ARCADIS Design & Consultancy for natural and built assets

Moorebank Precinct East - Stage 2 Proposal

Noise and Vibration Impact Assessment

SIMTA

SYDNEY INTERMODAL TERMINAL ALLIANCE

Part 4, Division 4.1, State Significant Development

December 2016

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ACOUSTICS AND AIR

MPE STAGE 2

NOISE & VIBRATION IMPACT ASSESSMENT

REPORT NO. 12186-S2
VERSION C

DECEMBER 2016

PREPARED FOR

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WILKINSON MURRAY

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Wilkinson Murray is an independent firm established in 1962, originally as Carr & Wilkinson. In 1976 Barry Murray joined founding partner Roger Wilkinson and the firm adopted the name which remains today. From a successful operation in Australia, Wilkinson Murray expanded its reach into Asia by opening a Hong Kong office early in 2006. 2010 saw the introduction of our Queensland office and 2011 the introduction of our Orange office to service a growing client base in these regions. From these offices, Wilkinson Murray services the entire Asia-Pacific region.

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GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

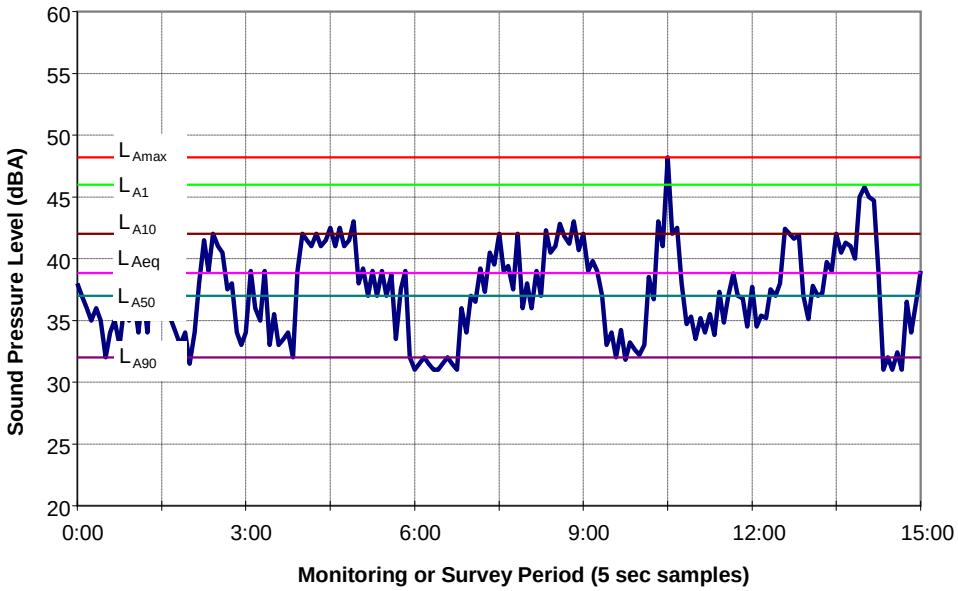
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

Typical Graph of Sound Pressure Level vs Time



EXECUTIVE SUMMARY

Wilkinson Murray Pty Limited (WM) has conducted a Noise and Vibration Impact Assessment (NVIA) for Stage 2 (the Proposal) of the Moorebank Precinct East Project (MPE Project). This report forms part of the Environmental Impact Statement (EIS) for approval of the Proposal.

The nearest potentially affected noise sensitive receivers have been identified. These receivers comprise residential, industrial, educational and recreational land uses. Potential noise and vibration impacts at sensitive receivers, associated with the construction and operation of the Proposal, have been considered, along with potential cumulative noise impacts from other significant developments in the surrounding area.

Potential noise and vibration impacts have been assessed in general accordance with the following NSW Government guidelines and policies:

- NSW Industrial Noise Policy (INP) (EPA, 2000);
- Noise Guide for Local Government (NGLG) (EPA, 2013);
- NSW Road Noise Policy (RNP) (DECCW, 2011);
- Rail Infrastructure Noise Guideline (RING) (EPA, 2013);
- Interim Construction Noise Guideline (ICNG) (DECC, 2009); and,
- Assessing Vibration: a technical guide (Assessing Vibration) (DEC, 2006).

Noise levels at sensitive receivers have been predicted using a computer noise model created with the CadnaA software package. Noise source and receiver locations, and details of warehouse buildings and surrounding topography have been incorporated into the noise model.

Construction noise levels during all anticipated works during standard construction hours for the Proposal are anticipated to comply with the established Noise Management Levels (NML) at all sensitive receivers. Construction noise levels during all proposed out of hours works periods are predicted to comply with the NML at all times, except those during weekday evenings in Wattle Grove, which are predicted to exceed the NML by up to 1 dB. This exceedance is considered negligible.

Cumulative construction noise levels due to concurrent activities associated with MPW Early Works, MPW Stage 2, MPE Stage 1 and the Proposal are predicted to comply with the NML at all receivers, except for the most sensitive receivers in Casula. At these receiver locations, cumulative construction noise levels may exceed the NML by up to 2 dB. This is considered a minor exceedance.

Due to the large separation distances between the Proposal and nearby sensitive receivers, construction vibration impacts are considered unlikely.

A Construction Noise and Vibration Management Plan (CNVMP) would be developed for the Proposal, considering all reasonable and feasible measures to reduce noise levels at sensitive receivers.

The study has found that operational noise levels from the Proposal, and in concurrent operation with MPE Stage 1, comply with the relevant criteria, including relevant sleep disturbance goals. Additionally, cumulative noise levels due to the concurrent operation of MPE Stage 1 and MPE Stage 2, and the Moorebank Precinct West (MPW) Stage 2 Proposal are predicted to comply with the established criteria.

The Proposal has the potential to increase road noise levels at sensitive receivers along the M5 Motorway, Moorebank Avenue and Anzac Road. Any increases in road noise levels at sensitive receivers along these roads, during both the construction and operation of the Proposal, are predicted to be well below 2 dB, and in accordance with the *NSW Road Noise Policy,* no mitigation is necessary.

On the basis of the assessments conducted by WM, it is concluded that noise and vibration impacts associated with the construction and operation of the Proposal are not expected to degrade the existing acoustic environment, or create significant annoyance to nearby sensitive receivers.

1 INTRODUCTION

Concept Plan Approval (MP 10_0193) for an intermodal terminal (IMT) facility at Moorebank, NSW (the Moorebank Precinct East Project (MPE Project) (formerly the SIMTA Project)) was received on 29 September 2014 from the NSW Department of Planning and Environment (DP&E). The Concept Plan for the MPE Project involves the development of an IMT, including a rail link to the Southern Sydney Freight Line (SSFL) within the Rail Corridor, warehouse and distribution facilities with ancillary offices, a freight village (ancillary site and operational services), stormwater, landscaping, servicing, associated works on the eastern side of Moorebank Avenue, Moorebank, and construction or operation of any part of the project, which is subject to separate approval(s) under the *Environmental Planning and Assessment Act 1979* (EP&A Act).

This Environmental Impact Statement (EIS) is seeking approval, under Part 4, Division 4.1 of the EP&A Act, for the construction and operation of Stage 2 of the MPE Project (herein referred to as the Proposal) under the Concept Plan Approval for the MPE Project, being the construction and operation of warehouse and distribution facilities.

This EIS has been prepared to address:

- The Secretary's Environmental Assessment Requirements (SEARs) (SSD 16-7628) for the Proposal, issued by NSW DP&E on 27 May 2016 (Appendix A).
- The relevant requirements of the Concept Plan Approval MP 10_0913 dated 29 September 2014 (as modified) (Appendix A).
- The relevant requirements of the approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (No. 2011/6229, granted in March 2014 by the Commonwealth Department of the Environment (DoE)) (as relevant) (Appendix A).

This EIS also gives consideration to the MPE Stage 1 Project (SSD 14-6766) including the mitigation measures and conditions of consent as relevant to this Proposal.

This EIS has been prepared to provide a complete assessment of the potential environmental impacts associated with the construction and operation of the Proposal. This EIS proposes measures to mitigate these issues and reduce any unreasonable impacts on the environment and surrounding community.

1.1 Purpose of This Report

This report supports the Environmental Impact Statement (EIS) for the Proposal (refer to Section 1.2 below for an overview of the Proposal) and has been prepared as part of a State Significant Development (SSD) Application for which approval is sought under Part 4, Division 4.1 of the EP&A Act.

This report has been prepared to address:

- The Secretary's Environmental Assessment Requirements (SEARs) (SSD 16-7628) for the Proposal, issued by NSW DP&E on 27 May 2016.
- The relevant requirements of Concept Plan Approval MP 10_0913 dated 29 September 2014 (as modified).
- The relevant requirements of the approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (No. 2011/6229, granted in March 2014 by the Commonwealth Department of the Environment (DoE)) (as relevant).

The SEARs and the Concept Plan Conditions of Approval and Statement of Commitments relevant to this study, and the section of this report where they have been addressed are provided in Table 1-1 and Table 1-2, respectively.

Table 1-1 Secretary's Environmental Assessment Requirements

Section	Environmental Assessment Requirement	Where addressed in this report
5. Noise and Vibration	An updated assessment of noise and vibration impacts. The assessment shall:	
	a) Assess construction noise and vibration impacts associated with construction of the proposal, including impacts from construction traffic and ancillary facilities. The assessment shall identify sensitive receivers and assess construction noise/vibration generated by representative construction scenarios focusing on high noise generating works. Where work hours outside of standard construction hours are proposed, clear justification and detailed assessment of these work hours must be provided, including alternatives considered, mitigation measures proposed and details of construction practices, work methods, compound design, etc.;	Section 6
	b) Assess operational noise and vibration impacts and identify feasible and reasonable measures proposed to be implemented to minimise operational noise impacts of the intermodal facility and rail link, including the preparation of an Operational Noise Management and Monitoring Plan; and,	Section 7
	c) Be prepared in accordance with: NSW Industrial Noise Policy (EPA 2000), Interim Construction Noise Guideline (DECC 2009), Assessing Vibration: a technical guide (DEC 2006), the Rail Infrastructure Noise Guideline (EPA 2013), Development Near Rail Corridors and Busy Roads Interim Guideline (DoP 2008), and the NSW Road Noise Policy 2011.	Sections 6, 7 & 8

Table 1-2 Concept Plan Conditions of Approval and Statement of Commitments

Section	Environmental Assessment Requirement	Where addressed in this report
Concept Plan Conditions of Approval, Schedule 3, Section 2 General Requirements, Best Practice Review,	a. Clearly demonstrate that the Proponent will at each project stage adopt and implement best practice facility and process design and management measure	The Best Practice Review relates to the intermodal terminal and Rail link component of the SIMTA Project (MPE Stage 1). A Best Practice Review was undertaken as part of

Air Quality	to the extent that is reasonably practicable, to minimise operational air pollutant and noise emissions at the terminal and on the rail link;	the MPE Stage 1 EIS in accordance with the Concept Plan Conditions of Approval. A Best Practice Review is not relevant or required for the Proposal, as it relates to warehouse and distribution facilities only, not the intermodal terminal, within the SIMTA site.
Concept Plan Conditions of Approval, Schedule 3, Section 2 General Requirements, Best Practice Review	The following noise requirements shall be included in the best practice review: a. assessment of an ongoing noise compliance and response system; d. site layout and operations options to: i. eliminate the need to reverse vehicles and plant (not dedicated to on site operations); and ii. where reversing vehicles and plant is unavoidable only reversing such vehicles and plant in noise attenuated enclosures. e. assessment of alternative options to the use of traditional 'beeper' type reversing/ movement alarms; and f. framework for on and off-site noise monitoring during operation	The Best Practice Review relates to the intermodal terminal and Rail link component of the SIMTA Project (MPE Stage 1). A Best Practice Review was undertaken as part of the Stage 1 EIS in accordance with the Concept Plan Conditions of Approval. A Best Practice Review is not relevant or required for the Proposal, as it relates to warehouse and distribution facilities only, not the intermodal terminal, within the SIMTA site.
Concept Plan Conditions of Approval, Schedule 3, Section 2 General Requirements, Noise and Vibration	Any future Development Application shall include an updated assessment of noise and vibration impacts. a. The assessment shall: assess construction noise and vibration impacts associated with construction of the intermodal facility including rail link, including impacts from construction traffic and ancillary facilities. The assessment shall identify sensitive receivers and assess construction noise/vibration generated by representative construction scenarios focusing on high noise generating works. Where work hours outside of standard construction hours are proposed,	Section 6

	clear justification and detailed assessment of these work hours must be provided, including alternatives considered, mitigation measures proposed and details of construction practices, work methods, compound design, etc	
	b. assess operational noise and vibration impacts and identify feasible and reasonable measures proposed to be implemented to minimise operational noise impacts of the intermodal facility and rail link, including the preparation of an Operational Noise Management and Monitoring Plan; and	Section 7
	c. be prepared in accordance with: NSW Industrial Noise Policy (EPA 2000), Interim Construction Noise Guideline (DECC 2009), Assessing Vibration: a technical guide (DEC 2006), the Rail Infrastructure Noise Guideline (EPA 2013), Development Near Rail Corridors and Busy Roads Interim Guideline (DoP 2008), and the NSW Road Noise Policy 2011.	Sections 6, 7 & 8
Statement of Commitments, Development and Staging	The Proponent commits to including the following information with the detailed planning application(s) for the warehouse buildings: • Siting and design of buildings in consideration of potential noise impacts from the intermodal terminal facility;	Section 7.2.3
Statement of Commitments, Noise and Vibration	The Proponent will undertake further detailed assessments at each application stage after the Concept Plan Approval to provide input to planning and confirm the need for and degree of noise mitigation if required. This should be undertaken based on the most detailed information available at that stage of works. These subsequent assessments should address the DGR requirements for the SIMTA proposal as a minimum.	Section 6, 7 & 8
	The Proponent shall consider locating buildings at or near the north-eastern and south-eastern boundaries of the site to provide beneficial acoustic shielding to the nearest residences.	Section 7.2.3

	The Proponent shall consider locating less noise-intensive activities and operations at the north-eastern and south-eastern corners of the site where residences are closest.	Section 7.2.3
	The Proponent should make provision for a noise barrier along the western boundary of the SIMTA site. The requirement for the barrier will be determined having regard to the outcomes of the operational noise monitoring.	Section 7.2.3 & 7.7
	The Proponent will carry out detailed assessments for the subsequent application stages and when the SIMTA proposal is operational, including monitoring of background noise levels at nearby receivers. The monitoring data should be used to validate noise models used in these assessments. The subsequent assessments should address the environmental assessment requirements, as determined by the approval authority, as a minimum.	Section 6, 7 & 8

1.2 Overview of the Proposal

The Proposal involves the construction and operation of Stage 2 of the MPE Project, comprising warehousing and distribution facilities on the MPE site and upgrades to approximately 1.4 kilometres of Moorebank Avenue between the northern MPE site boundary and 120 metres south of the southern MPE site boundary.

Key components of the Proposal include:

- Warehousing comprising approximately 300,000m^2 GFA, additional ancillary offices and the ancillary freight village
- Establishment of an internal road network, and connection of the Proposal to the surrounding public road network
- Ancillary supporting infrastructure within the Proposal site, including:
    - Stormwater, drainage and flooding infrastructure
    - Utilities relocation and installation
    - Vegetation clearing, remediation, earthworks, signage and landscaping
- Subdivision of the MPE Stage 2 site
- The Moorebank Avenue upgrade would be comprised of the following key components:
    - Modifications to the existing lane configuration, including some widening
    - Earthworks, including construction of embankments and tie-ins to existing Moorebank Avenue road level at the Proposal's southern and northern extents

  - Raking of the existing pavement and installation of new road pavement
  - Establishment of temporary drainage infrastructure, including temporary basins and / or swales
  - Raising the vertical alignment by about two metres from the existing levels, including kerbs, gutters and a sealed shoulder
  - Signalling and intersection works
- Upgrading existing intersections along Moorebank Avenue, including:
  - Moorebank Avenue / MPE Stage 2 access
  - Moorebank Avenue / MPE Stage 1 northern access
  - Moorebank Avenue / MPE Stage 2 central access
  - MPW Northern Access / MPE Stage 2 southern emergency access

The Proposal would interact with the MPE Stage 1 Project (SSD_6766) via the transfer of containers between the MPE Stage 1 IMT and the Proposal's warehousing and distribution facilities. This transfer of freight would be via a fleet of heavy vehicles capable of being loaded with containers and owned by SIMTA. The fleet of vehicles would be stored and used on the MPE Stage 2 site, but registered and suitable for on-road use. The Proposal is expected to operate 24 hours a day, seven days per week.

An overview of the Proposal is shown in Figure 1-1. To facilitate operation of the Proposal, the following construction activities would be carried out across and surrounding the Proposal site (area on which the Proposal is to be developed):

- Vegetation clearance
- Remediation works
- Demolition of existing buildings and infrastructure on the Proposal site
- Earthworks and levelling of the Proposal site, including within the terminal hardstand
- Drainage and utilities installation
- Establishment of hardstand across the Proposal site, including the terminal hardstand
- Construction of a temporary diversion road to allow for traffic management along the Moorebank Avenue site during construction (including temporary signalised intersections adjacent to the existing intersections) (the Moorebank Avenue Diversion Road)
- Construction of warehouses and distribution facilities, ancillary offices and the ancillary freight village
- Construction works associated with signage, landscaping, stormwater and drainage works.

Construction works associated with signage, landscaping, stormwater and drainage works. The Proposal would operate 24 hours a day, 7 days a week.

The footprint and operational layout of the Proposal are shown on Figure 1-1. More information relating to the construction and operation of the Proposal is provided in Section 3 and Section 4 of this report, and in Chapter 4 of the MPE Stage 2 EIS.

1.3 Key terms relevant to the Proposal

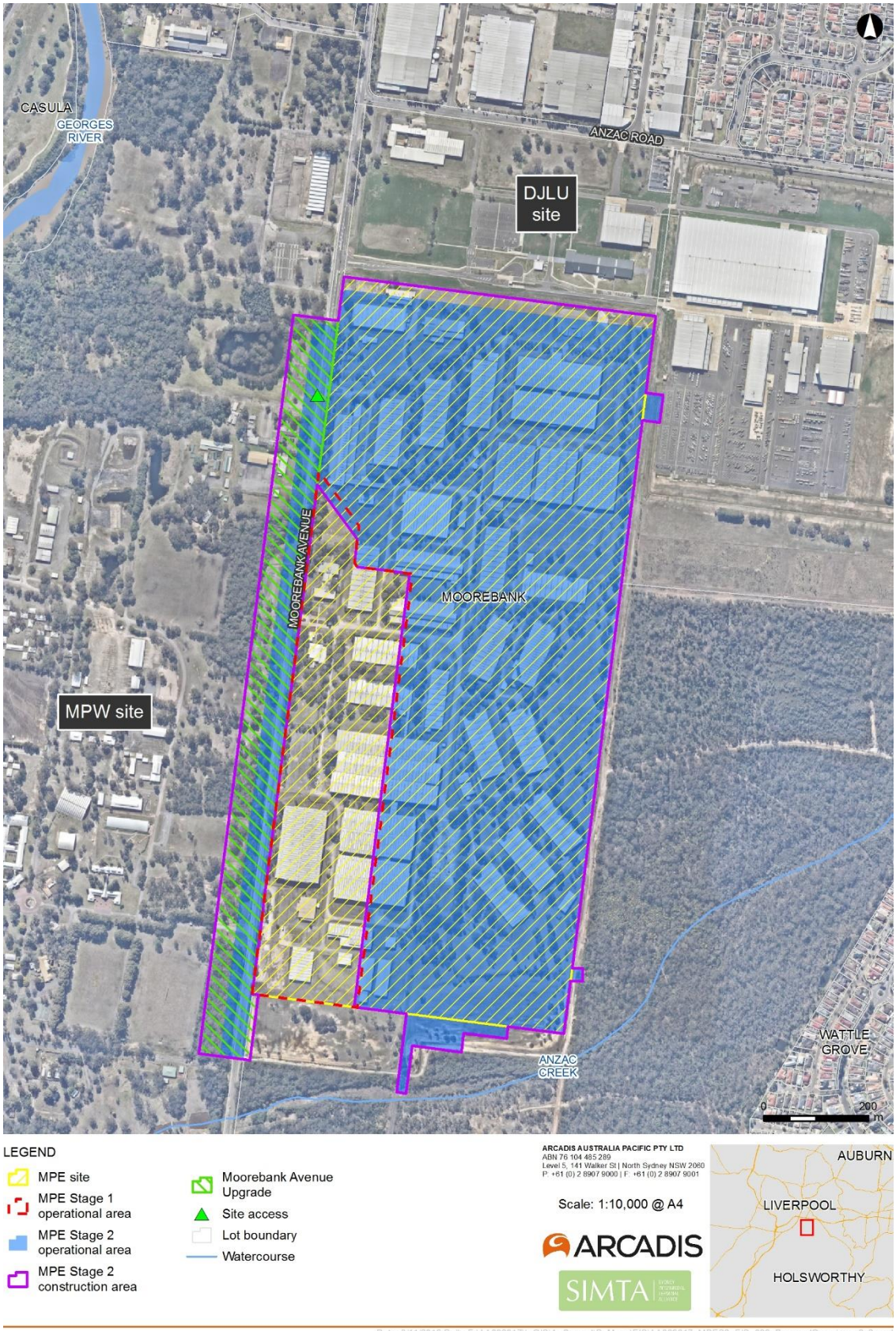
Table 1-3 provides a summary of the key terms relevant to the Proposal, which are included throughout this report.

Table 1-3 Summary of Key Terms

Term	Definition
General terms	
The Moorebank Precinct	Refers to the whole Moorebank intermodal precinct, i.e. the MPE site and the MPW site
Moorebank Precinct West (MPW) Project (formerly the MIC Project)	The MPW Intermodal Terminal Facility as approved under the MPW Concept Plan Approval (SSD_5066) and the MPW EPBC Approval (No. 2011/6086).
Moorebank Precinct West (MPW) site (formerly the MIC site)	The site which is the subject of the MPW Concept Plan Approval, MPW EPBC Approval and MPW Planning Proposal. The MPW site does not include the rail link as referenced in the MPW Concept Plan Approval or MPE Concept Plan Approval.
Moorebank Precinct East (MPE) Concept Plan Approval (formerly the SIMTA Concept Plan Approval)	MPE Concept Plan Approval (SSD_0193) granted by the NSW Department of Planning and Environment on 29 September 2014 for the development of former defence land at Moorebank to be developed in three stages; a rail link connecting the site to the Southern Sydney Freight Line, an intermodal terminal, warehousing and distribution facilities and a freight village.
Moorebank Precinct East (MPE) Project (formerly the SIMTA Project)	The MPE Intermodal Terminal Facility, including a rail link and warehouse and distribution facilities at Moorebank (eastern side of Moorebank Avenue) as approved by the Concept Plan Approval (MP 10_0913) and the MPE Stage 1 Approval (14_6766).
Moorebank Precinct East (MPE) Site (formerly the SIMTA Site)	Including the former DSNDC site and the land owned by SIMTA which is subject to the Concept Plan Approval. The MPE site does not include the rail corridor, which relates to the land on which the rail link is to be constructed.
Statement of Commitments (SoC)	Recommendations provided in the specialist consultant reports prepared as part of the MPE Concept Plan application to mitigate environmental impacts, monitor environmental performance and/or achieve a positive environmentally sustainable outcome in respect of the MPE Project. The Statement of Commitments have been proposed by SIMTA as the Proponent of the MPE Concept Plan Approval.
MPE Stage 1 Project-specific terms	
Rail Corridor	Area defined as the 'Rail Corridor' within the MPE Concept Plan Approval.
Rail Link	The rail link from the South Sydney Freight Line to the MPE IMEX Terminal, including the area on either side to be impacted by the construction works included in MPE Stage 1.

Term	Definition
MPE Stage 1	Stage 1 (14-6766) of the MPE Concept Plan Approval for the development of the MPE Intermodal Terminal Facility, including the rail link at Moorebank. This reference also includes associated conditions of approval and environmental management measures which form part of the documentation for the approval.
MPE Stage 1 site	Includes the MPE Stage 1 site and the Rail Corridor, i.e. the area for which approval (construction and operation) was sought within the MPE Stage 1 Proposal EIS.
MPE Stage 2 specific terms	
MPE Stage 2 Proposal/ the Proposal	The subject of this EIS; being Stage 2 of the MPE Concept Plan Approval including the construction and operation of 300,000m2 of warehousing and distribution facilities on the MPE site and the Moorebank Avenue upgrade within the Moorebank Precinct.
MPE Stage 2 site	The area within the MPE site which would be disturbed by the MPE Stage 2 Proposal (including the operational area and construction area). The MPE Stage 2 site includes the former DSNDC site and the land owned by SIMTA which is subject to the MPE Concept Plan Approval. The MPE site does not include the rail corridor, which relates to the land on which the rail link is to be constructed.
The Moorebank Avenue site	The extent of construction works to facilitate the construction of the Moorebank Avenue upgrade.
The Moorebank Avenue upgrade	Raising of the vertical alignment of Moorebank Avenue for 1.4 kilometres of its length by about two metres, from the northern boundary of the MPE site to approximately 120 metres south of the MPE site. The Moorebank Avenue upgrade also includes upgrades to intersections, ancillary works and the construction of an on-site detention basin to the west of Moorebank Avenue within the MPW site.
Construction area	Extent of construction works, namely areas to be disturbed during the construction of the MPE Stage 2 Proposal (the Proposal).
Operational area	Extent of operational activities for the operation of the MPE Stage 2 Proposal (the Proposal).

Figure 1-1 Overview of the Proposal



2 SITE DESCRIPTION

2.1 Regional context

The MPE site, including the Proposal site, is located approximately 27 km south-west of the Sydney Central Business District (CBD) and approximately 26 km west of Port Botany. The MPE site is situated within the Liverpool Local Government Area (LGA), in Sydney's South West subregion, approximately 2.5 km from the Liverpool City Centre.

The MPE site is located approximately 800 m south of the intersection of Moorebank Avenue and the M5 Motorway. The M5 Motorway provides the main road link between the MPE site, and the key employment and industrial areas within Sydney's West and South-Western subregions, the Sydney orbital network and the National Road Network. The M5 connects with the M7 Motorway to the west, providing access to the Greater Metropolitan Region and NSW road network. Similarly the M5 Motorway is the principal connection to Sydney's north and north-east via the Hume Highway. The regional context of the Proposal is shown on Figure 2-1.

2.2 Local context

The Proposal site is located approximately 2.5 km south of the Liverpool City Centre, 800 m south of the Moorebank Avenue/M5 Motorway interchange and one kilometre to the east of the SSFL providing convenient access to and from the site for rail freight (via a dedicated freight rail line) and for trucks via the Sydney Motorway Network.

The land surrounding the Proposal site comprises:

- The MPW site, formerly the School of Military Engineering (SME), on the western side of Moorebank Avenue directly adjacent to the MPE site (subject to the MPW Concept Plan Approval), which is owned by the Commonwealth;
- The East Hills Rail Corridor to the south of the MPE site, which is owned and operated by Sydney Trains;
- The Holsworthy Military Reserve, to the south of the East Hills Rail Corridor, which is owned by the Commonwealth; The Boot Land, to the immediate east of the MPE site between the eastern site boundary and the Wattle Grove residential area, which is owned by the Commonwealth.
- The southern Boot Land, to the immediate south of the MPE site between the southern site boundary and the East Hills Rail Corridor, which is owned by the Commonwealth.

Glenfield Waste Services, south-west of the Proposal is proposing to develop a Materials Recycling Facility on land owned by the Glenfield Waste Services Group within the boundary of the current landfill site at Glenfield. The facility is proposed to recycle a maximum of 450,000 tonnes of material per year. The Glenfield Waste Services Proposal is the subject of a DA (SSD_6249) under Part 4, Division 4.1 of the EP&A Act.

The area immediately south of the MPE site, known as the 'Southern Boot Land', includes an existing rail spur within heavily vegetated remnant bushland. The Southern Boot Land to the south of the proposal and forming part of the MPE Stage 1 Proposal site includes a range of vegetation, varying from remnant bushland to the north-east of the Sydney Trains East Hills Rail Corridor.

A number of residential suburbs are located in proximity to the Proposal site. The approximate distances of these suburbs to the MPE Stage 2 site and the Moorebank Avenue site are provided in Table 2-1 below.

Table 2-1 Distance to residential suburbs from the Proposal site

Suburb	Distance to MPE Stage 2 site	Distance to Moorebank Avenue site
Wattle Grove	360 m to the north-east	865 m to the north-east
Moorebank	1300 m to the north	1430 m to the north
Casula	820 m to the west	760 m to the west
Glenfield	1830 m to the south-west	1540 m to the south-west

The closest industrial precinct to the Proposal is at Moorebank, comprising around 200 hectares of industrial development. This area includes (but is not limited to) the Yulong and ABB sites to the south of the M5 Motorway and the Goodman MFive Business Park and Miscellaneous industrial and commercial development to the north of the M5 Motorway. The majority of this development is located to the north of the M5 Motorway between Newbridge Road, the Georges River and Anzac Creek. The Moorebank Industrial Area supports a range of industrial and commercial uses, including freight and logistics, heavy and light manufacturing, offices and business park developments.

There are other areas of industrial development near the Proposal at Warwick Farm to the north, Chipping Norton to the north-east, Prestons to the west and Glenfield and Ingleburn to the south-west.

The local context of the Proposal is shown on Figure 2-2.

Figure 2-1 Regional Context of the Proposal

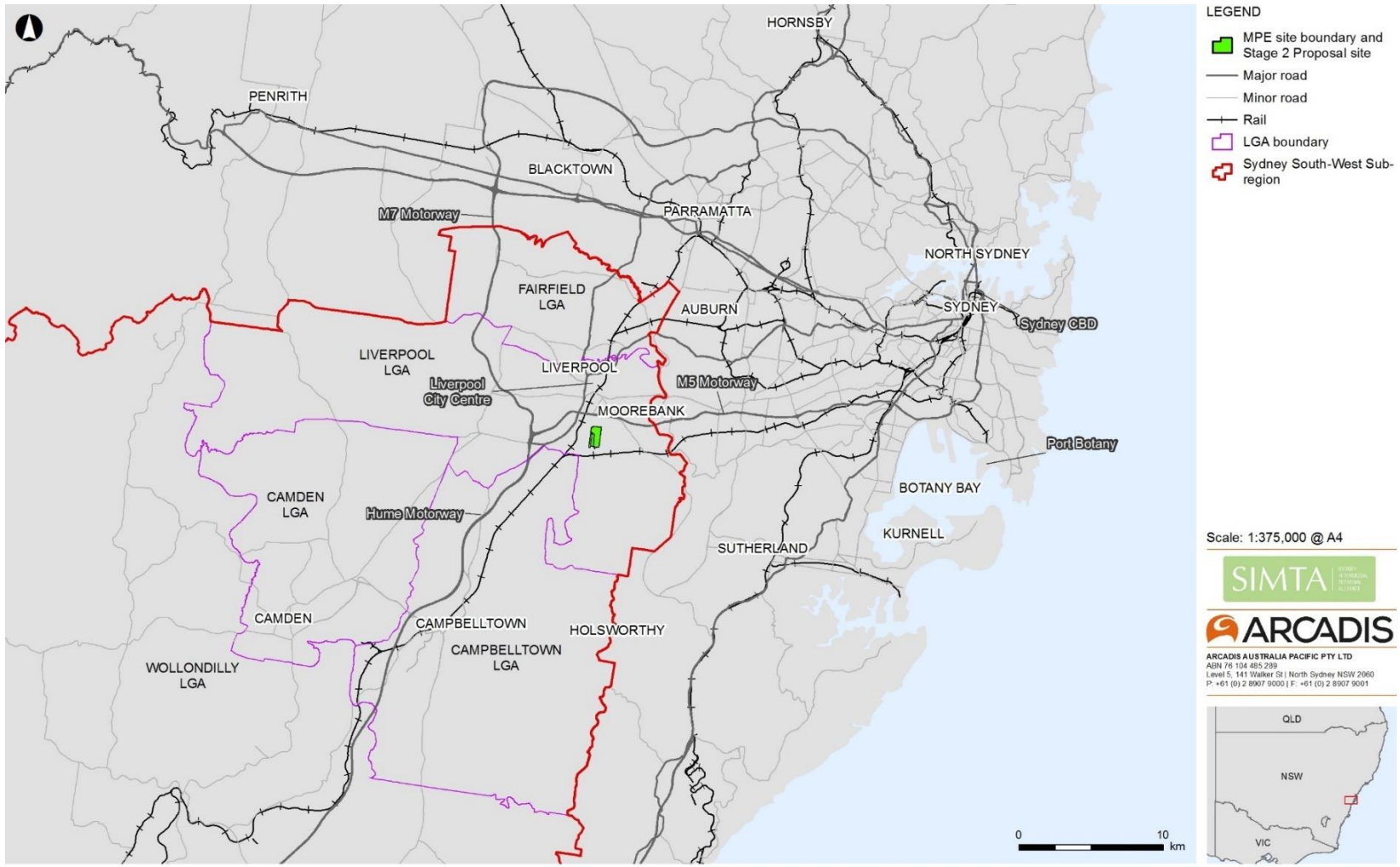
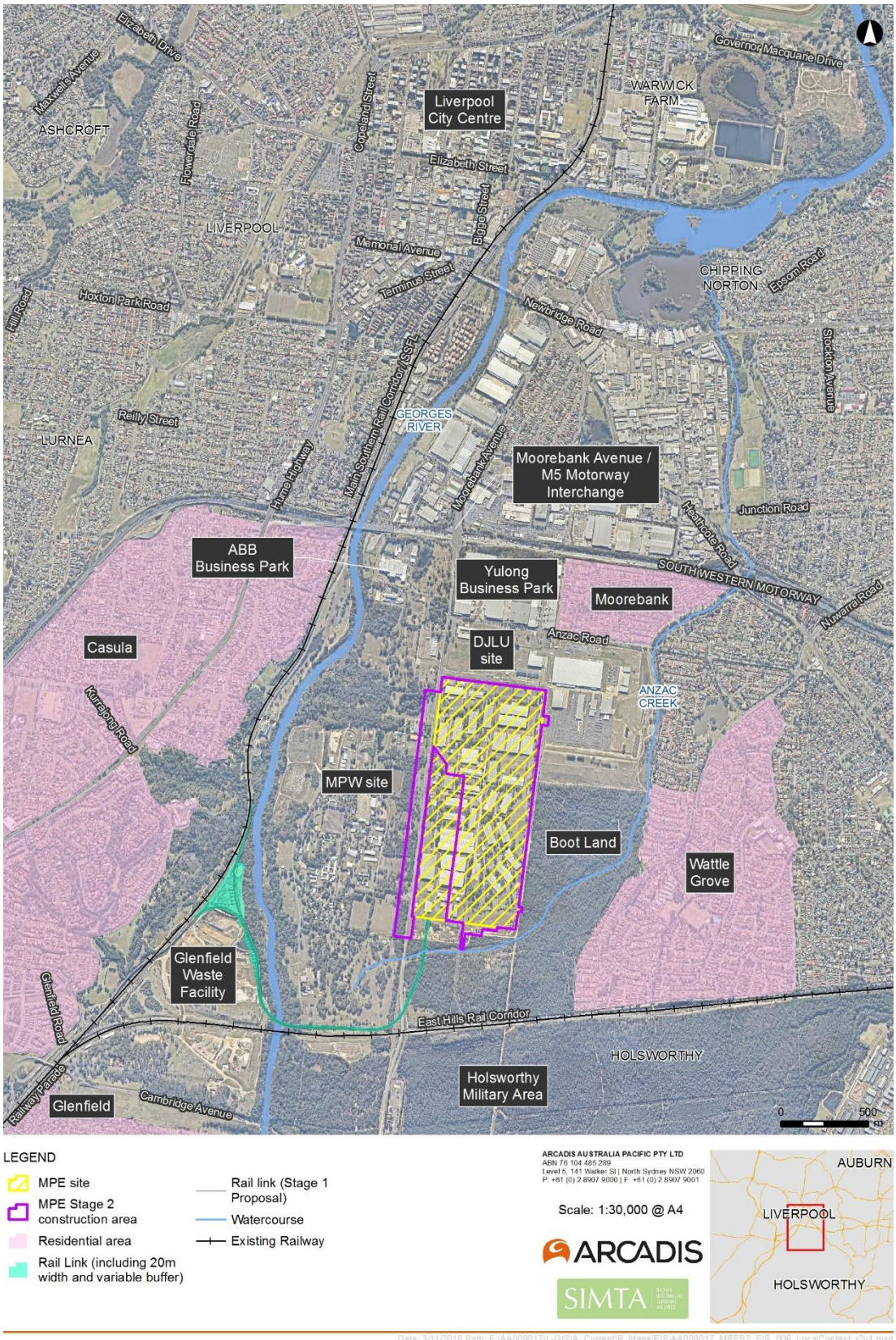


Figure 2-2 Local Context of the Proposal



3 CONSTRUCTION OVERVIEW

3.1 Construction program

Construction of the Proposal is proposed to take between 24 and 36 months, commencing in the final quarter of 2017, with the completion of construction in the third quarter of 2019 (should construction take 24 months). The final construction program will depend on the market demand for warehouses to be constructed on the MPE Stage 2 site.

The indicative construction program (based on a 24 month program) is shown in Table 3-1. The construction works have been divided into seven 'works periods' which are interrelated and would potentially overlap. Subject to confirmation from the construction contractor, the order and staging of these construction works periods may change.

Table 3-1 Indicative Construction Program (based on a 24 month construction period)

Construction works period	2017				2018				2019			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Works period A – Pre-construction activities												
Works period B - Site Preparation activities												
Works Period C - Construction of the Moorebank Avenue diversion road												
Works period D - Pavement and intersection works along Moorebank Avenue												
Works period E – Bulk earthworks, drainage and utilities												
Works period F - Construction and internal fit-out of warehousing												
Works period G – Miscellaneous construction and finishing works												

3.2 Construction activities

A summary of the indicative construction works and associated activities proposed to be undertaken during each of these works periods is provided in Table 3-2.

Table 3-2 Construction activities to be undertaken within each construction works period

Construction works period	Activity
Works period A – Pre-construction activities	• Establishment of site access points • Importation of fill for site preparation activities • Installation of site fencing • Remediation, where required.
Works period B - Site preparation activities	• Demolition of existing structures • Clearing of vegetation • Raising and levelling of land (to final operational levels) within which the Main Warehousing Compound would be located • Temporary works, including installation of construction environmental management measures (e.g. erosion and sedimentation controls) • Establishment of construction compound fencing and hoardings • Installation of site offices and amenities • Construction of hardstands for staff parking and laydown areas • Establishment of temporary batch plant and materials crushing plant • Construction of access roads, site entry and exit points and security • Establishment of site haulage roads. • Establishment of construction compound(s)
Works period C: Construction of the Moorebank Avenue diversion road	• Stripping of topsoil within footprint of temporary diversion road • Installation of temporary drainage • Placement of fill and temporary road pavement (e.g. gravel) • Construction of interface between temporary diversion road and existing Moorebank Avenue • Installation of temporary road signage, street lighting and signalling • Transfer of traffic onto temporary diversion road from Moorebank Avenue.
Works period D – Bulk earthworks, drainage and utilities	• Removal of existing pavement and stripping of topsoil within Moorebank Avenue • Importation, stockpiling and placement of approximately 600,000 m^3 of imported clean fill • Installation of on-site detention (OSD) and drainage infrastructure within the MPE Stage 2 site • Construction of retaining walls • Creation of a road formation by general earthworks (by constructing fill embankments) • Bulk earthworks and raising of the Proposal site to final level, including the terminal hardstand • Utilities relocation and installation

Construction works period	Activity
	• Establishment of hardstand areas.
Works period E – Pavement works along Moorebank Avenue	• Placement of select layer of earthworks material on top of the road formation • Placing and compacting the pavement later (concrete, or concrete and asphalt) over the select layer (consisting of a sub-base and base) and potential sealing with bitumen • Traffic switching from diversion road onto final, raised Moorebank Avenue • Removal of construction traffic management and progressive opening of the internal road and warehouse access roads to traffic • Removal of road surface, road signage, street lighting and signalling from temporary diversion road • Commissioning of Moorebank Avenue.
Works period F - Warehouse construction and internal fit-out	• Foundation and floor slab installation • Erection of framework and structural walls • Installation of roof • Internal fit-out of warehouses (racking and associated services).
Works period G – Miscellaneous construction and finishing works	• Pavement construction (internal transfer roads and perimeter road), including forming of new kerbs, gutters, medians (where required) and other structures • Line marking, lighting and sign posting • Installation of road furniture, including traffic signs and pavement markers. • Miscellaneous structural construction • Finishing works, including landscaping and general site rehabilitation, where required. • Commissioning of the Proposal • Decommissioning/Demobilisation of the Proposal site, including removal of construction compound(s) and construction environmental controls.

3.3 Plant and equipment

A range of plant and equipment would be required for the construction of the Proposal. A summary of the indicative plant and equipment likely to be utilised is provided in Table 3-3.

Table 3-3 Indicative construction plant and equipment required for construction

Equipment	Construction works period						
	Works period A – Pre-construction activities	Works period B - Site Preparation activities	Works period C: Construction of the Moorebank Avenue diversion road	Works period E - Road and intersection works to facilitate the raising of Moorebank Avenue	Works period D – Bulk earthworks, drainage and utilities	Works period F - Construction and internal fit-out of warehousing	Works period G – Miscellaneous construction and finishing works
Loaders		✓			✓	✓	✓
Static and vibratory rollers, and high energy impact compaction	✓	✓	✓	✓	✓	✓	
Mobile cranes	✓	✓			✓	✓	
Excavators	✓	✓	✓	✓	✓	✓	
Excavators with hammers		✓			✓		
Backhoes		✓			✓	✓	✓
825 Compactor			✓	✓			
Crushing plant		✓			✓		
Batch plant					✓	✓	
Concrete agitators (or similar)		✓			✓	✓	✓
Concrete pumps		✓			✓	✓	✓
Concrete saws					✓	✓	✓
Air compressors					✓	✓	✓
Jackhammers						✓	✓
Dozers		✓	✓	✓	✓		

Equipment	Construction works period						
	Works period A – Pre-construction activities	Works period B - Site Preparation activities	Works period C: Construction of the Moorebank Avenue diversion road	Works period E - Road and intersection works to facilitate the raising of Moorebank Avenue	Works period D – Bulk earthworks, drainage and utilities	Works period F - Construction and internal fit-out of warehousing	Works period G – Miscellaneous construction and finishing works
Mulchers		✓					
20-40 tonne articulated tipper trucks	✓	✓			✓		
Scrapers		✓			✓		
Graders	✓	✓	✓	✓	✓	✓	
Water trucks	✓	✓	✓	✓	✓	✓	✓
Piling rigs					✓	✓	
Forklifts					✓	✓	✓
Small earthmoving equipment	✓				✓	✓	✓
Welder					✓	✓	✓
Road profiler			✓	✓			
Rubber Roller			✓	✓			

3.4 Construction compounds

Temporary construction compounds would be required to support construction of the Proposal. The locations of these compounds are indicative and subject to confirmation by the construction contractor, once appointed.

It is envisaged that construction of the Proposal would require the use of two construction compounds:

- The Warehousing Compound, within the MPE site
- The Moorebank Avenue Compound, within the MPW site and immediately west of Moorebank Avenue.

The location and indicative layout of the construction compounds are shown in Figure 3-1.

The Main Warehousing Compound and Moorebank Avenue Compound are described in more detail in Section 3.4.1 and 3.4.2 respectively.

3.4.1 Main Warehousing Compound

The main construction compound for the Proposal (herein referred to as the Warehousing Compound) would be located within land proposed to be used as the Stage 1 Proposal's main IMT compound.

It is expected that some additional satellite compounds would be required during the construction of each individual warehouse on the Proposal site; however, the Warehousing Compound would be used for the majority of construction works.

The Warehousing Compound would include:

- A site office(s)
- Staff amenities
- Car parking
- Storage and laydown areas
- Materials testing facilities
- Material crushing facilities
- A concrete batching plant.

The indicative layout of the Warehousing Compound is shown on Figure 3-1.

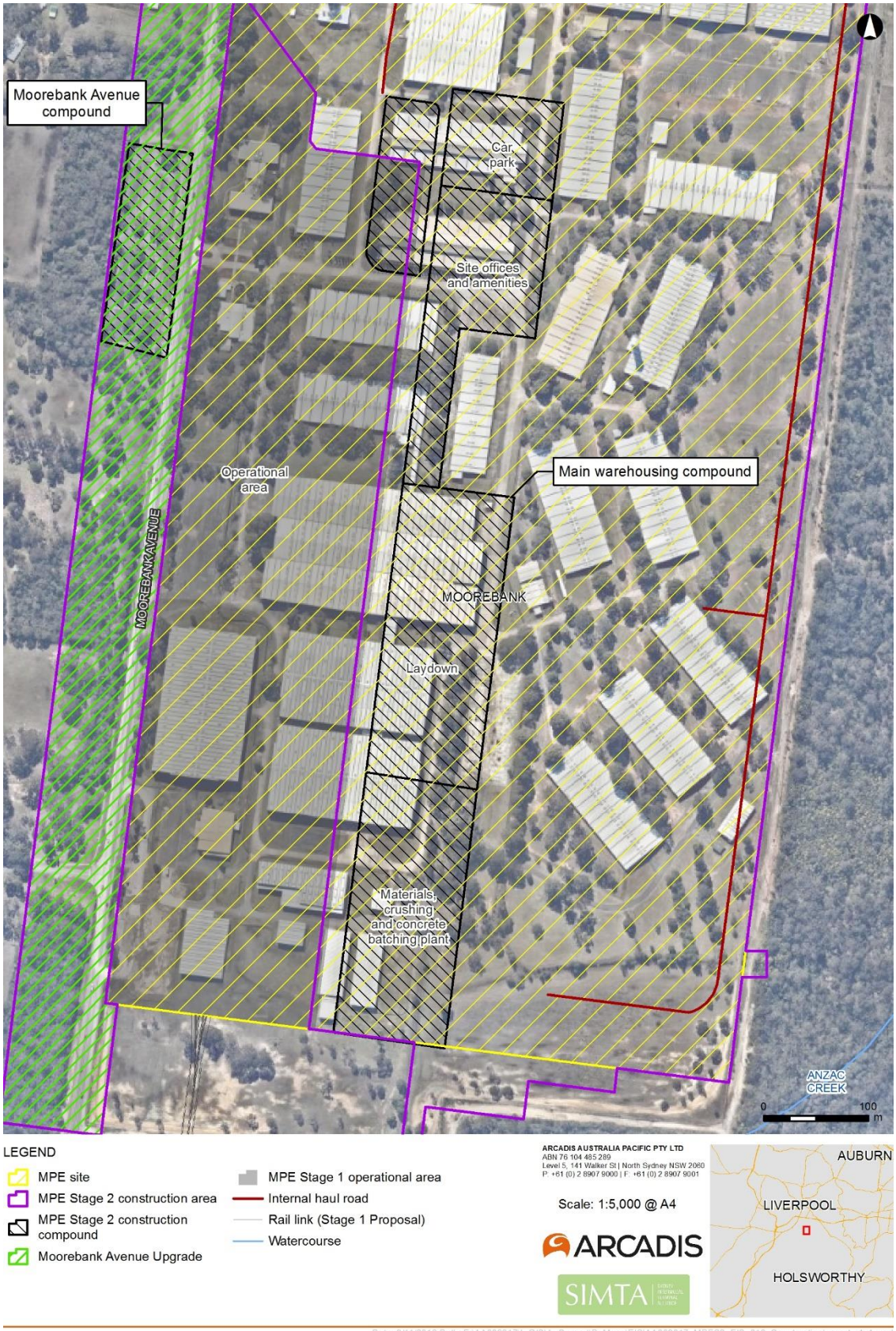
3.4.2 Moorebank Avenue Compound

The Moorebank Avenue Compound would be located on the western side of Moorebank Avenue, in an existing area of hardstand within the MPW site. This area was previously used as a staff car park and as such, is characterised by large areas of level paved / hardstand surfaces and narrow garden beds that support a small number of trees.

The Moorebank Avenue Compound would include, site offices, car parking, and equipment storage and laydown areas, with some materials such as pre-cast culverts being temporarily stored within the compound area on occasion. The entrance to this compound would be generally at the location of the existing intersection off Moorebank Avenue.

No stockpiles are proposed to be located within the Moorebank Avenue Compound. Some materials such as pre-cast culverts may be temporarily stored within the compound area on occasion. The location of the Moorebank Avenue Compound is shown on Figure 3-1.

Figure 3-1 Overview of Construction Layout



3.5 Construction hours

Construction works would generally be undertaken during standard daytime construction working hours, being:

- 7am to 6pm Monday to Friday
- 8am to 1pm Saturday
- No works on Sunday or Public Holidays.

Bulk earthworks activities and construction works to facilitate the Moorebank Avenue upgrade during peak construction periods may be undertaken outside of standard construction hours, but not during the night-time (i.e. 10pm to 7am).

The proposed construction hours for activities associated with bulk earthworks and construction of the Moorebank Avenue upgrade are summarised in Table 3-4.

Table 3-4 Construction hours for activities associated with bulk earthworks and the Moorebank Avenue upgrade

Bulk earthworks activity	Construction hours	
	Weekdays	Saturdays
Material Delivery	6am-10pm	7am-6pm
Direct placement	7am-10pm	8am -6pm
Stockpiling	7am-6pm	7am-6pm
Crushing	7am-6pm	8am-1pm
Moorebank Avenue Upgrade	6am-10pm	7am-6pm

Some additional construction works would be undertaken outside of standard daytime construction working hours, subject to consultation with the relevant authorities and in accordance with the *Interim Construction Noise Guidelines* (DECC, 2009), including:

- Any works which would not result in audible noise emissions at any nearby sensitive receptors.
- The delivery of oversized plant and/or structures that police or other authorities determine require special arrangements to transport along public roads
- Emergency work to avoid the loss of lives, property and/or to prevent environmental harm
- Maintenance and repair of public infrastructure where disruption to essential services and/or consideration of worker safety do not allow work within standard construction hours.
- Public infrastructure works that shorten the length of the project and are supported by noise-sensitive receivers.
- Construction works where it can be demonstrated and justified that these works are required to be undertaken outside of standard construction hours.
- Any other work as approved through the Construction Noise and Vibration Management Plan.

4 OPERATIONS OVERVIEW

4.1 The Proposal

The Proposal involves the construction and operation of Stage 2 of the MPE Project, comprising warehousing and distribution facilities on the MPE site and upgrades to approximately two kilometres of Moorebank Avenue between Anzac Road and 200 metres south of the MPE site.

Key components of the Proposal include:

- Warehousing comprising approximately 300,000m^2 GFA, additional ancillary offices and the ancillary freight village
- Establishment of an internal road network, and connection of the Proposal to the surrounding public road network
- Ancillary supporting infrastructure within the Proposal site, including:
    - Stormwater, drainage and flooding infrastructure
    - Utilities relocation and installation
    - Vegetation clearing, remediation, earthworks, signage and landscaping
- Subdivision of the MPE Stage 2 site
- The Moorebank Avenue upgrade would be comprised of the following key components:
    - Modifications to the existing lane configuration, including some widening
    - Earthworks, including construction of embankments and tie-ins to existing Moorebank Avenue road level at the Proposal's southern and northern extents
    - Raking of the existing pavement and installation of new road pavement
    - Establishment of temporary drainage infrastructure, including temporary basins and / or swales
    - Raising the vertical alignment by about two metres from the existing levels, including kerbs, gutters and a sealed shoulder
    - Signalling and intersection works
- Upgrading existing intersections along Moorebank Avenue, including:
    - Moorebank Avenue / MPE Stage 2 access
    - Moorebank Avenue / MPE Stage 1 northern access
    - Moorebank Avenue / MPE Stage 2 central access
    - MPW Northern Access / MPE Stage 2 southern emergency access

The Proposal would interact with the MPE Stage 1 Project (SSD_6766) via the transfer of containers between the MPE Stage 1 IMT and the Proposal's warehousing and distribution facilities. The vehicle movements associated with the transfer of containers between the MPE Stage 1 IMT and the Proposal would be within the Proposal site only, and would not impact on the surrounding road network.

The Proposal is expected to operate 24 hours a day, seven days per week.

4.2 Built Form

4.2.1 Warehousing

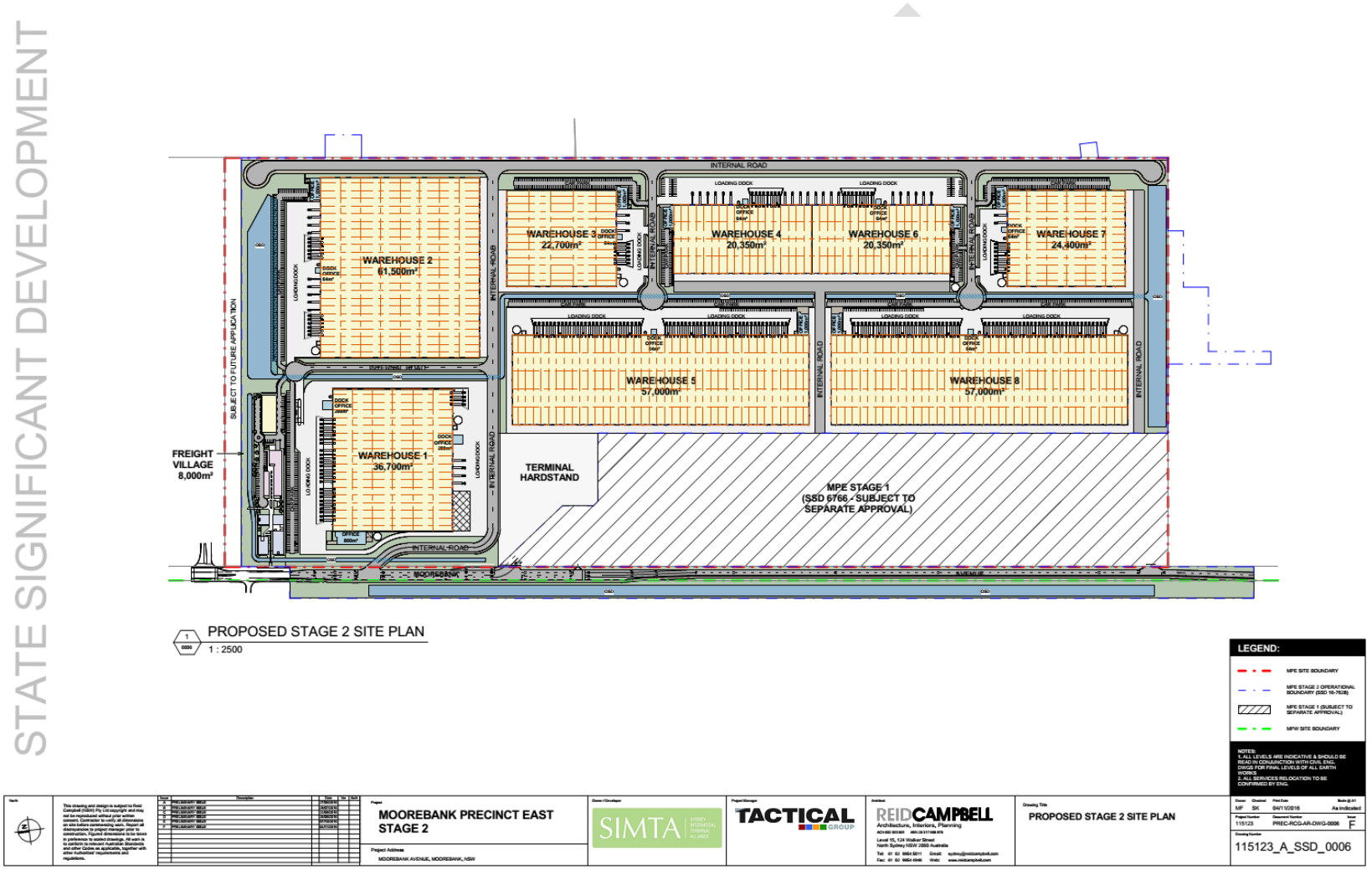
The Proposal would provide up to 300,000m^2 of warehousing across the MPE Stage 2 site, with ancillary offices attached. The Proposal would include eight warehouses, which would be up to 21 metres in height and would range in size from 20,350m^2 to 61,500m^2. The Proposal would also include some internal fitout of the warehouses, namely the installation of racking and associated services. The Proposal would seek approval for the construction of these warehouses and also the operation of these warehouses by future tenants.

The indicative layout of the warehouses are shown in Figure 4-1.

Each individual warehouse would consist of the following:

- A container storage area
- Office and administration facilities
- Amenities
- Car parking
- Truck loading/unloading docks
- Internal parking for pick-up and delivery vehicles (PUD)
- Specialised sortation and conveyor equipment
- Hardstand areas that provide trailer parking spaces, external PUD parking spaces, vehicle manoeuvring areas and access to the main internal site road
- Signage for business identification purposes, including backlit illuminated signage on each warehouse (refer to Architectural drawings at Appendix D)

Figure 4-1 Indicative Warehousing Layout



4.2.2 Freight village

A freight village including amenities would be provided on the MPE site as part of the Proposal. The ancillary freight village would be located in the north-west of the Proposal site, directly north of Warehouse 1 and east of Moorebank Avenue. The freight village would include five buildings which would provide for a mixture of retail, commercial and light industrial land uses, with a combined GFA of approximately 8,000m^2. An overview of buildings within the ancillary freight village is provided in Figure 4-1.

The freight village would also include the provision of:

- Food outlets
- Amenities
- Loading dock(s)
- Services area
- Services corridor
- landscaping,
- Car parking (230 spaces), including basement parking.

The indicative layout of the freight village is show on Figure 4-1.

Buildings and structures within the freight village would be up to 15 m in height and of varying size and design, as detailed in Section 15 (visual amenity, landscape and urban design). The Proposal would also include the internal fitout of these buildings, including utilities and services. The Proposal would seek approval for the construction of this freight village and also the operation of these premises by future tenants.

Associated with this built form is a number of ancillary works, which include materials and finishes, signage, lighting, vegetation removal and landscaping, water management works and utilities, which have been discussed throughout this section of the EIS.

4.2.3 Vehicle movement and access

The Proposal would include one site access point, with traffic circulating through the site using internal roads, service roads and internal transfer roads. A description of site access and traffic circulation throughout the Proposal site is described below.

MPE Stage 2 site access

Access to and from the Proposal site would be via the existing DSNDC northern access, to the north of the MPE Stage 1 Project. Site access at this location would allow for vehicular access to warehouse and distribution facilities to enable the direct delivery and dispatch of goods to the warehouses. The site access point is shown on Figure 1-1.

Traffic circulation within the MPE Stage 2 site

During the interim stages of operation, the traffic circulation throughout the MPE Stage 2 site would be via a combination of the roads described below (i.e. the final configuration) and the use of modified existing roads. Interim vehicle movement and access throughout the MPE Stage 2 site would be included in the relevant environmental management plans for operation of the Proposal, including the Construction Traffic Management Plan and Operational Traffic Management Plan.

Internal roads

The MPE Stage 2 site includes two main internal roads, which provided the main east-west and north-south traffic movements throughout the MPE Stage 2 site. On entering the MPE Stage 2 site, light and heavy vehicles would travel along an east-west oriented internal road (internal road 1). Internal road 1 would connect at its easternmost point to a second north-south oriented internal road (internal road 2).

Internal roads 1 and 2 would connect to three service roads which would provide vehicle access to warehouses, loading docks and car parking.

Internal road 2 would provide for traffic movements along the entire eastern perimeter of the Proposal, and would have a cul-de-sac at both the northern and southern ends to allow vehicles to turn around. The internal roads would be two lanes wide (one lane in each direction) and would be wide enough to accommodate heavy vehicle turning movements, including B-doubles.

Service roads

Three service roads would connect to the internal roads within the MPE Stage 2 site. The service roads would provide access to loading docks at warehouses for heavy vehicles to park and be packed with materials which have been received and stored within the warehouses. Service roads would also enable access to light vehicle parking for users of the warehouses. Each service road would have a cul-de-sac for vehicles to turn around, which would be able to accommodate turning movements of B-doubles.

Service road 1 would connect to internal road 1 via a T-intersection, and would provide access to Warehouse 1, Warehouse 2 and the ancillary freight village. Two additional service roads would connect to internal road 2 via t-intersections; service road 2 would provide access for warehouses 3, 4 and 5, and service road 3 would provide access to warehouses 6, 7 and 8.

Transfer roads

There would be three Transfer roads within the MPE Stage 2 site. These roads would provide connections between the warehouses and the MPE Stage 1 IMT. It is intended that the transfer of freight between the Stage 1 IMT and warehouses would be via an internal fleet of vehicles which would remain on the MPE Stage 2 site and would not use the external road network.

Transfer road 1 would travel mostly along the same path as internal road 1 and provide access between the Stage 1 IMT facility and Warehouses 1, 2 and 3. Transfer road 2 would travel through the centre of the MPE Stage 2 site and would provide access between the Stage 1 IMT facility and Warehouses 4, 5, 6 and 8. Transfer road 3 would travel along the southern boundary of the MPE site, and provide access between the Stage 1 IMT facility and Warehouses 7 and 8.

With the exception of transfer road 1, which travels along the same path as internal road 1, the movement of internal fleet vehicles along transfer roads would be separated from light and heavy vehicles entering and exiting the MPE Stage 2 site to maintain efficiency and to provide for a safe internal road network.

4.2.4 Roadworks – Moorebank Avenue

As part of the Proposal, Moorebank Avenue would be upgraded for about 1.4 kilometres. The Moorebank Avenue upgrade commences from approximately 95 metres south of the northern boundary of the MPE site to approximately 120 metres south of the southern MPE site boundary. The Moorebank avenue upgrade is located within the existing Moorebank Avenue road corridor and along the eastern boundary of the MPW site (refer to Figure 1-1 for extent of works).

The Moorebank Avenue upgrade would be comprised of the following key components:

- Modifications to the existing lane configuration, including some widening
- Signalling and intersection works.
- Raising the vertical alignment by about two metres from the existing levels, including kerbs, gutters and a sealed shoulder

Lane configuration

The Moorebank Avenue upgrade would provide for the integration of the Proposal with the wider Moorebank Precinct works and to tie-in to Moorebank Avenue at its existing vertical and horizontal alignment near the northern boundary of the MPE site.

The arrangement of lanes along Moorebank Avenue as part of the Proposal would include:

- Four lanes from the northern extent of the Moorebank Avenue upgrade to the MPE Stage 1 central access.
- Two lanes between the MPE Stage 1 central access to approximately 120 metres south of the MPE site.

The lanes would generally be 3.5m wide central travel lanes, with 4.2m wide kerbside travel lanes with a 4.5 metre verge along both the northbound and southbound carriageways.

Intersection upgrades

The Proposal includes upgrades to four intersections along Moorebank Avenue, including:

- Moorebank Avenue / MPE Stage 2 access
- Moorebank Avenue / MPE Stage 1 northern access
- Moorebank Avenue / MPE Stage 2 central access
- MPW Northern Access / MPE Stage 2 southern emergency access

Road alignment

The horizontal alignment of Moorebank Avenue is not expected to change significantly as a result of the Proposal, with the upgraded road remaining primarily within the existing Lot 2 of DP1197707.

As part of the Proposal, the vertical alignment of Moorebank Avenue within the operational footprint of the Moorebank Avenue upgrade would be raised by approximately two metres. At the northern and southern extents of this work, the vertical alignment would be graded to tie-in to the remainder of Moorebank Avenue.

4.2.5 Ancillary infrastructure

The Proposal would also include ancillary supporting infrastructure to facilitate the efficient operation of the Proposal, to minimise the environmental impact and enhance the visual amenity of the Proposal site. Ancillary infrastructure to be included on the Proposal site would comprise:

- Landscaping within the MPE site and along Moorebank Avenue
- Water management works, including stormwater infrastructure and on-site detention within the MPE site and along Moorebank Avenue
- The installation of signage throughout the Proposal site for the purposes of way finding and access to/from the warehousing facilities.
- The provision of road signage along Moorebank Avenue within the Proposal site
- Lighting around the warehouse entry and exit points, freight village, ancillary offices and along the internal roads.
- Street lighting along Moorebank Avenue
- Relocation and installation of utilities to connect to nearby public utility networks within the MPE site and along Moorebank Avenue
- Subdivision of the Proposal site for the purpose of segregating the intermodal terminal and warehousing, and also for the tenanting of individual warehouses within the facility.

4.3 Operational hours

Movement of freight between the IMT and warehouses within the Proposal site would be undertaken 24 hours per day, seven days a week. The warehouses would generally be operational for 24 hours per day, seven days a week.

5 SENSITIVE RECEVIERS

The potentially most affected residential receivers in the vicinity of the Proposal site are located in the suburbs of Casula, Glenfield and Wattle Grove. In addition to residential receivers, a number of potentially affected non-residential receivers have been identified near the Proposal site, including All Saints Senior College and the Casula Powerhouse, located to the west of the Proposal site, across the Georges River. The nearest industrial receivers, MPW, ABB and the Defence Joint Logistics Unit (DJLU) are located to the east of the Proposal site, across Moorebank Avenue. Table 5-1 presents a summary of the potentially most affected receivers near the Proposal site.

Table 5-1 Sensitive Receivers

Receiver / Suburb	Category	Distance (m)	
		Stage 2 Operational Area	Stage 2 Construction Area
Wattle Grove	Residential	390	390
Wattle Grove North		375	350
Casula		800	760
Glenfield		1,550	1,580
All Saints Senior College (S1)	Educational	1,220	1,250
Casula Powerhouse (S2)		850	890
MPW (I1)	Industrial	Boundary	Boundary
DJLU (I2)		Boundary	Boundary
ABB (I3)		475	495

Figure 5-1 Sensitive Receivers

6 CONSTRUCTION NOISE & VIBRATION ASSESSMENT

The following section presents an assessment of potential noise impacts associated with the construction of the Proposal.

6.1 Construction Noise Management Levels

The construction Noise Management Levels (NML) for the MPE site were presented in the MPE Concept Plan EIS and were subsequently reviewed and accepted by relevant regulatory and approval authorities.

Table 6-1 presents the established NMLs for sensitive receivers in proximity to construction activities for the Proposal. Sensitive receiver locations are shown in Figure 5-1 above.

Table 6-1 Construction Noise Management Levels

Receiver	Acceptable $L_{Aeq,\ 15\ min}$ Noise Level			
	Standard Construction Hours	Outside Standard Construction Hours RBL + 5 (dBA)		
	RBL + 10 (dBA)	Daytime[1]	Evening[1]	Night[1]
Wattle Grove	52	47	42	42
Wattle Grove North	46	41	41	41
Casula	51	46	42	39
Glenfield	54	49	49	42
S1, S2	55	55	55	55
I1, I2, I3	75	75	75	75

1. Daytime = 7:00am–6:00pm; Evening = 6:00pm – 10:00pm; Night = 10:00pm-7:00am.

As outlined in Section 3.5, a range of specific construction activities are proposed to occur beyond standard construction hours. Accordingly, the following out of hours (OOH) work periods have been established:

- OOH Period 1: 6.00am – 7.00am weekdays;
- OOH Period 2: 6.00pm – 10.00pm weekdays;
- OOH Period 3: 7.00am – 8.00am Saturday; and,
- OOH Period 4: 1.00pm – 6.00pm Saturday.

Table 6-2 presents construction NMLs for the Proposal for each of these works periods.

Table 6-2 Construction Noise Management Levels by Work Period

Receiver	Noise Management Levels				
	Standard Hours	OOH Period 1	OOH Period 2	OOH Period 3	OOH Period 4
Wattle Grove	52	42	42	47	47
Wattle Grove North	46	41	41	41	41
Casula	51	39	42	46	46
Glenfield	54	42	49	49	49
S1, S2	55	55	55	55	55
I1, I2, I3	75	75	75	75	75

6.2 Construction Vibration Criteria

When assessing the effects of vibration from construction activities; both human exposure to vibration and the potential for building damage from vibration are typically considered. However, vibration levels with the potential to cause building damage are typically more than 10 times greater than those which cause annoyance. For this reason, human comfort vibration criteria have been used to assess potential vibration impacts from the Proposal. It is noted that vibration intensive construction plant are anticipated to be operated intermittently, and not continuously.

Assessing Vibration: a technical guideline (DEC, 2006) provides guidance for assessing human exposure to vibration. The publication is based on British Standard BS6472:1992, which sets 'preferred' and 'maximum' vibration levels for human comfort.

Criteria for intermittent vibration, which is caused by plant such as rock breakers, are expressed as a Vibration Dose Value (VDV) and are shown in Table 6-3.

Table 6-3 Acceptable Vibration Dose Values for Intermittent Vibration ($m/s^{1.75}$)

Location	Daytime[1]		Night Time[1]	
	Preferred Value	Maximum Value	Preferred Value	Maximum Value
Critical areas	0.1	0.2	0.1	0.2
Residences	0.2	0.4	0.13	0.26
Offices, schools, educational institutions and places of worship	0.4	0.8	0.4	0.8
Workshops	0.08	1.6	0.8	1.6

1. Daytime 7.00am-10.00pm; Night 10.00pm-7.00am.

Vibration intensive equipment is likely to be used during the proposed bulk earthworks (refer to Section 3 for more information relating to construction); however, as the distance from vibration intensive plant to the nearest residential receiver is more than 500 m away, ground vibration at surrounding residential receivers would be low. On this basis, the recommended safe working distances for vibration intensive plant suggested in the Transport Construction Authority's *Construction Noise Strategy* (2012) have been adopted in this assessment to evaluate the vibration impacts. Table 6-4 sets out the recommended safe working distances for various vibration intensive plant.

Table 6-4 Recommended Safe Working Distances for Vibration Intensive Plant

Item	Description	Safe Working Distance	
		Cosmetic Damage	Human Response
Small Hydraulic Hammer	(300 kg – 5 to 12t excavator)	2m	7m
Medium Hydraulic Hammer	(900 kg – 12 to 18t excavator)	7m	23m
Pile Boring	≤ 800 mm	2m (nominal)	N/A
Jackhammer	Hand held	1m (nominal)	Avoid contact with structure

Source: Construction Noise Strategy, 2012, Transportation Construction Authority

A review of the information in Table 6-4 indicates that the human comfort vibration impacts at surrounding residences would be negligible during construction activities. Furthermore, structural damage vibration criteria in residential buildings are much higher than human comfort criteria, and the nearest residential receiver is situated far enough from the Proposal site for impacts to be minimal in all circumstances. Therefore, no further assessment of construction vibration is warranted.

6.3 Construction Equipment and Sound Power Levels

Sound Power Levels (SWLs) associated with typical construction plant to be used throughout the construction of the Proposal are identified in Table 6-5. These SWLs have recently been measured at other similar construction sites. The table gives both Sound Power Level and Sound Pressure Levels (SPL) at 7m for the equipment. Sound Power Level is independent of measurement position.

Table 6-5 Typical Construction Plant Sound Levels – dBA

Plant	Sound Power Level	Sound Pressure Level at 7m
Loaders	112	87
Static and vibratory rollers	109	84
Mobile cranes	110	85
Excavators	110	85
Excavators with hammers	122	97
Backhoes	105	80
Compactor	112	87
Crushing plant	118	93
Concrete batch plant	113	88
Concrete agitators (or similar)	105	80
Concrete pumps	103	78
Concrete saws	112	87
Air compressors	100	75
Jackhammers	113	88
Dozers	118	93
Mulchers	118	93
20-40 tonne articulated tipper trucks	110	85
Scrapers	110	85
Graders	109	84
Water trucks	105	80
Piling rigs	121	96
Forklifts	106	81
Small earthmoving equipment	95	70
Rail tamper	118	93
Welder	90	65
Road profiler	116	91
Rubber roller	108	83

6.4 Assessment of Construction Noise During Standard Working Hours

The following section presents predicted $L_{Aeq,\ 15min}$ construction noise levels during standard working hours, and assesses the predicted levels against the established NML.

Table 6-6 presents the construction plant items expected to be used in each works period, and the total combined sound power level (SWL) of all equipment in each works period.

Table 6-6 Works Periods, Equipment and Total SWL

Equipment	Construction works period						
	Works period A – Pre-construction activities	Works period B - Site Preparation activities	Works period C: Construction of the Moorebank Avenue diversion road	Works period E - Road and intersection works to facilitate the raising of Moorebank Avenue	Works period D – Bulk earthworks, drainage and utilities	Works period F - Construction and internal fit-out of warehousing	Works period G – Miscellaneous construction and finishing works
Loaders		✓			✓	✓	✓
Static and vibratory rollers	✓	✓	✓	✓	✓	✓	
Mobile cranes	✓	✓			✓	✓	
Excavators	✓	✓	✓	✓	✓	✓	
Excavators with hammers		✓			✓		
Backhoes		✓			✓	✓	✓
825 Compactor			✓	✓			
Crushing plant		✓			✓		
Batch plant					✓	✓	
Concrete agitators (or similar)		✓			✓	✓	✓
Concrete pumps		✓			✓	✓	✓
Concrete saws					✓	✓	✓
Air compressors					✓	✓	✓
Jackhammers						✓	✓
Dozers		✓	✓	✓	✓		
Mulchers		✓					
20-40 tonne articulated tipper trucks	✓	✓			✓		
Scrapers		✓			✓		
Graders	✓	✓	✓	✓	✓	✓	
Water trucks	✓	✓	✓	✓	✓	✓	✓
Piling rigs					✓	✓	
Forklifts					✓	✓	✓
Small earthmoving equipment	✓				✓	✓	✓
Welder					✓	✓	✓
Road profiler			✓	✓			
Rubber Roller			✓	✓			
Combined SWL for Works Period (dBA)	**117**	**126**	**122**	**122**	**127**	**124**	**118**

The predicted $L_{Aeq, 15min}$ noise levels at sensitive receivers during standard hours for each identified works period are presented in Table 6-7

Table 6-7 Predicted Construction Noise Levels During Standard Hours

Receiver	Construction works period							NML
	Works period A – Pre-construction activities	Works period B - Site Preparation activities	Works period C: Construction of the Moorebank Avenue diversion road	Works period E - Road and intersection works to facilitate the raising of Moorebank Avenue	Works period D – Bulk earthworks, drainage and utilities	Works period F - Construction and internal fit-out of warehousing	Works period G – Miscellaneous construction and finishing works	
Wattle Grove	39	48	38	38	49	46	41	52
Wattle Grove North	34	44	35	35	45	41	36	46
Casula	36	46	41	41	47	43	38	51
Glenfield	25	34	30	30	35	32	26	54
S1	34	43	39	39	44	41	35	55
S2	32	41	37	37	42	39	34	55
I1	61	71	66	66	72	68	63	75
I2	62	71	57	57	72	69	63	75
I3	40	50	41	41	51	47	42	75

Review of Table 6-7 indicates that predicted $L_{Aeq, 15min}$ construction noise levels comply with the established NML at all receivers.

6.5 Assessment of Construction Noise During OOH Works

The following section presents the identified OOH work activities associated with the Proposal, and presents the predicted construction noise levels at sensitive residential receivers for each identified OOH work period.

6.5.1 Predicted Construction Noise Levels during OOH Period 1

During OOH period 1 (6.00am – 7.00am weekdays) Material Delivery is the only proposed activity.

$L_{Aeq, 15min}$ noise levels at sensitive receivers have been predicted where all plant is operating simultaneously, with a modelled SWL of 117 dBA over the works area. The predicted levels are presented in Table 6-8. Table 6-8 indicates that construction noise levels are not predicted to exceed the applicable NML at sensitive receivers during OOH Period 1.

Table 6-8 Predicted Construction Noise Levels during OOH Period 1

Receiver	Predicted $L_{Aeq, 15min}$ Noise Level	NML	Exceedance
Wattle Grove	38	42	0 dB
Wattle Grove North	34	41	0 dB
Casula	36	39	0 dB
Glenfield	25	42	0 dB

6.5.2 Predicted Construction Noise Levels during OOH Period 2, 3 and 4

During OOH period 2 (6.00pm – 10.00pm weekdays), OOH Period 3 (7.00am – 8.00am Saturday) and OOH Period 4 (1.00pm – 6.00pm Saturday), the following activities are proposed:

- Material Delivery; and,
- Direct Placement of fill, or Stockpiling.

$L_{Aeq, 15min}$ noise levels at sensitive receivers have been predicted where all plant is operating simultaneously, with a modelled SWL of 122 dBA over the works area. The predicted levels are presented in Table 6-9.

Table 6-9 indicates that construction noise levels in Wattle Grove, Wattle Grove North and Casula are not predicted to exceed applicable NML at sensitive receivers during OOH Period 2, 3 or 4. Predicted construction noise levels during OOH Periods 2, 3 & 4 are predicted to exceed the NML in Wattle Grove by up to 1 dB. This exceedance is considered negligible, and does not warrant mitigation.

It should be noted that since the construction noise assessment is conservative, whereby all plant items are assumed to be operating simultaneously, and that the works will be conducted under a Construction Noise and Vibration Management Plan, there is a likelihood that the predicted exceedance would not occur.

Table 6-9 Predicted Construction Noise Levels during OOH Period 2, 3 and 4

Receiver	Predicted $L_{Aeq, 15min}$ Noise Level	NML			Exceedance
		OOH Period 2	OOH Period 3	OOH Period 4	
Wattle Grove	43	42	47	47	1 dB
Wattle Grove North	39	41	41	41	0 dB
Casula	41	42	46	46	0 dB
Glenfield	30	49	49	49	0 dB

6.6 Assessment of Cumulative Construction Noise

In addition to the construction works associated with the Proposal, a number of other construction activities are expected to occur simultaneously in the vicinity of the Proposal site. Construction activities associated with the following proposals are expected to occur concurrently with the construction of the Proposal:

- MPE Stage 1;
- MPW Early Works; and,
- MPW Stage 2.

The highest predicted $L_{Aeq, 15min}$ construction noise levels at sensitive receivers, during relevant phases, for each project have been added to provide an indication of potential cumulative construction noise impacts. Predicted $L_{Aeq, 15min}$ construction noise levels for the MPE Stage 1 project have been taken from *SIMTA Intermodal Terminal Facility – Stage 1 – Noise and Vibration Impact Assessment*, prepared by Wilkinson Murray, dated May 2015. Predicted $L_{Aeq, 15min}$ construction noise levels for the MPW Early Works have been taken from *Moorebank Intermodal Terminal EIS – Noise and Vibration Impact Assessment*, prepared by SLR Consulting, dated October 2014. Predicted $L_{Aeq, 15min}$ construction noise levels for the MPW Stage 2 project have been taken from *MPW Stage 2 – Noise and Vibration Impact Assessment*, prepared by Wilkinson Murray, dated October 2016.

Worst-case cumulative $L_{Aeq, 15min}$ construction noise levels at sensitive receivers, during standard construction hours, are presented in Table 6-10

Table 6-10 Worst-Case Cumulative Construction Noise Levels

Receiver	Predicted $L_{Aeq, 15min}$ Noise Levels					NML	Exceedance
	MPE Stage 2 Proposal	MPW Early Works	MPW Stage 2	MPE Stage 1	Cumulative		
Wattle Grove	49	38	37	40	50	52	0 dB
Wattle Grove North	45	38	37	27	46	46	0 dB
Casula	47	44	50	40	53	51	2 dB
Glenfield	35	40	36	32	43	54	0 dB
S1	44	49	49	39	53	55	0 dB
S2	42	49	48	37	52	55	0 dB

Review of Table 6-10 indicates that the predicted worst-case cumulative construction noise levels exceed the NML at the most affected residential receivers in Casula by up to 2 dB. This is considered a minor exceedance.

It should be noted that since the construction noise assessments for each proposal are conservative, whereby all plant items are assumed to be operating simultaneously; that the cumulative assessment is also conservative, since it assumes the highest predicted construction noise levels at the receivers from each proposal; and that the works will be conducted under a Construction Noise and Vibration Management Plan, there is a likelihood that the predicted exceedance would not occur.

7 OPERATIONAL NOISE ASSESSMENT

7.1 Operational Noise Criteria

The operational noise criteria for the MPE site were presented in the MPE Concept Plan EIS and were subsequently reviewed and accepted by relevant regulatory and approval authorities.

The *NSW Industrial Noise Policy* (INP) recommends two sets of criteria, 'intrusiveness' and 'amenity', for the assessment of operational noise. Intrusiveness criteria are only applied to residential receivers. The intrusiveness and amenity criteria established for sensitive receivers near the Proposal are presented in Table 7-1 and Table 7-2, respectively.

Table 7-1 Operational Noise Criteria – Intrusiveness

Catchment	Intrusiveness Criteria ($L_{Aeq, 15min}$)		
	Daytime[1]	Evening[1]	Night Time[1]
Wattle Grove	47	42	42
Wattle Grove North	41	41	41
Casula	46	42	39
Glenfield	49	49	42

1. Daytime 7:00am–6:00pm; Evening 6:00pm–10:00pm; Night 10:00pm-7:00am.

The INP amenity criterion for educational facilities is an internal $L_{Aeq, 1hour}$ noise level of 35 dBA. For the purposes of assessment, this criterion has been converted to an equivalent external $L_{Aeq, 1hour}$ noise level. It can be conservatively assumed that the attenuation of noise from outside to inside, via partially open windows, is 10 dB. Therefore, the equivalent external amenity criterion for educational facilities is 45 dBA.

Table 7-2 Operational Noise Criteria – Amenity

Receiver / Catchment	Indicative Noise Amenity Area	Time Period[1]	Amenity Criteria ($L_{Aeq, period}$)
Wattle Grove, Casula, Glenfield	Residential Suburban	Daytime	55
		Evening	45
		Night Time	40
Wattle Grove North	Residential Urban	Daytime	60
		Evening	50
		Night Time	45
S1, S2	School/Classroom	Noisiest 1-hour period (when in use)	35 (internal) (45 external)
I1, I2, I3	Industrial	When in use	70

1. Daytime 7:00am–6:00pm; Evening 6:00pm–10:00pm; Night 10:00pm-7:00am.

7.1.1 Sleep Disturbance Screening Levels

Screening levels for maximum operational noise levels during the night time period (10:00pm – 7:00am) were established in accordance with the INP Application Notes (www.epa.nsw.gov.au/noise/applicnotesindustnoise.htm) and are presented in Table 7-3.

Table 7-3 Sleep Disturbance Screening Levels

Catchment	Sleep Disturbance Screening Level ($L_{A,1min}$ / L_{Amax})
Wattle Grove	52
Wattle Grove North	51
Casula	49
Glenfield	52

7.2 Operational Noise Prediction Methodology and Assumptions

7.2.1 Computer Noise Model

Operational and noise emissions associated with the Proposal were modelled using the CadnaA V4.6 acoustic noise prediction software and the CONCAWE noise prediction algorithm. The CONCAWE noise propagation model is used around the world and is widely accepted as an appropriate model for predicting noise over significant distances. Factors that were addressed in the noise modelling are:

- Equipment noise level emissions and locations;
- Shielding from structures;
- Noise attenuation due to geometric spreading;
- Meteorological effects;
- Ground absorption; and,
- Atmospheric absorption.

7.2.2 Meteorological Effects

At relatively large distances from a source, the resultant noise levels at receivers can be influenced by meteorological conditions, particularly temperature inversions and winds; and can therefore vary from hour to hour and night to night. Where these factors are a feature of an area their effect on resultant noise levels is required to be taken into account.

It has been determined that the area surrounding the Proposal site is subject to temperature inversions. In accordance with the INP, default parameters have been used in this assessment to include the effects of meteorological conditions that enhance noise levels. These parameters comprise an F-class temperature inversion during the night time period. As the potentially most affected receivers are located at heights similar to, or greater than the Proposal site, drainage winds are unlikely to occur with temperature inversions and as such have not been modelled.

There is potential for gradient winds to enhance noise levels at sensitive receivers, and such conditions have the potential to arise in any of the daytime, evening or night time periods. The default parameters for the assessment of gradient winds in accordance with the INP is a 3 m/s wind from source to receiver.

The CONCAWE noise propagation model divides the range of possible meteorological conditions into six separate "weather categories", from Category 1 to Category 6. Weather Category 1 provides "best-case" (i.e. lowest noise level) weather conditions for the propagation of noise, whilst weather Category 6 provides "worst-case - Adverse Meteorological Conditions" (i.e. highest noise level), when source to receiver gradient winds exist and/or there are temperature inversions. The categories are described as follows:

- Categories 1, 2 and 3 weather conditions are generally characterised by wind blowing from the receptor to the noise source during the daytime with a temperature lapse (Pasquill stability class A, B and C).
- Weather Category 4 provides "neutral" weather conditions for noise propagation. Category 4 conditions can be characterised by no wind and a mild temperature lapse (Pasquill stability class D). Typically this weather condition occurs during the day.
- Category 5 and 6 are "worst-case - Adverse Meteorological Conditions" conditions, when winds up to 3m/s source to receiver exist and/or and temperature inversion (Pasquill stability class E, F and G).

For noise modelling purposes, consistent with the INP, typical daytime "calm meteorological conditions" conditions were modelled using Category 4 and "adverse meteorological conditions" where modelled using worst-case Category 6.

7.2.3 Noise Barriers

Warehouses and other nearby buildings are likely to provide some level of shielding to sensitive receivers. The following buildings are included in the operational noise model:

- Proposed warehouse buildings on the Proposal site;
- Warehouse buildings on the MPW site; and,
- Existing large buildings associated with ABB, DJLU and the industrial area to the north of DJLU.

In addition to shielding from buildings, a noise wall, approximately 5 metres high, has been proposed to be established along the western operational boundary of the MPW Stage 2 site (SSD-7709). It should be noted that this noise wall has been proposed as a result of the noise modelling for the MPW Stage 2 Proposal to address noise emissions generated as a result of the MPW Stage 2 Proposal, and as such is not related to the MPE Project or MPE Stage 2 Proposal. This noise wall, on the MPW site, has been included in the operational noise model.

The location and extent of the MPW Stage 2 noise wall, and the footprints of buildings included in the operational noise modelling are presented in Figure 7-1.

The NVIA for the MPE Concept Plan Approval identified a potential requirement for the establishment of a noise wall along the western boundary of the MPE site. This was based on an intermodal throughput of 500,000 TEU, and the modelling at the time did not take into account any shielding from the large warehouses proposed to be established on the MPW site. It was recommended that future detailed assessments for MPE should investigate the need for such a noise wall, based on updated modelling. The detailed assessment for the Proposal has considered this requirement and the results are included in section 7.7.

It should be noted that the proposed warehouse layout provides a significant amount of shielding to receivers located north and east of the Proposal from noise generating activities on the MPE Site, particularly those on the MPE Stage 1 site. The warehouse layout for the Proposal is considered an effective compromise between maximising the shielding of the warehouses and the efficiency of site operations.

Figure 7-1 Noise Wall and Buildings Included in Noise Model

7.3 Operational Noise Sources

7.3.1 MPE Stage 1 Sources

A complete description of the operational noise sources within the MPE Stage 1 site was presented in the Stage 1 NVIA. Table 7-4 provides a summary of the Sound Power Levels (SWL) of key noise sources identified for Stage 1 operations.

Table 7-4 Sound Power Levels – MPE Stage 1

Source	Sound Power Level at Octave Band Centre Frequency									Overall SWL (dBA)
	31.5	63	125	250	500	1k	2k	4k	8k	
Reach Stacker (diesel)	110	111	107	103	105	101	97	96	87	106
Truck – Idling	98	97	94	91	90	91	88	80	72	95
Truck – 10km/h	100	103	101	99	98	99	96	90	79	103
Locomotive – Idling	103	107	104	101	98	93	89	88	90	100
Locomotive – 10km/h	142	126	113	99	91	86	83	80	80	106
Locomotive Shifter	75	80	82	85	89	89	89	85	83	95

7.3.2 MPE Stage 2 Sources

Additional significant noise sources associated with the Proposal comprise cars and trucks accessing the warehouses from outside the site, via the access roads, and a captive fleet of internal transfer trucks, used to transfer containers between the IMT and warehouses. The SWL of the cars, warehouse trucks and the internal transfer trucks are presented in Table 7-5.

Table 7-5 Sound Power Levels – MPE Stage 2

Source	Sound Power Level at Octave Band Centre Frequency									Overall SWL (dBA)
	31.5	63	125	250	500	1k	2k	4k	8k	
Car – 40 km/h	98	102	93	87	88	87	83	74	64	91
Truck – Idling	98	97	94	91	90	91	88	80	72	95
Truck – 10 km/h	100	103	101	99	98	99	96	90	79	103
Truck – 40 km/h	91	101	103	104	103	101	98	94	86	106

7.3.3 Traffic Distribution

As described above, cars and trucks would enter the site throughout the day, bound for the warehouses. Approximately 1,936 cars (3,872 movements) and 282 trucks (564 movements) would enter the site each day.

Traffic distribution data, including hourly breakdown of the expected distribution of vehicle movements within the site is presented in Table 7-6. This data has been used to model the total number of cars and trucks travelling along relevant sections of the internal road network during the daytime, evening and night time.

Table 7-6 Daily Distribution of Vehicle Movements

Time	Cars	Trucks
Midnight - 1am	0.0%	0.8%
1 am - 2am	0.0%	0.8%
2am - 3am	0.1%	0.7%
3am - 4am	0.2%	1.0%
4am - 5am	0.6%	2.1%
5am - 6am	1.4%	4.0%
6am - 7am	3.0%	6.1%
7am - 8am	6.5%	7.3%
8am - 9am	6.0%	8.2%
9am - 10am	5.0%	8.8%
10am - 11am	4.5%	8.2%
11am – Midday	5.0%	8.2%
Midday - 1pm	5.5%	7.7%
1 pm - 2pm	6.0%	6.9%
2pm - 3pm	7.0%	7.1%
3pm - 4pm	8.0%	5.8%
4pm - 5pm	8.5%	4.7%
5pm - 6pm	8.0%	3.3%
6pm - 7pm	7.0%	2.3%
7pm - 8pm	6.0%	2.0%
8pm - 9pm	5.0%	1.3%
9pm - 10pm	4.0%	1.2%
10pm - 11pm	1.7%	0.9%
11pm – Midnight	1.0%	0.9%
Total	**100.0%**	**100.0%**
Day Time (7am-6pm)	70.0%	76.1%
Evening (6pm-10pm)	22.0%	6.8%
Night Time 9 hrs (10pm-7am)	8.0%	17.1%

7.4 Predicted Operational Noise Levels

The following section presents the predicted noise levels due to the operation of the Proposal. It is anticipated that operational noise limits will be set for the whole of the MPE Project, consistent with those established in the MPE Concept Plan. Accordingly, the following assessment will present the predicted operational noise levels from the Proposal, and the combined operation of the Proposal and the MPE Stage 1 Project. The operational noise emissions from the MPE Stage 1 Project are consistent with those presented in the NVIA for the MPE Stage 1 EIS.

7.4.1 Amenity

The predicted $L_{Aeq, period}$ operational noise levels at nearby receivers due to MPE Stage 2, and the combined operation of MPE Stage 1 and MPE Stage 2 are presented in Table 7-7 and Table 7-8, respectively.

Table 7-7 Predicted $L_{Aeq, period}$ Noise Levels – MPE Stage 2 Only

Receiver	Predicted $L_{Aeq, period}$ Noise Level (dBA)				Criteria (dBA)			Exceedance
	Day[1]	Evening[1]	Night[1]		Day[1]	Evening[1]	Night[1]	
			Calm[2]	Adverse[3]				
Wattle Grove	25	25	20	23	55	45	40	0 dB
Wattle Grove North	<20	<20	<20	<20	60	50	45	0 dB
Casula	21	21	<20	<20	55	45	40	0 dB
Glenfield	<20	<20	<20	<20	55	45	40	0 dB
S1	<20	<20	<20	<20	45 (external, when in use)			0 dB
S2	<20	<20	<20	<20	45 (external, when in use)			0 dB
I1 (MPW)	49	49	43	43	70 (external, when in use)			0 dB
I2 (DJLU)	44	44	37	38	70 (external, when in use)			0 dB
I3 (ABB)	26	26	20	24	70 (external, when in use)			0 dB

1. Daytime = 7:00am–6:00pm; Evening = 6:00pm – 10:00pm; Night = 10:00pm-7:00am.
2. CONCAWE Category 4.
3. CONCAWE Category 6.

Table 7-8 Predicted $L_{Aeq, period}$ Noise Levels – MPE Stage 1 & Stage 2

Receiver	Predicted $L_{Aeq, period}$ Noise Level (dBA)				Criteria (dBA)			Exceedance
	Day[1]	Evening[1]	Night[1]		Day[1]	Evening[1]	Night[1]	
			Calm[2]	Adverse[3]				
Wattle Grove	27	27	23	27	55	45	40	0 dB
Wattle Grove North	<20	<20	<20	<20	60	50	45	0 dB
Casula	27	27	27	32	55	45	40	0 dB
Glenfield	22	22	22	27	55	45	40	0 dB
S1	29	29	29	33	45 (external, when in use)			0 dB
S2	<20	<20	<20	<20	45 (external, when in use)			0 dB
I1 (MPW)	55	55	55	55	70 (external, when in use)			0 dB
I2 (DJLU)	44	44	37	38	70 (external, when in use)			0 dB
I3 (ABB)	30	30	28	33	70 (external, when in use)			0 dB

1. Daytime = 7:00am–6:00pm; Evening = 6:00pm – 10:00pm; Night = 10:00pm-7:00am.
2. CONCAWE Category 4.
3. CONCAWE Category 6.

Review of Table 7-7 and Table 7-8 indicates that the predicted $L_{Aeq, period}$ noise levels at sensitive receivers comply with the established amenity criteria.

7.4.2 Intrusiveness

The predicted $L_{Aeq, 15min}$ operational noise levels at nearby receivers due to MPE Stage 2, and the combined operation of MPE Stage 1 and MPE Stage 2 are presented in Table 7-9 and Table 7-10, respectively.

Table 7-9 Predicted $L_{Aeq, 15min}$ Noise Levels – MPE Stage 2 Only

Receiver	Predicted $L_{Aeq, 15min}$ Noise Level (dBA)				Criteria (dBA)			Exceedance
	Day[1]	Evening[1]	Night[1]		Day[1]	Evening[1]	Night[1]	
			Calm[2]	Adverse[3]				
Wattle Grove	26	26	24	28	47	42	42	0 dB
Wattle Grove North	<20	<20	<20	20	41	41	41	0 dB
Casula	22	22	20	25	46	42	39	0 dB
Glenfield	<20	<20	<20	<20	49	49	42	0 dB

1. Daytime = 7:00am–6:00pm; Evening = 6:00pm – 10:00pm; Night = 10:00pm-7:00am.
2. CONCAWE Category 4.
3. CONCAWE Category 6.

Table 7-10 Predicted $L_{Aeq, 15min}$ Noise Levels – MPE Stage 1 & MPE Stage 2

Receiver	Predicted $L_{Aeq, 15min}$ Noise Level (dBA)				Criteria (dBA)			Exceedance
	Day[1]	Evening[1]	Night[1]		Day[1]	Evening[1]	Night[1]	
			Calm[2]	Adverse[3]				
Wattle Grove	29	29	28	32	47	42	42	0 dB
Wattle Grove North	20	20	<20	23	41	41	41	0 dB
Casula	31	31	31	35	46	42	39	0 dB
Glenfield	20	20	20	25	49	49	42	0 dB

1. Daytime = 7:00am–6:00pm; Evening = 6:00pm – 10:00pm; Night = 10:00pm-7:00am.
2. CONCAWE Category 4.
3. CONCAWE Category 6.

Operational noise modelling results for MPE Stage 2 only and MPE Stage 1 and MPE Stage 2 (combined) shown respectively in Table 7-9 and Table 7-10 indicates that the predicted $L_{Aeq, 15min}$ noise levels at sensitive receivers comply with the established criteria.

Contour plots of night time operational $L_{Aeq, 15min}$ noise levels during calm and adverse meteorological conditions are presented in Appendix A.

7.5 Sleep Disturbance Assessment

Transient noise events associated with the operation of the site, with the potential to cause sleep disturbance include horns, tonal reversing alarms, pneumatic trailer brakes, and 'banging' noises associated with moving containers.

The use of horns and tonal reversing alarms within the Proposal site would be strongly discouraged, and promulgated via the Operational Noise Management Plan. The occasional use of horns by trucks and other mobile equipment may be required under emergency situations, and therefore is beyond the scope of the assessment. Due to the open access arrangement of the Proposal, there is potential for tonal reversing alarms to occasionally be used on site, most likely by trucks accessing the terminal or warehouse areas. The L_{Amax} SWL of a tonal reversing alarm is up to 110 dBA.

Notwithstanding the above, the loudest L_{Amax} noise source, with potential to cause sleep disturbance impacts, is pneumatic trailer brakes on trucks. The L_{Amax} SWL of a truck trailer brake is up to 122 dBA. It should be noted that this is significantly louder than a tonal reversing alarm.

The predicted L_{Amax} noise levels at nearby receivers due to pneumatic trailer brakes are shown in Table 7-11.

Table 7-11 Predicted L_{Amax} Noise Levels at Sensitive Receivers

Receiver	Predicted L_{Amax} Noise Level (dBA)		Sleep Disturbance Screening Level (dBA)	Exceedance
	Calm[1]	Adverse[2]		
Wattle Grove	50	53	52	1 dB
Wattle Grove North	32	34	51	0 dB
Casula	32	35	49	0 dB
Glenfield	22	26	52	0 dB

1. CONCAWE Category 4.
2. CONCAWE Category 6.

Review Table 7-11 indicates that the predicted L_{Amax} noise levels comply with the established sleep disturbance screening criteria in catchments Wattle Grove North, Casula and Glenfield, and no further assessment of sleep disturbance is warranted in these catchments.

The predicted L_{Amax} noise levels at the most affected receivers in Wattle Grove are predicted to exceed the established screening criterion by 1 dB, under adverse meteorological conditions. It should be noted that a 1 dB exceedance is considered negligible.

7.6 Cumulative Operational Noise Assessment

It is anticipated that the Proposal site will operate concurrently with the MPE Stage 1 site, and the MPW Stage 2 site. Since the noise sources within the sites are very similar, they are expected to have noise "signatures" which are almost identical. Therefore, it is likely that sensitive receivers will look upon the facilities as a single noise generating activity.

Accordingly, the following section presents the predicted cumulative noise levels from the cumulative operational noise scenario for MPE Stage 1, MPE Stage 2 and MPW Stage 2 facilities, and assesses them against the relevant amenity criteria.

The $L_{Aeq, period}$ noise levels at sensitive receivers due to the concurrent operation of the Proposal site, the MPE Stage 1 site, and the MPW Stage 2 site have been predicted by combining the computer noise models developed for each proposal. The predicted cumulative operational noise levels due to the operation of the cumulative scenario facilities are presented in Table 7-12.

Table 7-12 Predicted Cumulative Operational Noise Levels

Receiver	Predicted $L_{Aeq, period}$ Noise Level (dBA)				Criteria (dBA)			Exceedance
	Day[1]	Evening[1]	Night[1]		Day[1]	Evening[1]	Night[1]	
			Calm[2]	Adverse[3]				
Wattle Grove	27	27	25	29	55	45	40	0 dB
Wattle Grove North	30	30	29	33	60	50	45	0 dB
Casula	33	33	32	36	55	45	40	0 dB
Glenfield	22	22	22	27	55	45	40	0 dB
S1	29	29	29	34	45 (external, when in use)			0 dB
S2	26	26	25	29	45 (external, when in use)			0 dB
I2 (DJLU)	56	56	56	57	70 (external, when in use)			0 dB
I3 (ABB)	52	52	48	50	70 (external, when in use)			0 dB

1. Daytime = 7:00am–6:00pm; Evening = 6:00pm – 10:00pm; Night = 10:00pm-7:00am.
2. CONCAWE Category 4.
3. CONCAWE Category 6.

Predicted cumulative operational noise levels presented in Table 7-12 indicate that cumulative operational noise levels at sensitive receivers, due to the concurrent operation of MPE Stage 1, MPE Stage 2 and MPW Stage 2 comply with the relevant amenity criteria, at all times of the day.

Contour plots of night time cumulative operational noise levels during calm and adverse meteorological conditions are presented in Appendix A.

Glenfield Waste Services are proposing to develop a Materials Recycling Facility on a parcel of land south west of the Proposal, between the Georges River and the SSFL. The facility is proposed to operate during daytime hours.

Since the highest cumulative operational noise levels due to the intermodal facilities are more than 10 dB below the relevant daytime criteria at all sensitive receivers, and occur at receivers located more than 1,500 metres from the Glenfield Waste Services Proposal; when combined with the Glenfield Waste Services Proposal, they would be considered unlikely to contribute to any exceedance of daytime amenity criteria. For this reason, the Glenfield Waste Services Proposal was not included in the cumulative scenario noise assessment.

7.7 MPE Noise Wall Investigation

As outlined in Section 7.2.3, the NVIA for the MPE Concept Plan identified the potential need for a noise wall along the western boundary of the MPE site. Subsequently, the MPE Concept Plan Statements of Commitment include an undertaking to assess the requirement for a noise wall on the MPE site in the detailed assessments for each stage of the development.

In assessing potential operational noise impacts for the Proposal, as presented in the preceding Sections of this report, the requirement for a noise wall on the MPE site was investigated in optimising the layout for the Proposal. A detailed noise model was developed, which included proposed operations on both the MPE and MPW sites; and, based on the model predictions, a noise wall is not required along the western boundary, or on any other part, of the MPE site. The proposed warehouse layout would lead to an overall reduction in receiver noise levels from the combined operation of the MPE Stage 1 and Stage 2 sites.

The potential need for a noise wall along the western boundary of the MPE site was primarily driven by the operation of the intermodal terminal at 500,000 TEU. If intensification of the MPE intermodal terminal, beyond the level of 250,000 TEU, is proposed in future development stages, the investigation into the MPE noise wall would be updated.

8 ROAD NOISE ASSESSMENT

8.1 Road Noise Criteria

Applicable noise criteria for proposals which have the potential to indefinitely increase traffic on roads are presented in the *NSW Road Noise Policy* (RNP) (DECCW, 2011).

The Proposal will generate additional traffic along the M5 Motorway west of Moorebank Avenue, along Moorebank Avenue from the Proposal site northwards and minor additional traffic along Anzac Road to the Yulong industrial estate. According to the *RNP*, the M5 Motorway is classified as a Freeway, while Moorebank Avenue and Anzac Road are classified as sub-arterial roads.

The *RNP* assessment criteria for residential land uses are shown in Table 8-1.

Table 8-1 Road Noise Criteria

Road	Category	Assessment Criteria - dBA	
		Day (7am – 10pm)	Night (10pm – 7am)
M5 Motorway	Freeway	$L_{Aeq,\ 15\ hour}$ 60 (external)	$L_{Aeq,\ 9\ hour}$ 55 (external)
Moorebank Avenue, Anzac Road	Arterial Road	$L_{Aeq,\ 15\ hour}$ 60 (external)	$L_{Aeq,\ 9\ hour}$ 55 (external)

With regard to the permissible increase in road traffic noise from a land use development the *RNP* states:

> "*For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'.*"

As established in previous assessments for both the MPE and MPW projects, the existing levels of road noise at the most affected residential receivers along the M5 Motorway, Moorebank Avenue and Anzac Road exceed 60 dBA $L_{Aeq,\ 15hour}$ and 55 dBA $L_{Aeq,\ 9hour}$. Therefore, in accordance with the RNP, any increases in road noise levels at sensitive receivers along these roads should be below 2 dB.

8.2 Sensitive Receivers

The most affected residential receivers to potential increases in road noise resulting from the development are those residents located immediately adjacent to the M5 Motorway, on Moorebank Avenue north of the M5 Interchange, and on Anzac Road east of Moorebank Avenue. No sensitive receivers are identified along Moorebank Avenue between the Proposal site and the M5 Interchange.

8.3 Raising Moorebank Avenue

As outlined in Section 1.2, the proposed upgrades to Moorebank Avenue include raising the vertical alignment of a section of the road by approximately two metres. The section of Moorebank Avenue to be raised is approximately 1.4 kilometres long, and extends from the northern MPE site boundary to 120 metres south of the southern MPE site boundary. The section of Moorebank Avenue proposed to be raised is located between the MPE and MPW sites. No sensitive receivers are located adjacent to the section of Moorebank Avenue proposed to be raised. Therefore, the proposed raising of the section of Moorebank Avenue is unlikely to affect road noise levels at sensitive receivers.

8.4 Traffic Generated by the Development

8.4.1 Construction Traffic Generation

During the construction of the Proposal, all heavy vehicles, and the majority of light vehicles, will travel to and from the site via the M5 Motorway and Moorebank Avenue. Additionally, a small number of light vehicles will travel along Anzac Road, east of Moorebank Avenue, and along Moorebank Avenue, north of the M5 Motorway. No heavy vehicles, associated with the construction of the Proposal, would travel along Anzac Road, or along Moorebank Avenue, north of the M5 Motorway.

The existing and projected daily traffic volumes, and percentage heavy vehicles, along the identified roads, for the construction of the Proposal, are presented in Table 8-2. It is not yet known whether heavy construction vehicles would travel to the site, along the M5 Motorway, from the east or the west. This would depend upon factors such as the construction contractor, and the source(s) of fill. Therefore, the projected construction traffic volumes along the M5 Motorway, presented in Table 8-2, are based on all heavy construction vehicles travelling along the M5 Motorway both east and west of Moorebank Avenue. Such a scenario would not eventuate in practice, and therefore, the assessment of construction traffic noise along the M5 Motorway is conservative.

Table 8-2 Construction Traffic Volume and % Heavy Vehicles

Location	Time[1]	Existing (no Development)		Future (with Development)	
		Volume	%Heavy	Volume	%Heavy
M5 Motorway	Day	106,344	9.7	107,370	10.5
– East of Moorebank Avenue	Night	21,060	13.2	21,201	13.5
M5 Motorway	Day	124,264	10.2	125,290	10.8
– West of Moorebank Avenue	Night	24,036	11.5	24,177	11.8
Moorebank Avenue	Day	26,892	10.0	26,953	10.0
– North of M5 Motorway	Night	6,308	10.0	6,345	9.9
Anzac Road	Day	8,991	4.6	9,018	4.6
– East of Moorebank Avenue	Night	2,109	4.6	2,125	4.6

Source: Arcadis

1. Day = 7.00am – 10.00pm, Night = 10.00pm – 7.00am

8.4.2 Operational Traffic Generation

It has been determined by the client that the operational traffic flow to and from the Proposal will be primarily along the M5 Motorway west of the M5 Interchange, and along Moorebank Avenue between the site and the M5 Motorway. It is expected that a small volume of traffic would be generated along the M5 Motorway east of the M5 Interchange, along Moorebank Avenue north of the M5 Interchange, and along Anzac Road east of Moorebank Avenue.

The existing and projected daily traffic volumes, and percentage heavy vehicles, along the identified roads, for the operation of the Proposal, are presented in Table 8-3.

Table 8-3 Operational Traffic Volume and % Heavy Vehicles

Location	Time[1]	Existing (no Development)		Future (with Development)	
		Volume	%Heavy	Volume	%Heavy
M5 Motorway	Day	106,344	9.7	107,195	9.7
– East of Moorebank Avenue	Night	21,060	13.2	21,148	13.2
M5 Motorway	Day	124,264	10.2	126,817	10.5
– West of Moorebank Avenue	Night	24,036	11.5	24,572	12.8
Moorebank Avenue	Day	26,892	10.0	27,813	10.5
– North of M5 Motorway	Night	6,308	10.0	6,496	11.6
Anzac Road	Day	8,991	4.6	9,294	4.4
– East of Moorebank Avenue	Night	2,109	4.6	2,212	4.4

Source: Arcadis
1. Day = 7.00am – 10.00pm, Night = 10.00pm – 7.00am

8.5 Predicted Increases in Road Noise Levels

Using the data in Table 8-3, the increases in road noise levels along the M5 Motorway, Moorebank Avenue and Anzac Road, during the construction and operation of the Proposal, have been calculated. The calculations have been conducted using the *Calculation of Road Traffic Noise (CORTN)* algorithm, and are based upon the following assumptions:

- Vehicle speeds are 100 km/h along the M5 Motorway and 60 km/h along Moorebank Avenue and Anzac Road.
- Typical receiver setbacks are approximately 25 metres along the M5 Motorway and approximately 12 metres along Moorebank Avenue and Anzac Road. It is important to highlight that receiver setbacks are important when calculating absolute road noise levels, however setbacks are not important when calculating increases in road noise levels due to changes in traffic volume and mix.

8.5.1 Predicted Road Noise Increases During Construction

The predicted increases in road noise levels, due to the construction of the Proposal, are shown in Table 8-4.

Table 8-4 Increases in Road Noise Levels During Construction

Location	Predicted Increase (dBA)	
	Day[1]	Night[1]
M5 Motorway – East of Moorebank Avenue	0.1	0.0
M5 Motorway – West of Moorebank Avenue	0.2	0.1
Moorebank Avenue – North of M5 Motorway	0.0	0.1
Anzac Road – East of Moorebank Avenue	0.0	0.0

1. Day = 7.00am – 10.00pm, Night = 10.00pm – 7.00am

Table 8-4 shows that increases in road noise levels along the M5 Motorway, Moorebank Avenue, and Anzac Road are considerably less than 2 dB. In accordance with the RNP, no mitigation of traffic noise levels, due to the construction of the Proposal, is warranted.

8.5.2 Predicted Road Noise Increases During Operations

The predicted increases in road noise levels, due to the operation of the Proposal, are shown in Table 8-5.

Table 8-5 Increases in Road Noise Levels During Operations

Location	Predicted Increase (dBA)	
	Day[1]	Night[1]
M5 Motorway – East of Moorebank Avenue	0.0	0.0
M5 Motorway – West of Moorebank Avenue	0.2	0.3
Moorebank Avenue – North of M5 Motorway	0.3	0.5
Anzac Road – East of Moorebank Avenue	0.1	0.1

1. Day = 7.00am – 10.00pm, Night = 10.00pm – 7.00am

Table 8-5 shows that increases in road noise levels along the M5 Motorway, Moorebank Avenue, and Anzac Road are considerably less than 2 dB. In accordance with the RNP, no mitigation of traffic noise levels, due to the operation of the Proposal, is warranted.

9 MITIGATION

The preceding assessments of noise from the construction and operation of the Proposal indicate compliance with the established noise goals. Notwithstanding, the following sections present a range of mitigation and monitoring recommendations. These recommendations are largely considered standard practice for a development of this scale.

9.1 Construction

- A Construction Noise and Vibration Management Plan (CNVMP), or equivalent, would be prepared for the Proposal in accordance with the *Interim Construction Noise Guideline* (DECC, 2009) (or equivalent), and will include the following:
  - Identification of nearby residences and other sensitive land uses;
  - Description of approved hours of work;
  - Description and identification of construction activities, including work areas, equipment and duration;
  - Description of what work practices (generic and specific) will be applied to minimise noise and vibration;
  - Consider the selection of plant and processes with reduced noise emissions;
  - A complaints handling process;
  - Noise and vibration monitoring procedures;
  - Overview of community consultation required for identified high impact works;
  - Induction and training will be provided to relevant staff and sub- contractors outlining their responsibilities with regard to noise; and,
  - Procedure for approval of any works undertaken outside of the following hours:
    - Standard hours of 07:00 am to 18:00 pm Monday to Friday, and 08:00am to 13:00 pm Saturday
    - Out of hours (OOH) work periods of OOH Period 1 is 6:00am – 7:00am weekdays; OOH Period 2 is 6:00pm – 10:00pm weekdays; OOH Period 3 is 7:00am – 8:00am Saturday; and OOH Period 4 is 1:00pm – 6:00pm Saturday.
- Any works undertaken outside of the hours prescribed in mitigation measure 2A would be undertaken in consultation with relevant authorities. Works outside these hours that may be permitted would include:
  - Any works which would not result in audible noise emissions at any nearby sensitive receptors;
  - The delivery of oversized plant and/or structures that police or other authorities determine require special arrangements to transport along public roads;
  - Emergency work to avoid the loss of lives, property and/or to prevent environmental harm;
  - Maintenance and repair of public infrastructure where disruption to essential services and/or consideration of worker safety do not allow work within standard construction hours;

- Public infrastructure works that shorten the length of the project and are supported by noise-sensitive receivers;
- Construction works where it can be demonstrated and justified that these works are required to be undertaken outside of standard construction hours; and,
- Any other work as approved through the CNVMP.

- In the event of any noise or vibration related complaint or adverse comment from the community, noise and ground vibration levels (as relevant) would be investigated. Remedial action would be implemented where feasible and reasonable. The procedures for managing complaints would be provided within the Community Information and Awareness Strategy.

9.2 Operational

- An Operational Noise Management Plan (ONMP) would be prepared which includes a framework for regular monitoring of operational noise. Monitoring would begin at the commencement of the operation of the Proposal and would be conducted on an annual basis for up to 2 years (after commencement of operations of the Proposal).
- In the event of any noise or vibration related complaint or adverse comment from the community, noise and ground vibration levels (as relevant) would be investigated. Remedial action would be implemented where feasible and reasonable. The procedures for managing complaints would be provided within the Community Information and Awareness Strategy.

10 CONCLUSION

Wilkinson Murray Pty Limited (WM) has conducted a Noise and Vibration Impact Assessment (NVIA) for Stage 2 (the Proposal) of the Moorebank Precinct East Project (MPE Project). This report forms part of the Environmental Impact Statement (EIS) for approval of the Proposal.

The nearest potentially affected noise sensitive receivers have been identified. These receivers comprise residential, industrial, educational and recreational land uses. Potential noise and vibration impacts at sensitive receivers, associated with the construction and operation of the Proposal, have been considered, along with potential cumulative noise impacts from other significant developments in the surrounding area.

Noise levels at sensitive receivers have been predicted using a computer noise model created with the CadnaA software package. Noise source and receiver locations, and details of warehouse buildings and surrounding topography have been incorporated into the noise model.

Construction noise levels during all a construction works activities during standard construction hours for the Proposal are anticipated to comply with the established Noise Management Levels (NML) at all sensitive receivers. Construction noise levels during all proposed out of hours works periods are predicted to comply with the NML at all times, except those during weekday evenings in Wattle Grove, which are predicted to exceed the NML by up to 1 dB. This exceedance is considered negligible and does not require mitigation.

Cumulative construction noise levels due to concurrent activities associated with MPW Early Works, MPW Stage 2, MPE Stage 1 and the Proposal are predicted to comply with the NML at all receivers, except for the most sensitive receivers in Casula. At these receiver locations, cumulative construction noise levels may exceed the NML by up to 2 dB. This is considered a minor exceedance.

Due to the large separation distances between the Proposal and nearby sensitive receivers, construction vibration impacts are considered unlikely.

A Construction Noise and Vibration Management Plan (CNVMP) would be developed for the Proposal, considering all reasonable and feasible measures to reduce noise levels at sensitive receivers.

This noise assessment has found that operational levels from the Proposal, and in concurrent operation with MPE Stage 1, comply with the relevant criteria, including relevant sleep disturbance goals. Additionally, cumulative noise levels due to the concurrent operation of MPE Stage 1 and Stage 2, and the Moorebank Precinct East (MPW) Stage 2 Proposal are predicted to comply with the established criteria.

The Proposal has the potential to increase road noise levels at sensitive receivers along the M5 Motorway, Moorebank Avenue and Anzac Road. Any increases in road noise levels at sensitive receivers along these roads, due to both the construction and operation of the Proposal, are predicted to be well below 2 dB, and in accordance with the *NSW Road Noise Policy,* no mitigation is necessary.

On the basis of the assessments conducted by WM, it is concluded that noise and vibration impacts associated with the construction and operation of the Proposal are not expected to degrade the existing acoustic environment, or create significant annoyance to nearby sensitive receivers.

APPENDIX A

NOISE CONTOUR PLOTS

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Figure A-1 Night Time $L_{Aeq, 15min}$ Operational Noise Levels – Calm Meteorological Conditions

Figure A-2 Night Time $L_{Aeq, 15min}$ Operational Noise Levels – Adverse Meteorological Conditions

Figure A-3 Night Time $L_{Aeq, period}$ Cumulative Operational Noise Levels – Calm Meteorological Conditions

Figure A-4 Night Time $L_{Aeq, period}$ Cumulative Operational Noise Levels – Adverse Meteorological Conditions