).

The existing acoustic shed is located in the middle of the site with tunnelling activities being undertaken inside the shed. The acoustic shed would be used to enclose most noise-generating and dust-generating activities associated with tunnelling works. Within the acoustic shed, the main construction activities proposed are spoil handling, stockpiling of spoil material along with the loading of spoil material onto haulage vehicles for transportation to designated landfill or reuse sites.

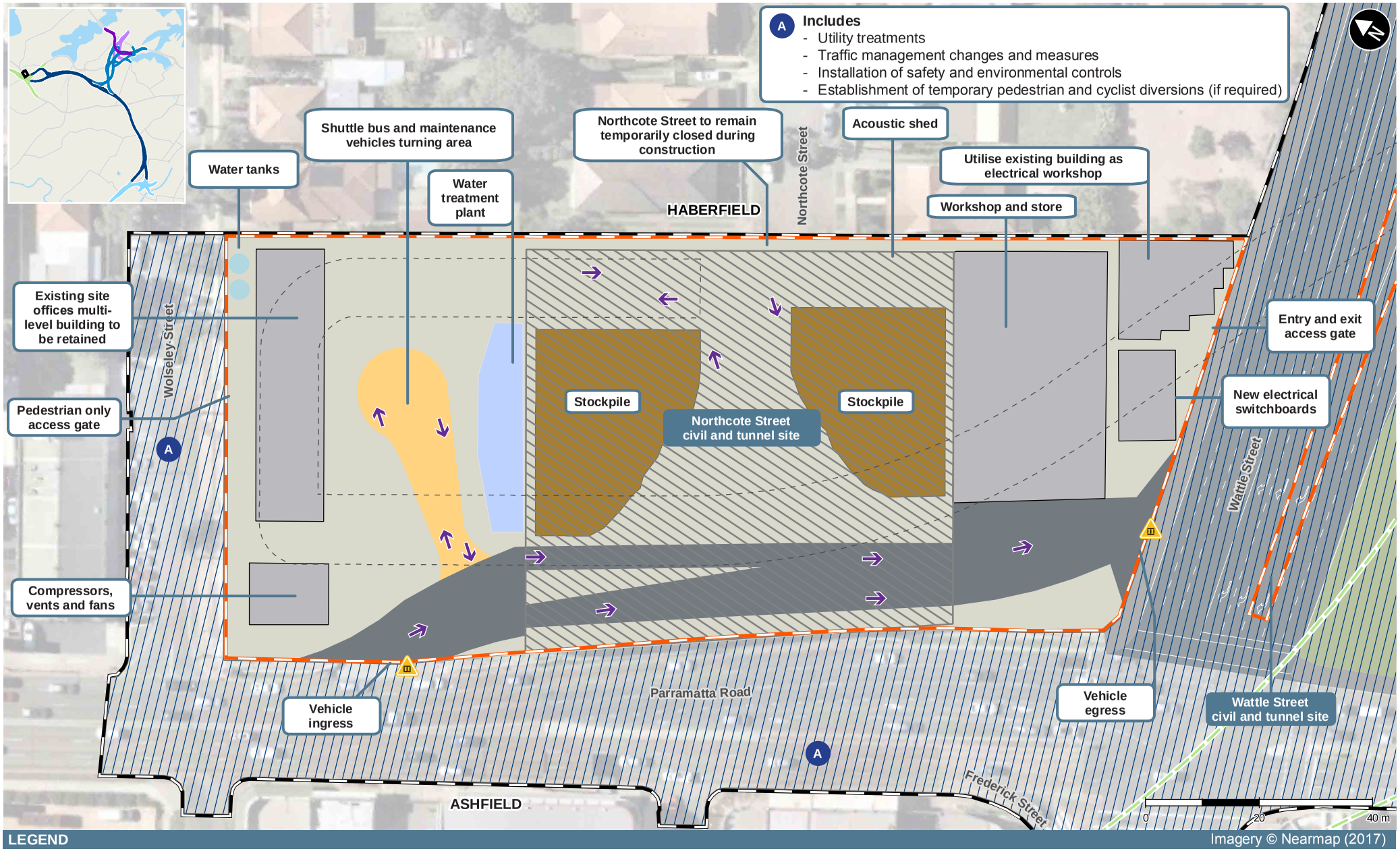

Figure 2-1 Indicative Northcote Street civil and tunnel site layout

2.1.2 Operating hours

Construction activities would operate 24 hours a day, seven days a week at the Northcote Street civil and tunnel site. Activities would predominately include tunnelling, spoil handling and spoil haulage and the delivery of shotcrete and concrete and general construction vehicles. The proposed hours of operation would be consistent with the operating hours used by the M4 East project at this site.

2.1.3 Construction access tunnel

The existing construction access tunnel located at the northern end of the site would be altered to meet the needs of the M4-M5 Link project. At present the access tunnel heads west under Parramatta Road to join the M4 East mainline tunnel. On completion of the M4 East project, demobilisation will occur, with some elements being retained for the M4-M5 Link project. Part of the existing M4 East access tunnel will be retained and blocked off adjacent to the eastern side of Parramatta Road. This will enable construction of the M4-M5 Link access tunnel.

For the M4-M5 Link project, the new construction access tunnel would head generally in a south eastern direction beneath Wattle Street, to the north of the Haberfield civil site and beneath a small number of residential properties (less than 10 properties) in Walker Avenue and Alt Street to connect with the M4-M5 Link mainline tunnels. This route has been selected as it would provide the most direct route from the access tunnel to the M4-M5 Link mainline tunnels. The route avoids the M4 East Motorway tunnels and Parramatta Road ventilation facility and ventilation tunnels.

Figure 2-2 presents the proposed alignment of the construction access tunnel. **Figure 2-3** presents an indicative cross section of the construction access tunnel.

The construction access tunnel would have an average grade of around 14 per cent with a maximum depth of around 50 metres and would be around 430 metres in length. The access tunnel would connect to the mainline tunnels around 30 metres below ground. The average width of the construction access tunnel would be 12 metres to allow two heavy construction vehicles to comfortably travel side by side.

For the construction of the access tunnel, roadheaders would be used to cut the top heading with a roadheader, and surface miner or excavators with breakers would be used to excavate the bench. To support the access tunnel, steel rock bolts, mesh and shotcrete would be used. Spoil would be removed by off road articulated trucks to the surface where it would be stockpiled in the acoustic shed until transported to a disposal or reuse site. Construction of the access tunnel would take around nine months. Once construction works are complete, the construction access tunnel would be backfilled.

Figure 2-2 Indicative alignment of construction access tunnel

LEGEND

M4 East

- Tunnel
- Ventilation tunnel
- Surface roads
- Ventilation facility
- Land subject to M4 East UDLP
- Shared path

M4-M5 Link

Boundaries

- Project footprint
- Ancillary facility

Underground construction

- Mainline tunnel
- Temporary access tunnel

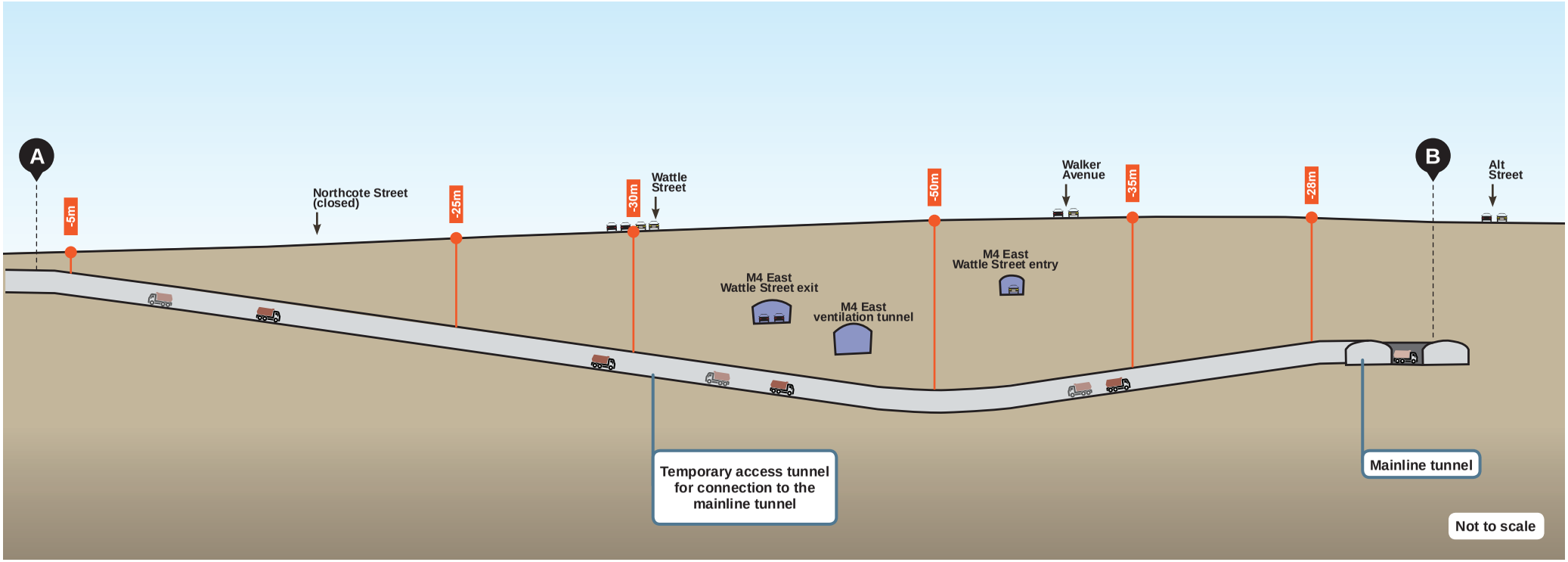

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Figure 2-3 Indicative cross section of construction access tunnel

2.1.4 Spoil volumes and spoil haulage route

Two spoil haulage routes are proposed to be used in association with the Northcote Street civil and tunnel site. **Table 2-1** describes each proposed route for spoil haulage. **Figure 2-4** shows the proposed spoil haulage routes.

Table 2-1 Indicative spoil haulage routes for Northcote Street civil and tunnel site

Route	Indicative spoil haulage route
Route A	Entry: via Parramatta Road city bound and then left turn into the site
	Exit: via left turn from site onto Wattle Street, then left turn into Ramsay Street/ Road, then left turn into Fairlight Street, then left turn into Great North Road, then right turn into Parramatta Road
Route B	Entry: via Parramatta Road city bound and then left turn into the site
	Exit: via left turn from site onto Wattle Street, then left turn onto the dedicated temporary construction vehicle turning lane (known as the G-loop) at the intersection of Dobroyd Parade and Waratah Street within part of Reg Coady Reserve. Right turn onto Wattle Street from truck turning facility toward M4 East tunnels or Parramatta Road. The G-loop has been used during the construction of the M4 East project.

Traffic signals are provided at intersections where vehicle turning is required for both Route A and Route B. All of the roads included in the proposed haulage routes are state roads managed by Roads and Maritime. Generally, all roads along the proposed routes have two traffic lanes in each direction with some on street parking and are heavily trafficked.

The G-loop at the intersection of Dobroyd Parade and Waratah Street was established in the M4 East project and would be utilised for the proposed Route B. M4 East construction traffic and public motorists are able to use the G-loop during construction of the M4 East project. The access to the G-loop for public motorists was provided because the construction of the M4 East project removed the ability to turn right into Waratah Street when travelling eastbound on Dobroyd Parade.

Minor changes would be required to the proposed intersection design at Dobroyd Parade and Waratah Street (after completion of the M4 East project at the end of Q1 2019) to allow Route B to be used, including:

- Adjustments to the kerb and channel, including protection of new drainage infrastructure, along the north side of Dobroyd Parade at the entry and exit to the G-loop
- A short section of the median designed to separate the eastbound traffic on Dobroyd Parade from the eastbound traffic using the M4 East tunnel exit ramp would be removed to allow heavy vehicles to exit the G-loop and turn right onto Dobroyd Parade westbound
- A section of the pedestrian path along the north side of Dobroyd Parade would be realigned around the perimeter of the G-loop to avoid potential conflict between heavy vehicles and pedestrians
- Upgrade the traffic light phasing at this intersection to accommodate the G-loop traffic
- Signage and line marking associated with the above.

Use of the G-loop for the proposed modification would be restricted to M4-M5 Link construction vehicles. This restriction would be communicated through appropriate signage and line marking. Public motorists would not be able to use the G-loop. However, the completed M4 East project will provide a right turn lane from the M4 East eastbound lanes into Waratah Street at this location and a right turn lane from the Wattle Street eastbound lanes into Ramsay Street.

On completion of construction of the M4-M5 Link project, the G-loop infrastructure would be removed and that part of Reg Coady Reserve would be rehabilitated in accordance with the M4 East Residual Land Management Plan.

Once the G-loop is in operation, Route B would be the preferred spoil haulage route and would be available for use 24 hours a day and 7 days a week in accordance with condition of approval E70.

Route A would also be used as a spoil haulage route. However, in response to feedback received from stakeholders during the consultation process, it is proposed that Route A would generally only be used between 7am and 6pm Monday to Friday and 8am to 6pm on Saturdays except in the following circumstances and in accordance with the relevant conditions of the project approval:

- During the early stages of construction until such time as the works to facilitate operation of the G-loop were completed and the G-loop was functional
- In the event of heavy traffic congestion, an incident or maintenance works on the arterial road and/or motorway network which has the potential to detrimentally impact on the efficient use of the G-loop and result in delays for spoil haulage vehicles.

A spoil haulage protocol would be developed by the contractor in consultation with Roads and Maritime and the Transport for NSW Traffic Management Centre to manage spoil haulage movements on Routes A and B. The protocol would be documented in the Construction Traffic Transport and Access Management Sub-Plan.

2.1.5 Car parking

Limited car parking would be provided at the Northcote Street civil and tunnel site due to space constraints. Car parking for the construction workforce would primarily be provided at the Parramatta Road West and Parramatta Road East civil sites with around a total of 200 spaces being provided at these two sites.

A shuttle bus would be provided to transport the majority of construction workforce to and from designated parking areas, which are anticipated to be predominantly at the Parramatta Road East and Parramatta Road West civil sites and the Northcote Street civil and tunnel site. Where possible, the workforce will be encouraged to walk between the Northcote Street, Parramatta Road and Wattle Street sites.

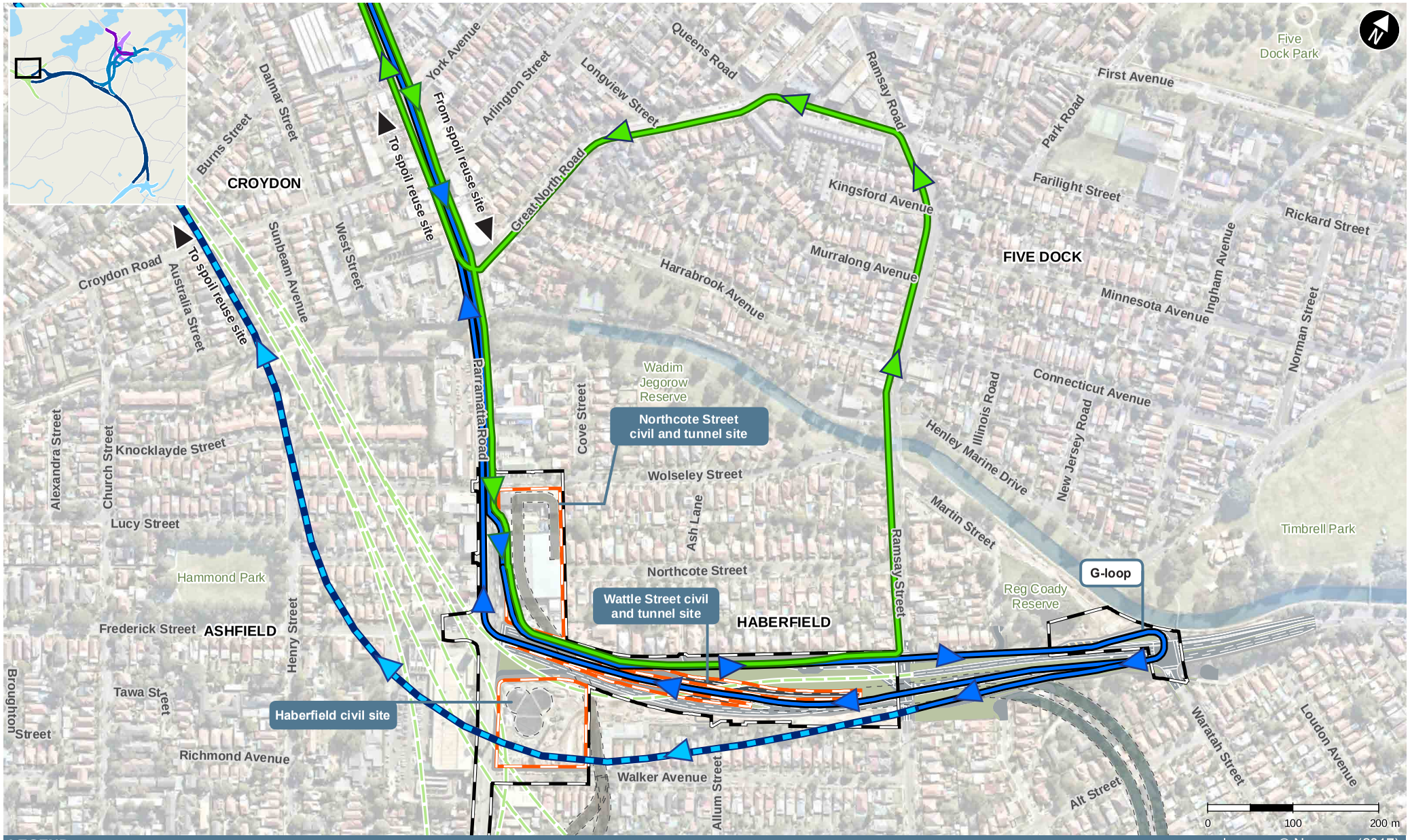


Figure 2-4 Northcote Street civil and tunnel site proposed spoil haulage routes

2.1.6 Program

An indicative program of works for the Northcote Street civil and tunnel site is shown in **Table 2-2**. The program shows that the construction activity at the Northcote Street site commences in Q2 2019, and continues through to end of Q1 2023. Once construction works are complete, construction facilities would be demobilised and the site would be rehabilitated in accordance with the M4 East Residual Land Management Plan. It is expected that Northcote Street would be reinstated, as provided for under the M4 East project approval.

Table 2-2 Indicative program of works - Northcote Street civil and tunnel site

Construction Activity	Indicative construction timeframe																							
	2018				2019				2020				2021				2022				2023			
Refurbishment and traffic management						■	■																	
Site establishment						■	■																	
Construct temporary access tunnel							■	■	■															
Tunnelling										■	■	■	■	■	■	■	■							
Civil and mechanical fitout											■	■	■	■	■	■	■	■						
Testing and commissioning																■	■	■	■	■				
Site demobilisation and rehabilitation																	■	■	■	■	■			

2.1.7 Construction activities

Four scenarios have been developed to assess potential noise and vibration impacts associated with construction works at the Northcote Street civil and tunnel site. **Table 2-3** outlines the construction scenarios and corresponding activities, as well as the assessed periods of operation. The estimated durations of activities are also summarised, noting that the activities are intermittent during this period and would not be expected to be undertaken every day during the scheduled activity.

For the G-loop, site establishment works to facilitate operation of the G-loop are limited and are expected to occur over a period of around two weeks. At the completion of construction G-loop decommissioning works are expected to occur over a period of up to eight weeks (up to 10 weeks in total).

Table 2-3 Indicative construction activity (works) scenarios

Scenario	Works ID	Indicative duration (weeks)[1]	Period of works[2]			
			Day	Day OOH	Eve	Night
Northcote Street civil and tunnel site						
Site establishment	NST-01	24	✓			
Tunnelling activities	NST-02	116	✓	✓	✓	✓
Tunnelling support activities	NST-03	116	✓	✓	✓	✓
Decommissioning	NST-04	52	✓			
G-loop						
Site establishment and decommissioning	NST-05	10	✓	✓	✓	✓

Notes:

1. The duration refers to the overall period during which the work activities would be undertaken. In reality the work activities are likely to be undertaken intermittently (not continuously) and the impacts would be localised to areas adjacent to where the works activity is being undertaken. The overall duration of work activities would be confirmed during detail design
2. Works periods are defined as:

   Day 7:00 am to 6:00 pm Monday to Friday, 8:00 am to 6:00 pm Saturday

   Day out of hours (OOH) Sunday and public holidays 8:00 am to 6:00 pm

   Evening (Eve) 6:00 pm to 10:00 pm Monday to Sunday

   Night 10:00 pm to 7:00 am Monday to Friday and 10:00 pm to 8:00 am Saturday, Sunday and public holidays

2.2 Parramatta Road West and Parramatta Road East civil sites

The Parramatta Road West and Parramatta Road East civil sites are located on the western and eastern sides of Parramatta Road between around Alt Street and Bland Street at Ashfield and Haberfield.

The Parramatta Road West and Parramatta Road East civil sites would be used in accordance with condition of approval C19 and other conditions of the project approval. The sites would be used for parking and other works that do not exceed the 'noise affected' Noise Management Levels (NMLs) as identified in the ICNG.

The sites would be used for site offices, light and heavy vehicle car parking, shuttle bus services, workshop and storage of equipment, materials and construction vehicles. Both sites would operate 24 hours a day, 7 days a week in accordance with the conditions of the project approval.

The sites would be used to support civil and tunnelling construction activities at other project construction sites, primarily within the Haberfield and Ashfield area. No tunnelling, tunnel spoil stockpiling and handling or tunnel spoil haulage would occur at these sites.

2.2.1 Site layout

The proposed indicative site layout for Parramatta Road West and Parramatta Road East civil sites is provided in **Figure 2-5**. The layout for the sites would be confirmed during detailed design and in the approved Site Establishment Management Plan (SEMP) and/or approved Construction Environmental Management Plan (CEMP).

Site establishment works would be carried out which would include demolition of buildings and structures, vegetation clearing and removal, establishment of vehicle entry and exit points, establishment of temporary noise attenuation measures and utility works. These site establishment works were assessed in the EIS.

Vehicle access points are provided for Parramatta Road West civil site from Parramatta Road, Bland Street and Alt Street. The entry along Parramatta Road would only be accessible for west-bound traffic with a left turn into the site. Exit onto Parramatta Road would be left turn out to travel west-bound. Entry and exit points are also proposed onto Bland Street and Alt Street to allow traffic to access between the sites or onto Parramatta Road.

Light and heavy vehicle access points for the Parramatta Road East civil site would be from Parramatta Road and Alt Street. Entry would be left turn in, only available for east-bound traffic. Exit would be left turn out to travel east bound along Parramatta Road. Vehicle access points would not be provided from Bland Street for this site.

Table 2-4 provides indicative heavy and light vehicle numbers for the Parramatta Road West and Parramatta Road East civil sites.

Table 2-4 Indicative construction vehicle numbers

Parramatta Road West and Parramatta Road East civil sites										
Site	**Daily Vehicles**		**AM peak hour**				**PM peak hour**			
	(one way)		**(7.30-8.30am)**				**(4.15-5.15pm)**			
	Heavy	**Light**	**Heavy vehicles**		**Light vehicles**		**Heavy vehicles**		**Light vehicles**	
			Arrive	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**
West	25	306	7	7	18	5	7	7	5	31
East	25	210	1	1	12	4	1	1	4	20

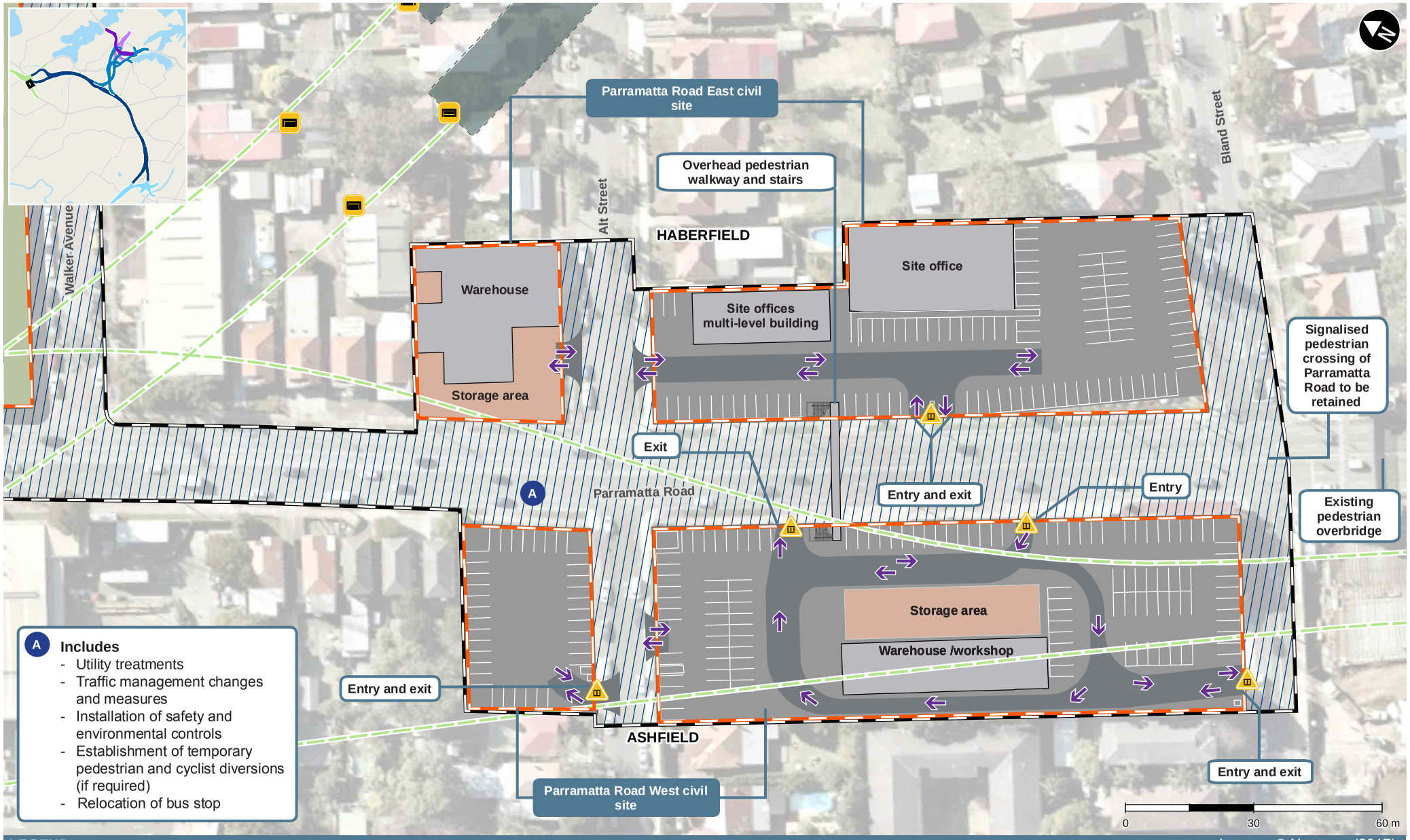


Figure 2-5 Indicative Parramatta Road West and Parramatta Road East site layouts

2.2.2 Operating hours

The Parramatta Road West and Parramatta Road East civil sites would be used 24 hours a day, seven days a week to support civil and tunnelling construction activities at other project construction sites, primarily within the Haberfield and Ashfield area. No tunnelling, tunnel spoil stockpiling and handling or tunnel spoil haulage would occur at these sites.

Site establishment works would generally occur during standard construction hours of 7.00 am to 6.00 pm Monday to Friday and 8.00 am to 6.00 pm on Saturdays (as permitted by conditions E68 and E69 of the project approval)or as provided for in other conditions of approval and the project Environment Protection Licence (EPL).

2.2.3 Car parking

A total of around 200 car parking spaces would to be provided at the Parramatta Road West and Parramatta Road East civil sites for the construction workforce. The parking spaces would be used by construction workforce staff working at other project construction sites and for some heavy vehicle parking. A shuttle bus service would be provided to transport the majority of the construction workforce to and from construction sites. Where possible the workforce would be encouraged to walk between sites. As required by condition of approval E54, a Construction Parking and Access Strategy would be prepared by the contractor to assist with managing parking demand for the project.

The site would also be used for heavy vehicle parking. The type of heavy vehicles likely to use the sites for parking would include rigid and articulated trucks dropping off or picking up materials or equipment from laydown areas, vehicles or equipment to be serviced at the workshop and short term layover of trucks across working shifts. No tunnel spoil trucks would use these sites.

2.2.4 Program

An indicative program of works for Parramatta Road West and Parramatta Road East civil sites is provided in **Table 2-5**. The construction program shows construction activities commencing in Q3 2018 and continuing through to the end of Q1 2023. Once construction activities are complete, construction facilities would be removed and the site would be rehabilitated in accordance with the Residual Land Management Plan for the project.

Table 2-5 Indicative program of works - Parramatta Road West and East civil sites

Construction Activity	Indicative construction timeframe																							
	2018				2019				2020				2021				2022				2023			
Site establishment and utility works			■	■	■	■																		
Site operations – offices, warehouse/storage, workshop and parking				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■						
Site demobilisation and rehabilitation																		■	■	■	■			

2.3 Parramatta Road West and East civil sites – pedestrian walkway

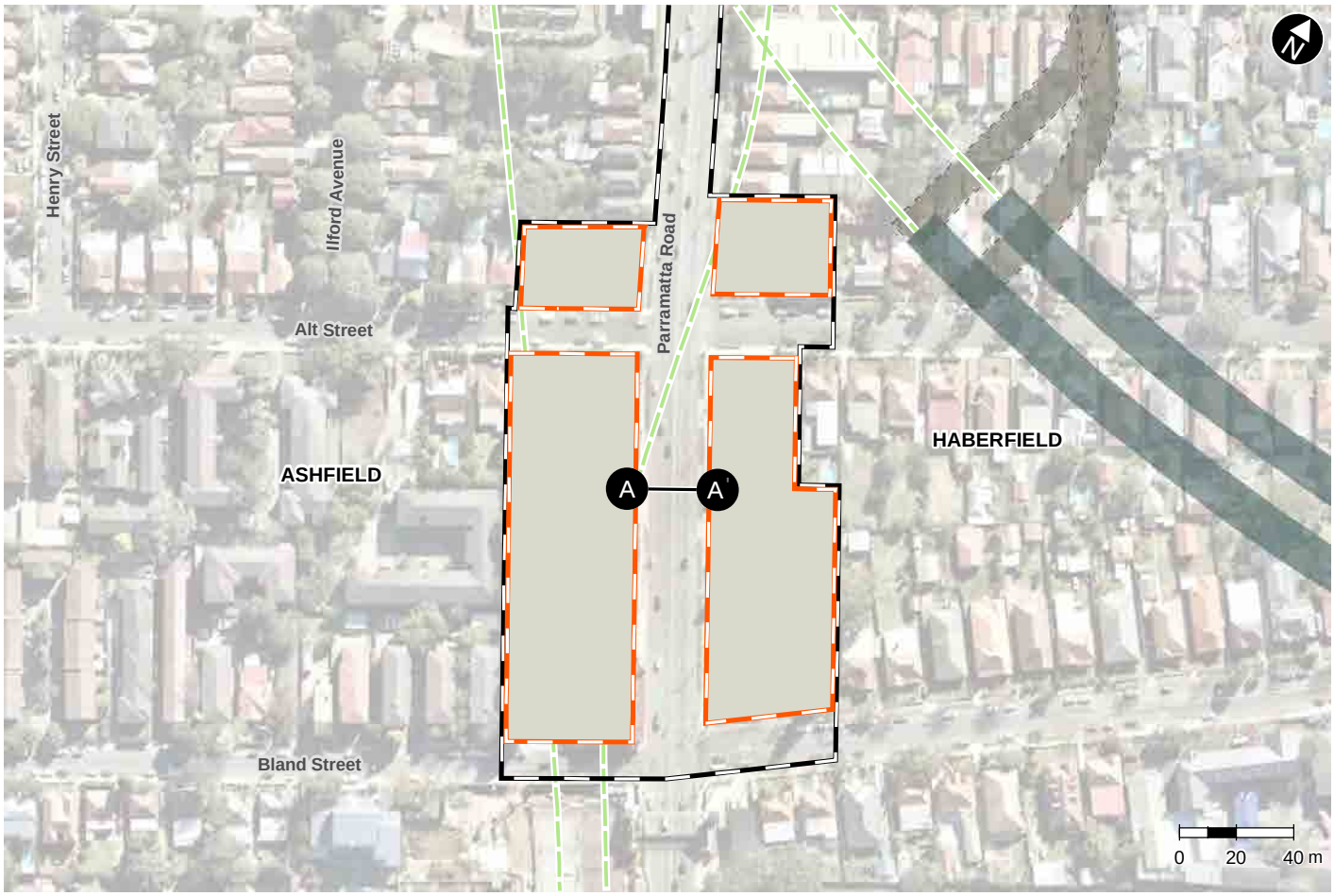
This modification proposes to link the Parramatta Road West and Parramatta Road East civil sites with a temporary overhead pedestrian walkway above Parramatta Road which would only be used by the construction workforce and would not be available for public use. Access to the walkway would be via stairs at either end located within the work sites. The pedestrian walkway is provided to allow the construction workforce to easily move between the two sites without the need to use the existing at-grade pedestrian crossing on Parramatta Road at the traffic signals.

The structure would provide sufficient clearance for vehicles travelling along Parramatta Road with the base of the walkway being around six metres above Parramatta Road. The overall height of the walkway structure would extend to around 10 metres above Parramatta Road. Both the walkway and access towers would be enclosed to provide weather protection for users and enable use 24 hours a

day, seven days a week. Lighting would be provided to allow the walkway to be used after daylight hours.

The bridge structure would be fabricated offsite in sections that are of suitable size for transportation to the site. The sections would be welded or bolted together at the Parramatta Road sites. The supporting steel towers would be assembled on site and mounted on concrete foundations to support the pedestrian walkway. The bridge would be a single span and would be lifted into position by a crane. Installation of the span would be carried out at night with full road closure of Parramatta Road and traffic detours provided. A Road Occupancy Licence from the Transport for NSW Traffic Management Centre would be required for the installation of the pedestrian walkway, allowing for the temporary closure of Parramatta Road. Once the walkway span is in place the roof and deck would be installed.

The pedestrian walkway is expected to be in place from around late 2018 to end of Q1 2023. Once construction works are complete, the pedestrian walkway would be removed following a similar process to that described above, but in reverse. An indicative site layout showing the location of the walkway and an elevation plan of the pedestrian walkway are provided in **Figure 2-6**.



Imagery © Nearmap (2017)

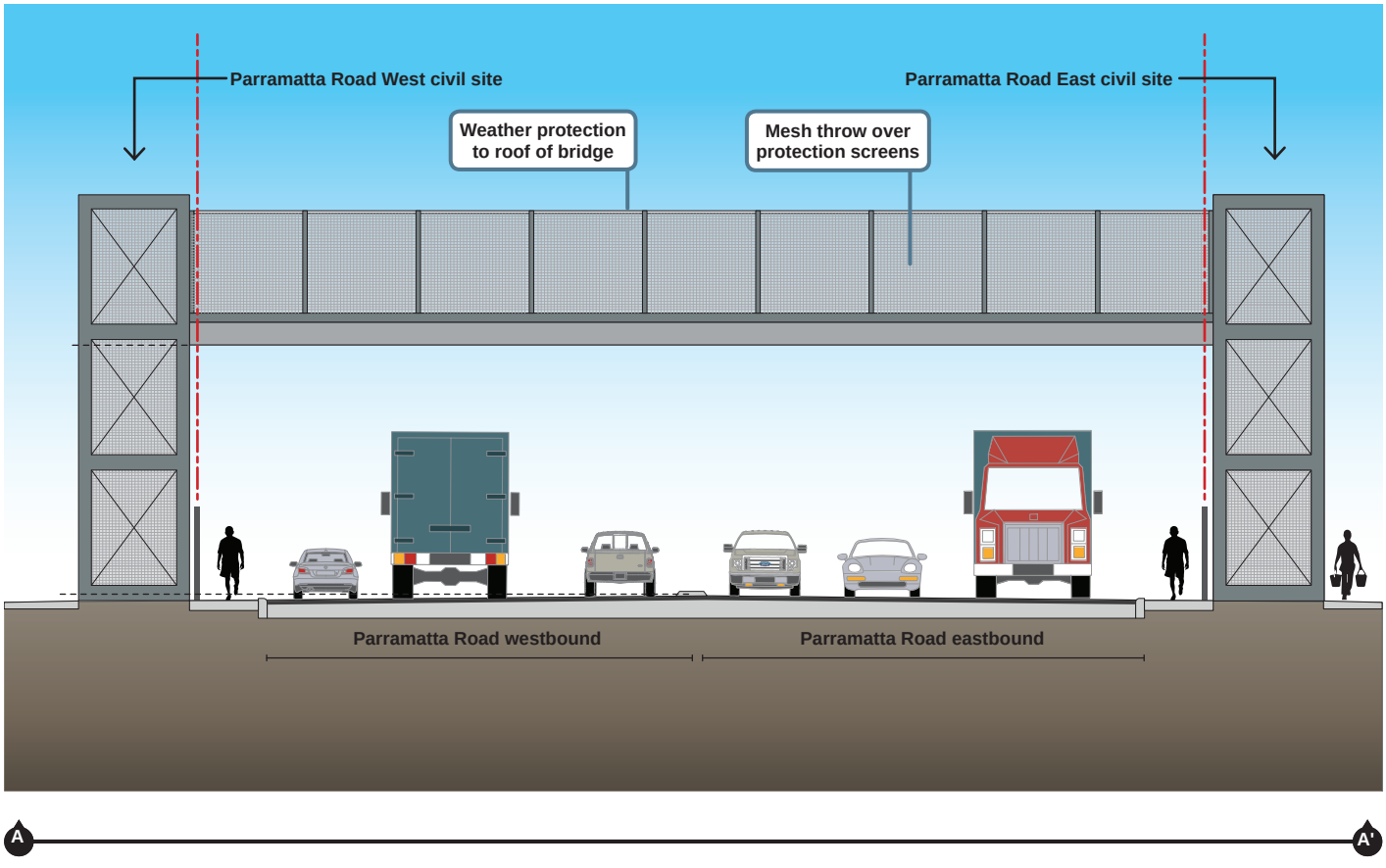


Figure 2-6 Indiactive location and design of Parramatta Road West and Parramatta Road East overhead pedestrian walkway

2.3.1 Operating hours

It is proposed to undertake activities associated with the construction of the footings and supporting structures for the overhead pedestrian walkway during standard construction hours. The bridge span would be craned into position during which temporary occupation of Parramatta Road would be required. This would occur during the non-peak (out-of-hours) period.

2.3.2 Construction activities

Three scenarios have been developed to assess potential impacts associated with the construction of the pedestrian overpass. **Table 2-6** outlines the construction scenarios and corresponding activities, as well as the assessed periods of operation. The estimated durations of activities are also summarised, noting that the activities are intermittent during this period and would not be expected to be undertaken every day during the scheduled activity.

While the bridge assembly and span lift is expected to occur over a duration of up to 8 weeks, the work associated with assembly of the bridge would be undertaken during the daytime hours and the span lift would be undertaken during night time but over a limited period of a few nights.

Table 2-6 Indicative program of works

Scenario	Works ID	Indicative duration (Weeks)[1]	Period of works[2,]			
			Day	Day OOH	Eve	Night
Footing constructions include concrete saws	MPO-01	1	✓			
Boarded piling	MPO-02	3	✓			
Bridge assembly and span lift	MPO-03	8	✓	✓	✓	✓

Notes:

1. The duration refers to the overall period during which the work activities would be undertaken. In reality the work activities are likely to be undertaken intermittently (not continuously) and the impacts would be localised in areas adjacent to where the works activity is being undertaken. The overall duration of work activities would be confirmed during detail design
2. Works periods are defined as:

   Day 7:00 am to 6:00 pm Monday to Friday, 8:00 am to 6:00 pm Saturday

   Day out of hours Sunday and Public holidays 8:00 am to 6:00 pm

   Evening (Eve) 6:00 pm to 10:00 pm Monday to Sunday

   Night 10:00 pm to 7:00 am Monday to Friday and 10:00 pm to 8:00 am Saturday, Sunday and Public holidays.

2.4 Removal of Darley Road site from project

The EIS identified the site as the Darley Road civil and tunnel site (C4) for the construction of the project and as the Darley Road motorway operations complex (MOC1) for the operation of the project.

Ongoing construction design and planning has determined that the Darley Road site is no longer required to support the construction and operation of the project.

2.4.1 Relocation of construction activities

Construction activities would not be carried out at the Darley Road civil and tunnel site. The construction activities proposed for Darley Road civil and tunnel site as described in the EIS would be accommodated at other project construction sites.

The approved project involved the removal and transportation of around 550,300 cubic metres of tunnel spoil from the Darley Road civil and tunnel site as described in section 23.3.2 of the EIS. Given that the length of the mainline tunnel would not change for the proposed modification, this spoil volume would be required to be removed from other tunnelling sites.

The overall intensity (rate) of spoil removal at approved tunnelling sites is not expected to change, however the additional spoil to be removed would require the extension of the tunnelling component of the overall construction program by around six months.

2.4.2 Relocation of operational ancillary infrastructure

The EIS described that an operational water treatment plant and substation would be located at the Darley Road motorway operations complex. The removal of the Darley Road site from the project would result in the relocation of the operational water treatment plant to the Campbell Road motorway operations complex at St Peters interchange. The relocation of the operational water treatment plant is described in **section 2.5**.

The permanent substation proposed at the Darley Road site in the EIS is no longer required. As described in the EIS, permanent power for Stage 1 of the M4-M5 link project will be supplied via the intake substation at the Campbell Road motorway operations complex at the St Peters interchange. Section 5.10.1 of the EIS and section 4.2.4 of Appendix F (Utilities Management Strategy) of the EIS provides further details on the proposed arrangements to provide electricity to the project.

The removal of the motorway operation complex from Darley Road would result in no permanent infrastructure for the project being located at this location.

2.5 Relocation of operational water treatment plant to St Peters

The proposed relocation of the operational water treatment plant to the Campbell Road motorway operations complex would result in the operational footprint of the motorway operations complex at St Peters being increased.

Figure 2-7 provides an indicative site layout for the Campbell Road motorway operations complex at St Peters interchange which includes an indicative location for the operational water treatment plant. The motorway operation complex is located on the cut and cover structure above the M4-M5 Link ramps at the St Peters interchange which is being constructed by the New M5 project and on land to the immediate east. The motorway operations complex as described in the EIS includes ventilation facilities and a substation. Additional land adjacent to, and to the immediate south east of the motorway operations complex would be required to accommodate the operational water treatment plant.

The increase in footprint of the motorway operations complex would have only a minimal impact on the total area of proposed open space on the southern side of Campbell Road at the St Peters interchange that is being delivered as part of the New M5 project. The increase in footprint will also have some impact on the proposed landscaping area for the St Peters interchange to be provided in this location.

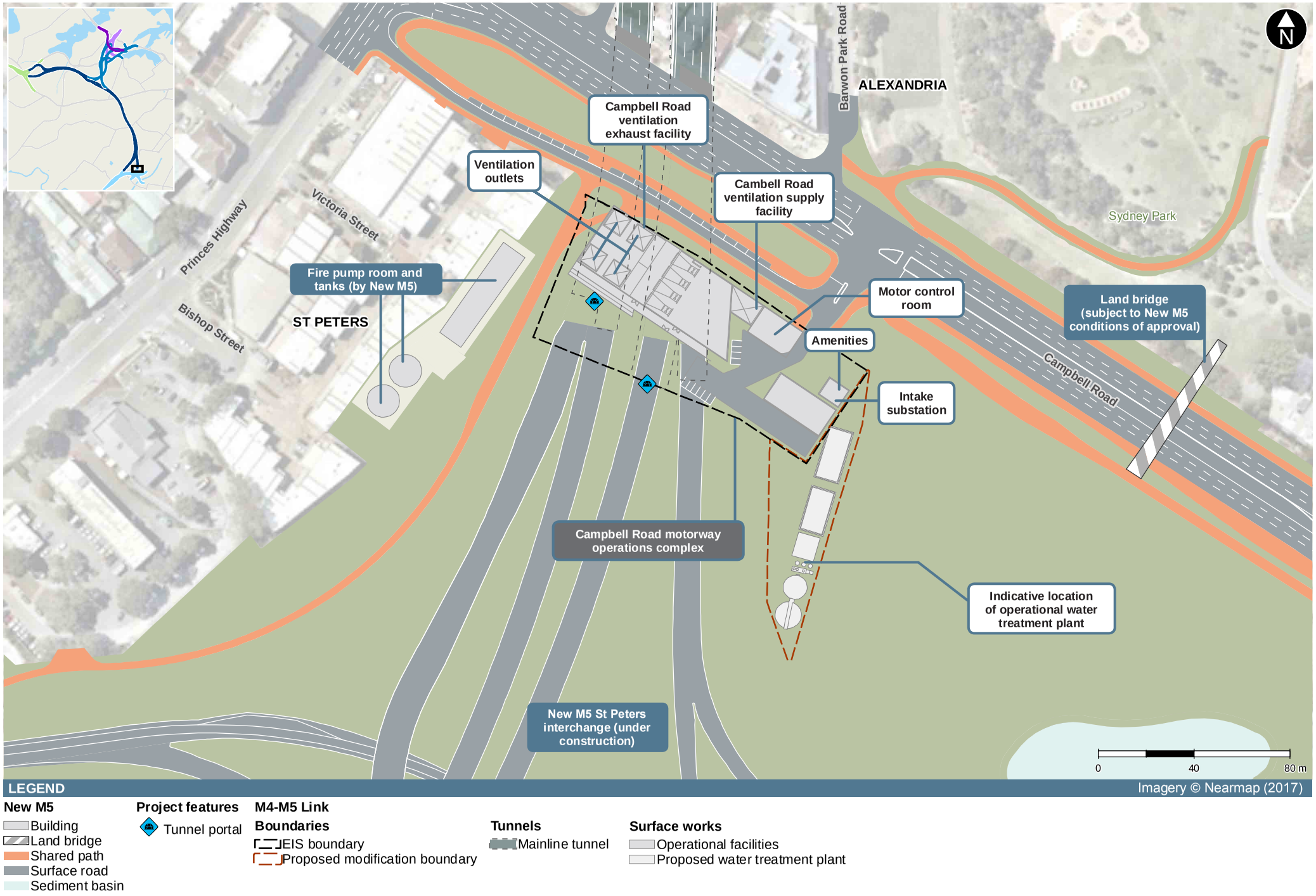


Figure 2-7 Indicative layout of the Campbell Road motorway operations complex

3 Existing environment

The existing ambient noise environment was described in Appendix J (Technical working paper: Noise and vibration) of the EIS. This section provides details of the existing ambient noise environment specifically relating to the proposed modification.

3.1 Noise catchment areas

For assessment purposes, the study area for the modification has been divided into multiple Noise Catchment Areas (NCAs). These NCAs include a variety of land uses within and surrounding the project and assist in the identification of impacts upon groups of receivers likely to be affected by the same works. The NCAs are consistent with the NCAs described in the EIS.

A description of each NCA relevant to the modification is provided in **Table 3-1** and depicted in **Figure 3-1**, **Figure 3-2** and **Figure 3-3.**

Table 3-1 Noise catchment areas and surrounding land uses

NCA description		
Reference	**Min. distance (m)[1]**	**Description**
Haberfield and Ashfield		
NCA00	40	West of Parramatta Road between Bland Street and Orpington Street. Land use consists of residential receivers.
NCA01	<5	West of Parramatta Road between Iron Cove Creek and Bland Street. Land use comprises of a mix of residential receivers, special use facilities, active and passive recreation areas and commercial receivers fronting Parramatta Road.
NCA02	<5	East of Parramatta Road between Henley Marine Drive and Walker Avenue. Land use comprises of a mix of residential and commercial receivers, a place of worship and a childcare centre.
NCA03	20	Catchment adjoins either side of Wattle Street between Ash Lane and Ramsay Street. Land use consists of residential receivers.
NCA04	30	Catchment area adjoins Ramsay Street and the northern side of Wattle Street. Land use consists of residential receivers, isolated commercial receivers and a passive recreational area
NCA05	n/a[2]	South of Dobroyd Parade between Hawthorne Parade and Martin Street. Land use consists of residential receivers with isolated commercial receivers and educational facilities
NCA06	<5	East of Parramatta Road between Walker Avenue and Alt Street residences. Land use consists of residential and commercial receivers and an educational facility on Ramsay Street
NCA07	<5	East of Parramatta Road between Dalhousie Street and Bland Street residences. Land use comprises of a mix of residential and commercial facilities, an educational facility on Bland Street and active and passive recreation areas.
St Peters		
NCA46	750	North of Sydney Park Road between Concord Street, Coulson Street and Maddox Street. Land use comprises of a mix of residential receivers and isolated commercial receivers.
NCA47	150	East of Euston Road, between Maddox Street and Campbell Road. Land use consists of commercial receivers.

NCA description		
Reference	**Min. distance (m)[1]**	**Description**
NCA48	50	South of Sydney Park Road between Barwon Park Road, Campbell Road and Euston Road. Land use comprises of a passive recreation area and isolated commercial receivers.
NCA49	75	Catchment area adjoins either side of Barwon Park Road, between Campbell Road and Crown Street. Land use comprises of a mix of residential and commercial receivers.
NCA50	<5	Catchment area adjoins either side of Princes Highway, between Mary Street, Church Street/Applebee Street and May Street. Land use comprises of a mix of residential and commercial receivers, an educational facility and an active recreation area.
NCA51	225	North of Campbell Street between Applebee Street and the Illawarra Rail Line/St Peters Rail Station. Land use comprises of a mix of residential and commercial receivers and active and passive recreation areas.
NCA52	225	South of the Illawarra Rail Line between Campbell Street, Sutherland Street and Princes Highway premises. Land use comprises of a mix of residential and commercial receivers, an educational facility and active and passive recreation areas.
NCA53	n/a[2]	West of Princes Highway, south of Sutherland Street. Land use comprises of a mix of residential and commercial receivers.
NCA54	n/a[2]	East of Princes Highway between Canal Street and Alexandra Canal. Land use comprises of a mix of residential and commercial receivers.
NCA55	190	East of Burrows Road. Land use comprises of a mix of residential and commercial receivers.

Notes:

1. Approximate minimum horizontal offset distance from the nearest receiver building facade (receiver of any type) to the nearest point that construction works are occurring
2. No surface works are proposed in this NCA. Receivers in this catchment would therefore only be potentially affected by impacts from tunnelling works during construction

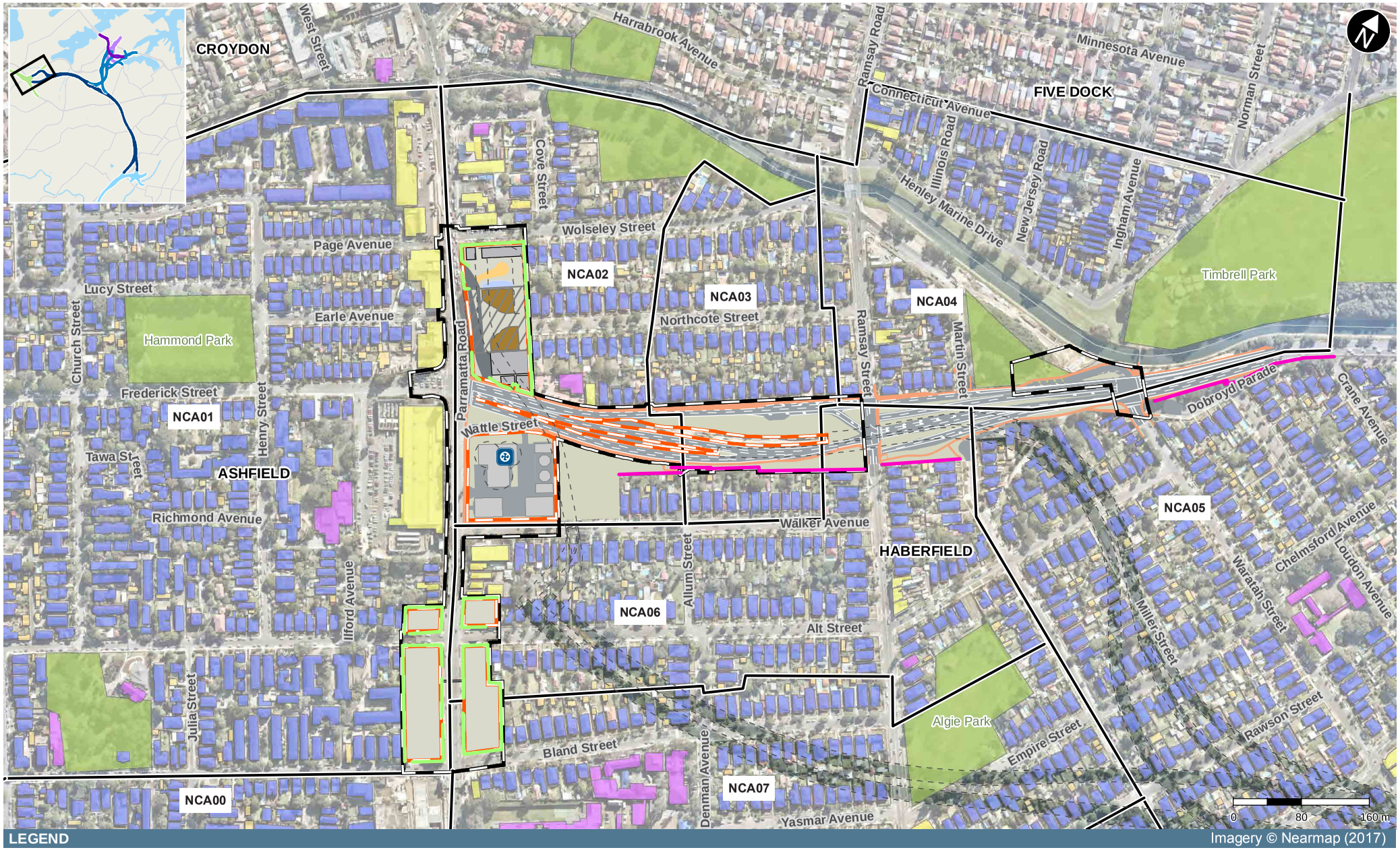


Figure 3-1 NCA boundary map around the Northcote Street civil and tunnel site and G-loop

Figure 3-2 NCA boundary map around the Parramatta Road West and Parramatta Road East civil sites

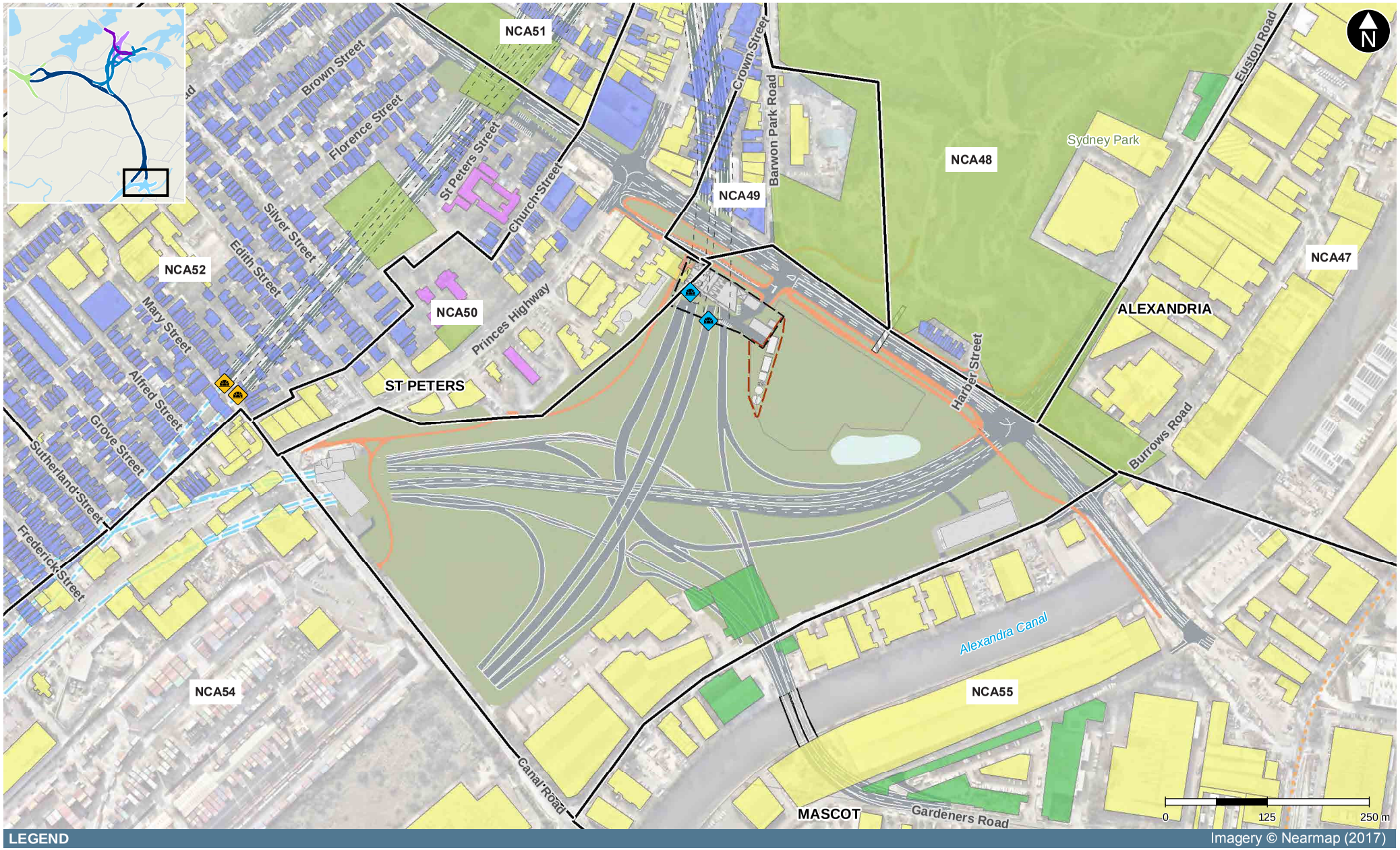


Figure 3-3 NCA boundary map arounnd the Campbell Road motorway operations complex (MOC5)

3.2 Ambient noise levels at Haberfield and Ashfield

The existing ambient noise environment across the study area around Haberfield and Ashfield varies; however, road noise is generally the primary contributor to background noise levels, largely due to the presence of major roads such as Parramatta Road, Wattle Street and the M4 East entry and exit ramps (when operational). The broader road network also contributes to background noise levels, albeit to a lesser degree than major roads. The noise environment is also influenced by the construction works for the M4 East project, which are occurring in the area until Q1 2019.

The measured ambient noise levels applicable to the Northcote Street civil and tunnel site, Parramatta Road West and Parramatta Road East civil sites and the G-loop at Haberfield and Ashfield are outlined in **Table 3-2.** No additional monitoring at representative locations was required for the assessment of potential noise impacts as a result of the proposed modification. Monitoring was undertaken prior to the construction of the M4 East project and is therefore representative of the ambient noise environment without M4 East construction noise. .

Table 3-2 Residential NMLs for the project around Haberfield and Ashfield

ID	Representative monitoring location	Rating Background Level (RBL) dBA ICNG defined time periods1		
		Daytime period RBL	Evening period RBL	Night period RBL
H.01	1A Wattle St, Haberfield	58	58	52
H.02	141 Alt St, Haberfield	46	46	43
H.03	119 Alt St, Ashfield	46	46	38
H.04	35 Wattle St, Haberfield	58	55	44
H.06	259 Ramsay St, Haberfield	56	53	43
L.02	99 Charles St, Lilyfield	51	49	42

Notes:

1. ICNG Governing Periods – Day: 7.00 am to 6.00 pm Monday to Saturday, 8.00 am to 6.00 pm Sunday; Evening: 6.00 pm to 10.00 pm; Night: 10.00 pm to 7.00 am Monday to Saturday, 10.00 pm to 8.00 am Sunday

3.3 Ambient noise levels – Campbell Road motorway operations complex (MOC5)

The existing ambient noise environment across the study area around the Campbell Road motorway operations complex (MOC5) also varies. However, as with Haberfield and Ashfield, road noise is generally the primary contributor to background noise levels. The noise environment is also influenced by the construction works for the New M5 project, which are occurring in the area until Q1 2020.

The measured ambient noise levels for the Campbell Road motorway operations complex (MOC5) are outlined in **Table 3-3.** No additional monitoring at representative locations was required for the assessment of potential noise impacts as a result of the proposed modification.

Table 3-3 Residential NMLs for the project around the Campbell Road motorway operations complex (MOC5)

ID	Representative monitoring location	Rating Background Level (RBL) dBA ICNG defined time periods1		
		Daytime period RBL	Evening period RBL	Night period RBL
S.01	400 Sydney Park Rd, Alexandria	57	51	40
S.02	108 Campbell St, St Peters	50	46	39
S.03	18 Campbell St, St Peters	54	45	40
S.04	187-211 Princes Hwy, St Peters	52	50	44
S.05	608 Princes Hwy, Tempe	58	56	49

4 Assessment methodology

The assessment of potential construction noise and vibration impacts from the proposed modification followed the same approach as was carried out for the approved project and involved:

- Identifying and classifying sensitive receivers
- Characterising the existing noise environment based on attended and unattended noise measurements at nearby receiver locations
- Determining noise and vibration management levels in accordance with relevant guidelines
- Modelling to quantify the potential construction noise and vibration impacts from the construction activities for the proposed modification
- Identifying the potential changes to the impacts from the approved project and assessing the significance of potential impacts identified
- Preparing and documenting any changes to the mitigation measures identified for the approved project that would be implemented during construction.

The only exception to this is the methodology used to assess the noise and vibration impacts associated with the Parramatta Road West and Parramatta Road East civil sites. As required by the environmental assessment requirements, a qualitative assessment was used to assess these sites, which included identification of differences in noise and/or vibration impact between the equivalent work activities for each of the proposed activities as assessed in the EIS and/or SPIR and those of the proposed modification. The assessment also considered whether the proposed uses at these sites would be consistent with requirements of condition of approval C19.

4.1 Relevant guidelines and policies

The Roads and Maritime *Construction Noise and Vibration Guideline,* August 2016 (CNVG) outlines Roads and Maritime's approach to assessing and mitigating construction noise. This guideline should be read in conjunction with other relevant policy and guidelines discussed in this section. Guidelines referenced in this noise and vibration assessment are listed in **Table 4-1**.

Table 4-1 Construction noise and vibration guidelines and policies

Noise and vibration guidelines and policies	
Construction noise and vibration	
Guideline/policy name	**When guideline is used**
Construction Noise and Vibration Guideline (Roads and Maritime 2016)	Assessment of airborne noise, ground-borne noise and vibration impacts on sensitive receivers
Interim Construction Noise Guideline (DECC 2009)	Assessment of airborne noise and ground-borne noise impacts on sensitive receivers
Assessing Vibration: a technical guideline (DECC 2006)	Assessment of vibration impacts on sensitive receivers
BS 7385 Part 2-1993 *Evaluation and measurement for vibration in buildings* Part 2, BSI, 1993	Assessment of vibration impacts on non-heritage sensitive structures (damage)
DIN 4150:Part 3-1999 *Structural vibration - Effects of vibration on structures*, Deutsches Institut für Normung, 1999	Screening assessment of vibration impacts on heritage sensitive structures (damage)
Australian Standard AS 2187: Part 2-2006 *Explosives - Storage and Use - Part 2: Use of Explosives*	Assessment of blasting impacts on sensitive receivers

4.1.1 Airborne noise

The *Interim Construction Noise Guideline* (ICNG) (DECC 2009) sets out ways to assess and manage the impacts of demolition and construction noise on residences and other sensitive land uses. It does this by presenting assessment approaches that are tailored to the scale of the proposed works.

The ICNG requires project specific NMLs to be established for noise affected receivers. In the event that construction noise levels are predicted to be above the NMLs, feasible and reasonable work practices are investigated to minimise noise emissions.

The project specific $L_{Aeq(15minute)}$ NMLs are provided in **Table 4-2**.

Table 4-2 NMLs for other sensitive receivers

Land use	NML $L_{Aeq(15minute)}$ (Applied when the property is in use)
Residential	Standard construction hours[1] measured RBL[2] + 10 Outside standard construction hours RBL + 5 Highly Noise affected > 75 dBA NMLs for residential receivers are presented in the assessment section.
Commercial / Industrial	Commercial 70 dBA Industrial 75 dBA
Child cares	External NML 65 dBA for play areas External NML 50 dBA for sleeping areas
Classrooms at schools and other education institutions	Internal noise level 45 dBA
Hospital wards and operating theatres	Internal noise level 45 dBA
Places of worship	Internal noise level 45 dBA
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	External noise level 65 dBA
Passive recreation areas (characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, e.g. reading, meditation)	External noise level 60 dBA
Community centres	Depends on the intended use of the centre. Refer to the recommended 'maximum' internal levels in AS 2107 for specific uses.

Notes:

1. ICNG Governing Periods – Day: 7.00 am to 6.00 pm Monday to Saturday, 8.00 am to 6.00 pm Sunday; Evening: 6.00 pm to 10.00 pm; Night: 10.00 pm to 7.00 am Monday to Saturday, 10.00 pm to 8.00 am Sunday
2. Measured Rating Back Ground Level (RBL)

For sensitive receivers such as schools and places of worship, the NMLs presented in **Table 4-2** are based on internal noise levels. For the purpose of this assessment, it is conservatively assumed that all schools and places of worship have windows that can open. On the basis that external noise levels are typically 10 dBA higher than internal noise levels when windows are open sufficiently for ventilation, an external NML of 55 dBA LAeq(15 minute) has been adopted.

Other noise-sensitive receivers require separate project specific noise goals and, as per the guidance in the ICNG, NMLs for these receivers have been derived from the internal levels presented in AS 2107.

4.1.2 Sleep disturbance

The assessment of sleep disturbance impacts followed the same approach as was carried out for the approved project. This included a night-time sleep disturbance 'screening criterion' noise goal of RBL +15 dBA. The term 'screening criterion' indicates a noise level that is intended as a guide to identify the likelihood of sleep disturbance. It is not a limit to be met, however where the criterion is met sleep disturbance is considered to be unlikely. Rather, when the screening criterion is not met, this triggers the requirement for a more detailed analysis to determine if an impact is likely.

With regard to reaction to potential sleep disturbance awakening events, the *Road Noise Policy* (RNP) gives the following guidance:

> *From the research on sleep disturbance to date it can be concluded that:*
>
> - *maximum internal noise levels below 50–55 dBA are unlikely to awaken people from sleep*
> - *one or two noise events per night, with maximum internal noise levels of 65–70 dBA, are not likely to affect health and wellbeing significantly.*

4.1.3 Construction road traffic

When construction related traffic moves onto the public road network a different noise assessment methodology is appropriate, as vehicle movements are regarded as 'additional road traffic' rather than as part of the on-site construction works and as such would be assessed under the Roads and Maritime *Noise Criteria Guideline* (NCG) (2015). The NCG documents Roads and Maritime's approach to implementing the Road Noise Policy (DECCW 2011) (RNP).

The NCG requires that an initial screening test should be applied by evaluating whether noise levels would increase by more than 2 dBA (an increase in the number of vehicles of around 60 percent) due to construction traffic or a temporary reroute due to a road closure. Where increases are predicted to be 2 dBA or less then no further assessment is required as noise level changes would most likely not be discernible to most people.

Where noise levels increase by more than 2 dBA (ie 2.1 dBA or greater) further assessment is required using criteria presented in the NCG (see **Table 4-3**).

Table 4-3 NCG criteria for assessing construction vehicles on public roads

NCG criteria			
Road category	**Type of project/land use**	**Assessment criteria (dBA)**	
		Daytime (7 am - 10 pm)	**Night-time (10 pm - 7 am)**
Freeway/ arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq(15hour)}$ 60 (external)	$L_{Aeq(9hour)}$ 55 (external)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq(1hour)}$ 55 (external)	$L_{Aeq(1hour)}$ 50 (external)

4.1.4 Ground borne noise

The CNVG provides residential NMLs for ground-borne noise, which are applicable when ground-borne noise levels are higher than the corresponding airborne construction noise levels. The CNVG provides ground-borne noise levels at residences for evening and night-time periods only, as the objectives aim to protect amenity and minimise potential sleep disturbance. The following ground-borne noise levels are applicable for residences:

- Evening 40 dBA $L_{Aeq(15minute)}$
- Night-time 35 dBA $L_{Aeq(15minute)}$.

For commercial receivers such as offices and retail areas, the CNVG does not provide guidance in relation to acceptable ground-borne noise levels. For the purpose of this assessment, an internal NML of 60 dBA $L_{Aeq(15minute)}$ has been adopted in order to assist in identifying potential impacts. This is consistent with the internal NMLs adopted for commercial receivers on similar large infrastructure projects and has taken guidance from Australian Standard 2107.

These NMLs are applicable to residences and commercial receivers located above tunnelling works, and could also apply to other construction activities such as rock-breaking in an adjoining building where ground-borne noise levels may be higher than airborne noise levels. This situation may occur at construction ancillary facilities where airborne noise impacts are shielded by noise barriers or other structures, or noise sensitive areas within residential or commercial buildings which are not directly affected by the airborne noise component of nearby construction works.

4.1.5 Vibration

The assessment of vibration impacts followed the same approach as was carried out for the approved project. The recommended minimum working distances for construction plant in **Table 4-4** are referenced from the CNVG and DIN 4150.

Consistent with BS 7385 and the Assessing Vibration guideline, the recommendations are for the practical management of potential vibration to minimise the likelihood of cosmetic damage to buildings and disturbance or annoyance in humans. The human comfort (response) minimum working distances are conservative, developed with reference to the more stringent objectives for continuous vibration for typical residential building constructions.

Table 4-4 Recommended minimum working distances for vibration intensive plant

Plant item	Rating/description	Minimum working distance			
		Cosmetic damage			Human response[1]
		Residential and light commercial[1]	Group 2 (typical)[2]	Group 3 (structurally unsound)[2]	
Vibratory roller	< 50 kn (Typically 1-2t	5 m	7 m	11 m	15 m to 20 m
	< 100 kn (Typically 2-4t)	6 m	8 m	13 m	20 m
	< 200 kn (Typically 4-6t)	12 m	16 m	15 m	40 m
	< 300 kn (Typically 7-13t)	15 m	20 m	31 m	100 m
	> 300 kn (Typically 13-18t)	20 m	26 m	40 m	100 m
	> 300 kn (Typically > 18t)	25 m	33 m	50 m	100 m
Small hydraulic hammer	300 kg - 5 to 12t excavator	2 m	3 m	5 m	7 m
Medium hydraulic hammer	900 kg - 12 to 18t excavator	7 m	10 m	15 m	23 m
Large hydraulic hammer	1600 kg - 18 to 34t excavator	22 m	29 m	44 m	73 m
Vibratory pile driver	Sheet piles	2 m to 20 m	3 m to 26 m[4]	5 m to 40 m[4]	20 m to 100 m[4]
Pile boring	≤ 800 mm	2 m (nominal)	3 m	5 m	4 m
Jackhammer	Hand held	1 m (nominal)	2 m	3 m	2 m
Road-header[3]	Tunnelling	2 m	3 m	5 m	7 m

Notes:

1. Criteria referenced from Roads and Maritime CNVG
2. Criteria referenced from DIN 4150
3. Measurement from SLR Database
4. Corresponds to the higher guideline range

4.1.6 Fixed facilities noise criteria

The *NSW Industrial Noise Policy* (INP) (EPA, 1999) sets two separate noise criteria to meet environmental noise objectives: one to account for intrusive noise and the other to protect the amenity of particular land uses. These criteria are to be met at the most-affected boundary of the receiver property. The more stringent of these two criteria usually defines the proposal specific noise levels. For both amenity and intrusiveness, night-time criteria are typically more stringent than daytime or evening criteria.

Operational noise goals for the fixed facilities were determined in Appendix J (Technical working paper: Noise and vibration) of the EIS. A summary of the operational noise goals is provided in **Table 4-5**. Assuming continuous operation of industrial noise sources, the more stringent of the intrusiveness or the amenity criteria sets the noise goals, as highlighted in the table.

Table 4-5 Summary of operational noise goals for fixed facilities

Area	NCAs	Applicable noise logger (ANL)	Receiver type	Existing night-time noise levels (dBA)		Operational noise goals (dBA)		
				RBL	LAeq	$L_{Aeq(15minute)}$ Intrusive[1]	$L_{Aeq(period)}$ Amenity[1,2,3]	$L_{A1(60second)}$ Sleep dist. screening level
St Peters	NCA46	S.01	Residential	40	62	45	45	55
	NCA48	S.03	Residential	40	61	45	45	55
	NCA49	S.03	Residential	40	61	45	45	55
	NCA50	S.04	Residential	42	63	47	45	57
	NCA51	S.02	Residential	39	63	44	45	54

Notes:

1. A grey highlight indicates the controlling design criteria (ie the lower of the intrusiveness and amenity criteria)
2. Criteria are identified as controlling as noise source is continuous throughout the period
3. No existing industrial noise sources were present therefore amenity criteria has been set as ANL for urban areas

4.2 Conditions of approval for the project

The conditions of approval that address the control and management of noise relevant to this modification are listed below in **Table 4-6**. A cross reference and/or comment is also included to indicate where the condition applies within this modification. It is important to note that these conditions of approval apply to all works associated with the construction of the project. The included cross reference to a particular works activity is only to highlight that an activity includes works which relate directly to a particular condition of approval.

Table 4-6 Relevant noise management conditions from the M4-M5 Link project approval

CoA	Condition Requirements	Document reference/ comment
C 19	Only one of the two ancillary facility options (A or B) presented in Chapter 6 of the EIS can be implemented at Haberfield, except if one site is used for parking and other works that do not exceed the 'Noise affected' Noise Management Levels as identified in the ICNG.	Applies to the operation of the Parramatta Road East and Parramatta Road West civil sites
E 68	Works must be undertaken during the following hours: a. 7:00 am to 6:00 pm Mondays to Fridays, inclusive; b. 8:00 am to 1:00 pm Saturdays; and c. at no time on Sundays or public holidays.	Applies to all construction works included within this modification
E 69	Notwithstanding Condition E68, works may be undertaken between 1:00 pm to 6:00 pm on Saturday.	
E 70	Notwithstanding Conditions E68 and E69 the following works are permitted to be undertaken 24 hours a day, seven days a week: a. tunnelling activities excluding cut and cover tunnelling; b. haulage of spoil and delivery of material; c. works within an acoustic shed; and d. tunnel fit out works. Other surface works associated with tunnelling must only be undertaken in accordance with the requirements of Condition E73.	Section 5.1 – Northcote Street tunnel and civil site
E 72	Except as permitted by an EPL, highly noise intensive works that result in an exceedance of the applicable NML at the same receiver must only be undertaken: a. between the hours of 8:00 am to 6:00 pm Monday to Friday; b. between the hours of 8:00 am to 1:00 pm Saturday; and c. in continuous blocks not exceeding three (3) hours each with a minimum respite from those activities and works of not less than one (1) hour between each block. d. For the purposes of this condition, 'continuous' includes any period during which there is less than a one (1) hour respite between ceasing and recommencing any of the work that are the subject of this condition.	Applies to all construction works included within this modification

CoA	Condition Requirements	Document reference/ comment
E 73	Notwithstanding Conditions E68 to E72 works may be undertaken outside the hours specified under those conditions in the following circumstances: a. for the delivery of materials required by the NSW Police Force or other authority for safety reasons; or b. where it is required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property or to prevent environmental harm; or c. where different construction hours are permitted or required under an EPL in force in respect of the CSSI; or d. works approved under an Out-of-Hours Work Protocol for works not subject to an EPL as required by Condition E77; or e. construction that causes LAeq (15 minute) noise levels: i. no more than 5 dB(A) above the rating background level at any residence in accordance with the Interim Construction Noise Guideline (DECC, 2009), and ii. no more than the 'Noise affected' noise management levels specified in Table 3 of the Interim Construction Noise Guideline (DECC, 2009) at other sensitive land uses, and iii. continuous or impulsive vibration values, measured at the most affected residence are no more than the maximum values for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006), and iv. intermittent vibration values measured at the most affected residence are no more than the maximum values for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006). Note: Section 5.24(1)(e) of the EP&A Act requires that an EPL be substantially consistent with this approval. For example, an EPL cannot authorise spoil movements at the Darley Road construction ancillary facility outside of the hours specified in Conditions E68 and E69. Out of Hours Works considered under Conditions E73(c) and (d) must be justified and include an assessment of mitigation measures.	

CoA	Condition Requirements	Document reference/ comment
E 75	Out-of-hours works that are regulated by an EPL as per Condition E73(c) or through the Out-of-Hours Work Protocol as per Condition E77 include: a. works which could result in a high risk to construction personnel or public safety, based on a risk assessment carried out in accordance with AS/NZS ISO 31000:2009 “Risk Management – Principles and Guidelines”; or b. where the relevant road network operator has advised the Proponent in writing that carrying out the works and activities could result in a high risk to road network operational performance; or c. where the relevant utility service operator has advised the Proponent in writing that carrying out the works and activities could result in a high risk to the operation and integrity of the utility network; or d. (d) where the TfNSW Transport Management Centre (or other road authority) has advised the Proponent in writing that a road occupancy licence is required and will not be issued for the works or activities during the hours specified in Condition E68 and Condition E69; or e. where Sydney Trains (or other rail authority) has advised the Proponent in writing that a Rail Possession is required. Note: Other out-of-hours works can be undertaken with the approval of an EPL, or through the project’s Out-of-Hours Work Protocol for works not subject to a EPL.	Section 5.15 – Construction of the G-Loop Section 5.2 – Construction of the Parramatta Road pedestrian overpass bridge Both works may require road occupancy (item b of E75) during construction.
E 76	In order to undertake out-of-hours work described in Condition E75, the Proponent must identify appropriate respite periods for the out-of-hours works in consultation with the community at each affected location. This consultation must include (but not be limited to) providing the community with: a. a schedule of likely out-of-hours work for a period no less than three (3) months; b. the potential works, location and duration; c. the noise characteristics and likely noise levels of the works; and d. likely mitigation and management measures. The outcomes of the community consultation, the identified respite periods and the scheduling of the likely out-of-hour works must be provided to the AA, EPA and the Secretary.	
E 78	All works undertaken for the delivery of the CSSI, including those undertaken by third parties, must be coordinated to ensure respite periods are provided. The Proponent must: a. reschedule any works to provide respite to impacted noise sensitive receivers so that the respite is achieved in accordance with Condition E76; or b. consider the provision of alternative respite or mitigation to impacted noise sensitive receivers; and provide documentary evidence to the AA in support of any decision made by the Proponent in relation to respite or mitigation.	Applies to all construction works included within this modification

CoA	Condition Requirements	Document reference/ comment
E 79	Construction Noise and Vibration Impact Statements must be prepared for construction ancillary facility(s) before any works that result in noise and vibration impacts commence, and include specific mitigation measures identified through consultation with affected sensitive receivers. The Statements must supplement the Construction Noise and Vibration Management Sub-plan or Site Establishment Management Plan(s) and are to be implemented for the duration of the works. The Construction Noise and Vibration Impact Statement for the White Bay Civil Site (C11) must be prepared in consultation with the Port Authority of NSW and NSW Heritage Council.	
E 80	Noise generating works in the vicinity of potentially-affected community, religious, educational institutions and noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories and operating theatres) resulting in noise levels above the NMLs must not be timetabled within sensitive periods, unless other reasonable arrangements with the affected institutions are made at no cost to the affected institution.	
E 81	Mitigation measures must be implemented with the aim of achieving the following construction noise management levels and vibration criteria: a. construction 'Noise affected' noise management levels established using the Interim Construction Noise Guideline (DECC, 2009); b. vibration criteria established using the Assessing vibration: a technical guideline (DEC, 2006) (for human exposure); c. Australian Standard AS 2187.2 - 2006 "Explosives - Storage and Use - Use of Explosives"; d. BS 7385 Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2" as they are "applicable to Australian conditions"; and e. the vibration limits set out in the German Standard DIN 4150-3: Structural Vibration- effects of vibration on structures (for structural damage). Any works identified as exceeding the noise management levels and/or vibration criteria must be managed in accordance with the Construction Noise and Vibration Management Sub-plan. Note: The Interim Construction Noise Guideline identifies 'particularly annoying' activities that require the addition of 5 dB(A) to the predicted level before comparing to the construction Noise Management Level.	
E 82	Mitigation measures must be applied when the following residential ground-borne noise levels are exceeded: a. evening (6:00 pm to 10:00 pm) — internal LAeq (15 minute): 40 dB(A); and b. night (10:00 pm to 7:00 am) — internal LAeq (15 minute): 35 dB(A). c. The mitigation measures must be outlined in the Construction Noise and Vibration Management Sub-plan, including in any Out-of-Hours Work Protocol, required by Condition E77.	Section 5.1.10 – Ground borne noise associated with the construction of the access tunnels

CoA	Condition Requirements	Document reference/ comment
E 83	Owners and occupiers of properties at risk of exceeding the screening criteria for cosmetic damage must be notified before works that generate vibration commences in the vicinity of those properties. If the potential exceedance is to occur more than once or extend over a period of 24 hours, owner and occupiers are to be provided a schedule of potential exceedances on a monthly basis for the duration of the potential exceedances, unless otherwise agreed by the owner and occupier. These properties must be identified and considered in the Construction Noise and Vibration Management Sub-plan.	Applies to all construction works included within this modification
E 84	The Proponent must conduct vibration testing before and during vibration generating activities that have the potential to impact on heritage items to identify minimum working distances to prevent cosmetic damage. In the event that the vibration testing and monitoring shows that the preferred values for vibration are likely to be exceeded, the Proponent must review the construction methodology and, if necessary, implement additional mitigation measures.	
E 85	The Proponent must seek the advice of a heritage specialist on methods and locations for installing equipment used for vibration, movement and noise monitoring at heritage-listed structures.	
E 86	All acoustic sheds must be erected as soon as site establishment works at the facilities are completed and before undertaking any works which are required to be conducted within the sheds.	Section 5.1 – Northcote Street tunnel and civil site
E 88	At receiver noise mitigation in the form of at-property treatment must be offered to the land owner for habitable living spaces, or other mitigation or management measures as agreed by the occupier, to residential properties identified in Appendix E. Mitigation must be offered prior to works commencing. This requirement does not apply if the sensitive receiver has been provided with noise mitigation under the RMS Noise Abatement Program or the State Environment Planning Policy (Infrastructure) 2007 (clause 102(3)). The adequacy of at-property treatments will be reviewed where previous treatments have been installed as part of other SSI or CSSI projects. Note: This condition does not preclude the application of other noise and vibration mitigation and management measures.	Applies to properties in Haberfield which are defined by Appendix E of the CoA
E 90	Receivers which are eligible for receiving treatment under the Noise Insulation Program required under Condition E89 must have treatment implemented within six (6) months following the commencement of construction which would affect the receiver. The implementation of the Noise Insulation Program must be prioritised based on the degree and duration of exceedance with high priority exceedances undertaken within three (3) months of the commencement of construction.	

CoA	Condition Requirements	Document reference/ comment
E 92	The Proponent must prepare an Operational Noise and Vibration Review (ONVR) to confirm noise and vibration control measures that would be implemented for the operation of the CSSI. The ONVR must be prepared in consultation with the Department, relevant council(s), other relevant stakeholders and the community and must: a. confirm the appropriate operational noise and vibration objectives and levels for adjoining development, including existing sensitive receivers; b. confirm the operational noise predictions based on the final design. Confirmation must be based on an appropriately calibrated noise model (which has incorporated noise monitoring, and concurrent traffic counting, where necessary for calibration purposes). The assessment must specifically include verification of noise levels at all fixed facilities, based on noise monitoring undertaken at appropriately identified noise catchment areas surrounding the facilities; c. confirm the operational noise and vibration impacts at adjoining development based on the final design of the CSSI, including operational daytime LAeq,15 hour and night-time LAe, 9 hour traffic noise contours; d. review the suitability of the operational noise mitigation measures identified in the EIS and SPIR and, where necessary, investigate and identify additional noise and vibration mitigation measures required to achieve the noise criteria outlined in the NSW Road Noise Policy (DECCW, 2011) and NSW Industrial Noise Policy (EPA, 2000), including the timing of implementation; e. include a consultation strategy to seek feedback from directly affected landowners on the noise and vibration mitigation measures; and f. procedures for the management of operational noise and vibration complaints. The ONVR is to be verified by a suitably qualified and experienced noise and vibration expert. The ONVR is to be undertaken at the Proponent's expense and submitted to the Secretary for approval prior to the implementation of mitigation measures. The Proponent must implement the identified noise and vibration control measures and make the ONVR publicly available.	Section 6.1 – Water treatment plant
E 105	The Proponent must offer pre-dilapidation surveys and must undertake and prepare pre-dilapidation reports where the offer is accepted, on the current condition of surface and sub-surface structures identified as at risk from settlement or vibration by the geotechnical model described in Condition E101. The pre-dilapidation surveys and reports must be prepared by a suitably qualified and experienced person(s) and must be provided to the owners of the surface and sub-surface structures for review prior to the commencement of potentially impacting works.	Section 5.1.10 – Ground borne noise associated with the construction of the access tunnels